GALILEAN ELECTRODYNAMICS

Experience, Reason, and Simplicity Above Authority
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EDITORIAL POLICY

Galilean Electrodynamics aims to publish high-quality scientific papers that discuss challenges to accepted orthodoxy in physics, especially in the realm of relativity theory, both special and general. In particular, the journal seeks papers arguing that Einstein's theories are unnecessarily complicated, have been confirmed only in a narrow sector of physics, lead to logical contradictions, and are unable to derive results that must be postulated, though they are derivable by classical methods.

The journal also publishes papers in areas of potential application for better relativistic underpinnings, from quantum mechanics to cosmology. We are interested, for example, in challenges to the accepted Copenhagen interpretation for the predictions of quantum mechanics, and to the accepted Big-Bang theory for the origin of the Universe.

On occasion, the journal will publish papers on other less relativity-related topics. But all papers are expected to be in the realms of physics, engineering or mathematics. Non-mathematical, philosophical papers will generally not be accepted unless they are fairly short or have something new and outstandingly interesting to say.

The journal seeks to publish any and all new and rational physical theories consistent with experimental fact. Where there is more than one new theory that meets the criteria of consistency with experiment, faultless logic and greater simplicity than orthodoxy offers, none will be favored over the others, except where Ockham's razor yields an overwhelming verdict.

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The journal most values papers that cite experimental evidence, develop rational analyses, and achieve clear and simple presentation. Papers reporting experimental results are preferred over purely theoretical papers of equally high standard. No paper seen to contradict experiment will be accepted. But papers challenging the current interpretation for observed facts will be taken very seriously.

Short papers are preferred over long papers of comparable quality. Shortness often correlates with clarity; papers easily understandable to keen college seniors and graduate students are given emphatic preference over esoteric analyses accessible to only a limited number of specialists. For many reasons, short papers may pass review and be published much faster than long ones.

The journal also publishes correspondence, news notes, and book reviews challenging physics orthodoxy. Readers are encouraged to submit interesting and vivid items in any of these categories.

All manuscripts submitted receive review by qualified physicists, astronomers, engineers, or mathematicians. The Editorial Board does not take account of any reviewer recommendation that is negative solely because manuscript contradicts accepted opinion and interpretation.

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Many thanks go to Mohammad Javanshiry for proofreading all of this issue of Galilean Electrodynamics.

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From the Editor's File of Important Letters:

Ether Wind in the Radial Direction

This letter presents an alternative to the two theories of relativity, Special and General, without absurd assumptions and without paradoxical effects. Support for this theory is given by the global positioning system, by the clocks in that system, by the Pioneer anomaly, and by the gravitational effects during solar eclipses. This theory is based on an ether constituted by fast particles, moving in all directions.

Electromagnetic Theory (EMT)

Maxwell described his ether by means of four equations, and demonstrated that waves with electrical and magnetic properties could propagate in this ether. These equations have been important for science and technology. We can even see these equations on T-shirts. It is therefore remarkable that Einstein could fool us to believe that this ether does not even exist.

Maxwell started with two first order differential equations, dependent on two variables, $\mathbf{r}$ and t, space and time. He found a general solution in the wave equation, with a constant speed c, as a relation between $\mathbf{r}$ and t. For finding a particular solution we add a constant of integration, which we can call $\mathbf{v}(\mathbf{r})$, independent of time t. The existence of the universal property, speed c, the magnitude of any light propagation vector $\mathbf{c}$ in the ether, does not exclude the possibility of a local property, a local vector $\mathbf{v}(\mathbf{r})$ that combines with $\mathbf{c}$. The combination $\mathbf{c}+\mathbf{v}(\mathbf{r})$ makes distance traversed into an integral over time.

We now need more information to find $\mathbf{v}(\mathbf{r})$. This information was not available to Maxwell. Since $v << c$, the missing information is not extremely important for technology, but very important for science. The $\mathbf{c}$ is a relation between space and time and $\mathbf{v}(\mathbf{r})$ is independent of time. Although very different vectors, addition of vectors must be valid between these two variables.

Since Maxwell's theory was not complete, it was also not well understood. As a result, interpretations of his ideas seemed to be influenced by experiences from sound waves and light particles.

Special Relativity Theory (SRT)

Einstein assumed that light moves with the same speed in relation to different observers in different states of motions. This absurd idea means that $\mathbf{v}(\mathbf{r})$ is assumed to always be zero. This mistake can probably be related to Occam's Razor. After many years of study Einstein tried to reintroduce the ether. Unfortunately, he failed to do this adequately.

The Global Positioning System (GPS)

The GPS system demands Sagnac correction, which is a correction due to the rotation of our planet. By disregarding this correction, we can see that the GPS system seems to measure velocities in relation to a not rotating frame with the velocity of the center of our planet. Therefore, we can find agreement to GPS by assuming that $\mathbf{v}(\mathbf{r})$ is a constant and equal to the velocity of the center of our planet. Unfortunately, this idea is not in agreement to common sense. We cannot assume our planet to entrain the ether in the whole Universe.

In the GPS system satellites with transmitters are moving at a constant distance from our planet, and the receivers are near the surface of our planet. **Continued on page 58**

The Theory of Density, Part III: General Observation Principle & Unified Mass-Charge Equation

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This paper explores the idea that a specific part of physical Nature can have a great resemblance to another seemingly different part. That is, what happens in a small scale can be recognized in the behavior of a macroscopic phenomenon (and *vice versa*) by using fundamental concepts called *homogeneity* and *Heterogeneity* that arise from a General Observation Principle (GOP). Homogeneity can be understood as the first philosophical opinion that, *e.g.*, validates the physical law stating that a specified physical force is inversely proportional to the square of the distance from the source of that physical force (mass or charge). The paper then demonstrates what different phenomena the other concept (Heterogeneity) can be attributed to, and discusses it application in forming practical formulae, such as a unified mass-charge equation. Within this concept, a revolving electrically neutral mass can be positively or negatively charged, *i.e.*, it is shown that a microscopic particle like electron is negatively charged in that it rotates swiftly and, in the same manner, a macroscopic object such as the Earth is electrically charged solely because of its rotation that violates the Dynamo theory of geomagnetic field; that is, the electric charge is intrinsically nothing but a rotating neutral mass. After presenting a unified mass-charge equation, the electric charge of sun and the planet earth is calculated and the magnetic field of solar planets are compared to observed data. A planetary model is then introduced for electron and electron's radius and angular velocity are calculated using Bohr magneton. Finally, a quasi-Lorentz force for magnets as the other predictions of Heterogeneity is introduced.

Keywords: Density theory; General observation principle; Isotropic scaling, Homogeneity, Heterogeneity, Unified mass-charge equation; Dynamo theory; Solar planets; Special relativity; Planetary model of electron; Quasi-Lorentz force

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1. Introduction

For Coulomb's law there is a logical or philosophical-based model according to which it is proved that the force between two charges is proportional to the inverse square of distance [1], However, for Newton's law of gravitation the proof of such a theoretical rule is considered empirically rather than philosophically. Section 2 introduces a geometry-observation-based law by which it is understood that all fundamental physical forces, while we can attribute a quantity to object, especially like charge and mass, obey the same rule of inverse square which differs from the accepted tenet according to which the total number of flux lines that are emitted from a source is constant with increasing distance because the surface area of a sphere increases with the square of the radius. Hence, the strength of the field is inversely proportional to the square of the distance from the source. [2]

Our novel law is called General Observation Principle (GOP) which is parted into two subcategories called *homogeneity* or isotropic scaling and *heterogeneity.* Homogeneity demonstrates how the inverse square law and heterogeneity shows how a unified mass-charge equation both can be derived from GOP, which can therefore be considered a profoundly fundamental concept for Physics. Section 3 is devoted to extending the equation $dq/dm = \pm\sqrt{G\varepsilon_0}$, which we used for both ether and photon [3], to all other objects so that, without knowing the idea of heterogeneity, it seems impossible bringing forward a unified equation for mass and charge. It is asseverated that a single electron and a planet both may have the same source for their electric and magnetic fields: *rotation*. That is, when an object revolves around itself, taking account of its mass and angular velocity; the more massive it is, the more electric charge and magnetic field it produces. A net charge is calculated for earth and sun and the observed magnetic field of solar planets are compared with the predictions of this theory and a planetary model of electron is introduced and its radius and angular velocity are calculated using our unified mass-charge equation. An amendment to the mass-charge equation is considered so that the equation has more compatibility with the observed magnetic field of planets and at last a quasi-Lorentz force is presented for a moving magnetic dipole as a by production of Heterogeneity.

2. The General Observation Principle (GOP)

We introduce the general principle of observation simply as follows:

If two or a set of objects are apparently similar from the view point of a specific observer so that he/she cannot distinguish them from each other observationally , physical laws shall remain unchanged!

There are good examples that help us to understand the meaning of the definition above:

2.1 Homogeneity (Isotropic Scaling)

The moon and the sun from the viewpoint of a terrestrial observer both have similar apparent sizes so that, *e.g.*, in a solar eclipse the moon is nearly superposed on the Sun. Now, assume the sun has the same mass density as the moon does or, in other words, the sun is being made of lunar materials. In this case, the terrestrial observer cannot distinguish these *two moons* from each other observationally regardless of the differences in their distances and masses. That is, isotropic scaled (IS) objects made of the same materials satisfies the definition of GOP and are not be distinguished by the observer considering which one is nearer (farther) and is smaller (larger) in size unless the observer performs some accurate experiments. In this case, GOP predicts that physical laws shall remain the same for the two moons from viewpoint of the terrestrial observer. Therefore, if there is a physical law like that of gravitation, electrostatics or magnetism that can be attributed to uniform scaled objects shall behave in a special way so that the observer views physical behaviors the same with no preference. In other words, for these two uniform scaled objects, if we release two test particles with initial distances so that are viewed with the same observation angle (See Fig. 1), the gravitation law should behave in a way that, for the observer, angular velocities of the test particles remain unchanged. This property causes the observer, according to the homogeneity, not to be able to detect differences during the free fall of the test particles. However, it is important to validate this deduction mathematically.

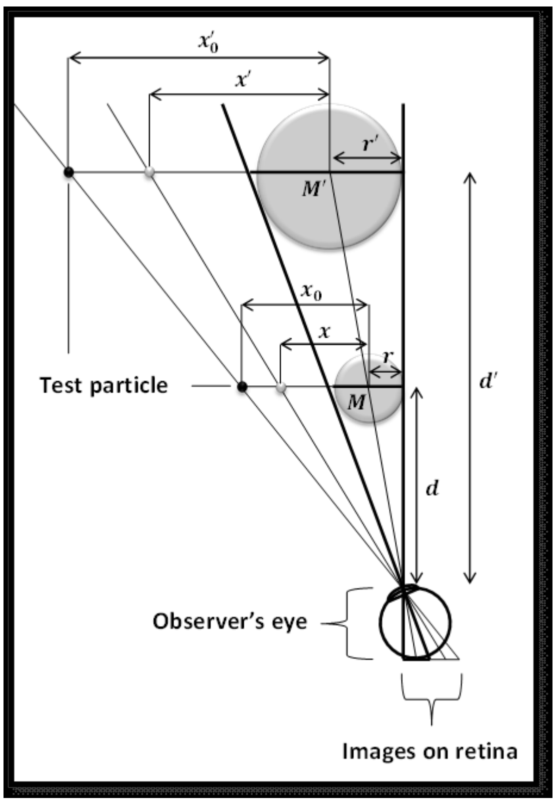

Figure 1. Two masses M and M' are scaled isotropically. Both have similar mass densities. The scale factor is $K = d'/d$, we have $M' = K^3 M$.

