# The Lorentz Aether Theory

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Abstract. **The Lorentz transformations are best known for the relativistic Lorentz factor, $\gamma = 1/\sqrt{(1 - v^2/c^2)}$, which appears in the equations of special relativity, and it is also known that the Lorentz transformations can be used to derive both the Biot-Savart law in the form $B = \gamma v \times E/c^2$, and the magnetic force in the form $E = \gamma v \times B$.**

It could therefore be argued that magnetism is a relativistic effect, even though it is observed at laboratory speeds. This article will now examine how the physical structure of the luminiferous medium enables the existence of magnetism. The aim will be to identify the latent presence of the speed of light within the fabric of a laboratory magnetic field. On establishing this, the Lorentz factor will then be exposed as an asymptotic coefficient which only becomes significant at speeds close to the speed of light.
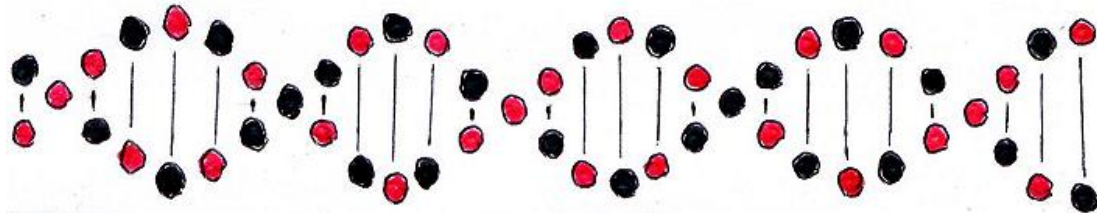
The Lorentz Force

I. The Lorentz force first appeared as an electromotive force term at equation (77) in Part II of Scottish physicist James Clerk Maxwell's 1861 seminal paper entitled **"On Physical Lines of Force"**, [1]. It appeared in the basic form,

$$\mathbf{E} = \mu_0 \mathbf{v} \times \mathbf{H} + \partial \mathbf{A}/\partial t - \nabla \psi \qquad (1)$$

and in 1864 he listed it as one of the original eight *"Maxwell's Equations"* in his paper entitled **"A Dynamical Theory of the Electromagetic Field"**, [2]. The term, **E**, on the left-hand side is the force acting on *unity of the electric particles* within his proposed dielectric sea of molecular vortices. Today, **E** is referred to as *"force per unit charge"*

while the term electromotive force is generally used for voltage, which of course plays the exact same role in electric circuit theory. In modern textbooks, the charge term, q, is taken over to the right-hand side, hence making equation **(1)** appear as,

$$\mathbf{F} = q[\mathbf{v} \times \mathbf{B} + \partial \mathbf{A}/\partial t - \nabla \psi] \tag{2}$$

where,

$$\mathbf{B} = \mu_0 \mathbf{H} \tag{3}$$

The quantity, **B**, is the magnetic flux density which will be referred to as the *magnetic field*, while μ_0 is the magnetic permeability which is closely related to the density of the sea of aethereal vortices, and **H** is the magnetic intensity. The second and third terms on the right-hand side of equation **(1)** are the *electric field* terms. The second term, which arises from Faraday's Law, is the partial time derivative of the *electromagnetic momentum*, **A**, nowadays referred to as the *magnetic vector potential*. The second term arises in conjunction with a time-varying magnetic field, while the third term is the electrostatic field as per Coulomb's law. Collectively they are represented as,

$$\mathbf{E} = \partial \mathbf{A}/\partial t - \nabla \psi \tag{4}$$

It's common to have a negative sign in front of the $\partial \mathbf{A}/\partial t$ term in order to take account of Lenz's Law, but it will be left out here so as to maintain consistency with Maxwell's original convention. In modern textbooks, equation **(1)** is generally written in the familiar *Lorentz force* format,

$$\mathbf{F} = q[\mathbf{E} + \mathbf{v} \times \mathbf{B}] \tag{5}$$

As regards the convective term, $\mathbf{v} \times \mathbf{B}$, which is often, on its own, referred to as the Lorentz force, it was derived by Maxwell in conjunction with his sea of molecular vortices long before Lorentz himself got involved in the topic, and so in this article it will be referred to as the *Maxwell-Lorentz Force*. The $\mathbf{v} \times \mathbf{B}$ force is like a kind of compound centrifugal force arising from the differential pressure acting on either side of an element of electric current as it flows through the sea of tiny aethereal vortices. This differential pressure causes a sideways deflection to the path of motion.

