FORCE AND GEOMETRY

Alberto Coe

albamv8@hotmail.com

Abstract.

Will describe a geometric link related with the ratio between two physical forces, gravitational force and electromagnetic force.

Keywords. Gravity, electromagnetism, geometry.

Let’s write gravitational force between proton and electron:

\[ F_G = \frac{G e_p m_p}{r^2} \]

Newtonian constant of gravitation \( G = 6.6735 \times 10^{-11} \frac{m^3}{kg s^2} \)
Electron mass = \( 9.109382 \times 10^{-31} \) Kg
Proton mass = \( 1.67262 \times 10^{-27} \) Kg

Now the electromagnetic force between two units of electric charge:

\[ F_{EM} = \frac{KQ^2}{r^2} \]

Coulomb’s constant = \( 8.9875518 \times 10^9 \frac{N m^2}{C^2} \)
Electric charge = \( 1.602176 \times 10^{-19} \) J

Since the distance (\( r \)) is the same in the two forces, shall ignore.

The comparison, ie the ratio, between gravitational force and electromagnetic force when proton and electron are used:

\[ \frac{F_G}{F_{EM}} = 4.4074 \times 10^{-40} \]

Will see what type of geometric value matches the dimensionless value described before. First write the length’s geometric unit from which we start:

\[ \text{it} = \left( \frac{1}{10^{34}} \right) \]

(in reference to the expression coined by the physicist J.A.Wheeler: “its from bits”)[1].
Note that one ‘it’ is close to the Planck scale = \(10^{-35}\)

Now let’s define a particular volume’s unit:

\[ V_{it} = \frac{32}{3} \pi \left[ N_A(it) \right]^4 \]

Or, in order to an easier visualization (fig 1):

\[ V_{it} = \frac{4}{3} \pi \left[ N_A(it) \right]^3 \left[ 8N_A(it) \right] \]

\(N_A\) refers to Avogadro’s number = 6.02214 \(x\) \(10^{23}\)

Resulting \(V_{it} = 4.4074 \times 10^{-40}\)

Therefore:

\[ \frac{F_G}{F_{EM}} = V_{it} \]

Bibliography.