Assume two uniform scaled objects made of the same materials ($\rho = \rho'$) have been located at distances d and d' from the observer's eyes as shown in Fig. 1. According to the homogeneity, if test particles are released from uniform scaled distances x_0 and x'_0, they shall move in a manner so that the observer cannot detect any differences or we can deduce that the movements of the test particles due to G-fields of masses M and M' must uniformly be scaled so that the apparent angular velocities of the test particles remain the same from observer's viewpoint, which makes the observer unable to distinguish any differences. According to Fig. 1, and using intercept (Thales) theorem, we can write:

$$d'/d = r'/r = x'/x = K \quad , \tag{1}$$

where K is the scale factor that can be chosen any positive real number. While $\rho = \rho'$, we can deduce:

$$\begin{gathered}\rho = \rho' \Rightarrow M/V = M'/V' \Rightarrow M\Big/\tfrac{4}{3}\pi r^3 = M'\Big/\tfrac{4}{3}\pi r'^3 \\ \text{with } r' = Kr \text{ implies } M'/M = K^3 \quad .\end{gathered} \tag{2}$$

According to Fig. 1 and intercept theorem, we have:

$$x'/x = d'/d = K \Rightarrow x' = Kx \quad . \tag{3}$$

Differentiating both sides of Eq. (3) WRT time twice, it obtains:

$$x' = Kx \Rightarrow d^2x'/dt^2 = Kd^2x/dt^2 \Rightarrow g(x', M') = Kg(x, M) \quad , \tag{4}$$

where $g(x', M')$ and $g(x, M)$ are the G-accelerations (fields) from the center of masses M' and M respectively. By inserting Eqs. (2,3) into Eq. (4), we can write:

$$g(Kx, K^3M) = Kg(x, M) \quad . \tag{5}$$

Now, assume that the acceleration equation has a straight proportionality to mass; thus, we can reduce $g(x, M)$ to a solvable one variable function of distance $g(x, M) = M \times r(x)$. Using Eq. (5) produces:

$$K^3M \times r(Kx) = KM \times r(x) \Rightarrow K^2 \times r(Kx) = r(x) \quad . \tag{6}$$

This odd equation is correct for all positive real numbers for K. We can solve the equation by differentiating both sides of Eq. (6) WRT K:

$$\begin{gathered}\frac{d}{dK}\left[K^2 \times r(Kx)\right] = d[r(x)]/dK \\ \Rightarrow 2K \times r(Kx) + K^2 x \times r'(Kx) = 0\end{gathered} \tag{7}$$

$$\Rightarrow 2r(Kx) + Kx \times r'(Kx) = 0 \quad . \tag{8}$$

Assume $Kx = u$, and we have:

$$2r(u) + u \times r'(u) = 0 \Rightarrow r'(u)/r(u) = -2/u \quad . \tag{9}$$

The differential equation above shows the *permitted* distance function for the acceleration of a G-mass generated on a test particle. Using integration, we obtain:

$$\begin{gathered}\int\left[r'(u)/r(u)\right]du = \int -(2/u)du \Rightarrow \\ -2\ln(u) + \ln(G) = \ln(G/u^2) \Rightarrow r(u) = G/u^2 \quad ,\end{gathered} \tag{10}$$

where u can be understood as any arbitrarily chosen variable thus, by choosing it as x and assuming $\ln G$ as the integration constant, for the acceleration $g(x, M)$; we finally find:

$$g(x,M) = M \times r(x) = GM / x^2 \quad . \tag{11}$$

Eq. (11) confirms that it is possible to erect a gorgeous statue of philosophical postulates in order to receive exciting results completely compatible with experiments. According to homogeneity, any other repulsive or attractive forces (accelerations) that can be attributed to an object, remains Eq. (11) valid. That is, if we assume that an object attracts or repels a test particle with an origin other than mass like the electric charge, the isotropic principle leads to the inverse square law of distance with a little modification of replacing M with Q but not that easy! For this case, we have:

$$\begin{gathered} \rho = \rho' \Rightarrow Q / V = Q' / V' \Rightarrow Q \Big/ \tfrac{4}{3}\pi r^3 = Q' \Big/ \tfrac{4}{3}\pi r'^3 \\ \text{with } r' = Kr \text{ implies } Q' / Q = K^3 \quad . \end{gathered} \tag{12}$$

(Recall that ρ is the charge density, which shows that the charge is distributed throughout the volume of m and M as nonconductors uniformly. We neglect the gravitational effect of M) and repeating the same calculations, we have:

$$x' = Kx = \frac{d^2x'}{dt^2} = K\frac{d^2x}{dt^2} \Rightarrow a(x', m', q', Q') = Ka(x, m, q, Q) \quad . \tag{13}$$

In this case the acceleration of the test particle is a function of its charge q and mass m as well as the greater charge Q and the distance x between them. We can write:

$$\begin{cases} F = ma \\ F = Eq \end{cases} \Rightarrow a = Eq / m \quad . \tag{14}$$

If we assume that the electric field E is a function of x and Q, assuming $E = Qr(x)$ and using Eq. (13):

$$\begin{gathered} a(x', m', q', Q') = Ka(x, m, q, Q) \quad \Rightarrow Q'r(x')q' / m' = KQr(x)q / m \\ \text{and using Eqs.(3,12) and } q' = K^3 q \text{ and } m' = K^3 m \\ \text{gives } K^2 \times r(Kx) = r(x) \quad . \end{gathered} \tag{15}$$

Recall that we assumed that the test particle's mass m and charge q complies with the principle of homogeneity and both are uniformly scaled as well as x and Q. Eq. (15) is as the same as Eq. (6) and culminates in $r(x) = G / x^2$. If we use a proper constant $k = 1 \big/ 4\pi\varepsilon_0$ instead of G, we get:

$$E = Qr(x) = kQ / x^2 \quad , \tag{16}$$

or using Eq. (14), the electric acceleration is calculated as follows:

$$a = Eq / m \Rightarrow a(x, m, q, Q) = kQq / mx^2 \quad . \tag{17}$$

Therefore, the principle of homogeneity can also validate Coulomb's law of force. Now we consider another example in which two IS (isotropic scaled) men standing at the equator of two IS rotating gravitational masses (planets) undergo centrifugal forces due to an intense angular velocity. If the centrifugal acceleration equals that of gravitational on the surface of one planet and if the man has been standing on the pan of a weighing machine thus, he sees that his weight reduces to zero and so does the observer far away the plant who tries to validate GOP. According to GOP, we anticipate the IS man to experience the same weightlessness. In the first case, before isotropic scaling, assume that the man has a mass m and the planet has a mass, a radius, and an angular velocity M, r and ω respectively. For the man's weight, we have:

$$F_{\mathrm{G}} = GmM / r^2 \quad , \tag{18}$$

and for the centrifugal force (F_{C}) of the rotating planet, we can write:

$$F_{\mathrm{C}} = ma = mr\omega^2 \quad . \tag{19}$$

The proper angular velocity according to which the weighing machine monitors a zero number is calculated to be:

$$F_{\mathrm{G}} = F_{\mathrm{C}} \Rightarrow GmM / r^2 = mr\omega^2 \Rightarrow \omega = \sqrt{GM / r^3} \quad . \tag{20}$$

We expect that for the IS man and planet, the angular velocity remains unchanged from the viewpoint of the distant observer. (Recall that similar angular velocities are necessary for two isotropic scaled objects in order for the observer not to distinguish the objects from each other observationally). For the isotropic scaled planet we have $M' = K^3 M$ and $r' = Kr$ for its mass and radius respectively. And the IS mass of the man is $m' = K^3 m$. For relevant angular velocity, we can write:

$$\omega' = \sqrt{GM' / r'^3} = \sqrt{GK^3 M / (Kr)^3} = \sqrt{GM / r^3} \quad , \tag{21}$$

which is compatible with Eq. (20). Eq. (21) shows that the angular velocity shall remain the same so that the observer cannot detect any differences of the two IS masses which is a correct conclusion.

The isotropic scaling can somehow show that how it is possible to obtain the general path of a particle in a G-field with no use of differential equations! This deduction is a little problematic, so we explain it here:

Assume that we accept with this fact that *circle* is the simplest geometrical path of an orbiting object as a presumption; isotropic scaling then *nearly* demonstrates all other conic sections as valid paths for an orbiting object in G-field. If the Postulate of Homogeneity is to be correct then it shan't depend on the initial angle of observation, e.g., if we settle observer's eye as shown in Fig. 1, with any arbitrary angle which observer's vision line made with x line, the principle of homogeneity shall still work. This means that the function of distance $r(x)$ would no more vary with the arbitrarily chosen location of the observer and it remains the same still obeying the inverse square law. Now, if the observer views a circular motion of a test mass orbiting a greater one complying with the inverse square law, the law must remain unchanged while he alters his line of vision.

In this case, according to Fig. 2, different curves of the test particle path appear: ellipse, parabola and hyperbola. (Recall that the eye's retina is just a supporting definition that cannot be always explaining the purport of homogeneity thus, we used flat planes B instead as shown in Fig. 2. Isotropic scaling predicts that the location of both passive (planet) and active (sun) masses shall obey the law but the problem with this deduction is that the sun, as shown in Fig. 2, must save its place on the cone axis, *e.g.*, the axis of a cone must pass through the foci of any of its conic sections but unfortunately it does not! See Appendix I.

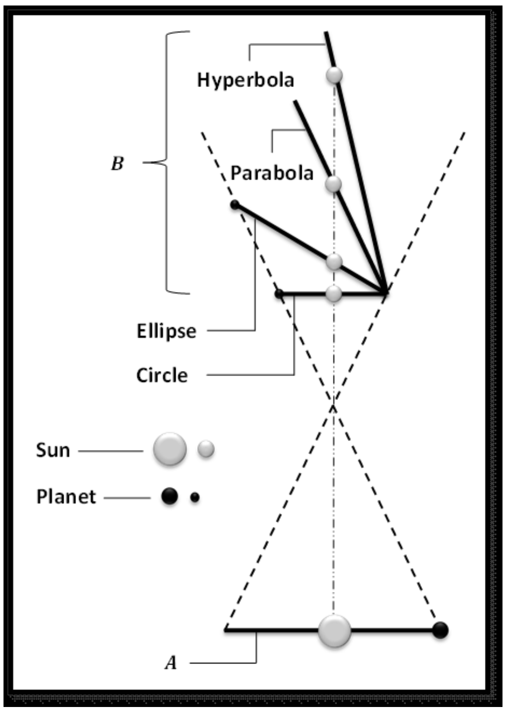

Figure 2. The general path of a test particle obeys the principle of homogeneity regardless of the angle of eye's retina. Instead of retina, we used flat planes (B) with different angles to show that the principle of isotropic scaling shall be independent of the initial angles of the plane. A: A section of the plane onto which the planet orbits Sun circularly. B: Isotropic scaled planes of the main plane A with different angles.

This problem is probably due to that the isotropic scaling does not completely match to this case. That is, if the observer tries to change its location in order to see the circular plane of an orbiting object, he would see that by the time the object becomes nearer to him on its orbit it becomes greater in size, and in some places of the orbit the planet becomes farther and smaller in size. While there are changes in the apparent size of the passive body from the viewpoint of the observer, the law of homogeneity may be no more applicable. In this article we show that the utilization of this simple law is very vast in the nature, however, it would be very important how it is used to simulate the behavior of physical phenomena.

2.2 Heterogeneity

In here, we want to study GOP from a new aspect. We realized that isotropic scaling is a powerful mean to describe and formulate some physical laws such as gravitation and electrostatics. Isotropic scaling is a subset of the observation law through which two objects with *different sizes* but with *homogeneous (same) physical law e.g., gravitational* are assumed to behave similarly. We showed that isotropic scaling allows us to present two objects with different physical properties such as mass and volume for an observer but with similar scenes just before his/her eyes to which homogeneous physical forces are ascribed.

Isotropic scaling (Homogeneity) does not allow the observer to distinguish which object is nearer, or which one is farther, in reality. However, there is still another way *but* isotropic scaling according to which an observer can not distinguish the physical reality of objects before his/her eyes. We showed that isotropic scaling confirms that gravitational and electric forces comply with the same function of distance: inverse square. Now assume that we have two spherical objects being similar in size are equidistant from observer at a large distance Δy away from each other. (the observer is the reader indeed) See Fig. 3.

It is assumed that the below *planet* in Fig. 3 which is made of a dense material like iron has a great mass M and is electrically neutral and the above planet is made of a grey gaseous material with a very low density but a great charge of $-Q$. Homogeneity showed that the law of distance is the same for both gravitational and electrostatic forces. This property allows us to attribute a specific amount of electric charge to the gaseous plant so that the gravitational and electric accelerations become equal for two similar electrically charged test masses m_{+q} with a mass m and a net charge $+q$. That is, if we set one electrically charged test mass at distance x away from each iron and charged gaseous planets, it would be problematic for the observer (reader) to distinguish which planet exerts electric force and which one exerts that of gravitational on the charged test masses! In this case, we considered two *inhomogeneous forces* for two objects with *similar sizes and distances* from the observer. Meanwhile, we have succeeded in baffling the observer in order not to distinguish reality using the general principle of observation.

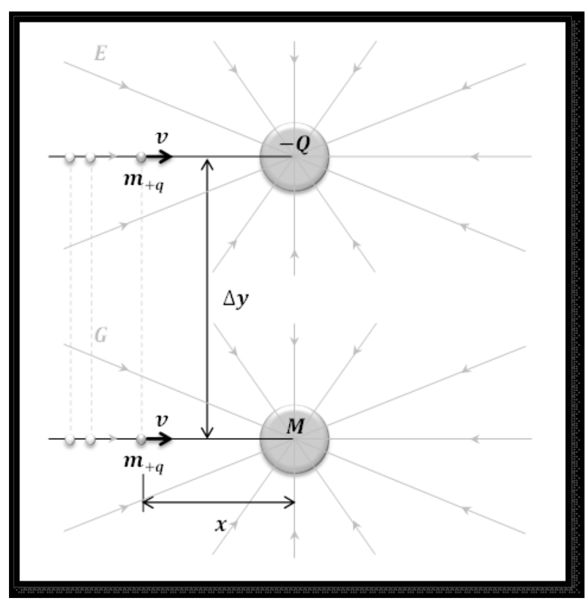

Figure 3. Two physical objects one with high density and mass is electrically neutral (down) and the other one with a small mass and density is highly charged (up). These objects are separated enough with a distance Δy from each other so that they have no effect on each other. Two similar test masses m_{+q} are left to fall on the objects. Because of similar sizes of spheres, a distant observer cannot distinguish which object exerts a gravitational force on m_{+q} and which one does that of electric.