Prior to introducing electric particles into his sea of aethereal vortices in Part II of his 1861 paper, Maxwell had relied exclusively on three-dimensional aether hydrodynamics, and he employed the concept of *force per unit volume*. Let us consider the two force terms which appear as parts 3 and 4 on the right-hand side of equation (5) in part I of his 1861 paper. In modern format, these are components of,

$$\mathbf{E} = \mu_0 \mathbf{v} \times (\nabla \times \mathbf{v}) \tag{6}$$

where **E** refers to force per unit volume. Since the velocity term, **v**, is the fine-grained circumferential velocity of the tiny vortices, then the vorticity must be expressed as,

$$\nabla \times \mathbf{v} = 2\boldsymbol{\omega} \tag{7}$$

where $\boldsymbol{\omega}$ is the angular velocity at the edge of the vortices, and since the magnetic permeability, μ_0, is related to the density of the sea of vortices, this brings us to,

$$\mathbf{F} = 2m\mathbf{v} \times \boldsymbol{\omega} \qquad \textbf{(Coriolis Force)} \tag{8}$$

which is the familiar Coriolis force. Maxwell identified the circumferential velocity, **v**, with the magnetic intensity, **H**. Substituting equations **(3)** and **(7)** into equation **(6)** therefore leads to,

$$\mathbf{E} = \mathbf{B} \times (\nabla \times \mathbf{B}/\mu_0) \tag{9}$$

Comparing with Ampère's Circuital Law, and substituting $\mathbf{J} = \rho\mathbf{v}$, where ρ is the charge density, we obtain,

$$\mathbf{E} = \mathbf{B} \times \rho\mathbf{v} \tag{10}$$

which is the familiar Maxwell-Lorentz force. A subtle difference between the Coriolis force when observed in atmospheric cyclones on the one hand, and the Maxwell-Lorentz force when observed in a magnetic field on the other hand, is that in the atmospheric case, we are observing inertial motion in a vortex, whereas in the electromagnetic case, we are observing motion between vortices. See *"The Coriolis Force in Maxwell's Equations"*, [3].

The Three-Dimensional Aether Hydrodynamical Analysis

II. In Maxwell's hydrodynamical analysis in Section **I** above, he bases the magnetic intensity, **H**, and the magnetic flux density, **B**, on the fine-grained circumferential aether circulation in his sea of tiny vortices. However, all papers relating to ***"The Double Helix Theory of the Magnetic field"***, [6], [7], instead apply **H** directly to the vorticity of the vortices, and hence Maxwell's electromagnetic momentum, **A**, becomes the circumferential momentum, [4], [5]. It's upon that basis that we will operate in this article. The scalar potential, ψ, represents hydrostatic aether pressure, and together with the momentum density, **A**, they make up the two important ingredients of Bernoulli's principle within the sea of fine-grained aethereal vortices. The convective term, $\mathbf{E} = \mathbf{v} \times \mathbf{B}$, follows naturally from three-dimensional aether hydrodynamics as shown in Section **I** above, and also in **Appendix A** at the end.

Maxwell introduces the speed of light into the equations of electromagnetism through the 1855 Weber-Kohlrausch experiment, [8], but relativists argue that the Lorentz transformation does this anyway, as well as inducing $\mathbf{E} = \mathbf{v} \times \mathbf{B}$ without any need for a sea of aethereal vortices. The Lorentz transformation operates on the combined electric field term, which is, $\partial \mathbf{A}/\partial t - \nabla \psi$, and this results in the convective term, $\mathbf{E} = \mathbf{v} \times \mathbf{B}$, emerging. The question is never asked, though, as to what exactly do $\partial \mathbf{A}/\partial t$ and $\nabla \psi$ physically refer to in the context. So we need to establish the answer to that question first, before we go doing away with Maxwell's sea of aethereal vortices prematurely.

