Units independent Avogadro number and its applications in unification

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December 20, 2011

Abstract: By implementing the gravitational constant in atomic and nuclear physics, independent of the CGS and SI units, Avogadro number can be obtained very easily. It is observed that, either in SI system of units or in CGS system of units, value of the order of magnitude of Avogadro number $\cong N \cong 6 \times 10^{23}$ but not 6×10^{26}. 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 may be the beginning of unification of 'gravitational and non-gravitational interactions'.

Keywords: Avogadro number, classical gravitational constant, atomic gravitational constant and unification.

1 Current status of the Avogadro number

History: Avogadro's number, N is the fundamental physical constant that links the macroscopic physical world of objects that we can see and feel with the submicroscopic, invisible world of atoms. In theory, N specifies the exact number of atoms in a palm-sized specimen of a physical element such as carbon or silicon. The name honors the famous Italian mathematical physicist Amedeo Avogadro (1776-1856), who proposed that equal volumes of all gases at the same temperature and pressure contain the same number of molecules [1-6]. Long after Avogadro's death, the concept of the mole was introduced, and it was experimentally observed that one mole (the molecular weight in grams) of any substance contains the same number of molecules. This number is Avogadro's number, although he knew nothing of moles or the eponymous number itself. Today, Avogadro's number is formally defined to be the number of carbon-12 atoms in 12 grams of unbound carbon-12 in its rest-energy electronic state. The current state of the art estimates the value of N, not based on experiments using carbon-12, but by using x-ray diffraction in crystal silicon lattices in the shape of a sphere or by a watt-balance method. According to the National Institute of Standards and Technology (NIST), the current accepted value for $N \cong (6.0221415 \pm 0.0000010) \times 10^{23}$. This definition of N and the current experiments to estimate it, however, both rely on the precise definition of a gram.

Current status: *The situation is very strange and sensitive. Now this is the time to think about the significance of 'Avogadro number' in a unified approach. It couples the gravitational and non-gravitational interactions. It is observed that, either in SI system of units or in CGS system of units, value of the order of magnitude of Avogadro number* $\cong N \cong 6 \times 10^{23}$ *but not* 6×10^{26}. *But the most surprising thing is that, without implementing the classical gravitational constant in atomic or nuclear physics this fact cannot understood. It is also true that till today no unified model (String theory or Supergravity) successfully implemented the gravitational constant in the atomic or nuclear physics.* Really this is a challenge to the modern nuclear physics and astrophysics.

1.1 Mystery of the gram mole

If $M_P \cong \sqrt{\frac{\hbar c}{G}}$ is the Planck mass and m_e is the rest mass of electron, semi empirically it is observed that,

$$M_g \cong N^{-\frac{1}{3}} \cdot \sqrt{(N \cdot M_P)(N \cdot m_e)} \cong 1.0044118 \times 10^{-3}\ Kg \tag{1}$$

$$M_g \cong N^{\frac{2}{3}} \cdot \sqrt{M_P m_e} \tag{2}$$

Here M_g is just crossing the mass of one gram. If m_p is the rest mass of proton,

$$\frac{M_g}{m_p} \cong N \cong 6.003258583 \times 10^{23} \tag{3}$$

$$\frac{\sqrt{M_P m_e}}{m_p} \cong N^{\frac{1}{3}} \tag{4}$$

More accurate empirical relation is

$$\frac{2\sqrt{M_P m_e}}{(m_p c^2 + m_n c^2 + m_e c^2 - B_a)} \cong N^{\frac{1}{3}} \tag{5}$$

where m_n is the rest mass of neutron, and $B_a \cong 8$ MeV is the mean binding eneregy of nucleon. Obtained value of $N \cong 6.023144823 \times 10^{23}$.

These are very simple and strange observations. But their interpretation seems to be a big puzzle in fundamental physics.

1.2 Squared Avogadro number in unification

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.

$$G_A m_p^2 \cong G_C M_g^2 \tag{6}$$

$$\left(\frac{M_g}{m_p}\right)^2 \cong N^2 \cong \frac{G_A}{G_C} \tag{7}$$

where m_p = operating mass unit in atomic physics $\cong$ mass of proton
M_g = operating mass unit in classical physics
G_A is the atomic gravitational constant
and G_C the classical gravitational constant.