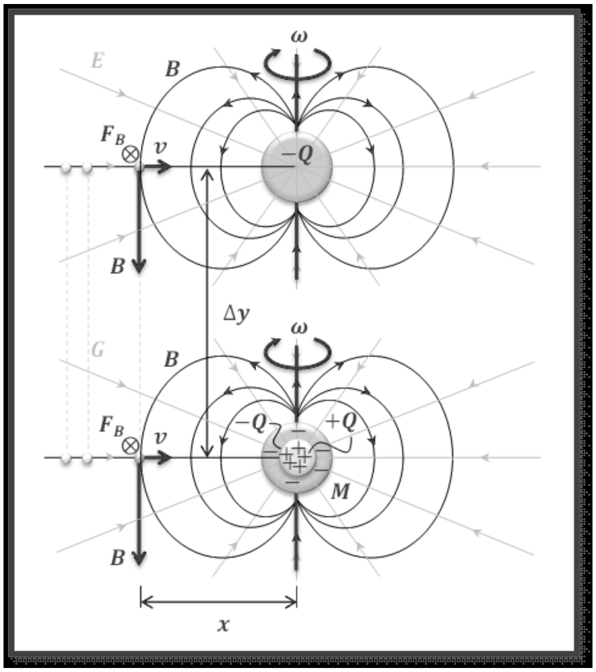

Figure 4. When objects shown in the previous Figure tend to rotate swiftly around a vertical axis with an equal angular velocity ω, GOP predicts that the observer shall not detect any differences in the curvilinear path of the falling test mass. When the charged matter above rotates, a magnetic field is induced at the location of the test mass that exerts an extra magnetic force on the moving charged test mass as well as a previously exerted electric force. GOP urges us to consider and justify a similar magnetic force for the neutral dense mass below so that the observer *sees* a similar curvilinear path for the second charged test mass below!

Nothing special seems to happen thus far; however, consider the question of 'what if the planets start to rotate swiftly by the time the charged test masses reach similar speeds of v at a distance x away each planet?' is notable. If angular velocities of the plants are equal, GOP predicts that physical laws must remain the same steadily during the charged test masses are falling towards the planets. Nonetheless, an odd problem occurs when the highly charged planet rotates: A magnetic field appears all around the planet that exerts a magnetic force on the moving charged test mass. See Fig. 4.

Therefore, although it seems odd much more than it first meets the eye, we have to justify a similar magnetic field for the rotating neutral dense mass below in Fig. 4 which must affect m_{+q} as same as the magnetic field of $-Q$ must do. But the odd point is that how a neutral rotating mass can produce a considerable magnitude of magnetic field. Assume that each rotating neutral *planet* (mass) causes a strange effect in the mass overall. The core of such a planet becomes positively charged ($+Q$) and its *crust* and *mantle* become negatively charged ($-Q$) (or vice versa). See Appendix II. This deduction has two merits: 1- Total charge of the mass remains nearly neutral 2- different tangential velocities of the rotating matter particles produce a non-zero net magnetic field outside the mass. That is to say, if we consider every rotating neutral mass as a planet and assume that its core with a small radius r_c is positively charged and the entire rest of the mass gains negative charges so that charges are of similar magnitudes ($|+Q|=|-Q|$), we can anticipate that the mass still remains electrically neutral, however, by the time it rotates, a similar magnetic field is produced just analogous to the rotating mass with a charge $-Q$ shown in Fig. 4 (up). This deduction is very important because it points out that *electric charge*, intrinsically, is nothing special than *mass* plus *rotation*.

3. A Unified Mass-Charge Equation

Proceeding with our trial to introduce a unified mass-charge equation, we need an equation that relates mass to charge initially. We previously demonstrated that for ether and photon we can use the following equation [3]:

$$dq_{\mathrm{eth}} / dm_{\mathrm{eth}} = \pm\sqrt{G\varepsilon_0} \quad . \tag{22}$$

If we assume that the above equation can also be used for matter, we can write:

$$Q / M = \pm\sqrt{G\varepsilon_0} \quad . \tag{23}$$

This equation shows that every particle with a mass M carries equal magnitudes of positive and negative charges *other than* its natural sub-atomic charges say protons and electrons. It shows that there are several centers of positive and negative charges inside a matter without considering its atomic structure that may be affected by *acceleration*. When we consider an inertial reference frame, the numbers of these *centers* are equal and this causes a neutral matter remains neutral electrically as it is considered from different inertial references, however, a naturally neutral object when is shifted into a non-inertial frame of reference, e.g., it rotates swiftly around its center of mass; a centrifugal force makes the centers of charges to become parted from each other and, as it was show in Fig. 4, negative charges are being heaped up in outer layers of the matter and positive charges are being gathered near the center of rotation. Do not mistake this sort of charged particles that behaves as matter's *soul* for atomic and sub atomic structure of matter, which is considered in the common literature on different fields in physics.

We leave more explanations about this matter's soul and instead, we focus on strange and plausible predictions that are brought forth by speculating upon this matter and trying to formulate the *heterogeneity*!

A relativistic form of Eq. (23) can be introduced as follows:

$$(1 - v^2 / c^2)^{3/2} Q / M = \pm\sqrt{G\varepsilon_0} \quad , \tag{24}$$

where M is the proper mass and Q is the corresponding relativistic electric charge. The factor $(1 - v^2 / c^2)^{3/2}$ is chosen so that the predictions can be extended from giant stars to tiny particles like electrons thus, there might be other approximations for the entire term or its exponent. See Appendix II. The plus-minus sign shows that both sorts of electric charges are being produced and they grow inside a neutral object with equal magnitudes that remains the net charge neutral.

Nonetheless, in a rotating neutral mass, due to different tangential velocities which is very small near the center of rotation that is positively charged and is very high in outer layers which is negatively charged, Eq. (24) predicts that rotating outer layers of the object obtain a greater negative charge than those of inner. Therefore, we can deduce that when an electrically neutral mass rotates swiftly, it would become diminutively charged in outer layers so that the net charge is no longer zero!

How does Eq. (24) allow a rotating neutral mass to become electrically charged? When an object with a proper mass M rotates, its final mass would be augmented relativistically, however, the gamma factor differs from $1\big/\sqrt{1-v^2/c^2}$ for a rotating mass:

$$M_\omega = \xi(v_R)M \quad , \tag{25}$$

where M_ω is the relativistic mass for a rotating solid sphere with a radius R and a constant angular velocity ω, M is its proper mass before rotation, $v_R = R\omega$ is the tangential speed of the equator of the sphere, and:

$$\xi(v_R) = \frac{3}{4}\frac{c}{v_R^3}\left[2cv_R - (c^2 - v_R^2)\ln(|1+v_R/c|/|1-v_R/c|)\right] \quad . \tag{26}$$

Indeed, $\xi(v_R)$ replaces the traditional gamma factor for a rotating mass. See Appendix III (Recall that we need Eq. (25) in Sect. 5) We can rewrite Eq. (24):

$$\begin{aligned} Q_\omega/M &= \pm\sqrt{G\varepsilon_0}\left[1 - v^2/c^2\right]^{-3/2} \\ \Rightarrow dQ_\omega &= -\sqrt{G\varepsilon_0}\left[1 - r^2\omega^2/c^2\right]^{-3/2} dM \quad . \end{aligned} \tag{27}$$

The equation above shows that a rotating ring element with a radius r of a rotating solid sphere with a radius R, produces a superfluous charge $d(\Delta Q_\omega)$ with respect to the sphere's initial charge before rotation, which can be calculated as follows:

$$d(\Delta Q_\omega) = \underbrace{-\sqrt{G\varepsilon_0}\,(1 - r^2\omega^2/c^2)^{-3/2}dM}_{\substack{\text{crust and mantle's charge}\\ \text{in high angular velocities}}} - \underbrace{-\sqrt{G\varepsilon_0}\,dM}_{\substack{\text{crust and mantle's charge}\\ \text{in low angular velocities}}} \quad . \tag{28}$$

For a sphere with a radius R, the integration of the above formula over V (Volume) is calculated to be: (See Fig. 5)

$$\int d(\Delta Q_\omega) = \int_M -\sqrt{G\varepsilon_0}(1 - r^2\omega^2/c^2)^{-3/2}dM - (-\sqrt{G\varepsilon_0}\,dM) \quad ,$$

and with $dM = \rho dV$ implies

$$\Delta Q_\omega = \int_V \rho\sqrt{G\varepsilon_0}\left[1 - (1 - r^2\omega^2/c^2)^{-3/2}\right]dV \quad ,$$

and with $dV = r\ dr\ d\theta\ dz$ implies

$$\Delta Q_\omega = \rho\sqrt{G\varepsilon_0}\int_0^{2\pi}\int_{-R}^{R}\int_0^{\sqrt{R^2-z^2}}\left[1 - (1 - r^2\omega^2/c^2)^{-3/2}\right] r\,dr\,dz\,d\theta$$

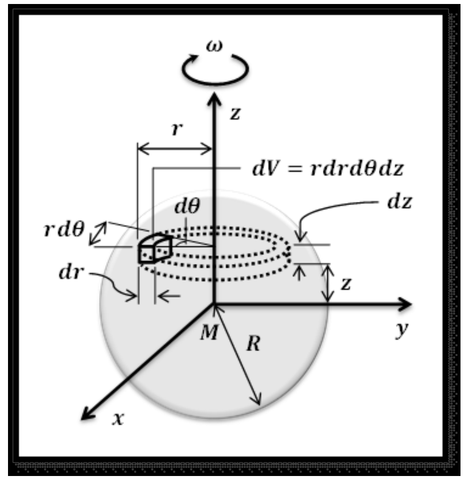

Figure 5. The volume element of a rotating sphere with a radius R can both be calculated as $dV = r\,dr\,d\theta\,dz$ or $dV = 2\pi r\,dr\,dz$ (the ring element).

Then we can write:

$$\Delta Q_\omega = 2\pi\rho\sqrt{G\varepsilon_0}\times \left[\int_{-R}^{R}\int_0^{\sqrt{R^2-z^2}} r\,dr\,dz - \int_{-R}^{R}\int_0^{\sqrt{R^2-z^2}}(1 - r^2\omega^2/c^2)^{-3/2} r\,dr\,dz\right]$$

$$\Rightarrow \Delta Q_\omega = \frac{2\pi\rho c^3}{3\omega^3}\sqrt{G\varepsilon_0}\left[2(v_R/c)^3 - 3\ln\left|\frac{1+v_R/c}{1-v_R/c}\right| + 6\frac{v_R}{c}\right] \tag{29}$$

and with $\rho = \dfrac{M}{4\pi R^3/3}$ & $R^3\omega^3 = v_R^3$ implies

$$\Delta Q_\omega = \frac{M\sqrt{G\varepsilon_0}}{2(v_R/c)^3}\left[2(v_R/c)^3 + 6\frac{v_R}{c} - 3\ln\left|\frac{1+v_R/c}{1-v_R/c}\right|\right] \quad .$$

Remember that $v_R = R\omega$. For simplicity, we can write:

$$\Delta Q_\omega = M\sqrt{G\varepsilon_0}\ \Omega(v_R) \quad , \tag{30}$$

where $\Omega(v_R)$ is the *rotation factor* is:

$$\begin{aligned} &\Omega(v_R) = 2^{-1}(v_R/c)^{-3}\times \\ &\left[2(v_R/c)^3 + 6v_R/c - 3\ln\left|(1+v_R/c)/(1-v_R/c)\right|\right] \quad . \end{aligned} \tag{31}$$

With $v_R \ll c$, the binomial approximation for $\Omega(v_R)$ gives:

$$\Delta Q_\omega = \sqrt{G\varepsilon_0}\Omega(v_R)M \cong -3\sqrt{G\varepsilon_0}M(v_R^2/5c^2) \quad . \tag{32}$$

An important hint in rotation is that nearly the entire object gets negatively charged, but for its core. The rotation increases only the rotating negative charges without affecting the magnitude of positive charges near the center of rotation.

The above equation can be considered as one of the revolutionary formulas has ever been introduced in physics, which asserts that a neutral rotating mass is no more electrically neutral! When an object moves with a *constant velocity* without any rotation, this difference is obtained nearly equal to $\Delta Q \cong \pm 3M\sqrt{G\varepsilon_0}\,v^2/2c^2$ (use binomial approximation to Eq. (24) and consider its difference from $M\sqrt{G\varepsilon_0}$) which shows that the neutral object undergoes an increase in both of positive and negative charge centers and remains neutral.

However, when we consider a rotating object, we know that positive and negative charges are becoming parted soon after rotation so that a considerable amount of negative charges are gathered wherever inside the mass but near its core thus, we shall anticipate that the mentioned charge discrepancy has a sign similar to the rotating negative charge as it was obtained in Eq. (32).

Example 1

An electrically neutral solid iron ball with a mass 10^4 kg and a radius 1 m rotates swiftly around its axis so that its tangential velocity near its equator is close to the speed of sound ($v_R = 330$ m/s). How much superfluous charge does it produce?