The Lorentz Transformations

III. In a letter entitled ***"The Ether and the Earth's Atmosphere"*** written by the Anglo-Irish physicist George Francis Fitzgerald, dated 2nd May 1889 and published in the ***"Science"*** illustrated weekly journal, [9], Professor Fitzgerald expressed great interest in the recent experiment carried out in 1887 by Messrs. Michelson and Morley at Cleveland, Ohio, in the USA. Michelson and Morley, using an interferometer in an attempt to measure the speed of the Earth relative to the luminiferous medium, had obtained no significant fringe shifts. Professor Fitzgerald stated that the only hypothesis that could be reconciled with this negative observation is that the length of moving bodies changes due to electrical interaction with the aether.

In 1892 the Dutch physicist Hendrik Lorentz began working on a project aimed at reconciling Maxwell's equations with certain

experiments involving optics and relative motion, [10]. Initially attention was focused on stellar aberration and Fizeau's 1851 experiment involving the speed of light in a moving column of water, but Lorentz later extended the investigation to see if length contraction might explain the null result of the Michelson-Morley experiment. In 1897 the Ulster physicist and mathematician Sir Joseph Larmor extended Lorentz's work further, paying particular attention to the electrical interaction between matter in motion and the luminiferous aether, [11]. Lorentz on the other hand was largely working on an *ad hoc* mathematical basis. It was Larmor who first suggested that length contraction would have to also involve some kind of retardation of local time, a concept which he never clearly explained, and it was Larmor who is said to have been the first to have arrived at the Lorentz transformations as we know them today, [12]. See **Appendix B**.

   In 1905, French physicist Henri Poincaré formulated equivalent transformation equations and named them the *Lorentz transformations* as it seems that he was unaware of Larmor's contributions, [13]. Shortly afterwards, Albert Einstein published an alternative derivation of the Lorentz transformation equations which gave them a brand-new interpretation not involving the aether at all, [14]. This act of scientific vandalism on Einstein's part caused a major controversy which is not over yet.

The Luminiferous Aether

IV. Maxwell never overtly mentioned electric charge in his 1861 paper. Instead, he talked about the density of *free electricity*, a concept which he never elaborated upon. This is highly significant since the term free electricity is likely to refer to the electric fluid, which is the primordial aether from which everything is made. This would equate electric charge to the state of compression of space itself, space being something that can be compressed or stretched, and which can also flow. Maxwell considered the luminiferous medium to be a sea of tiny aethereal vortices exhibiting 3-D cylindrical symmetry and obeying the classical laws of hydrodynamics. Meanwhile, in 1908, Hermann Minkowski realized that the Lorentz transformation could be expressed by the equation,

$$s^2 = x^2 + y^2 + z^2 - c^2t^2 \tag{11}$$

   where s is invariant under the transformation. Therefore, if we can somehow reconcile equation **(11)** with Maxwell's vortex sea, where the speed of light, c, is measured relative to this sea, this will link Maxwell directly to the *Lorentz Aether Theory*. If on the other hand the speed of

light, c, is treated to be a universal constant, then we will be left with Einstein's special theory of relativity, which gives rise to the controversial concept of time dilation. But we all know, that when the Earth has performed a complete orbit of the Sun, relative to the background stars, that one year will have passed for everybody in the universe, and that therefore time dilation is a nonsense concept.

Equation **(11)** is closely related to the Doppler shift in the frequency of a ray of light, [15], but it would appear to have no obvious connection to the hydrodynamics of a sea of tiny vortices. If, however, we could somehow connect this equation to the electric and magnetic fields that are involved in a ray of light, we might get to see the picture at a deeper level. Throughout the 1890s, Sir Joseph Larmor was working directly on this problem in connection with a rotationally elastic aether and the manner in which the frequency of rotating dipoles is altered as they move through this aether, [11], [12]. Larmor's papers would be an ideal place to begin in order to investigate this matter further. Larmor talked about positive and negative electrons being singularities in the aether and he connected this idea with electromagnetic radiation. See page 211 in his 1897 paper, [11], and Section 114, pages 179-180, in his 1900 paper, [12]. This line of research would be relevant to the effect that motion through the luminiferous medium has on atomic clocks, such as in the case of the atomic clocks in GPS satellites, where it can be shown how the ensuing frequency dilations relate to energy changes, and where the associated equations can be shown to approximate to the Lorentz transformation equations, [16].

