Unification of Forces: A complete model with theoretical proof

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Abstract:

In a previous paper, I have proposed that the forces of nature are manifestations of a basic force that exists as reaction to motion. In this paper, I provide theoretical proof for that proposal by deriving from it (i) The classical radius of electron (ii) The relation between magnetic and electrostatic constants, and (iii) A 'common constant' and a 'common equation' for all forces. Moreover, the 'equality of inertial and gravitational masses' and 'why a unit pole does not exist' are explained based on that proposal. Based on these, I claim that the problem of unification of forces stands resolved.

Key words: Forces of nature, Unification of forces, Unit charge and unit pole, Classical radius of electron, Relation between electrostatic and magnetic constants, Gravitational and inertial mass

1. Introduction:

The classical concept is that bodies possess force and hence interact; however, a clear physical definition of force is absent. So, as a modification, it was proposed[1] that motion is the basic property of matter, and force is reaction to motion. If that argument is correct, then it should be possible to calculate the various forces using a common constant and a common equation, and also, it should be possible to arrive at some existing relations using the new concept. If some existing problems get resolved along with this, the new concept will be more credible. Such possibilities are explored in this paper. The explanations are based on classical concepts that agree with our common sense; naturally, Quantum Mechanics and Relativity Theories of Einstein are completely ignored.

2. Forces of nature – the new proposal:

The fundamental particles move at the speed of light, and the reaction to this motion creates the forces of nature; so both energy and force are equal to $mc^2/2$ – it is convenient to express force in energy units, and in all force equations, d^2 (distance-square) can be replaced by 'd'. When an electron-positron pair[2] is formed from fundamental particles, energy remains divided equally as internal vibrations and speed, and force remains divided equally as electrostatic force and gravity. Thereafter, gravity and electrostatic force act as separate forces, and are conserved separately; gravity depends on speed, and electrostatic force depends on internal energy (potential energy). The motion of an electron creates magnetic force, and there is a corresponding decrease in its electrostatic force. Magnetic force depends on both the potential energy and the speed. The above three are the only 'real forces' of nature; and energy acts as repulsive 'pseudo-force' (antigravity)[1]. The so-called strong nuclear force is gravity at the level of electrons, and the weak nuclear force is a pseudo-force.

For each interaction, the body contributes half the force required, and thus force is used up, as the fundamental particles integrate. Field indicates the availability of force; if no force is available, the body will not have any fields.

3. Unit charge and unit pole:

The natural energy of any body is $mc^2/2$ and the speed limit is 'c'. Any change in the energy possessed will create potential states. Charge represents the potential state of particles. Electrons and positrons have the same internal energy, but positron is slightly heavier, and thus, electron has excess energy and positron has shortage of energy. So they have potential states, but the states are opposite in nature: one has a negative charge and the other, a positive charge. Unit charge represents the potential energy (internal energy) of electron/positron, and is not arbitrary; it is equal to half the natural energy. Or the energy of unit charge is $mc^2/4$, where 'm' is the average mass of electron/positron; the energy works out to 2.0475×10^{-14}J. Electrostatic force is due to this energy, and the maximum force that can be exerted by an electron is $mc^2/4$.

Magnetic force is due to the motion of 'unit charge' (not of electron), and the force created is equal to the kinetic energy of the unit charge. The maximum kinetic energy possible = the maximum magnetic force = the energy of the unit charge = the maximum electrostatic force = $mc^2/4$. The maximum kinetic energy is attained when the speed is 'c', and so the 'mass equivalent' of unit charge is m/2. At the speed of light, the whole electrostatic force manifests as magnetic force, and thus the electron is deprived of its electrostatic field.

The present theories cannot explain the arbitrary value of unit charge, and so the possibility of the existence of a unit pole having some arbitrary value is not ruled out. But, as has been shown above, unit charge represents a 'fixed amount of energy', and is not arbitrary. When an electron is created, a positron is simultaneously created, and they exist as distinct units. The motion of 'unit charge' creates magnetic force, and the north and south poles exist simultaneously as long as the motion continues. So there cannot be any unit poles.

4. The classical radius of electron:

The 'classical radius' can be regarded as the actual physical radius of electron, and can be derived from the new concept. As explained, gravity and electrostatic force, available to an electron, are equal to $mc^2/4$. When two electrons touch each other, the force is the maximum, and so the force between them is $mc^2/2$, the available force two electrons. If G and E are the gravitational and electrostatic constants, 'r', the radius of electron, and 'e' the unit charge,

We get, $Gm^2/2r = Ee^2/2r = mc^2/2$ …… (i)

So, $r = Ee^2/mc^2$

$= (1/4\pi\varepsilon_0)(e^2/m_e c^2)$ ..... 'm' = m_e nearly

The above equation for the radius of electron is the same as the existing equation used to calculate the 'classical radius of electron'. The equation has now been obtained based on the

concept that force is reaction to motion, and this provides theoretical proof for that concept. However, to justify the argument that the classical radius is the actual physical radius of electron, some correlation with the sizes of proton and neutron[3] is required.

