

# CLASSICAL MECHANICS OF CHARGE, SPACE, TIME WITHOUT MASS DIMENSION

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**ABSTRACT.** This paper continues from the author's earlier paper of Simple Unified Theory (SUT). It extends the new electric classical mechanics based on electric charge, space and time without mass as an independent physical dimension. Mass is now a defined concept as magnitude of charge times volume of charge. New definitions of an electric unified atomic unit and an electric kilogram have been introduced. A complex Coulomb's law is developed with a formal analytical extension of the electric charge as a complex quantity; a charge  $Q$  of magnitude  $q$  is represented as  $z = Q + i q k$  where the constant  $k$  is dependent on the system of units. The complex Coulomb's law for the forces between two charges  $z_1, z_2$  at distance  $r$  apart is:  $\mathbf{F} = \frac{1}{4\pi\epsilon_0} \frac{z_1 z_2}{r^2} \hat{\mathbf{r}}$ . The forces acting between two Hydrogen-1 atoms would be shown to have a net attractive force; this explains how gravity is the result of a slight excess of Coulomb attractions over repulsions.

## 1. INTRODUCTION

This paper continues from the author's earlier paper on Coulomb electric gravity and an aether simple unified theory (SUT) [6]. The paper proposes a new classical mechanics without mass as an independent physical dimension of the natural world. It may be called '*Electric Mechanics*' as it is a new classical mechanics without mass as an independent physical dimension of the natural world. The fundamental physical dimensions of nature would be charge, space and time instead of the traditional mass, space and time. Mass in electric mechanics is now a defined concept dependent on electric charge and space. The electric mechanics is fundamentally the same mechanics of Newton's '*Principia*' [1]. Although this introduces no new principle in classical mechanics, it does have great implications to physics if it is found to be the correct mechanics of the physical world.

Currently, mainstream physics academia has accepted the relativistic mechanics of Einstein's special relativity to be the correct mechanics of the physical world replacing Newtonian mechanics. It has to be noted that the relativistic mechanics is founded on the postulates of special relativity together with the hypothesis of mass-energy equivalence quantitatively represented by the equation  $E = mc^2$ . Newtonian mechanics, on the other hand, is founded on Newton's three axioms of motion together with the concept of an invariant mass

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*Key words and phrases.*

as '*quantity-of-matter*'. The two mechanics are two completely independent mechanics that cannot be compared or brought into relationship in any manner. The physical reality of nature may only be consistent with one mechanics, either Newtonian mechanics or relativistic mechanics, but not both. The physics community has to come to a conclusion as to which of the two mechanics truly represents physical reality. It has to either accept Newton and dismisses Einstein or it accepts Einstein and dismisses Newton; there is no compromise.

## 2. POSTULATES OF THE SIMPLE UNIFIED THEORY (SUT)

The mechanics of SUT is a new interpretation of Newtonian mechanics developed within the physical dimensions of space, time and electric charge. The independent physical dimension of mass - as '*quantity-of-matter*' - is no more needed. Newton at his time could not have known that matter consists of atoms with charged particles of protons and electrons. Today, we have the new knowledge of the fundamental makeup of matter as atoms. It is this new knowledge that allow us to reinterpret Newton's '*quantity-of-matter*'. The new formal definition of mass can now be proposed solving one of the unsolved '*greatest mystery*' of physics: '*what is mass?*'.

*Mass is defined as the magnitude of charge times volume*

For an amount of electric charge  $Q$  occupying a volume  $V$ , its mass is the magnitude of  $QV$ .

There are eight (previously seven; added the mass postulate) basic postulates of SUT:

- (1) The electric charge - The material substance of the universe is the electric charge, positive and negative. The total amount of positive charge in the universe is a constant equal to the total amount of negative charge.
- (2) The aether - The aether is the substance of space. It is a superposition of two uniform charge density  $+\rho_a$  and  $-\rho_a$ . It fills all space except the volumes of discrete electric matter. An aether volume element is electrically neutral, but may be polarized giving an electric dipole.
- (3) Matter - Atoms of matter are formed from the fundamental subatomic particles of the proton and the electron. The electron has an electron charge of  $-e$  distributed uniformly within a sphere of constant volume  $V_e$ . The proton has an equal electron charge of  $+e$  distributed uniformly within a sphere of constant volume  $V_p$ .
- (4) Matter creation and uncreation - Subatomic particles in pairs of equal unlike charges, such as the proton and electron, are created from the aether charge; they may be uncreated returning to the aether.
- (5) Force - There is only a single universal force. It is the Coulomb electrical forces of attraction and repulsion. The attraction of unlike charges exceeds that of repulsion between like charges by a small fixed amount.