We need to investigate the deeper physical origins of the magnetic field, and to this end it is proposed that a magnetic field is a solenoidal alignment of the tiny vortices that comprise Maxwell's vortex sea, with these vortices being modified in line with *"The Double Helix Theory of the Magnetic Field"*, [6], [7]. This theory replaces Maxwell's vortices with rotating electron-positron dipoles. These tiny dipolar vortices press against each other with centrifugal force while striving to dilate, and they naturally self-align along their mutual rotation axes to form solenoidal magnetic lines of force, [17], [18], [19].

Local Time

V. In Einstein's 1905 paper, [14], he derived the kinematical Lorentz transformations in his own way and then went on to apply them to Ampère's Circuital Law and the Maxwell-Faraday equation. On page 907, Einstein wrote out these two curl equations side by side in a perfectly dual format involving three rows and two columns. He split

each equation into three, one for each of the three Cartesian components, and he used Gaussian units so that the speed of light was overtly displayed. Einstein then applied the Lorentz transformations to these two dual curl equations and wrote out the solutions. See **Appendix C**. The components of these solutions in the plane perpendicular to the motion, are $\mathbf{E} = \gamma(1/c)\mathbf{v}\times\mathbf{B}$ and $\mathbf{B} = \gamma(1/c)\mathbf{v}\times\mathbf{E}$, where $\gamma = 1/(\sqrt{1 - v^2/c^2})$, but it's not clear how Einstein actually arrived at these. Interestingly though, in the same year, French mathematician and theoretical physicist Henri Poincaré devised an analytical tool known as *four-vectors* which showed how Einstein could have arrived at these solutions. This was written up in Poincaré's *"Palermo paper"*, [20], and the same idea was later developed further in 1908 by German mathematician Hermann Minkowski whose name is now associated with the 4-D space-time continuum.

The Lorentz transformation equations can be converted into four-vector format by treating time as a fourth dimension. We can then re-write equation **(11)** as,

$$s^2 = x_1{}^2 + x_2{}^2 + x_3{}^2 + x_4{}^2 \tag{12}$$

The term x_4 involves the imaginary number, $i^2 = -1$, such that,

$$x_4 = ict \tag{13}$$

The Lorentz transformations for motion exclusively along the *x*-axis then take on the form,

$$x_1' = \gamma(x_1 + iv_\mathrm{x}x_4/c) \tag{14}$$

$$x_2' = x_2 \tag{15}$$

$$x_3' = x_3 \tag{16}$$

$$x_4' = \gamma(x_4 - iv_\mathrm{x}x_1/c) \tag{17}$$

When $s = 0$, these are the equations of the optical return-path longitudinal Doppler effect, where c is the speed of light relative to the luminiferous medium, [15]. But while the Doppler effect is something that normally applies to waves, we will now see if these equations can be applied to the context of a rotating dipole in a state of translational motion. The reason for this enquiry is because such motion exhibits a similar to-and-fro behaviour to that involved in the return-path Doppler effect, and also because the circumferential speed of the rotating electron-

positron dipoles, which comprise the all-pervading luminiferous medium, is equal to the speed of light. Hence, when the Lorentz transformation is applied to a magnetic field, the time variable will relate to the angular period of the rotating electron-positron dipoles that comprise the magnetic field, while the space variables relate to their circumference. The concept of Minkowski 4-D space-time is therefore somewhat of an over sensation, because the time variable does not refer to astronomical time.

The Biot-Savart Law

VI. The circumferential momentum density of a rotating electron-positron dipole is **A**, where $\nabla \times \mathbf{A} = \mathbf{B}$. Consider such a dipolar vortex, of random orientation, undergoing translational acceleration along the *x*-axis through a larger sea of such rotating dipoles. The physical interaction will alter **B**, in both magnitude and direction, and the component of **B'** along the *z*-axis will take the form,

$$B'_z = \partial A'_y/\partial x' - \partial A'_x/\partial y' \tag{18}$$

In four-vector notation this becomes,

$$B'_z = \partial A'_2/\partial x'_1 - \partial A'_1/\partial x'_2 \tag{19}$$

And now we will introduce the *Lorentz condition*, more accurately known as the *Lorenz gauge* after Danish physicist Ludvig Lorenz. It takes the form,

$$\nabla \cdot \mathbf{A} + 1/c^2 \partial \psi/\partial t = 0 \tag{20}$$

where **A** is the momentum and ψ is the scalar potential (pressure). This is the equation of continuity of the aether within the context of the luminiferous medium, where the elasticity is related to the average aether flow speed within and between the tiny dipolar vortices, that being the speed of light. The momentum-pressure four-vector, which is closely related to Bernoulli's principle, takes either the form, $(A_x, A_y, A_z, i\psi/c)$, or, (A_1, A_2, A_3, A_4), while the four-vector for ∇ and $\partial/\partial t$ becomes either $(\partial/\partial x, \partial/\partial y, \partial/\partial z, i/c.\partial/\partial t)$ or $(\partial/\partial x_1, \partial/\partial x_2, \partial/\partial x_3, \partial/\partial x_4)$.