According to Eq. (32), we can write:

$$\Delta Q_\omega \cong -3\sqrt{G\varepsilon_0}\,M\,v_R^2/5c^2 =$$
$$-3\times\sqrt{6.67\times10^{-11}\times8.85\times10^{-12}}\times10^4\times330^2/(5\times9\times10^{16})$$
$$\cong -1.7\times10^{-17}\ \mathrm{C} \quad .$$

The above example shows that detecting the extra electric charge needs sensitive experiments for measuring a charge with a magnitude just a hundred times the order of elementary charge. However, there are still examples that culminate in tangible results:

Example 2

The planet Earth and the Sun can be considered as big rotating objects. **a)** How much extra charge do they produce due to their rotation? **b)** How much Coulomb's force do these two celestial objects exert on each other? Compare it with corresponding gravitational force. ($r_{\mathrm{ES}} \cong 1.5\times10^{11}$ m)

$$(M_{\mathrm{E}} \cong 6\times10^{24}\ \mathrm{kg},\ \omega_{\mathrm{E}} \cong 7.3\times10^{-5}\ \mathrm{rad/s}, R_{\mathrm{E}} \cong 6.4\times10^6\ \mathrm{m})\ ,$$

$$(M_{\mathrm{S}} \cong 2\times10^{30}\ \mathrm{kg},\ \omega_{\mathrm{S}} \cong 2.5\times10^{-6}\ \mathrm{rad/s}, R_{\mathrm{S}} \cong 7\times10^8\ \mathrm{m})\ .$$

Using Eq. (32), we obtain:

$$\Delta Q_{\omega_{\mathrm{E}}} \cong -210\ \mathrm{C} \quad , \Delta Q_{\omega_{\mathrm{S}}} \cong -9.6\times10^8\ \mathrm{C} \quad .$$

The corresponding Coulomb's force is:

$$F_{\mathrm{E}} = \frac{1}{4\pi\varepsilon_0}\Delta Q_{\omega_{\mathrm{E}}}\Delta Q_{\omega_{\mathrm{S}}}\Big/r_{\mathrm{ES}}^2 =$$
$$9\times10^9\left(210\times9.6\times10^8/(1.5\times10^{11})^2\right) \cong 8.1\times10^{-2}\ \mathrm{N} \quad .$$

For the gravitational force, we have:

$$F_G = G\frac{M_{\mathrm{E}}M_{\mathrm{S}}}{r_{\mathrm{ES}}^2} = 6.67\times10^{-11}\frac{6\times10^{24}\times2\times10^{30}}{(1.5\times10^{11})^2} \cong 3.5\times10^{22}\ \mathrm{N}\ .$$

We can see that the Coulomb's force is negligible in comparison with gravitation.

4. An Alternative to Dynamo Theory

Although in 1919 Joseph Larmor proposed that a conductive fluid geo-dynamo may generate long-lived magnetic fields in astrophysical objects [4,5], here we instead, show that the distribution of the charges inside a rotating object as introduced by heterogeneity can predict the magnetic field of rotating celestial bodies better than Dynamo theory regardless of matter's electrical conductivity. As it was shown in Fig. 4, by the time the negative charges are accumulated wherever inside a rotating mass except its center nearby, it is anticipated that the whole amount of the negative charges produces a magnetic field around the mass due to tangential velocity that each negative charge has and that the positive core produces no tangible magnetic field because of small tangential velocities. Here, we want to calculate how much magnetic field this accumulated negative charges produce. Calculating the magnetic field, we can assume that a rotating solid sphere is made of too many imaginary concentric circular wires that each one carries an electric flow proportion to the negative charge within and the magnitude of its tangential speed due to the mass constant angular velocity. The net magnetic field can be considered as the summation of the fields that imaginary wires produce.

The magnetic field of a loop at a distance $d-z$ away from its center, (point P) See Fig. 6, is calculated to be: [6]

$$dB_{d-z} = \tfrac{1}{2}\mu_0\,r^2 dI\Big/\left[(d-z)^2+r^2\right]^{3/2} \quad . \tag{33}$$

We know that $dI = dQ_\omega/T$ and $T = 2\pi/\omega$ which means that after a complete cycle with a period T, a charge of dQ_ω just passes a section of the so-called imaginary wire. We can write:

$$dI = \frac{\omega}{2\pi}dQ_\omega \quad . \tag{34}$$

By inserting Eq. (34) into Eq. (33) and using integration we get:

$$\int dB_{d-z} =$$
$$\int_{Q_\omega}\frac{\mu_0}{4\pi}r^2\omega\left[(d-z)^2+r^2\right]^{-3/2}dQ_\omega \quad .$$

Using Eq. (27),

$$B_d =$$
$$\int_M\frac{-\mu_0}{4\pi}\sqrt{G\varepsilon_0}\,(1-r^2\omega^2/c^2)^{-3/2}r^2\omega\left[(d-z)^2+r^2\right]^{-3/2}dM \quad .$$

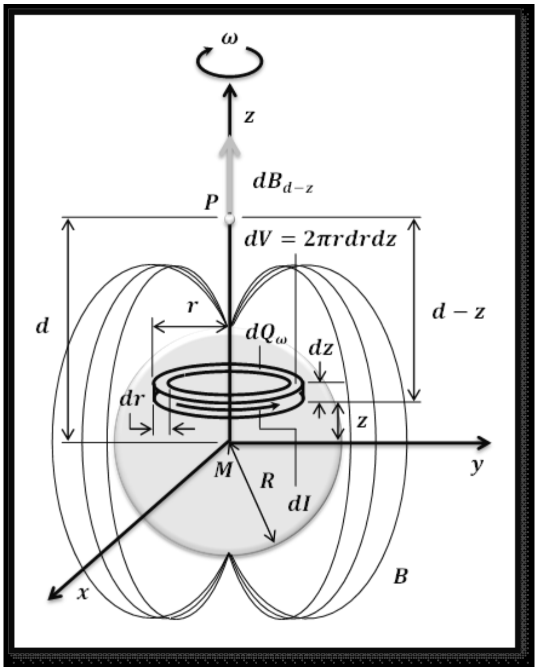

Figure 6. An imaginary loop with a radius r that carries a current dI. This current is due to the rotation of a mass M with a radius R and an angular speed ω that carries a net charge Q_ω.

Using $dM = \rho dV$ & $dV = 2\pi r dr dz$,

$$B_d = -\frac{1}{2}\mu_0\rho\omega\sqrt{G\varepsilon_0}\times \int_{-R}^{R}\int_0^{\sqrt{R^2-z^2}} \left\{\left[(d-z)^2+r^2\right]\left(1-r^2\omega^2/c^2\right)\right\}^{-3/2} r^3\,dr\,dz \quad . \tag{35}$$

The integration above is hard to be calculated and if we change the domain of integrals as follows, then the inner integral can be obtained using a scientific calculator or programs like Mathcad but the outer one seems not to be computable:

$$B_d = -\frac{1}{2}\mu_0\rho\omega\sqrt{G\varepsilon_0}\times \int_0^R\int_{-\sqrt{R^2-r^2}}^{\sqrt{R^2-r^2}} \left\{[(d-z)^2+r^2](1-r^2\omega^2/c^2)\right\}^{-3/2} r^3\,dz\,dr \quad . \tag{36}$$

Whether or not the integrals are being calculated, we can always compute them numerically:

Example 3

Find the magnetic induction field of earth at its surface near the pole:

$$(M_{\mathrm{E}} \cong 6\times10^{24}\ \mathrm{kg},\ \omega_{\mathrm{E}} \cong 7.3\times10^{-5}\ \mathrm{rad/s}\ ,R_{\mathrm{E}} \cong 6.4\times10^{6}\ \mathrm{m}$$
$$\rho_{\mathrm{E}} \cong 5520\ \ \mathrm{kg/m^3}\ \ .)$$

Using Eq. (35) (or Eq. (36)) and assuming $d = R_{\mathrm{E}} \cong 6.4\times10^6\ \mathrm{m}$, we can write:

$$B_{R_{\mathrm{E}}} = (1/2)\times 4\pi\times10^{-7}\times5520\times7.3\times10^{-5}\times\sqrt{6.67\times10^{-11}\times8.85\times10^{-12}}\times \int_{-6.4\times10^6}^{6.4\times10^6}\int_0^{\sqrt{\left(6.4\times10^6\right)^2-z^2}} \left\{\begin{array}{c}\left[(6.4\times10^6-z)^2+r^2\right]^{-3/2}\times \\ (1-r^2\omega^2/c^2)^{-3/2}r^3drdz\end{array}\right\}$$

$$\Rightarrow |B_{R_{\mathrm{E}}}| \cong 6.7\times10^{-5}\,T \quad .$$

This result is amazingly in accord with recent experiments that show a $6\times10^{-5}\,T$ field for earth near its pole! For other astronomical objects See Table 1.

Planet/ Star	ω [7] (rad/s)	R [7] (m)	ρ [7] (kg/m^3)	$\lvert B\rvert$ (T) (Observed)		$\lvert B\rvert$ (T) (Eq. (35))	Accordance Status
Sun	2.6×10^{-6}	6.9×10^{8}	1400	p	2×10^{-4} [8]	7.0×10^{-3}	Good
Mercury	1.2×10^{-6}	2.4×10^{6}	5400	e	2×10^{-7} [9]	1.6×10^{-7}	Very good
Venus	3.0×10^{-7}	6.0×10^{6}	5200	e	$\le10^{-9}$ [10]	2.3×10^{-7}	Bad
Earth	7.3×10^{-5}	6.4×10^{6}	5520	p	6×10^{-5} [11]	6.7×10^{-5}	Very good
Moon	2.7×10^{-6}	1.7×10^{6}	3340	e	$\le10^{-10}$ [12]	1.1×10^{-7}	Bad
Mars	7.1×10^{-5}	3.4×10^{6}	3900	e	$\le10^{-7}$ [13]	1.3×10^{-5}	Bad
Jupiter	1.7×10^{-4}	6.9×10^{7}	1400	p	0.0013 [14]	4.7×10^{-3}	Very good
Saturn	1.7×10^{-4}	5.7×10^{7}	690	p	8×10^{-5} [15]	1.6×10^{-3}	Good
Uranus	1.0×10^{-4}	2.5×10^{7}	1190	p	1×10^{-4} [16]	3.1×10^{-4}	Very good
Neptune	9.7×10^{-5}	2.5×10^{7}	1660	p	9×10^{-5} [17]	1.4×10^{-5}	Very good
Neutron star [18]	*From* 1.0 *to* 393.0	1.0×10^{4}	4×10^{16}	*From* 10^7 *to* 10^9		*From* 10^7 *to* 10^9	Very good

Table 1. Observed magnetic field of Sun, solar planets and neutron stars are compared with Eq. (35). 'p' stands for polar magnetic field and 'e' stands for that of equatorial. Data in the bold face border are derived from Ref. [7]. If the ratio of Eq. (35) to the observed magnetic field is smaller that 10, it is considered as *very good*; if the ratio is between 10 to 50, it is considered as *good* and ratios greater than 50 are assumed as *bad*.

5. Planetary Model of Electron

According to heterogeneity, we can say that the physics of an atom is as similar as that of solar system. This perception had previously led Niels Bohr (1913) to a model for atom similar in structure to the solar system. However, homogeneity/heterogeneity goes beyond all the renowned theories that depict the behavior of nature and makes more similarities between macroscopic and microscopic phenomena.

5.1 Calculating Electron's *Equator* Tangential Speed

We realized that what is measured as electric charge can be nothing but mass plus rotation. If the planet Earth is no longer neutral and is $-210\ C$ charged due to its rotation; is it possible to assume that a single electron receives its charge due to a swift rotation either?! If we extend homogeneity/heterogeneity to atomic particles, it culminates in planetary models for theses microscopic objects.

Example 4

If we consider an electron as a rotating object, and if we assume that its initial charge is due to its rotation, what is its tangential velocity near its equator?

$$(q_e = -1.6 \times 10^{-19}\ \text{C},\ m_e = 9.1 \times 10^{-31}\ \text{kg}) \quad .$$

We know that the mass of electron is its rotating mass M_ω thus, we have to calculate its proper mass using Eq. (25). If we assume that the tangential velocity of a rotating electron is close to the speed of light and according to Eq. (26), we can write:

$$\lim_{v_R \to c} \xi(v_R) = 1.5 \quad .$$

Using Eq. (25) for the proper mass of electron before rotation, we have:

$$m_e = \frac{m_{\omega_e}}{\xi(c)} = \frac{9.1 \times 10^{-31}}{1.5} \cong 6 \times 10^{-31}\ \text{kg} \quad .$$

Using Eq. (29), supposing $\Delta Q_{\omega_e} = q_e = -1.6 \times 10^{-19}$ and $v_R = kc$ (significant portion of the speed of light where $0 < k < 1$ (very close to unity)), it yields:

$$q_e = \frac{m_e}{2k^3} \sqrt{G\varepsilon_0} \left[2k^3 + 6k - 3\ln\left|\frac{1+k}{1-k}\right| \right] \quad .$$

It seems that the root of the equation above needs a super computer to be calculated because k seems to be a number extraordinarily close to unity. However, when k approaches unity, $2k^3 + 6k - 3\ln|(1+k)/(1-k)|$ is asymptotic to $-3\ln|(1+k)/(1-k)|$ when k approaches unity. Thus:

$$q_e = \lim_{k \to 1^-} \frac{m_e\sqrt{G\varepsilon_0}}{2k^3} \left[2k^3 + 6k - 3\ln\left(|(1+k)/(1-k)| \right) \right] \Rightarrow$$

$$q_e \approx -\frac{3}{2} m_e \sqrt{G\varepsilon_0} \ln|(1+k)/(1-k)| \Rightarrow$$

$$k \approx \frac{-1 + \exp\left[-2q_e / 3m_e\sqrt{G\varepsilon_0} \right]}{1 + \exp\left(-2q_e / 3m_e\sqrt{G\varepsilon_0} \right)} \quad .$$

My own approximation (along with some guess!) has been resulted in: $k = 0.999...999 \quad (9 \text{ repeated } 10^{22} \text{ times})$. This result shows that the electron rotates very swiftly so that its surface tangential velocity approaches the speed of light. This high tangential velocity is needed to produce a charge of $q_e = e = -1.6 \times 10^{-19}\ C$. Remember that if k becomes exactly equal to unity, the electron charge would approach infinity (Eq. (31)):

$$\lim_{v_R \to c} \Omega(v_R) = -\infty \quad .$$

This model demonstrates that electron might have a tiny positively charged core! This small charge can be calculated using Eq. (27):

$$Q_\omega / M = \pm\sqrt{G\varepsilon_0} \left[1 - r^2\omega^2 / c^2 \right]^{-3/2} \xrightarrow{r \cong 0}$$

$$q_{\omega_e} \cong +m_e\sqrt{G\varepsilon_0} \cong 6 \times 10^{-31} \times \sqrt{6.67 \times 10^{-11} \times 8.85 \times 10^{-12}}$$

$$q_{\omega_e} \cong +1.4 \times 10^{-41}\ \text{C} \quad .$$

5.2 Calculating Electron's Radius And Angular Velocity

The unified mass-charge equation [Eq. (29)] allows us to calculate a single electron's radius using magnetic moment of electron regarding the fact that the magnetic moment of a loop with a current I and area A is $\mu = IA$. [19]

Example 5

If Bohr magneton indicates the intrinsic magnetic moment of a single electron caused by its spin, what does the unified mass-charge equation predict for electron's radius?

