Charge, Spin, and 'Charge to Mass' Ratio

(A Unified Theory of Gravity and Electricity)

Frederick David Tombe,
Belfast, Northern Ireland, United Kingdom,
Formerly a Physics Teacher at
College of Technology Belfast, and
Royal Belfast Academical Institution,
sirius184@hotmail.com
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Abstract. It is proposed that space is a liquid aethereal medium of unknown substance, in which electrons constitute sinks, and in which positrons constitute sources. Electric charge is merely a measure of the rate of flow of the aether into the sinks and out of the sources. Two sinks will attract each other, two sources will repel each other, whereas a sink and a source will either repel or attract each other depending on which has got the greater charge. Mass is not involved in the hydrodynamics of elementary particles, while spin is a quantity directly related to aether vorticity.

It will be shown that mass is a cumulative quantity which arises in systems of particles, and that it can act as a retarding factor when an applied force acts on that system.

Attraction and Repulsion

I. It is commonly believed that like charges repel whereas unlike charges attract, and that Coulomb's law of electrostatics is the law governing the forces acting between charged particles, with Newton's law of gravity being a negligent additional force. A hydrodynamical analysis as demonstrated in 'Gravitational Induction and the Gyroscopic Force' along with the issues raised in 'Gravity Reversal and Atomic Bonding',

http://www.wbabin.net/science/tombe5.pdf
http://www.wbabin.net/science/tombe6.pdf

imply that the situation should theoretically be somewhat more complicated.

(a) If negative charge is a measure of the inflow rate of the aether into a sink, then it follows that two sinks must necessarily mutually attract each other, and that the field lines between two negatively charged bodies will spread away from each other. However, the situation becomes further complicated when the two charged bodies in question become immersed in a sea of rotating electron positron dipoles (the luminiferous medium). In this situation, we would expect that the linear polarization of the dipoles in sympathy with the field lines will

result in centrifugal repulsion pushing the two charged bodies apart from each other. The dipoles must be aligned solenoidally by the **F** = q**v**X**B** force, and so the dipoles within adjacent **E** lines of linear polarization must be aligned in their equatorial planes, and hence repelling each other with centrifugal repulsion. We should expect this centrifugal over ride mechanism to kick in at a particular threshold of field intensity. Below this threshold, negative electric charge manifests itself to us as gravity.

(b) If positive charge is a measure of the outflow rate of aether from a source, then it follows that two sources must always repel each other, and that the field lines will spread away from each other. This will continue to be the situation, even if the two positive charges are immersed in the luminiferous medium.

(c) The situation regarding how a sink reacts in the vicinity of a source is somewhat more complicated yet again. If the sink and the source both have the same magnitude of charge, then the inflow rate will cancel with the outflow rate and there should be no mutual acceleration between the sink and the source. If the positive charge is greater than the negative charge, then we should expect a repulsion to occur. If the negative charge is greater than the positive charge, then we should expect an attraction to occur. Hence we should expect the negative charge in a rotating electron positive dipole to be greater than the positive charge by an amount equal to the gravitational charge of the dipole as a whole.

If two unlike charged bodies are repelling each other and are both free to move, we would expect the field lines between them to cross over directly.

If two unlike charged bodies are repelling each other, but are constrained not to move, we should expect the field lines to begin to spread apart from each other.

Aether Hydrodynamics, Charge, and Spin

II. Gauss's law leads us to the inverse square law of force for situations that involve spherical symmetry and irrotational fluid flow. This situation corresponds to fluid flowing radially into a sink, or out of a source. Coulomb's law of electrostatics and Newton's law of gravitation are both solutions to Gauss's law under these circumstances. An example of a cylindrical solution is the inverse of distance (power one) law that applies for the magnetic field surrounding a long straight electrical wire.

As well as the irrotational component of fluid flow, we can also have a rotational component acting tangentially to the sink or the source. This tangential component gives rise to the angular $\partial\mathbf{A}/\partial t$ force, where **A** is a function of the aether field velocity. The existence of an angular $\partial\mathbf{A}/\partial t$ force would necessarily imply that there exists a degree of vorticity **B** in the aether, and that the aether would be swirling into a sink or out of a source in a spiral fashion, with curl **A** = **B**. The aether imparts its acceleration to a particle and we call the irrotational Coulomb force component and the angular $\partial\mathbf{A}/\partial t$ force component the two local components. These two local components of force both involve acceleration in the sense of changing speed. They are magnitude changing effects as opposed to the direction changing effects which will be discussed

in the next section. The irrotational Coulomb component is a conservative force, whereas the rotational $\partial\mathbf{A}/\partial t$ component is a non-conservative energy transferring force that is important in electromagnetic radiation.