Using the Lorentz transformation equations **(14)** to **(17)**, *but deliberately omitting the gamma factor, $1/(\sqrt{1 - v^2/c^2})$,* equation **(19)** then expands to,

B′$_z$ = ($\partial/\partial x_1$ + $iv_x/c.\partial/\partial x_4$)A$_2$ − $\partial/\partial x_2$(A$_1$ + iv_xA$_4/c$) **(21)**

    Hence,

B′$_z$ = (∂A$_2/\partial x_1$ − ∂A$_1/\partial x_2$) + (iv_x/c)(∂A$_2/\partial x_4$ − ∂A$_4/\partial x_2$) **(22)**

    The first bracketed term on the right-hand side of equation **(22)** should already be recognizable as the *z*-component of $\nabla\times$**A**, which is B$_z$. As regards the second bracketed component on the right-hand side of equation **(22)**, we must remember that $\partial/\partial x_4$ is $(i/c)\partial/\partial t$ while A$_4$ is $i\psi/c$.

    Hence,

B′$_z$ = B$_z$ − $(v_x/c^2)(\partial$A$_y/\partial t$ − $\partial\psi/\partial y)$ **(23)**

    Hence,

B′$_z$ = B$_z$ − v_xE$_y/c^2$ **(24)**

    A reciprocal result for B′$_y$ leads us to,

B′ = B − (**v**$\times$**E**)$/c^2$ **(25)**

    where (**v**$\times$**E**)$/c^2$ is restricted to the *yz*-plane. This suggests that a rotating dipole, when in translational motion along the *x*-axis, precesses, and that as its speed, v_x, increases, the precession axis will increasingly align with the direction of motion. The gamma factor, $1/(\sqrt{1 - v^2/c^2})$, was deliberately omitted from the analysis in order to explicitly demonstrate that it has no involvement in these classical electromagnetic relationships, but it will be restored again for the physical interpretation in the next section.

    We will now perform a Lorentz transformation on the **E** field that emerged in equation **(25)**,

E = ∂**A**$/\partial$t − $\nabla\psi$ **(26)**

    where ∂**A**$/\partial$t is the torque that causes the rotating dipole to precess, while $\nabla\psi$ is the electrostatic attraction between the electrons and the positrons within the vortex sea. The *z*-component of **E′** is,

E′$_z$ = ∂A′$_z/\partial$t′ − $\partial\psi$′$/\partial z$′ **(27)**

Hence, we can write,

$$\text{E}'_z = ic[\ \partial \text{A}'_4\ /\partial x'_3 - \partial \text{A}'_3/\partial x'_4] \tag{28}$$

From equation (17), *while still deliberately omitting the gamma factor, γ,* we can apply the Lorentz transformations,

$$\text{A}'_4 = (\text{A}_4 - iv_x\text{A}_1/c) \tag{29}$$

and

$$\partial/\partial x'_4 = (\partial/\partial x_4 - iv_x/c.\partial/\partial x_1) \tag{30}$$

Then trivially, since motion is only along the *x*-axis, it follows from equation (16) that $\text{A}'_3 = \text{A}_3$ and $\partial/\partial x'_3 = \partial/\partial x_3$. Applying these transformations to equation (28) leads to,

$$\text{E}'_z = ic[\partial/\partial x_3(\text{A}_4 - iv_x\text{A}_1/c) - (\partial/\partial x_4 - iv_x/c.\partial/\partial x_1)\text{A}_3] \tag{31}$$

therefore,

$$\text{E}'_z = ic(\partial \text{A}_4/\partial x_3 - \partial \text{A}_3/\partial x_4) + v_x(\partial \text{A}_1/\partial x_3 - \partial \text{A}_3/\partial x_1) \tag{32}$$