For magnetic moment, we can write:

$$d\mu = AdI = \pi r^2 dI \quad .$$

By substituting Eq. (34) into equation above and using integration, we get: (See Fig. 6)

$$d\mu = AdI = \pi r^2 \frac{\omega}{2\pi} dQ_\omega \quad .$$

Using Eq. (27),

$$\mu = -\tfrac{1}{2}\sqrt{G\varepsilon_0}\,\omega \int_M r^2 (1 - r^2\omega^2 / c^2)^{-3/2}\, dM \quad .$$

Then using $dM = \rho dV$ & $dV = 2\pi r dr dz$ & $\omega = \omega_e$ gives

$$\mu = -\pi\sqrt{G\varepsilon_0}\rho\omega_e \int_{-r_e}^{r_e}\int_0^{\sqrt{r_e^2-z^2}} \frac{r^3 drdz}{(1-r^2\omega_e^2/c^2)^{3/2}} \quad .$$

Next using $\rho = 3m_e/4\pi r_e^3$ and $r_e\omega_e/c = k$ gives

$$\mu = \frac{3}{8}\sqrt{G\varepsilon_0}\left(m_e c^2/\omega_e k^3\right)\left[(k^2-3)\ln\left|\frac{1+k}{1-k}\right| + 6k\right] \quad .$$

We are fortunate to be able to calculate the above equation when $k \to 1$ because, Example 4 previously obtained:

$$\ln\left|(1+k)/(1-k)\right| \approx -2q_e\Big/3m_e\sqrt{G\varepsilon_0} \quad .$$

For μ_e and considering the fact that $\mu_e = q_e\hbar/2m_e$ ([19], p. 293), we get:

$$\mu_e = \lim_{k\to 1^-}\frac{3}{8}\sqrt{G\varepsilon_0}\frac{m_e c^2}{\omega k^3}\left[(k^2-3)\ln\left|(1+k)/(1-k)\right| + 6k\right] \quad ,$$

or
$$\mu_e \approx -\frac{3}{4}\sqrt{G\varepsilon_0}\frac{m_e c^2}{\omega}\ln|(1+k)/(1-k)| \quad .$$

Substituting $\ln|(1+k)/(1-k)| = -2q_e\Big/3m_e\sqrt{G\varepsilon_0}$ implies

$$\mu_e \approx \left(-2q_e\Big/3m_e\sqrt{G\varepsilon_0}\right)\times\left(-\frac{3}{4}\sqrt{G\varepsilon_0}\, m_e c^2\Big/\omega\right) \quad .$$

using $\omega = c/r_e$ & $\mu_e = q_e\hbar/2m_e$ implies

$$r_e \approx \frac{\hbar}{cm_e} \cong \frac{1.05\times 10^{-34}}{3\times 10^8 \times 6\times 10^{-31}} \cong 5.83\times 10^{-13}\text{ m} \quad .$$

Here $\hbar = h/2\pi$ is the reduced Plank constant and m_e is the proper mass of electron before its rotation as it was calculated in Example 4. The above magnitude of electron's radius is hundreds of times greater than the size of a single proton and is in contradiction to theories and experimental results that predicts a radius smaller than 10^{-16} m for electron. However, our result is compatible with electron Compton wavelength 3.8×10^{-13} m according to the concept of *zitterbewegung* (trembling motion) that was introduced by Schrödinger reflecting his own solution to Dirac equation for relativistic electron in free space. [20]

The angular velocity of electron is then calculated to be:

$$\omega_e = \frac{c}{r_e} = \frac{3\times 10^8}{5.8\times 10^{-13}} \cong 5.2\times 10^{20}\text{ rad/s} \quad .$$

Consequentially the above number is compatible with Schrödinger's circular frequency of $1.6\times 10^{21}\,Hz$. [20] Recall that the only difference between our final results for the radius and angular velocity of electron and those calculated by Schrödinger seems to be in the mass of electron. Indeed, we have used a proper mass for electron that is smaller than the mass of the rotating electron. See Example 4. If we consider the proper mass of electron in Schrödinger's solution, Density Theory would be in exact accordance to Dirac's relativistic equation on some physical properties of electron.

5.3 Ring Model of Electron

Heterogeneity may support other models for electron like the model of ring like. [21] Although the reason that urged us to consider a sphere shape for electron was making more similarity between the solar system and atom according to GOP, a ring model of electron can be acceptable with regarding the fact that a swiftly rotating *planet* may become an ellipsoidal due to high tangential velocities near its equator and in the realm of quantum mechanics this rotation may heap up all the mass in a thin ring.

6. The General Unified Mass-Charge Equation

This Section introduces a formula for mass and charge more general than that previously obtained in Eq. (27). In Table 1 shows that the magnetic fields of some astronomical objects do not satisfy our unified mass-charge equation for magnetic field of a rotating mass [Eqs. (35,36)] so that their *accordance status* are described as *bad.* This deficiency is may be due to the geomagnetic reversal of planets according to which the positions of magnetic poles are interchanged. [22] This phenomenon causes a planet magnetic field to become reduced to zero and maximized such that the magnetic poles are reversed periodically. If a planet is on its midway of polarity reversal then its magnetic field has minimum value that may not be predictable using Eqs. (35,36), however, heterogeneity is capable of describing polarity reversal:

As was shown in Fig. 4, we assumed that a rotating neutral mass accumulates negative charges wherever inside matter but near its core which is positively charged due to a centrifugal force, however, the question of why we did not chose positive charges to be heaped up in crust and mantle and instead, the negative ones to be gathered near the core is considerable. According to heterogeneity, it is assumed that both cases are permitted regarding the fact that a net external charge choose which sort of charge shall gather near the core. See Fig. 4. Indeed, we think that it is possible the electric distribution of charges be very *fragile* inside the matter such that the external distribution of other objects (planets) affects the rotating object prior distribution of charges. That is, if positive charges are gathered inside the core as we previously assumed, an external periodic electric forces of other planets due to their own rotation that are exerted on the rotating mass can slowly change the electric distribution such that the core is negative and outer layers are positive. This deduction is based on a probability according to which other planets might have different distributions of electric charges due to their rotation so that some may have positively been charged at their crusts and mantels and some others behave vice versa which can be considered as *electrical perturbation* on the planet.

This kind of perturbation may cause a periodic change in the electric distribution inside the rotating matter such that positive charges in core reduces and being heaped up in mantel and negative charges instead are being accumulated in the core periodically. For simplicity, one can assume that the so called centers of electric charges behave as a chemical solution and rotation causes substances with negative charges to be precipitated from the solution and gather in outer layers away from the center of rotation and positively charged substances are being gathered near the center. In this case, a net external electric force of other planets, which can be either negative or positive, can periodically upset this distribution and redissolve all precipitations at the outer layers and after a while negatively charged substances subside near the core conversely! But, what magnitude shall this period have and how do we detect it?

If our deduction is correct, we have to attribute this period to something detectable on a specific planet which can indicate us to the effect of planetary perturbation. From the viewpoint of gravitation, two good candidates are the *precession of the rotation axis* and *nutation*, which is a nodding motion in the axis of rotation. If such motions record a gravitational perturbation of other plants then it is possible that they also record an electric perturbation. Therefore, Eq. (27) can be reformulated in its general form:

$$dQ_\omega = -\sqrt{G\varepsilon_0}dM\left[1 - r^2\omega^2 / c^2\right]^{-3/2} \sin(k\theta_0\Omega t) \quad , \qquad (37)$$

where Ω is the angular velocity of the precession of the rotation axis which is equal to $\Omega = 2\pi / T$ where T is the period of such an oscillation. θ_0 is the *axial tilt* (obliquity) of the planet and k is a correction constant. Eq. (35) is also reformulated:

$$\begin{gathered} B_{d,t} = -\tfrac{1}{2}\mu_0\rho\omega\sqrt{G\varepsilon_0}\sin\left(k\theta_0\Omega t\right)\times \\ \int_{-R}^{R}\int_0^{\sqrt{R^2-z^2}} \left\{\left[(d-z)^2 + r^2\right]\left(1 - r^2\omega^2 / c^2\right)\right\}^{-3/2} r^3\, dr\, dz \quad . \end{gathered} \qquad (38)$$

Eq. (38) shows that there happens a maximum value for a planet's magnetic field when $\sin(k\theta_0\Omega t) = 1$, a minimum value when $\sin(k\theta_0\Omega t) = 0$, and a maximum value with reversed polarity when $\sin(k\theta_0\Omega t) = -1$. Maximum values are equal to each other and to Eq. (35) or in short, we can write:

$$B_d(t) = B_{d\max}\sin(k\theta_0\Omega t) \quad , \qquad (39)$$

where $B_{d\max}$ has earlier been calculated for different astronomical objects. See Table 1. $B_{d\max}$ is actually equal to B_d. [Eqs. (35,36)]. Therefore, according to the period of the above sine function [Eq. (39)], magnetic reversal gets a period:

$$\tau = 2\pi / k\theta_0\Omega \quad . \qquad (40)$$

Now we tend to calculate the correction constant k using earth magnetic field data: [22]

Example 6

The most geomagnetic reversals of earth are estimated to take place between 1,000 to 10,000 years. If the precession of the rotation axis has a period 26,000 years, calculate an average value for k. Earth's axial tilt is $\theta_0 \cong 23.4^\circ \cong 0.41\,rad$

We can write:

$$\Omega = \frac{2\pi}{T} \cong \frac{2\pi}{26000} \cong 2.4 \times 10^{-4}\ \mathrm{rad/yr} \quad .$$

An average geometric reversal period can be calculated $= (1000 + 10,000)/2 = 5500\,\mathrm{yr}$. Thus:

$$\tau = \frac{2\pi}{k\theta_0\Omega} \Rightarrow 26000 = \frac{2\pi}{k \times 0.41 \times 2.4 \times 10^{-4}} \quad , \quad k \cong 2.5$$

Now we can somehow justify the discordance between the observed magnetic field and Eq. (35) of planets Venus, Moon and Mars as was shown in Table 1. That is, these planets might be near the midway of their geomagnetic reversal where magnetic field reduces to zero:

Example 7

If the precession of the rotation axis of the Moon has a period $T \cong 78\,\mathrm{yr}$ (solely due to Earth); **a)** Calculate the geometric reversal period for Moon neglecting the effect of other solar objects. **b)** Using data in Table 1, calculate how long does it take from now for the moon to receive its maximum magnetic field ($\theta_0 = 7^\circ \cong 0.12\,\mathrm{rad}$)

$$\Omega = \frac{2\pi}{T} \cong \frac{2\pi}{78} \cong 0.08\ \mathrm{rad/yr} \quad ,$$

$$\tau = \frac{2\pi}{k\theta_0\Omega} = \frac{2\pi}{2.5 \times 0.12 \times 0.08} \cong 260\,\mathrm{yr} \quad .$$

Because the moon's observed geomagnetic field is close to zero, we can deduce that it gets its maximum strength of $1.1 \times 10^{-7}\,T$ (See Table 1) after $\tau/4 \cong 65\,yr$ since now! Recall that more accurate results shall be obtained by considering the effect of all other planets and the sun on moon.

It is questionable with what reason we combined θ_0 and Ω in that odd way which culminated in term $\sin(k\theta_0\Omega t)$. Indeed, we have just guessed that this sort of combination might be helpful and it is not a certain fact predicted by heterogeneity and there can be several other plausible functions for describing geomagnetic reversal. However, there are some merits with the introduced term: **1)** It has a simple form. **2)** When $\theta_0 \to 0$, magnetic reversal gets an infinite value ($\tau \to \infty$) which means that whether or not the external electric field of other planets changes the planet tends not to upset the strength and direction of its own magnetic field; *i.e.*, we attempt to extend this phenomenon to atomic particles to show that, *e.g.*, a single electron tends to save its charge forever (electron's half-life time is infinite) because it might have no axial tilt! That is, we guess that the half life duration of a particle depends on how much long its obliquity precession is. (Remember the planetary model of electron)

7. Other Applications of Heterogeneity

This is a supplementary Section through which we can discuss more applications of heterogeneity in nature.