Electric charge is a measure of the rate of inflow or outflow of the aether, into or out of sinks or sources, and so it becomes of relevance in the irrotational Coulomb force. The vorticity of the aether is connected with the quantity that we call spin, and it becomes of relevance in the angular $\partial\mathbf{A}/\partial t$ force. In order for an electron or a positron to possess spin they must be paired together into a Keplerian orbit. The aether will flow across from the positron to the electron and it will rotate at the same time due to the orbital motion. This will have the effect of causing the aether to spiral out of the positron and into the electron. The electron, the positron, and the space between them will all become vortices. The rotating electron positron dipole is the basic unit which accounts for all spin and vorticity related phenomena in electromagnetism. We could say that electrons and positrons are concentrations of space.

The Convective Components

III. We stated above in section **II** that the local components of force arose by virtue of the aether imparting its acceleration to particles. There is an additional effect which now needs to be mentioned. When a particle moves at right angles to the direction of the aether flow, it experiences a direction changing force.

Imagine a curled flow of aether converging towards a sink. This can be pictured as radial field lines that have been bent so as to appear like spirals. Now imagine a particle moving at right angles to the direction of the aether flow. This motion will have both a tangential component and a radial component.

The tangential component will always be moving against the flow. We call the tangential component centrifugal repulsion. Centrifugal repulsion occurs between any two particles that share a mutual tangential speed.

The radial component could be either inwards with the aether flow or outwards against the aether flow. In one case the particle will vear to the right of the flow. In the other case the particle will vear to the left of the flow. We call this effect the Coriolis force. The Coriolis force and the centrifugal force are known as the convective components.

If the aether is irrotational and has hence got no vorticity, then the field lines will be perfectly radial and there will be no Coriolis force. Kepler's law of areal velocity eliminates the tangential components of acceleration in planetary orbital theory and hence we are dealing only with the radial inflow (inverse square law) operating in tandem with the centrifugal force. This may of course be an approximation because the orbiting planets are bound to cause at least some vorticity in the aether.

Aether vorticity becomes of importance in electromagnetism since electromagnetism arises out of a sea of tiny aether vortices. These vortices have the effect of inducing the Coriolis force on moving charged particles in the form $\mathbf{F} = q\mathbf{v}\times\mathbf{B}$ where $\mathbf{B}$ is a measure of the vorticity. When the vortices are undergoing angular acceleration, then the Coriolis force combines with the angular $\partial\mathbf{A}/\partial t$ force to yield the Lorentz force.

If the particle velocity exceeds the aether field velocity, which is related to **A**, then the particle will overcome the flow and escape. This is the principle behind the escape velocity, and as such the escape velocity is equal to the aether field velocity.

Prof. AKT Assis in Brazil has shown that the velocity dependent extension that Weber added to Coulomb's law of electrostatics can be expanded into the rotational $\partial\mathbf{A}/\partial t$ force, along with the two velocity dependent convective forces. See,

http://www.ifi.unicamp.br/%7Eassis/Commun-Theor-Phys-V18-p475-478(1992).pdf

Inertial Mass

IV. Mass is generally accepted to be a measure of the amount of matter in a body. It impedes acceleration in certain situations.

We will now seek to find a definition of mass which when multiplied by acceleration leads to the orthodox expressions for both the gravitational force and the electrostatic force, and which ties in with Mach's definition of inertial mass,

$$\frac{m_1}{m_2} = \frac{a_2}{a_1} \qquad \textbf{(1)}$$

where m is mass and a is acceleration in relation to two interacting bodies.

For the purposes of this definition we will keep with orthodox thinking, and we will temporarily separate gravity and electrostatics into two separate forces. When it becomes accepted that gravity is just a particular manifestation of electrostatics, then all the gravitational terms can simply be dropped out of the following analysis.