5. A common constant for the forces:

From equation (i), we can get the equation for the gravitational constant of electron, $G= rc^2/m = 2.7782x10^{32}\ m^3/kgs^2$. The constant 'G' is speed (energy) dependent, and is directly proportional to the square of the speed. Since the speed and internal energy of an electron are equal to $mc^2/4$, the speed equivalent of both is $c/\sqrt{2}$. So the above obtained value is for that speed, and the constant for any speed can be calculated. From equation (i), $Gm^2 = Ee^2$; so we can use G and the 'mass of electron' (in place of charge) to calculate electrostatic force, and G/c^2 to calculate magnetic force. Thus we get a speed-dependent common constant, 'G'.

When electron-positron pairs integrate, force and energy are used up. But the force used need not be equal to energy used at any level; and this affects the force constant. However, the energy of unit charge is unaffected, and so the above constant is valid for electrostatic interactions in all large scale structures. In the case of gravity, the constant is different at each level, and is theoretically deducible from the above common constant. The strong nuclear force is gravity at particle level, and can be calculated using the above value of G. How gravity becomes very weak in the case of bodies like Earth will be explained in a separate paper[4]. The gravitational and magnetic constants vary with speed; so the speed factor should be included either in the constant or in the force equation.

6. The relation between electrostatic and magnetic constants:

It may be noted that the existing magnetic constant is for unit speed (drift velocity) of electrons, whereas the electrostatic constant, as explained before, is for the speed $c/\sqrt{2}$. That is why magnetic constant appears to be very small. As explained, the magnetic force created by unit charge moving at speed 'c' is $mc^2/4$. So, the magnetic force between two unit charges remaining in contact and moving at speed 'c' will be equal to the sum of the forces created. The constant for the speed 'c' is Mc^2, where M is the magnetic constant for unit speed. So using mass in place of charge we get the relation,

$$(Mc^2)\ m^2/2r = 2mc^2/4$$

So, $(Mc^2) = rc^2/m = G$ …… from equation (i).

$M = G/c^2$ (if mass is used)

$= E/c^2$ (if charge is used)

Thus we get the existing relation that the electrostatic constant is c^2 times the magnetic constant; and this provides proof for the new concept. This relation is valid for any arbitrary unit charge, irrespective of its energy. This relation is true for electromagnetic radiations, indicating that electromagnetic radiations are streams of fundamental particles which acquire a variable charge due to the peculiarity of their motion, as proposed in a previous paper[5].

7. A common equation:

Since the forces of nature are manifestations of the same basic force, mass should be used in all cases to calculate the force. At present, we use charge for calculating electrostatic and magnetic force. By using charge, we are actually using a relative value for mass, and the difference is adjusted in the constant. In the case of electrons, this does not create any error. However, in the case of proton, this seems to have created a serious error. Proton is nearly 1837 times heavier than electron, but its accepted radius, based on force calculated using charge, is nearly 1/3 of electron. This anomaly can be removed by using 'mass' and the 'common constant'. As force is conserved like energy, it is more meaningful to calculate force in energy units. A modified equation that incorporates different speeds and hence different constants of interacting bodies has been given in a previous paper[1]; it can be used as the common equation for all forces, and is given below.

$$F = \frac{\sqrt{G_1 G_2}\, M_1 M_2}{d} - 2 \times \frac{M_1 v^2}{2}$$

8. Equality of inertial and gravitational masses:

The concept that force is reaction to motion (energy) immediately leads to the conclusion that inertial and gravitational mass are not just proportional, but are equal. Had Newton thought of such a possibility, he would have instantly defined force using his third law of motion, and the history of physics would have been different. Now that the proposed concept is supported by theoretical proof, the long-standing problem can be regarded as resolved.

9. Conclusion:

It has been shown that gravitational, electrostatic and magnetic forces can be calculated using mass, a common constant and a common equation. Thus, based on the concept that force is reaction to motion (energy), these three forces have been complete unified. The deduction of 'the classical radius of electron' and 'the relation between electrostatic and magnetic constants' provides theoretical proof for the above concept. The explanations 'why inertial and gravitational masses are the same' and 'why unit pole does not exist' provide further credibility to the concept. However, the proposal 'that strong nuclear force is gravity' and the prediction 'that proton has a larger size' require further theoretical validation[3] [14].

Reference:

[1]. Jose P Koshy, *The inherent relation between motion and force (Motion creates the forces of nature),* **viXra: 1312.0176** (classical physics)

[2]. Jose P Koshy, *From Microcosm to Macrocosm: the structure of the Physical World at a glance,* **viXra: 1401.0178** (quantum gravity and string theory)

[3]. A paper proposing the '*the internal structures of electron, proton and neutron*' will be posted subsequently in **viXra**.

[4]. A paper describing the deduction of '*the measured value of G from the proposed constant for strong nuclear force*' will be posted subsequently in **viXra**.

[5]. Jose P Koshy, *The fundamental particle of matter – Let's call it photon,* **viXra: 1401.0135** (high energy particle physics)