7.1 A Quasi-Lorentz Force for Magnets

As we realized, heterogeneity is capable of unifying mass and charge. However, it also can introduce some interesting phenomena in the realm of electromagnetism wherein an experiment is carried out satisfying the conditions of heterogeneity such that an observer is confused weather the observed objects and forces are belonging to a charge dipole in an E-field *or* a magnet in a B-field! Assume that we have two crossed dumbbells, one's balls have negatively and positively been charged and the other one has magnetic balls without electric charges and both dumbbells are supposed to be very heavy. A distant observer whose vision line is perpendicular to the plane (page) is stationary with respect to massive dumbbells. See Fig. 7

These dumbbells are considered to be electric and magnetic dipoles respectively. If we release another electric dipole $(+q,-q)$ with a small mass as it is shown in Fig. 7, a net electric force due to dipole $(+\boldsymbol{Q},-\boldsymbol{Q})$ repels the smaller dipole with an acceleration a_E so that it is supposed that both dumbbells are rather heavier to be moved from the viewpoint of the observer. However, from the viewpoint of the distant observer, the moving $(+q,-q)$ feels a magnetic field of dipole (N,S) and thus, the well-known Lorentz force acts on $(+q,-q)$ and tends to produce a torque with forces F_{B_1} & F_{B_2} where:

$$\begin{cases}\mathbf{F}_{B_1} = q\mathbf{v}\times\mathbf{B}_1 \quad , \\ \mathbf{F}_{B_2} = q\mathbf{v}\times\mathbf{B}_2 \quad . \end{cases}$$

These forces are due to Lorentz force on a moving charge in a magnetic field with a general form:

$$F_B = qvB\sin\theta \quad . \tag{41}$$

However, if nobody tells the distant observer about the nature and physical properties of the all three dipoles, he/she may become confused that which dipole is electric and which one is magnetic! Indeed, if the observer replace all electric dipoles with those of magnetic and visa versa, according to heterogeneity, final behavior of *released dipole* would not vary. That is to say, the observer thinks that, instead of an electric dipole, if a magnetic one is released near the crossed dumbbells, which just changed their position (or being rotated 90°), the so-called torque will appear again. See Fig. 8. If we denote by q^B the magnetic charge in units of mC/s ([1], p. 133) of the released dipole in this case, the observer claims that the smaller dipole $(+q^B,-q^B)$ not only moves away from the magnetic balls of one dumbbell with an acceleration a_B, but also it undergoes a *quasi-Lorentz force* due to the motion of dipole $(+q^B,-q^B)$ in the electric field of the other dumbbell $(+\boldsymbol{Q},-\boldsymbol{Q})$.

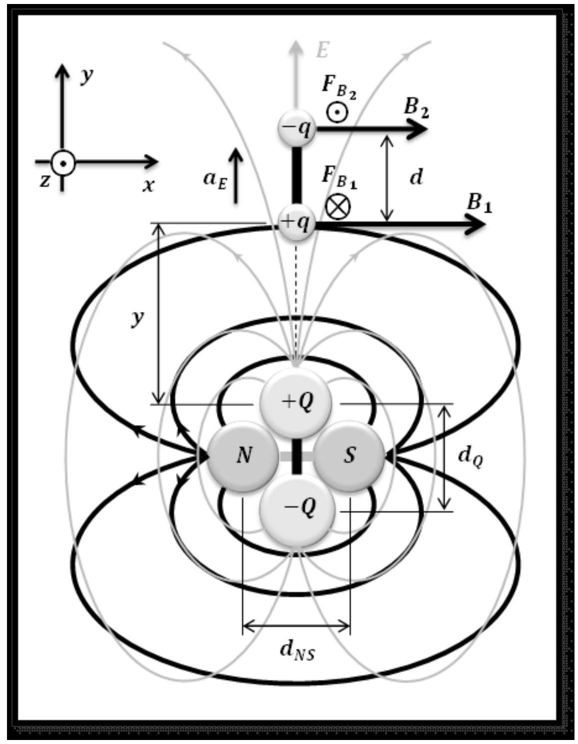

Figure 7. Two crossed heavy dumbbells one with charged balls and the other with magnetized ones are shown. A *test dipole* $(+q,-q)$ is left at distance y away from the nearest ball and tends to recede from the electric dipole with acceleration a_E. While accelerating, it feels the magnetic field of the other dumbbell and gets a torque due to Lorentz forces in the z direction

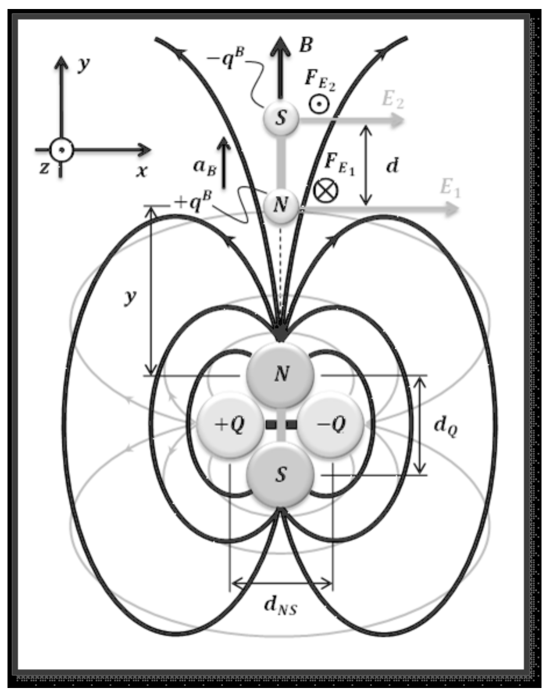

Figure 8. A distant observer claims that the behavior of the test dipole shall remain unchanged if all charges are replaced with magnets, and *visa versa*. In this case, the previous electric dipole changes into a magnetic one and the torque-producer force is a quasi-Lorentz force.

He/She claims that the recent force that exerts a torque on $(+q^B, -q^B)$ shall have the form of the Lorentz force where $q \,\&\, \mathbf{B}$ are replaced with $q^B \,\&\, \mathbf{E}$, respectively, with an appropriate constant k. Therefore, the quasi-Lorentz force for a moving magnet in an E-field is:

$$F_B = kq^B vE \sin\theta \quad . \tag{42}$$

By assuming $k = -1/c^2$ we can introduce a novel force of $\mathbf{F}_{jav}$ that can be useful along with the general Lorentz force F_{Lor} [23]:

$$\mathbf{F}_{\mathrm{Lor}} = q\left(\mathbf{E} + \mathbf{v}\times\mathbf{B}\right) \;\&\; \mathbf{F}_{\mathrm{jav}} = q^{\mathrm{B}}(\mathbf{B} - \mathbf{v}\times\mathbf{E}/c^2) \quad . \tag{43, 44}$$

Eq. (44) can be useful for investigating the behavior of a moving magnet in an electric field, and that this force always produces torque because we have no magnetic monopole. In a similar way, by setting forth proper examples, heterogeneity predicts the following equations for two magnets: ([1], p. 133)

$$F = k' q_1^B q_2^B / r^2 \quad , \tag{45}$$

where $k' = \mu_0 / 4\pi$. Eq. (45) can be considered as quasi-Columbus law for magnets ([1], p. 133) and we also can write:

$$F = Bq^B \quad , \tag{46}$$

instead of $F = Eq$. ([1], p. 133)

7.2 A Galaxy Can Behave As a Gaseous System

The reason directed my attention to the fact that and electron or any other fundamental particles can behave as a planet was that, according to heterogeneity, if we recede from a planet it becomes as tiny as a single electron then, heterogeneity predicts that physical properties of these two objects, *i.e.*, a distant planet and a close electron to a specific observer, must be similar to each other; I thought myself which it was known that both of them have magnetic fields and if the earth is not electrically neutral, this similarity would increase. These thoughts finally indicated me to considering a real spin for electron and the fact that angular velocity of a rotating neutral object may produce electric charges intrinsically.

Another application of heterogeneity can be discussed when we recede from a galaxy so that its stars and planets become as small as protons and electrons. In this case, the observer can not distinguish the galaxy with a released gaseous material in his nearby! If the gaseous material has a refractive index that causes a passing through light ray to become refracted, then according to heterogeneity, the distant galaxy, as well as the gas, must refract a passing beam of light if light's intensity (and maybe its wavelength) is great enough. This deduction may be useful to obtain a refractive index for a galaxy.

Heterogeneity also predicts that there are general behaviors for macroscopic and microscopic objects. It is said that giant stars have smaller life time and they soon explode into a neutron star and some energy and other smaller objects. This phenomenon, according to heterogeneity, would occur for elementary particles. That is, it is predicted that in the realm of elementary particles, the more massive a particle is, the smaller half life time it has unless it has a great mass density or be electrically charged. Unfortunately the sizes of elementary particles are mostly not detected experimentally and thus, we can not go further.

7. Conclusion

A General Observation principle (GOP) was introduced according to which, in proper conditions, the physical laws remain unchanged for different phenomena that are just *seemingly* similar from the viewpoint of an observer. This deduction is divided into two important branches: 1- Homogeneity (Isotropic Scaling) 2- Heterogeneity. The first one describes why the physical forces obey an inverse square law and the second one indicates us to a unified mass-charge equation. Our mass-charge equation provides us with a profound unifier insight according to which electric charge is nothing but mass plus rotation. Heterogeneity not only introduces an alternative for Dynamo theory but also it predicts a planetary model for atomic particles. GOP calculates the magnetic field of solar planets and other celestial bodies and it predicts a radius with a magnitude of $5.8\times10^{-13}\ m$ for electron and a positively charged core with magnitude $+1.4\times10^{-41}\ C$.

Geomagnetic reversal of planets were explained by using an amendment to the unified mass-charge equation and it was guessed that there might be a relation between geomagnetic reversal period and the period of the precession of the rotation axis. We also predicted that the same phenomenon might happen for atomic and sub atomic particles so that there may be a dependence of half life time upon particle's precession of the rotation axis.

8. Acknowledgement

When I was only 23, I had been involved with too many confusing thoughts and ideas. It was a summer evening and I had a heaviness on my soul without being able to describe it. Indeed, I just felt that my entire 5-year endeavor in finding a new theory or a valuable concept in physics was disappearing like a fading rainbow. I was very frustrated and about to cry. There was lacking a profound philosophical insight within my thoughts that I knew it very well and it was all my knowledge after a night and day thinking and studying in physics for five years.

After walking a while around our empty swimming pool, I went upstairs to our balcony and sat on an iron chair when my soul were just going to be fragmented into pieces. It was of my scarce times that I felt the existence of a powerful and kind God that could do something to me: "God help me! I beg you…, I can not put a step forward without your help" I called my God from deep inside with tears filled my eyes.

Later on, an odd question crossed my mind suddenly: "Why the apparent sizes of moon and sun are equal?!" It was one of the most exciting moments in my life. I ran inside, towards my room and started to make some calculations on the paper. There were some mistakes at first and the result did not satisfy me. I tried again and again till I obtained the final result: the equation number 6 of this Article! I prostrated and started to cry with my fore-

head on the ground. Yes, that question was an obvious inspiration from God whom I sometimes call him Allah. A great gift was bestowed upon me from above and it became more obvious to me than before that the Lord always listens to the prayers of his godly slave.

Although for me it took several years since then to understand the deepness of the question which at first I could not find its link to my previous thoughts, it guided me to the General Observation Principle now. I want to have the honor to thank my God who inspired me for many times with different sparkles of profound perceptions in the realm of science.

References to the Main Text

[1] M. Born, **Einstein's Theory of Relativity**, Chapt. 5, Sect. 1, p. 130 (E.P. Dutton and Company Publishers, New York, 1922).

[2] "Inverse-square law", Wikipedia, https://en.wikipedia.org/wiki/Inverse-square_law

[3] M. Javanshiry, "The Theory of Density, Part II" Galilean Electrodynamics **27** (3) 50 (2016); "… Part I", **26** (3) 43 (2015).

[4] J. Larmor, "How could a rotating body such as the Sun become a magnet?", Reports of the British Association, **87,** pp. 159–160 (1919).

[5] J. Larmor, "Possible rotational origin of magnetic fields of sun and earth", Electrical Review, **85,** p. 412ff (1919).

[6] P.A. Tipler, **Physics Vol. 2**, Chapt. 27, Sect. 1, p. 747 (CBS Publishers & Distributors, India, 2004).

[7] E.V.P. Smith, K.C. Jacobs, M. Zeilik, **Introductory Astronomy and Astrophysics**, (Saunders College Publishing/Harcourt Brace, USA, 1987).

[8] "Sun fact sheet", NASA files, http://nssdc.gsfc.nasa.gov/planetary/factsheet/sunfact.html

[9] NASA files, "Mercury fact sheet", NASA files, http://nssdc.gsfc.nasa.gov/planetary/factsheet/mercuryfact.html

[10] "Why does not Venus have a magnetic field?", NASA files, http://image.gsfc.nasa.gov/poetry/venus/V3.html

[11] "Earth fact sheet", NASA files, http://nssdc.gsfc.nasa.gov/planetary/factsheet/earthfact.html

[12] "Moon Anomalies", NASA files, http://www.nasa.gov/pdf/180577main_ETM.Moon.Anomalies.pdf

[13] "Mars Crustal Magnetism", NASA files, p. 4, http://mgs-mager.gsfc.nasa.gov/publications/ssr_111_connerney/ssr_111_connerney.pdf

[14] "Jupiter fact sheet", NASA files, http://nssdc.gsfc.nasa.gov/planetary/factsheet/jupiterfact.html

[15] "Saturn fact sheet", NASA files, http://nssdc.gsfc.nasa.gov/planetary/factsheet/saturnfact.html

[16] "Uranus fact sheet", NASA files, http://nssdc.gsfc.nasa.gov/planetary/factsheet/uranusfact.html

[17] "Neptune fact sheet", NASA files, http://nssdc.gsfc.nasa.gov/planetary/factsheet/neptunefact.html

[18] A. Reisenegger, "Origin and Evolution of Neutron Star Magnetic Fields", International Workshop on Strong Magnetic Fields and Neutron Stars (ICIMAF), arXiv:astro-ph/0307133, p. 3

[19] J.R. Taylor, C.D. Zafiratos, M.A. Dubson, **Modern Physics**, Chapt. 9, Sect. 3, p. 290 (Prentice Hall, New Jersey, 2004).