We will work on the premises, that the quantity mass has got absolutely no significance whatsoever in relation to elementary particles, but that nevertheless an elementary particle can still be allocated a mass for the purposes of mathematical calculations. The definition of mass which will follow in section **IV** will reflect this fact in such a manner as to render elementary particles and compound particles indistinguishable in mathematical calculations.

Consider the irrotational acceleration of an elementary particle (a particle which is itself not made up of other particles) in a frame of reference which is fixed relative to the background stars. The background stars mark out the average aether rest frame of reference. The irrotational acceleration law will look like this,

$$\ddot{\underline{r}} = \frac{\pm Q - W}{r^2}\hat{\underline{r}} \qquad \textbf{(2)}$$

where the left hand side represents the acceleration of a particle due to it being in the vicinity of another particle of charge $Q - W$. Q represents electric charge and W represents gravitational charge. The only property of the particle, whose acceleration we are considering on the left hand side of the equation **(2)**, which will

actually effect its own acceleration, is the sign of its own electric charge. This will determine the sign beside the Q on the right hand side of equation **(2)**. [1]

Now if this law is to be applied to situations concerning the acceleration of systems of particles, we must first of all clarify the meaning of such. We therefore consider the motion of a point defined with respect to the system. This point will be called the centre of charge and defined as follows

$$\underline{R} = \frac{\sum_{i=1}^{n} (|Q_i| - W_i)\underline{r}_i}{\sum_{i=1}^{n} (|Q_i| - W_i)} \qquad \textbf{(3)}$$

and hence

$$\underline{\ddot{R}} = \frac{\sum_{i=1}^{n} (|Q_i| - W_i)\underline{\ddot{r}}_i}{\sum_{i=1}^{n} (|Q_i| - W_i)} \qquad \textbf{(4)}$$

where

$$\underline{\ddot{r}}_i = \underline{\ddot{r}}_i\,(INT) + \underline{\ddot{r}}_i\,(EX) \qquad \textbf{(5)}$$

i.e. the acceleration of each elementary particle in the system can be split up into the internal acceleration due to all other elementary particles in the system $\underline{\ddot{r}}_i(\mathrm{INT})$, and the external acceleration $\underline{\ddot{r}}_i(\mathrm{EX})$ due to an external source. Considering the internal component of equation **(4)**, we have for the numerator,

$$\sum_{i=1}^{n} (|Q_i| - W_i)\underline{\ddot{r}}_i\,(INT) = \sum_{i=1}^{n} \left[(|Q_i| - W_i) \left(\sum_{\substack{j=1 \\ j \neq i}}^{n} \frac{\pm Q_j - W_j}{r_{ij}^2} \underline{\hat{r}} \right) \right] \qquad \textbf{(6)}$$

The right hand side of equation **(6)** will sum to pairs of quantities of equal magnitude and because all particles either attract or repel each other, members of each pair will have opposite sign. hence

$$\sum_{i=1}^{n} (|Q_i| - W_i)\underline{\ddot{r}}_i\,(INT) = 0 \qquad \textbf{(7)}$$

If $\underline{\ddot{r}}_i(EX)$ is not caused by a collision with another system and is generated by a system far enough away, it would be reasonable to assume that $\underline{\ddot{r}}_i\,(EX)$ is the same for every elementary particle in the system whose acceleration we are considering. Hence

$$\ddot{\underline{R}} = \frac{\sum_{i=1}^{n}(|Q_i| - W_i)(\pm Q_{EX} - W_{EX})}{\sum_{i=1}^{n}(|Q_i| - W_i)r^2}\hat{\underline{r}} \qquad \textbf{(8)}$$

therefore

$$\ddot{\underline{R}} = \frac{\sum_{i=1}^{n}(|Q_i| - W_i)(\pm Q_{EX})}{\sum_{i=1}^{n}(|Q_i| - W_i)r^2}\hat{\underline{r}} - \frac{W_{EX}}{r^2}\hat{\underline{r}} \qquad \textbf{(9)}$$