Hence $M_g \cong N \times m_p \cong 1.0072466 \times 10^{-3}\ Kg \cong 1.0072466$ gram. In this way gram mole can be understood. Clearly speaking Avogadro number is the square root of ratio of atomic gravitational constant G_A and the classical gravitational constant G_C. Magnitude of $G_A \cong N^2 G_C = 2.420509614 \times 10^{37}\ m^3 kg^{-1} sec^{-2}$.

Another interesting observation is

$$\ln \sqrt{\frac{e^2}{4\pi\epsilon_0 G_C m_p^2}} \cong \sqrt{\frac{m_p}{m_e} - \ln\left(N^2\right)} \tag{8}$$

Here m_p is the proton rest mass and m_e is the electron rest mass. N is the Avogadro number and G_C is the gravitational constant. $\frac{e^2}{4\pi\epsilon_0 G m_p^2}$ is the electromagnetic and gravitational force ratio of proton.

Here in this equation, Lhs = 41.55229152; Rhs = 41.55289244; This is an excellent fit. In grand unification program this type of fitting can not be ignored. This relation clearly suggests that there exists a definite relation between m_p, m_e and N^2. Considering all the atomic physical constants, obtained value of the gravitational constant is $6.666270179 \times 10^{-11}\ m^3 Kg^{-1} sec^{-2}$.

1.3 To fit the Avogadro number with gravitational constant and other atomic constants

It is well established that, in β decay, neutron emits an electron and transforms to proton. Thus the nuclear charge changes and the nucleus gets stability. From the semi empirical mass formula, it is established that,

$$Z \cong \frac{A}{2 + (E_c/2E_a)\, A^{2/3}}. \tag{9}$$

where Z = number of protons of the stable nucleus and A =number of nucleons in the stable nucleus. E_a and E_c are the asymmetry and coulombic energy constants of the semi empirical formula [6]. Semi empirically it is noticed that,

$$A_S \cong 2Z + \frac{Z^2}{S_f} \cong 2Z + \frac{Z^2}{157.069} \tag{10}$$

Here S_f is a new number and can be called as the nuclear stability factor and A_S is stable mass number. With reference to the ratio of neutron and electron rest masses, S_f can be expressed

$$S_f \cong \sqrt{\alpha} \cdot \frac{m_n}{m_e} \cong 157.0687113 \tag{11}$$

Here α is the fine structure ratio. If Z= 21, A_S = 44.8, Z= 29, A_S = 63.35, Z=47, A_S = 108.06, Z=79, A_S = 197.73 and Z=92, A_S = 237.88. By considering A as the fundamental input its corresponding stable Z = Z_S takes the following form.

$$Z_S \cong \left[\sqrt{\frac{A}{157.069} + 1} - 1\right] 157.069 \tag{12}$$

Thus Green's stability formula in terms of Z takes the following form.

$$\frac{0.4A^2}{A + 200} \cong A_S - 2Z \cong \frac{Z^2}{S_f}. \tag{13}$$

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

$$(m_n - m_p)\, c^2 \cong \ln\left(\sqrt{S_f}\right) m_e c^2 \cong 1.29198 \text{ MeV} \tag{14}$$

Here m_n, m_p and m_e are the rest masses of neutron, proton and electron respectively. Semi empirically it is noticed that

$$\frac{E_c}{2E_a} \cdot \frac{e^{S_f}}{N} \cong \frac{e^2}{4\pi\varepsilon_0 G_C m_e^2} \tag{15}$$

Electron rest mass can be expressed as

$$m_e \cong \sqrt{\frac{2E_a}{E_c} \cdot \frac{N}{e^{S_f}}} \cdot \sqrt{\frac{e^2}{4\pi\varepsilon_0 G_C}} \tag{16}$$