By comparing the first bracketed term on the right-hand side of equation (32) with the starting equation (28), it simply becomes E_z. The second bracketed term on the right-hand side applies purely within 3-D space and it is readily identifiable as the *y*-component of the curl of **A**. It's of interest to note that curl is a purely spatial operation which exists only in three and seven dimensions. There can be no curl in four dimensions, [21], but curl can still operate in tandem with time in 4-D space-time. Hence,

$$\text{E}'_z = \text{E}_z + v_x\text{B}_y \tag{33}$$

Repeating this exercise across all the Cartesian components, we end up with,

$$\mathbf{E'} = \partial \mathbf{A}/\partial \text{t} - \nabla \psi + \mathbf{v} \times \mathbf{B} \tag{34}$$

where **v**×**B** is exclusively in the *yz*-plane, just like the additional component of the magnetic field in equation **(25)**. The obvious similarity in mathematical form between equations **(1)** and **(34)** establishes a clear connecting bridge between Maxwell's sea of aethereal vortices and the Lorentz aether theory. However, Maxwell was operating in a different physical context. In Maxwell's case, $\partial\mathbf{A}/\partial t$ related to time-varying electromagnetic induction, while **v**×**B** related to the deflection of electricity in motion through an already existing background magnetic field. And besides that, equation **(34)** will ultimately involve the gamma factor, $1/\sqrt{(1 - v^2/c^2)}$, of the Lorentz transformation, which is not involved in Maxwell's equation **(1)**.

Two specific points of interest are, (1) that this derivation could not have been done without invoking Hermann Minkowski's concept of 4-D space-time, albeit using local time as opposed to astronomical time, and (2) that there was no need to invoke the gamma factor in order to expose the relationships, $\mathbf{B} = -(\mathbf{v}\times\mathbf{E})/c^2$, and $\mathbf{E} = \mathbf{v}\times\mathbf{B}$. Contrary to popular opinion, these are not relativistic effects. Meanwhile, the equation $\mathbf{B} = -(\mathbf{v}\times\mathbf{E})/c^2$ is the Biot-Savart Law in its most fundamental form. See the three **Appendices D**, **E**, and **F**.

The Physical Interpretation

VII. A Lorentz transformation should not be considered in the manner of a Galilean transformation whereby we are viewing the same event from a different frame of reference. A Lorentz transformation is intricately tied up with the elasticity of the luminiferous medium, which is the carrier of both magnetic fields and electromagnetic waves, and so we are studying the physical effects of absolute motion, and not simply relative motion.

In the previous section, we saw how a Lorentz transformation appears to be describing the application of a gyroscopic force to a rotating dipolar vortex, such as to cause it to precess. Consider now a charged sphere at rest relative to the luminiferous medium, along with its surrounding radial electrostatic field. According to whether the charge is negative or positive, its electrostatic field will involve a large-scale inflow or outflow of pure aether, which will flow through the tiny dipolar vortices that comprise the luminiferous medium. These tiny vortices in the vicinity are of course vortices in the very same aether as the large-scale inflow (or outflow). The large-scale radial flow and the fine-grained vortex flow are being superimposed on each other. Now, because the tiny vortices are dipolar, the large-scale radial aether flow of the sphere's electrostatic field will cause the tiny vortices to precess about the flow lines. This is equivalent to a Lorentz transformation where the velocity

term relates to the escape velocity. When the sphere is at rest within the sea of vortices, we will have a state of spherical symmetry.

If, however, the charged sphere is then accelerated translationally, relative to the luminiferous medium, it will entrain the large-scale radial aether inflow (or outflow), hence inducing an additional relative speed between the aether and the tiny dipolar vortices, assuming that the electrostatic force of the charged sphere is not strong enough to entrain the vortices themselves. This additional translational speed will distort the spherical symmetry, and so the constituent tiny vortices in the vicinity of the sphere will begin to re-align. Their mutual rotation axes will then begin to trace out concentric vortex rings around the path of motion, much in the likeness of smoke rings. These vortex rings, perpendicular to the direction of motion, constitute magnetic lines of force, and in this context, if we now apply the Lorentz transformation to the electric field, $\mathbf{E} = \partial \mathbf{A}/\partial t - \nabla \psi$, this time using the speed of the sphere relative to the actual sea of vortices itself, the prediction is that this induced magnetic field will approach completion as the charged sphere approaches the speed of light. The additional induced $\mathbf{v} \times \mathbf{B}$ component that appears in equation **(34)**, as a result of the Lorentz transformation, is the centrifugal force emanating from the equatorial plane of the tiny vortices, as they press inwards on the sphere from all sides perpendicular to its direction of motion. Meanwhile, within this magnetic field, the electrostatic force, $\nabla \psi$, will be manifested as an attractive force being channelled along the double helix of electrons and positrons that form the magnetic lines of force. See the figure below the abstract at the top of the article. This induced magnetic field will therefore block out the radial electrostatic field on the large scale in the region perpendicular to the direction of motion. The large-scale electrostatic field has in effect physically transformed into a large-scale magnetic field.