Now care must be taken when considering the summation term of equation **(9)** because the sign in front of Q_{EX} will depend upon the sign of Q_i. The equation should look like this

$$\ddot{\underline{R}} = \frac{\pm(NETT(|Q| - W))Q_{\mathrm{EX}}}{\sum_{i=1}^{n}(|Q_i| - W_i)r^2}\hat{\underline{r}} - \frac{W_{EX}}{r^2}\hat{\underline{r}} \qquad \textbf{(10)}$$

where $|Q|$ is the modulus of the cancelled down net electric charge, and W is a cancelled down quantity of gravitational charge which depends on the difference between the number of negative electrically charged particles, and the number of positive electrically charged particles in the system. It is most likely that since the gravitational charge of a particle is negligible compared with its electric charge, that this quantity would also be negligible in the equation **(10)** which could then be written,

$$\ddot{\underline{R}} = \frac{Q_{NETT}\ Q_{EX}}{\sum_{i=1}^{n}(|Q_i| - W_i)r^2}\hat{\underline{r}} - \frac{W_{EX}}{r^2}\hat{\underline{r}} \qquad \textbf{(11)}$$

hence multiplying across by m we obtain

$$m\ddot{\underline{R}} = \frac{Q_1 Q_2}{r^2}\hat{\underline{r}} + m\underline{g} \qquad \textbf{(12)}$$

where

$$\underline{g} = -\frac{W_{EX}}{r^2}\hat{\underline{r}} \qquad \textbf{(13)}$$

and

$$m = \sum_{i=1}^{n} (|Q_i| - W_i) \qquad \textbf{(14)}$$

Equation **(12)** therefore incorporates Coulomb's law of electrostatics, Newton's law of gravitation, and Newton's first and second laws of motion with inertial mass m defined as $\sum_{i=1}^{n} (|Q_i| - W_i)$, which is a measure of the amount of matter (number of elementary particles) in a system. Newton's third law of motion is only apparently incorporated into equation **(12)** for the electrostatic component of the right hand side. Equation **(12)** also incorporates Galileo's observations that different weights fall under gravity at the same rate.

Gravitational charge which is only known to exist with one sign (and hence no levitation) must therefore be directly proportional to mass. Our traditional systems of units ensure that inertial mass and gravitational mass are treated with identical magnitude. This ensures that Newton's third law is general for electrostatics and gravitation.

By defining mass as a head count of the magnitude of all the charges present in a system, we are maintaining consistency with the idea that mass is a measure of the amount of matter in a body. We are also maintaining consistency with Coulomb's law of electrostatics, Newton's law of gravity, and Galileo's experiment in which he dropped different weights off the Leaning Tower of Pisa and showed that they all fell at the same rate. We are further maintaining consistency with Newton's three laws of motion and also Mach's definition of inertial mass.

Mass has a retarding effect on acceleration in situations where the applied force is not applied evenly on a rigid body, and has to be transmitted and shared amongst all the particles of the body. An example of this would be a rope pulling a trolley. The rope is connected at only one point on the trolley, and the force has to then be transmitted, particle by particle, throughout the trolley. Experiments in static electricity involving surface charge will involve mass for these same reasons. Electromagnetic force is another example of this, because the magnetic field that permeates through matter, only acts on the electron positron orbitals and not on the actual nuclei of the atoms and molecules that comprise the matter. The orbital electrons and positrons then have to transmit this effect to the nuclei via their bonding mechanisms to the nuclei.

Mass would also have an effect if the applied force acting on a rigid body causes a different force to act on the negative particles of the body than it does on the positive particles of the body. Theoretically this should mean that a body accelerating in a gravitational field should be affected by its own mass, whereas we know that this is not so. As we have just stated, Galileo proved that this is not so, by dropping different weights off the Leaning Tower of Pisa and demonstrating that they are fell to the ground at the same rate.

However, the irrelevance of the mass of the test body in a gravitational field can be explained by the fact that all bodies which are normally deemed to be neutral [2], have got the same charge to mass ratio.

With the definition of mass at equation **(14)**, we can then retrospectively apply it to elementary particles and give them a mass, so that we don't need to distinguish between elementary particles and compound particles when doing mathematical calculations.

[1] A recent review of the following derivation suggests that, in the case of a source particle attracting a sink particle, we may need to consider the difference between the charges of the two particles as opposed to the charge of only one of the two particles.

[2] What has been accepted as the official standard of electrical neutrality is almost certainly a negative charge, as gravity is a sink based theory. Our modern day systems of units automatically build in this constant ratio, and so we make no distinction between gravitational mass and inertial mass.