Here N is the Avogadro number. $\frac{e^2}{4\pi\varepsilon_0 G_C m_e^2}$ is the electromagnetic and gravitational force ratio of electron. In this proposal the important questions are: What is the role of Avogadro number in β decay ? and How to interpret the expression $\sqrt{\frac{e^2}{4\pi\varepsilon_0 G_C}}$? This is a multi-purpose expression. Either the value of Avogadro number or the value of gravitational constant can be fitted. Multiplying and dividing RHS of equation (16) by N

$$m_e c^2 \cong \sqrt{\frac{2E_a}{E_c} \cdot \frac{N^3}{e^{S_f}}} \cdot \sqrt{\frac{e^2}{4\pi\varepsilon_0} \cdot \frac{c^4}{N^2 G_C}} \cong X_E \cdot \sqrt{\frac{e^2}{4\pi\varepsilon_0} \cdot \frac{c^4}{G_A}} \tag{17}$$

where $X_E \cong \sqrt{\frac{2E_a}{E_c} \cdot \frac{N^3}{e^{S_f}}} \cong 295.33$ can be called as the 'gravitational mass generator' of charged leptons.

1.4 Nuclear charge radius, atomic gravitational constant and the Hydrogen atom

In 1911 under the supervision of Rutherford, H. Giger and E. Marseden [7] for the first time experimentally showed that A being the number of nucleons in the nucleus, nuclear size is the order of

$$R_A \cong A^{\frac{1}{3}} \cdot 1.4 \text{ fermi} \cong \mathrm{A}^{\frac{1}{3}} \cdot \mathrm{R}_0 \tag{18}$$

Later electron scattering experiments revealed that close to a distance of $A^{\frac{1}{3}} \cdot R_0$ 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 $G_A \cong N^2 G_C$ but not G_C.

$$-\frac{e^2}{8\pi\epsilon_0 a_0} \cong -\frac{e^2}{4\pi\epsilon_0 G_A m_e^2} \times \frac{e^2}{4\pi\epsilon_0 R_0} \tag{19}$$

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.

$$X_E^2 \cong \frac{e^2}{4\pi\epsilon_0 G_A m_e^2} \tag{20}$$

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

$$-\frac{e^2}{8\pi\epsilon_0 a_0} \cong -\frac{1}{X_E^2} \times \frac{e^2}{4\pi\epsilon_0 R_0} \tag{21}$$

$$a_0 \cong \frac{4\pi\epsilon_0 G_A m_e^2}{2e^2} \times R_0 \tag{22}$$

$$\frac{a_0}{R_0} \cong \frac{4\pi\epsilon_0 G_A m_e^2}{2e^2} \cong \frac{X_E^2}{2} \tag{23}$$

With reference to Bohr's theory of Hydrogen atom, revolving electrons basic quanta of angular momentum can be expressed as

$$m_e v r \cong \hbar \cong \sqrt{\frac{G_A\, m_e^3\, R_0}{2}} \cong N\sqrt{\frac{G_C\, m_e^3\, R_0}{2}} \tag{24}$$

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

$$\frac{\hbar}{N} \cong \frac{h}{2\pi N} \cong \sqrt{\frac{G_C\, m_e^3\, R_0}{2}} \tag{25}$$

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. 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? Revolving electron‘s quantum of circulation can be expressed as

$$vr \cong \sqrt{\frac{G_A\, m_e\, R_0}{2}} \cong \frac{\hbar}{m_e} \cong N\sqrt{\frac{G_C\, m_e\, R_0}{2}} \tag{26}$$

Guessing that quantum mechanics play a vital role in nuclear physics, minimum scattering distance electron and the nucleus or the characteristic nuclear charge radius can be expressed as

$$R_0 \cong \left(\frac{\hbar c}{G_A m_e^2}\right)^2 \frac{2G_C m_e}{c^2} \cong \frac{2\hbar^2}{G_A m_e^3} \cong 1.215650083 \text{ fermi} \tag{27}$$

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.

$$N \cong \sqrt{\frac{2\hbar^2}{G_C m_e^3 R_0}} \tag{28}$$

If Avogadro number is known, value of G_C can be directly estimated from the atomic physical constants accurately.

$$G_C \cong \frac{2\hbar^2}{N^2 m_e^3 R_0} \tag{29}$$

Accuracy depends only on the value of R_0. But till today its origin is a mystery. In all of the above empirical relations, either in SI system of units or in CGS system of units, value of the order of magnitude of N is close to 6×10^{23} but not 6×10^{26}.