- (6) Energy - The source of all energy is electrical. It takes only three forms: 1) light energy as electric waves in the aether 2) electrical potential energy of matter 3) the kinetic energy of matter. Matter creation and un-creation may involve transformation of energy.
- (7) Universal gravitation - Gravity is the result of the small excess of Coulomb attraction over repulsion. If the electric constant for Coulomb repulsion is  $k = \frac{1}{4\pi\epsilon_0}$  fo SI units, then the electric constant of attraction is  $k(1+d)$  where  $d = Gm_h^2/2ke^2$ ;  $G$  being the gravitational constant,  $m_h$  the mass of hydrogen  $^1\text{H}$  in kilogram,  $e$  the electron charge in coulomb.
- (8) The mass postulate - The mass of an amount of electric charge  $Q$  occupying a volume  $V$  is defined to be the magnitude of  $QV$ . The dimension of mass is [Coulomb][Length]<sup>3</sup>. It is proposed that the charge of the proton and the electron have volumes of  $V_p, V_e$  respectively; this effectively introduces two universal constants in physics. Their masses would then be  $eV_p, eV_e, e$  being the electron charge.

### 3. NEW DEFINITION OF ELECTRIC UNIFIED ATOMIC MASS UNIT AND ELECTRIC KILOGRAM

The author has papers [2, 3, 4, 5] which dismisses Einstein's hypothesis of mass-energy equivalence. Without mass-energy equivalence, the law of conservation of mass would be restored. The notion of nuclear binding energy within nuclei of atoms due to missing mass would be dismissed. As it is found that the neutron disintegrates into a proton and an electron, its mass would be the same as that of hydrogen  $^1\text{H}$ ; it may be taken to be another state of the hydrogen  $^1\text{H}$  atom. Within the nucleus of an atom, the neutron would be contributing an extra proton and a nuclear electron. This would mean that atoms have masses which would be a whole number of units of the mass of  $^1\text{H}$ . So the electric unified atomic mass unit may be defined as the mass of an atom of  $^1\text{H}$  replacing the definition based on Carbon-12; it is an invariant independent of the quantum state of the atom.

*The electric unified atomic mass unit (eu) is the mass of hydrogen  $^1\text{H}$*

With our new definition of mass dependent on charge and volume, the mass of hydrogen  $^1\text{H}$  would be  $e(V_p + V_e)$  eu.

With this new definition of the electric unified atomic mass unit eu, the macroscopic SI base unit of mass, the electric kilogram ekg, may be defined as  $1000 N_A$  eu,  $N_A$  being the Avogadro's number. If the universal constant  $N_A$  is defined to be an exact number, then we have a new electric kilogram definition that is all based on defined universal constants without the need of the old kilogram definition which requires keeping and maintaining a prototype sample of the kilogram.

*The SI electric kilogram is defined to be  $1000 N_A$  eu*

Although we have introduced electric versions of the unified atomic mass and the kilogram with dimensions of [Coulomb][Length]<sup>3</sup>, for all practical purpose, the traditional non-electric versions and their new electric versions may be used interchangeably as they are defined to be consistent.

#### 4. COMPLEX ELECTRIC CHARGE AND COMPLEX COULOMB'S LAW

Universal gravitation is now explained as being due to the slight excess of Coulomb electric attractions over repulsions. Analytically, it may be formalized by introducing complex versions of the electric charge and the complex Coulomb's law.

*An electric charge  $Q$  with charge magnitude  $q$  has a complex charge of  $z:z = Q + i q k$*

$k$  being a constant to be determined dependent on the system of units.

The complex Coulomb's law would now be defined between two complex charges  $z_1, z_2$  at a distance of  $r$  apart. In SI units the Coulomb's force would be:

$$\mathbf{F} = \frac{1}{4\pi\epsilon_0} \frac{z_1 z_2}{r^2} \hat{\mathbf{r}} \quad (1)$$

Based on equation (1), the forces between two Hydrogen-1 atoms may be derived. The total repulsive forces, taking only the real parts, would be:  $\frac{1}{4\pi\epsilon_0 r^2} (2e^2 - 2e^2 k^2)$ ,  $e$  being the electron charge. The total attractive forces would be  $\frac{1}{4\pi\epsilon_0 r^2} (-2e^2 - 2e^2 k^2)$ . The net force acting would be the sum of the attractive and repulsive forces:  $-\frac{1}{\pi\epsilon_0 r^2} e^2 k^2$ . Since the sign of the net force is negative, it implies there is a net attractive force between the two Hydrogen-1 atoms. To determine the value of  $k$  for SI units, the known gravitational force is equated with  $-\frac{1}{\pi\epsilon_0 r^2} e^2 k^2$ . With  $G$  as the gravitational constant,  $m_h$  the Hydrogen-1 mass in kilogram:

$$\begin{aligned} \frac{e^2 k^2}{\pi\epsilon_0} &= G m_h^2 \\ k &= \frac{m_h}{e} \sqrt{\pi\epsilon_0 G} \end{aligned}$$

An electrically neutral body has a mass proportional to the number of Hydrogen-1 atoms. Thus the gravitational forces between two neutral bodies would obey the same Newton's inverse square law of universal gravitation; only now, it is founded on Coulomb's law. With this Coulomb electric gravity, the '*unsolved mystery of gravity*' is now unraveled.

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