[20] D. Hestenes, "Quantum Mechanics from Self-Interaction", Foundations of Physics, **15**, 1, pp. 63-87 (1983)

[21] D. L. Bergman, J. P. Wesley, "Spinning Charged Ring Model of Electron Yielding Anomalous Magnetic Moment", Galilean Electrodynamics, **1**, pp. 63-67 (1990)

[22] "Geomagnetic Reversal", Wikipedia, https://en.wikipedia.org/wiki/Geomagnetic_reversal

[23] F. Moulin, "Magnetic monopoles and Lorentz force", Nuovo Cimento B, **116** (8), pp. 869–877, arXiv:math-ph/0203043 (2001).

Appendix I: Cone's Axis Does not Pass Through the Foci of Any of Its Ellipses!

Here we prove that there is a little deficiency with Homogeneity in predicting the general path of an object in a G-field. As a gravitational system, we know that Sun is in the focus of each planetary elliptic orbital of the solar system. According to Homogeneity (Isotropic Scaling), we anticipate that the axis of a cone shall intersect the foci of its elliptical sections; however, we show that this deduction is not valid. Assume a plane π with equation $By + Cz = D$ (perpendicular to plane yOz) intersects a cone with a vertex angle α and equation $h^2z^2 = x^2 + y^2$. See Fig. 9.

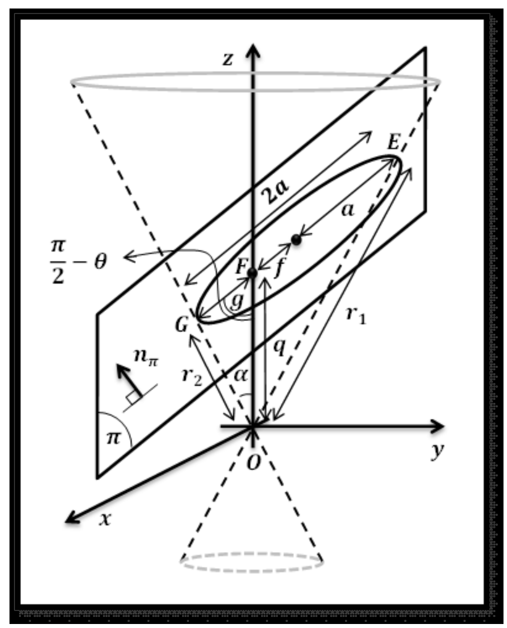

Figure 9. Plane π intersects a cone with a vertex angle α so that the intersection is an ellipse. The plane is assumed to be perpendicular to plane yOz at an angle θ to the positive direction of y-axis.

The parametric equation of the intersection of the cone and plane π is calculated to be:

$$\begin{cases} \left.\begin{matrix} x = hz\cos t \\ y = hz\sin t \end{matrix}\right\} \Rightarrow Bhz\sin t + Cz = D \quad \Rightarrow \\ z = D/(C + Bh\sin t) \end{cases} \tag{A1.1}$$

$$\mathbf{r}(t) = \frac{hD\cos t}{C + Bh\sin t}\mathbf{i} + \frac{hD\sin t}{C + Bh\sin t}\mathbf{j} + \frac{D}{C + Bh\sin t}\mathbf{k} \quad .$$

Because r_1 & r_2 lie in the plane yOz, we have:

$$\frac{hD\cos t}{C+Bh\sin t}=0\Rightarrow t=\pm\pi/2$$

$$\left\{\mathbf{r}_1=\frac{hD}{C+Bh}\mathbf{j}+\frac{D}{C+Bh}\mathbf{k}\ \&\ \mathbf{r}_2=\frac{-hD}{C-Bh}\mathbf{j}+\frac{D}{C-Bh}\mathbf{k}\Rightarrow\right.$$

$$|r_1|=\sqrt{\left(\frac{hD}{C+Bh}\right)^2+\left(\frac{D}{C+Bh}\right)^2}\xrightarrow{h=\tan\alpha}|r_1|=\frac{D}{(C+Bh)}\frac{1}{\cos\alpha} \tag{A1-2}$$

$$|r_2|=\sqrt{\left(\frac{hD}{C-Bh}\right)^2+\left(\frac{D}{C-Bh}\right)^2}\xrightarrow{h=\tan\alpha}|r_2|=\frac{D}{(C-Bh)}\frac{1}{\cos\alpha} \tag{A1-3}$$

For calculating q, we can use $x=0\ \&\ y=0$ for plane π while it is supposed that the focus F of the ellipse is on the axis of the cone (z -axis):

$$Cz=D\Rightarrow z=D/C=q\quad . \tag{A1-4}$$

Let θ be the angle between the normal vector of plane π (n_π) and z-axis, then we can write:

On the other hand, it has been known that the equation below relates the eccentricity of the shown ellipse to $\theta\ \&\ \alpha$: [1]

$$\varepsilon=f/a=\sin\theta/\cos\alpha\Rightarrow f=a\sin\theta/\cos\alpha\quad , \tag{A1-5,6}$$

where a is the semi-major axis and f is the semi-focal distance of the ellipse. Now with the use of law of cosines and using Eqs. (AI-2, AI-3) , we calculate:

$$\begin{cases}\Delta EFO\Rightarrow(a+f)^2=\left(\frac{D}{C}\right)^2+|r_1|^2-2\frac{D}{C}|r_1|\cos\alpha\\ \quad=\left(\frac{D}{C}\right)^2+\left(\frac{D}{C+Bh}\frac{1}{\cos\alpha}\right)^2-2\frac{D}{C}\cdot\frac{D}{C+Bh}\quad, & \text{(A1-7)}\\ \Delta FGO\Rightarrow(a-f)^2=\left(\frac{D}{C}\right)^2+|r_2|^2-2\frac{D}{C}|r_2|\cos\alpha\\ \quad=\left(\frac{D}{C}\right)^2+\left(\frac{D}{C-Bh}\cdot\frac{1}{\cos\alpha}\right)^2-2\frac{D}{C}\cdot\frac{D}{C-Bh}\quad. & \text{(A1-8)}\end{cases}$$

Inserting Eqs. (AI-5, AI-6) into Eqs. (AI-7, AI-8) yields:

$$\begin{cases}\left(a+a\frac{\sin\theta}{\cos\alpha}\right)^2\\ \quad=\left(\frac{D}{C}\right)^2+\left(\frac{D}{C+Ch\tan\theta}\frac{1}{\cos\alpha}\right)^2-2\frac{D}{C}\left(\frac{D}{C+Ch\tan\theta}\right)\quad,\\ \left(a-a\frac{\sin\theta}{\cos\alpha}\right)^2\\ \quad=\left(\frac{D}{C}\right)^2+\left(\frac{D}{C-Ch\tan\theta}\frac{1}{\cos\alpha}\right)^2-2\frac{D}{C}\left(\frac{D}{C-Ch\tan\theta}\right)\quad.\end{cases}$$

Now if we divide left hand sides by each other and do the same for right hand terms of the two equations above, we obtain:

$$\frac{\left(1+\frac{\sin\theta}{\cos\alpha}\right)^2}{\left(1-\frac{\sin\theta}{\cos\alpha}\right)^2}=\frac{1+\left(\frac{1}{(1+\tan\theta\tan\alpha)}\frac{1}{\cos\alpha}\right)^2-2\left(\frac{1}{1+\tan\theta\tan\alpha}\right)}{1+\left(\frac{1}{(1-\tan\theta\tan\alpha)}\frac{1}{\cos\alpha}\right)^2-2\left(\frac{1}{1-\tan\theta\tan\alpha}\right)}. \tag{A1.9}$$

After a long simplification, we get:

$$\tan\theta=\begin{cases}-\sin\theta/\sin\alpha & \text{(A1.10)}\\ -\cos^2\alpha/\sin\theta\sin\alpha & \text{(A1.11)}\end{cases}$$

Unfortunately, both of these equations are not plausible solutions, *i.e.*, we expected that for $0<\alpha\le\pi/2$ there would be a value for θ within interval $0<\theta\le\pi/2$ but there are not such values! The only solution to Eq. (A1-10) is $\theta=0$ regardless of the values for α which illustrates a circle. That is to say, there is no ellipse one of whose foci intersects the axis of the relevant cone. However, this deficiency cannot be considered as a great accusation of Homogeneity (Isotropic Scaling), and it needs further discussion that exceeds the Article scope.

Appendix II. About the Electric *Soul*

For a neutral mass it would be easy to explain how the growth of electric centers remains the mass uncharged when it moves with a constant velocity. See Fig. 10. However, a rotating object, as said earlier, accumulates charges of one sort, say positives, in a small space near the center of rotation and the negatives occupy outer layers. See Fig. 11 In this case, the farther a negative charge is, the greater charge magnitude it obtains due to faster tangential velocities. Although the rotation direction effect on the sort of the charge that is heaped up at center is not completely clear to me, or whether it is due to the effect of an external charge; I just supposed that negatives are gathered away from the center of rotation regardless of the direction of rotation.

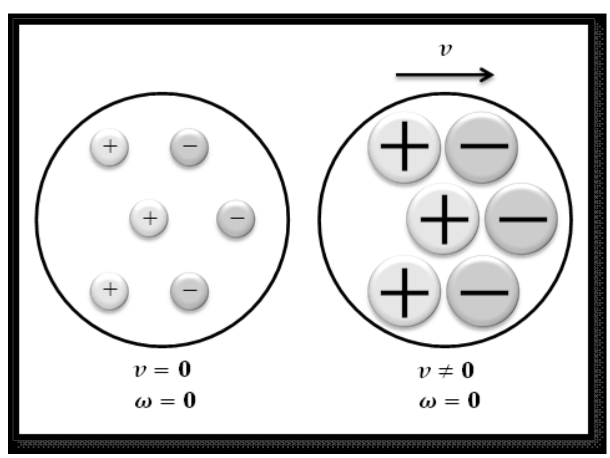

Figure 10. Left: A neutral object contains charges of Q^- and Q^+ at rest. Right: A uniformly moving neutral object with no rotation augments its charged centers to Q_v^- and Q_v^+ with the same rate.

As shown in Fig. 10, a uniform motion of a neutral mass increases the centers of electric charges similarly so that the final charge of a moving object remains neutral. That is, according to Eq. (24), for a stationary mass M (proper mass) there are a total negative charge of $Q^- = -\sqrt{G\varepsilon_0}M$ and that of positive of $Q^+ = +\sqrt{G\varepsilon_0}M$. However, by the time the mass moves, the charges obtain greater magnitudes of

$$Q_v^- = -\sqrt{G\varepsilon_0}(1-v^2/c^2)^{-3/2}M \ \& \ Q_v^+ = +\sqrt{G\varepsilon_0}(1-v^2/c^2)^{-3/2}M$$

which remain the moving mass uncharged. Nevertheless, the story ends differently for a rotating object: For a mass M, charges before rotation are $Q^- = -\sqrt{G\varepsilon_0}M$ and $Q^+ = +\sqrt{G\varepsilon_0}M$ as mentioned; but centrifugal forces after rotation augment the negatives by $\Delta Q_\omega^- = \sqrt{G\varepsilon_0}\ \Omega(v_R)M \cong -3\sqrt{G\varepsilon_0}Mv_R^2/5c^2$ [Eq.(32)] and it increases to $Q_\omega^- = \sqrt{G\varepsilon_0}\ \Omega(v_R)M - \sqrt{G\varepsilon_0}M$ which is greater than $Q_\omega^+ = +\sqrt{G\varepsilon_0}M$. See Fig. 11 (Recall that in rotation, due to the gathering of positive charges close to the center of rotation, they keep nearly their magnitude before rotation)

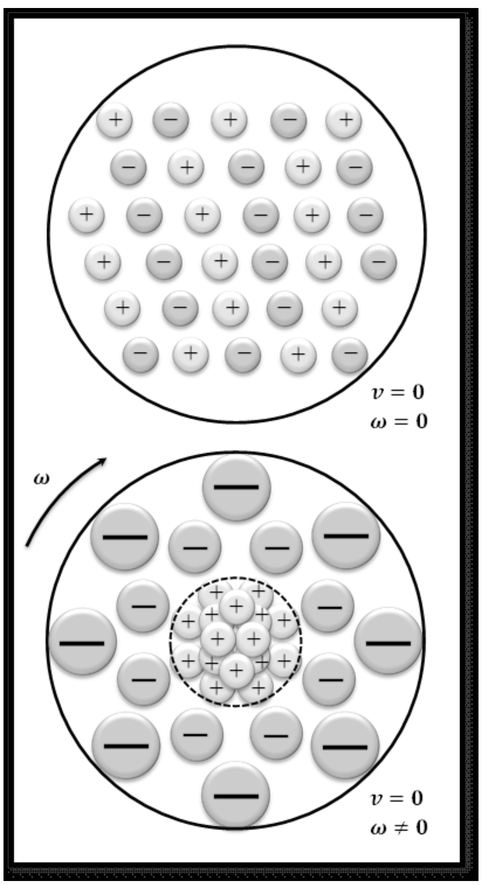

Figure 11. Up: A neutral object contains charges of Q^- and Q^+ at rest. Down: A rotating mass does not remain neutral. Its centers of charge are Q_ω^- and Q_ω^+, which are no longer equal.