1.5 Ratio of Planck mass and the electron mass

It is noticed that ratio of planck mass and electron mass is 2.389×10^{22} and is 25.2 times smaller than the Avogadro number. It is also noticed that the number 25.2 is close to 8π. 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.

$$\frac{M_P}{m_e} \cong \sqrt{\frac{\hbar c}{G_C m_e^2}} \cong 2.3892245954 \times 10^{22} \cong \frac{N}{8\pi} \tag{30}$$

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

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

Accepted value of $m_e = 9.109382154 \times 10^{-31}\ kg$ and accuracy is 99.7116%.

$$m_e \cong \frac{8\pi}{N\sqrt{\alpha}}\sqrt{\frac{e^2}{4\pi\epsilon_0 G_C}} \cong \frac{8\pi}{\sqrt{\alpha}}\sqrt{\frac{e^2}{4\pi\epsilon_0 G_A}} \tag{32}$$

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

$$X_E \cong \frac{8\pi}{\sqrt{\alpha}} \cong 294.2098 \cong \sqrt{\frac{4\pi\epsilon_0 \left(N^2 G_C\right) m_e^2}{e^2}} \cong 295.0606338 \tag{33}$$

can be called as the lepton-quark-nucleon gravitational mass generator. It is the utmost fundamental ratio compared to the fine structure ratio α.

1.6 The characteristic 'atomic planck mass', 'atomic coulomb mass' and the dark matter

With reference to the above relations it is possible to define two new mass units as

$$m_X \cong \sqrt{\frac{e^2}{4\pi\epsilon_0 \left(N^2 G_C\right)}} \cong 3.087291597 \times 10^{-33}\ Kg \tag{34}$$

$$m_X c^2 \cong \sqrt{\frac{e^2 c^4}{4\pi\epsilon_0 \left(N^2 G_C\right)}} \cong \sqrt{\frac{e^2}{4\pi\epsilon_0}\left(\frac{c^4}{G_A}\right)} \cong 1.731843735\ KeV \tag{35}$$

Similar to the Planck mass, 'Atomic plamck mass' can be represented as

$$m_P \cong \sqrt{\frac{\hbar c}{\left(N^2 G_C\right)}} \cong 3.614056909 \times 10^{-32}\ Kg. \tag{36}$$

$$m_P c^2 \cong \sqrt{\frac{\hbar c^5}{\left(N^2 G_C\right)}} \cong \sqrt{\hbar c\left(\frac{c^4}{G_A}\right)} \cong 20.27337431\ KeV \tag{37}$$

Conceptually these two mass units can be compared with the characteristic building block of the 'charged' or 'neutral' dark matter [8]. 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. 1.731843735 KeV is very close the (neutral) neutrino mass. 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.

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

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.

can be considered as the basic charged lepton or lepton potential. It can be considered as the basic charged 'dark matter' candidate.

1.7 To fit the Muon and Tau rest masses

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

$$m_l c^2 \cong \left[X_E^3 + \left(n^2 X_E\right)^n \sqrt{N}\right]^{\frac{1}{3}} \sqrt{\frac{e^2 c^4}{4\pi\epsilon_0 G_A}} \cong \frac{2}{3}\left[E_c^3 + \left(n^2 X_E\right)^n E_a^3\right]^{\frac{1}{3}} \quad (38)$$

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 β decay. See the following table-1. Obtained data can be compared with the PDG recommended charged lepton masses [9]. If electron mass is fitting at n = 0, muon mass is fitting at n = 1 and tau mass is fitting at n = 2 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. At n=3 there may exist a heavy charged lepton at 42262 MeV. 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.

2 New concepts and semi empirical results in unification

1. N being the Avogadro number, mole number of particles effective atomic gravitational constant [10-15] is $G_M \cong N \cdot G_C$. In N number of bound particles, average force requied to bind or seperate any one particle is $\frac{1}{N} \cdot \frac{c^4}{G_M} \cong \frac{c^4}{N^2 G_C} \cong \frac{c^4}{G_A}$

2. Nuclear weak force magnitude for any one particle is $F_W \cong \frac{c^4}{G_A} \cong 3.337152088 \times 10^{-4}$ newton.

3. Nuclear strong force and weak force magnitudes can be correlated as $\sqrt{\frac{F_S}{F_W}} \cong 2\pi \ln\left(N^2\right)$. Thus $F_S \cong 157.9944058$ newton.

4. Inverse of the fine structure ratio $= \frac{1}{\alpha} \cong \frac{1}{2}\sqrt{X_E^2 - \left[\ln\left(N^2\right)\right]^2} \cong 136.9930484.$

5. Characteristic nuclear size is $R_0 \cong \sqrt{\frac{e^2}{4\pi\varepsilon_0 F_S}} \cong 1.208398568$ fm.

6. Nuclear weak energy constant is $E_W \cong \sqrt{\frac{e^2 F_W}{4\pi\varepsilon_0}} \cong 1.731844 \times 10^{-3}$ MeV.

7. The proton-nucleon nuclear stability factor is $S_f \cong X_E - \frac{1}{\alpha} - 1 \cong 157.0246441$. Proton and nucleon stability relation can be expressed as, stable mass number $= A_S \cong 2Z + \frac{Z^2}{S_f}$ where Z is the proton number.

8. At n $=$ 1 and $n = 2$, with reference to electron rest mass , neutron and proton rest energy $= \left(mc^2\right)_n \cong \frac{S_f}{\sqrt{\alpha}} m_e c^2 - x\left(2^x + \frac{E_c}{2E_a}\right) m_e c^2$ where $x = (-1)^n$, E_c and E_a are the coulombic and asymmetry energy constants of semi empirical mass formula.

9. Proton rest mass is $m_p c^2 \cong \left(\frac{F_S}{F_W} + X_E^2 - \frac{1}{\alpha^2}\right) E_W \cong 938.1791391$ MeV. Neutron, proton mass difference is $m_n c^2 - m_p c^2 \cong \sqrt{\frac{F_S}{F_W} + X_E^2} \cdot E_W \cong 1.29657348$ MeV.

10. Electroweak energy scale is $\varepsilon_W \cong \frac{F_S}{F_W} \times m_e c^2 \cong \frac{F_S}{F_W} \times 0.511 \cong 241927.75$ MeV. This is a very simple confirmation for the proposed definitions of F_S and F_W.

11. Weak coupling angle is $\sin\theta_W \cong \frac{1}{\alpha X_E} \cong 0.464433353 \cong \frac{\text{Up quark mass}}{\text{Down quark mass}}$.

12. Relation between electron rest mass and up quark rest mass can be expressed as $\frac{Uc^2}{m_e c^2} \cong \left[\frac{m_e^2 c^4}{\hbar c F_W}\right]^{\frac{1}{3}} \cong 8.596650881 \cong e^{\alpha X_E}$. Relation between up quark and down quark rest masses is $\frac{Dc^2}{Uc^2} \cong \ln\left[\frac{Uc^2}{m_e c^2}\right] \cong 2.151372695 \cong \alpha X_E$. Up, strange and bottom quarks are in first geometric series and Down, charm and top quarks are in second geometric series.

13. USB geometric ratio is $g_U \cong \left[\frac{D}{U} \cdot \frac{D+U}{D-U}\right]^2 \cong \left[\alpha X_E \cdot \frac{\alpha X_E+1}{\alpha X_E-1}\right]^2 \cong 34.66$ and DCT geometric ratio is $g_D \cong \left[2 \cdot \frac{D}{U} \cdot \frac{D+U}{D-U}\right]^2 \cong \left[2 \cdot \alpha X_E \cdot \frac{\alpha X_E+1}{\alpha X_E-1}\right]^2 \cong 138.64 \cong 4r_U$.