The important question is that whether the charge is invariant according to Heterogeneity. That is, what would happen for a rotating particle if it moves with a constant velocity? In other words, if we assume that the origin of electric charge is rotation what will happen for, *e.g.*, the rotating electron when it moves uniformly considering the fact that special relativity predicts the angular velocity of such a particle to become reduced? Does the produced superfluous charge reduce due to time dilation for a moving electron and it entirely looses its charge?

Answering these questions depends on the term $(1-v^2/c^2)^{3/2}$ in Eq. (24), and it needs a long discussion beyond the capacity of this Article. In Eq. (24), we inserted an extra term of $(1-v^2/c^2)^{3/2}$ to justify the superfluous charge of elementary particles due to their swift rotation. Although omitting this term, our calculations for predicting, *e.g.*, the magnetic field of a rotating object as was shown in Fig. 4, remain nearly unchanged; we cannot consider, *e.g.*, the intrinsic electric charge of a single electron due to its rotation. That is, the mentioned term allows us to describe fundamental charges being solely due to the rotation. Moreover, such a term allows us to consider a relativistic effect for charge as well as for mass. Indeed, the coefficient shall predict that electric charge is invariant when a charged (=rotating mass) or neutral mass moves with a constant velocity. The exponent (3/2) must be greater than unity so that Eq. (24) can predict an intrinsic charge for electron due to its rotation; however, there are other candidates for the coefficient $(1-v^2/c^2)^{3/2}$ that can serve our wish of being invariant for a moving charge.

Appendix III: Relativistic Mass for a Rotating Solid Sphere

Suppose a solid ball with a proper mass M. When it revolves swiftly around its axis, SRT predicts that every single ring element of this rotating object (like the volume element shown in Fig. 6) undergoes a relativistic mass increase considering its tangential velocity with a Loren333333444ptz factor

$$dM_\omega = (1-r^2\omega^2/c^2)^{-1/2}dM \quad .$$

See Fig. 6; we can write:

$$M_\omega = \int_M (1-r^2\omega^2/c^2)^{-1/2}\,dM \quad .$$

With $dM = \rho dV$ and $dV = 2\pi r dr dz$, that implies

$$M_\omega = 2\pi\rho\int_{-R}^{R}\int_0^{\sqrt{R^2-z^2}}(1-r^2\omega^2/c^2)^{-1/2}\,r\,dr\,dz \quad .$$

$$M_\omega = \frac{3}{4}\frac{c}{v_R^3}\left[2cv_R - (c^2-v_R^2)\ln\left|\frac{1+v_R/c}{1-v_R/c}\right|\right]M \triangleq \xi(v_R)M \quad . \quad \text{(A3.1)}$$

We expect that if v_R approaches zero and the mass looses its rotation, then M_ω tends to M:

$$\lim_{v_R\to 0}\frac{3}{4}\frac{c}{v_R^3}\left[2cv_R - (c^2-v_R^2)\ln\left|\frac{(1+v_R/c)}{(1-v_R/c)}\right|\right]M = M \quad .$$

Reference to Appendices

[1] A. Schwartz, **Calculus and Analytic Geometry**, Chapt. 3, Sect. 16, p. 217 (Holt, Rinehart and Winston, Inc., New York, 1967).

Correspondence (continued from p. 42)

Ether Wind in the Radial Direction

Therefore, it seems reasonable to assume that GPS could work if the function $\mathbf{v}(\mathbf{r})$ has spherical symmetry in relation to our planet. It may also be reasonable to assume that $\mathbf{v}(\mathbf{r})$ approaches zero for large values of r. Since our planet is in a free fall, we can only see gravity and ether wind due to our own planet.

The demand for an ether wind $\mathbf{v}(\mathbf{r})$ with spherical symmetry in relation to our planet is interesting also from another point of view. Such an ether wind can explain gravity as well, due to the ether wind. To test this idea, we can assume $v^2(r)$ equal to the potential of gravity and a radial ether wind equal to the speed of a satellite in circular orbit. This means that a satellite will see a radial ether wind equal to the tangential ether wind due to speedBound electrons in atomic clocks move with the speed w at the distance r from the atomic nucleus. Since the Coulomb force field moves with the speed c in relation to the ether we get a distortion of the field due to the ether wind v (or $\beta = v / c$). In front of the nucleus, the field is compressed to $r(1-\beta)$, and electron speed is reduced to $\omega(1-\beta)$. Behind the nucleus, we get $r(1+\beta)$ and $w(1+\beta)$. The electron's motion is accelerated and decelerated in the direction of $\mathbf{v}$ and the electron's speed is changed in proportion to $(1 \pm \beta)$ in transverse direction in relation to $\mathbf{v}$. This means that the time period is proportional to $1/(1-\beta)+1/(1+\beta) = 2/(1-\beta^2)$ and the clock frequency is proportional to $(1-\beta^2)$. The satellite must communicate with Earth, so we can assume stabilization in that direction. If the clocks are orthogonal to that direction gravity is inside the orbiting plane of the electrons. In tangential direction we assume no stabilization and satellite rotation will reduce the ether wind's effect by half. This value is found by taking the average of a squared cosine function. These assumptions give a good agreement to GPS experience. See The Falling Ether available at www.gsjournal.net under my name.

The observed Pioneer anomaly can be explained by a radial ether wind directed towards our sun. Two- way speed of light is assumed to be $c(1-v^2/c^2)$. An increasing two-way light speed creates an illusion of a decreasing space station speed. Assuming 2 GHz carrier frequency and observations from 20 to 80 AU gives a frequency change of 1.5 Hz. This effect is calculated in the Pioneer Anomaly and in the Ether Wind, available at www.gsjournal.net under my name.

We will also see later that the bending of a light path near our Sun can be explained with this model.

The Behavior of Light

A telescope uses a refractor or a reflector to transform a plane wave front into spherical form directed towards a point on a detector. The normal to the wave front is thereby detected. If the detector is moving, during the time between focusing and detection, the recorded direction is changed. Therefore, the telescope makes an error due to telescope motion, $\mathbf{u}$, transverse to light direction. This error is the same for light waves as for light particles. An ether wind blowing inside a wave front cannot change wave front orientation, and is therefore not relevant in relation to stellar aberration. Orientation, or wave motion, $\mathbf{c}$, is detected (and dependent on $\mathbf{u}$) in a telescope, not total motion, $\mathbf{c}+\mathbf{v}$. See Fig. 1b.

In resonators and interferometers, standing waves exist because of mirrors, implying boundary conditions on the light waves. Any relative motion between ether and mirrors that is falling in the plane of the mirrors is without relevance for behavior of light, since boundary conditions are not changed. We can see this in another way, by the fact that each point on a wave front can be regarded as a center for a new wave front. Therefore, light always finds the fastest, not the shortest, way between two points. Therefore, we can conclude that light also finds the fastest way between two parallel surfaces. The wave vector $\mathbf{c}$ is therefore always orthogonal to the mirrors, and standing waves always have wave fronts parallel to defining mirrors. Stokes was therefore wrong when he used a spherical wave front to derive an effect in the transverse arm in Michelson and Morley's tests, MMX. Einstein's time dilation is based on Stokes' mistake. See Fig 1a (stationary equipment) and Fig. 2 regarding MMX (stationary ether).

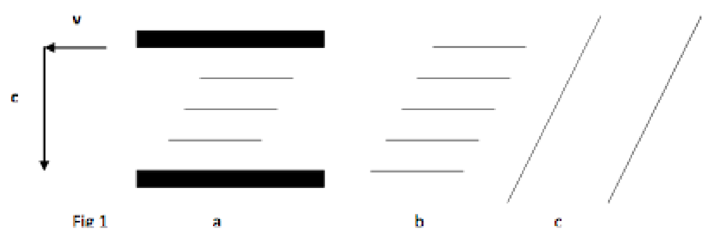

Figure 1. Stokes mistaken interpretation.

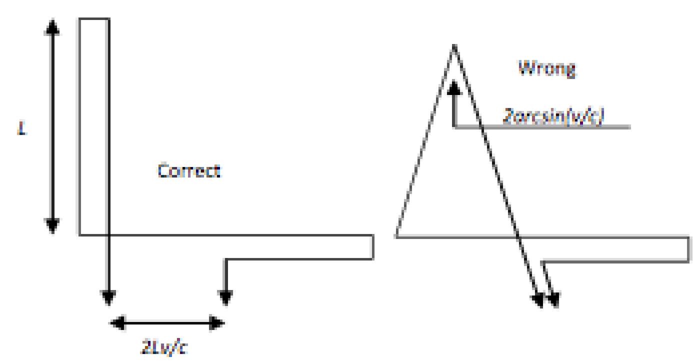

Figure 2. MMX mistaken interpretation.

Ether wind inside a wave front cannot bend the same wave front. However, bending can result from a gradient in the longitudinal ether wind. The bending of light near our Sun can be explained in this way. This effect is roughly estimated in "The Falling Ether" (available at www.gsjournal.net under my name) to be in the order of 10^{-5} radians, in agreement with observations. The same article also describes how a more precise estimation can be done. However, ether wind inside a wavefront can change direction of a focused beam (without changing wave fronts inside it). This means that transverse ether wind can be detected by amplitude, but not by phase. See Fig 1, Part c.

In the longitudinal arm in MMX light is moving forth and back sequentially between mirrors. Atoms in a solid cannot control their separations by means of action at a distance. Separations are controlled by means of the ether. Information is sent simultaneously forth and back between atoms in relation to the ether. Therefore, the two-way light speed and the separation between atoms in a crystal are both reduced by the ether wind in proportion to $1-v^2/c^2$. {Compare to effects of $(1-v^2/c^2)^{\pm 1/2}$ predicted in SRT). This means that in the longitudinal arm the effect is real, but compensated. Michelson and Morley's method is useless in relation to the ether wind. Therefore, the meter standard defined by optics depends on the ether wind in the same way as the older standard.

Gravity

Gravity is described by a radial ether wind in the falling ether based on an assumption of fast and small particles moving in all directions. Gravity is a small disturbance in the spherical symmetry of the flow due to attenuation inside matter. Fatio, Le Sage, and van Flandern have described such ideas. However, the fact that the force of gravity has no aberration has caused confusion. We can solve that problem by regarding the fact that gravity and ether wind, $\mathbf{v}(\mathbf{r})$, are functions of $\mathbf{r}$ only, and not of t, and therefore do not reveal any speed.

We can assume a satellite to experience the same ether wind in radial direction due to gravity as in the tangential direction caused due to motion. We must therefore explain why the radial component causes the force of gravity, but the tangential component does not produce any force. A possible explanation can be the fact that the radial component is focused in direction towards our planet, but the tangential flow is not focused. In free motion we see no gravity. It is also assumed here that in free motion we see no ether wind. Therefore, we only see gravity and ether wind from our own planet, which we are not in free motion to. Explaining gravity in this way avoids the mysterious concept in GRT: the 'bending' of nothing.

The description of gravity given here is supported by observations during solar eclipses. An effect in the vertical direction has been reported from China. See [1]. A very sensitive gravimeter was used. An effect in horizontal direction has been observed in the motions of a very high radio mast in Hungary. [2] It is important to notice that these observations represent the difference between the effect on a test mass and the effect on a part of our planet that can be as large as our Moon. Therefore, we can expect effects before and after the eclipse that are of opposite sign in relation to the effect in the middle.

Conclusions

SRT and GRT are based on absurd assumptions, and they predict paradoxical effects. The alternative given here is based on accepted and well-known concepts. According to this new interpretation stellar aberration and Michelson and Morley's tests are useless in relation to the ether wind. This new interpretation is supported by a first order effect in the GPS system, second order effects in the GPS clocks and in the Pioneer anomaly and observations during solar eclipses. The functionality of the GPS system can be united with a local ether having spherical symmetry. The bending of light near our sun can also be explained. The behavior of atomic clocks is explained by one model instead of by SRT plus GRT. This model is simpler. If we accept this model, we must accept quanta in ether but not necessarily quanta in light.

Accepting the ideas presented here allows gravity to be united with the rest of physics.

References

[1] Qian-Shen Wang, "Precise Measurements of Gravity Variations during a Total Solar Eclipse", Physical review D 62 041101-1.

[2] Janos Rohan, http://astrojan.zz.mu/laki.htm

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Editor's Comments

As a young PhD on my first job, I was shocked to learn from my government sponsors that Maxwell really had been an aether advocate. That fact had been obscured throughout my formal education in Physics!

Also obscured was the fact that SRT's Second Postulate, as written, is not actually the Second Postulate as *applied*. The Postulate as written does not specify any particular coordinate neighborhood for its application. The result is that everyone applies it over the *entire propagation path* - all the way back to the *source* – no matter how far away that source was – distant star - distant galaxy – or even Big Bang creation event! In all cases, it's " c relative to me, all the way back. "

Though not actually written down in black and white, you can tell that this extended statement is always applied. Look at the math expressions: there is always something like R/c, where R is the length of the propagation path, and c is light speed, both of them relative to the author of the text. If the reference for c were not assumed constant over the entire path R, the simple ratio R/c would not have been appropriate.

The extended statement is just not defensible. It represents the ultimate in 'Anthropocentrism': the attitude that we had before we had Science, when cosmology was a topic explained only by the Church, when we supposed that mankind was at the center of the Universe, and that everything else danced around us, some of it in regular progression, and some of it in complex and interesting epicycles designed for our enjoyment.

In light signaling we actually have a simple situation with differential equations (Maxwell's equations) and boundary conditions (no light before the source, no light after the receiver). We would make a more acceptable theory if we would admit that, while the reference for light speed can be receiver at the moment of reception, it must have been the source at the moment of emission, and it must therefore have changed from source to receiver as the journey transpired.

CKW