14. Surprisingly it is also noticed that $\frac{1}{\alpha_s} \cong \ln(r_U r_D) \cong 8.4747 \cong \frac{1}{0.1179598}$. Interesting observation is $\left(\frac{1}{\alpha} + \frac{1}{\alpha_s}\right)\sqrt{UD} \cdot c^2 \cong m_p c^2$ and $\frac{\sqrt{UD} \cdot c^2}{(m_n - m_p)c^2} \cong \ln\left(\frac{1}{\alpha} + \frac{1}{\alpha_s}\right)$ where m_p and m_n are the rest mass of proton and neutron.

15. Magnetic moment of electron is $\mu_B \cong \frac{ec}{2}\sqrt{\frac{e^2}{4\pi\varepsilon_0 F_W}}\sin\theta_W$ and magnetic moment of nucleon is $\mu_n \cong \frac{ec}{2}\sqrt{\frac{e^2}{4\pi\varepsilon_0 F_S}}\sin\theta_W \cong \frac{ecR_0}{2}\sin\theta_W$ where R_0 is unit nuclear size or nucleon size.

16. $X_S \cong \ln\left(X_E^2\sqrt{\alpha}\right) \cong 8.91424 \cong \frac{1}{\alpha_s}$ can be considered as 'inverse of the strong coupling constant'.

17. With reference to proton rest energy, semi empirical mass formula coulombic energy constant can be expressed as $E_c \cong \frac{\alpha}{X_S} \cdot m_p c^2 \cong \alpha \cdot \alpha_s \cdot m_p c^2 \cong 0.7681\ MeV$.

18. Pairing energy constant is close to $E_p \cong \frac{m_p c^2 + m_n c^2}{S_f} \cong 11.959$ MeV and asymmetry energy constant can be expressed as $E_a \cong 2E_p \cong 23.918$ MeV.

19. Volume and surface energy constants and asymmetric and pairing energy constants can be related as $E_a - E_v \cong E_s - E_p \cong (X_S + 1)\,E_c \cong$

7.615 MeV. $E_v + E_s \cong E_a + E_p \cong 3E_p$. Thus $E_v \cong 16.303$ MeV and $E_s \cong 19.574$ MeV. It is also noticed that, $\frac{E_a}{E_v} \cong 1 + \sin\theta_W$ and $\frac{E_a}{E_s} \cong 1 + \sin^2\theta_W$. Thus $E_v \cong 16.332$ MeV and $E_s \cong 19.674$ MeV.

20. Nuclear binding energy can be fitted with 2 terms or 5 factors with $E_c \cong 0.7681$ MeV as the single energy constant. First term can be expressed as $= T_1 \cong (f)(A+1)\ln[(A+1)X_S]E_c$, second term $= T_2 \cong \left[\frac{A^2+(f.Z^2)}{X_S^2}\right]E_c$ where $f \cong 1 + \frac{2Z}{A_S} \cong \frac{4S_f+Z}{2S_f+Z} < 2$ and $A_S \cong 2Z + \frac{Z^2}{S_f} \cong 2Z + \frac{Z^2}{157.025}$. Close to the stable mass number, binding energy $= T_1 - T_2$.

3 Conclusion

Estimating the value of Avogadro number and its order of magnitude is a challenging task in classical or unified physics. In this paper authors proposed many interesting relations for estimating the Avogadro number. Not only that, its absolute value was fitted independent of the various system of units. The very interesting thing is that in this new approach, the classical gravitational constant can also be implemented in atomic and nuclear physics.

Authors showed many applications in this new direction. Developing a true grand unified theory at 'one go' is not an easy task. In this critical situation, qualitatively proposed semi empirical relations can be given a chance in understanding and developing the grand unified concepts. This new branch of physics can be called as 'Avogadro's Atomic Gravity' or 'Strong Nuclear Gravity' [10-15]. Authors request the world science community to kindly look into this new approach.

Acknowledgements

First author is very much thankful to professor S. Lakshminarayana, Dept. of Nuclear physics, Andhra university, India for his kind and valuable guidance. Same author is indebted to professor K. V. Krishna Murthy, Chairman, Institute of Scientific Research on Vedas (I-SERVE), Hyderabad, India and Shri K. V. R. S. Murthy, former scientist IICT (CSIR) Govt. of India, Director, Research and Development, I-SERVE, for their valuable guidance and great support in developing this subject.

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