When we introduce the gamma factor, $1/\sqrt{(1 - v^2/c^2)}$, this predicts the asymptotic effect which results in a terminal speed, that being the speed of light, whereby the input energy from the external force acting on the charged sphere is more and more diverted towards increasing the aether pressure in both the sphere itself and in the surrounding vortices, rather than towards making the charged sphere move faster translationally on the large scale. In fact, going by Bernoulli's principle, the increased aether pressure should actually make the vortices spin slower, and if we establish the standard of *local time* upon the angular period of these vortices, this will account for the local time retardation.

If the speed of light could actually be reached by the charged sphere, hence completing the surrounding magnetic field alignment, the implication is that no further input energy could leak from the sphere into the magnetic field, as it would be blocked by the centrifugal force of the

tiny vortices pressing inwards on the sphere. The elastic wall of the luminiferous medium's inertial resistance will have fully kicked in.

This is all quite different from the interpretation of the identical mathematical components in Maxwell's equation **(1)** above. Equation **(34)** relates to the magnetic field which is induced around a body in motion, and the same general principle can be extended to the shape and the inertial mass of the body itself, whether or not with a scaling factor. In equation **(1)** however, the $\partial\mathbf{A}/\partial t$ term relates to time-varying electromagnetic induction and wireless radiation, while the $\mathbf{v}\times\mathbf{B}$ term relates to the deflection of electricity in motion through an already existing magnetic field, such as to cause it to undergo helical motion. In this Maxwellian context, $\mathbf{v}\times\mathbf{B}$ behaves more like a Coriolis force. This Coriolis-like aspect of the $\mathbf{v}\times\mathbf{B}$ force will be due to the fact that when a charged particle moves through the background sea of tiny vortices, since these vortices are all spinning in nearly the same direction as their immediate neighbours, the moving charged particle will experience a differential centrifugal pressure at right angles to its direction of motion, hence causing it to deflect sideways.

Lorentz-Fitzgerald Contraction in Electric Currents

VIII. In the year 1963, Edward M. Purcell purported to demonstrate, in connection with Einstein's special relativity, that an electrostatic field in one frame of reference can appear as a magnetic field in another frame of reference, [22]. This conclusion is an illusory version of the actual physical transformation of an electrostatic field into a magnetic field as described in the preceding section. But what Purcell has done is not a Lorentz transformation. Despite the superficially similar conclusion, it should be noted, that in the case of a Lorentz transformation, the gamma factor, $1/\sqrt(1 - v^2/c^2)$, only serves to produce the asymptotic effect, whereas, in Purcell's analysis, the gamma factor is the central piece in establishing the actual equality itself. Hence, we have a very troublesome discrepancy, indicating that something must be badly wrong somewhere.

In fact, the equality between electrostatic force and magnetic force, as derived by Purcell, has a distinct resemblance to the equality employed by Wilhelm E. Weber in 1855, in a physical context involving two actual opposing forces, when he was trying to establish the numerical value of a certain important constant in his 1846 force law, [8]. In 1857, Kirchhoff noticed the linkage between Weber's constant and the speed of light, [8], and this is all expressed through the equation, $c^2 = 1/\varepsilon_0\mu_0$, where c is the speed of light, ε_0 is the electric permittivity, and μ_0 is the magnetic permeability. It would appear that Purcell has applied Weber's equation in reverse, only enabled to do so by using a binomial approximation. This

approximation allowed Purcell to split the gamma factor so as to isolate the coefficient, $1/c^2 = \varepsilon_0\mu_0$. From there, Purcell selectively manufactured a Lorentz contraction, as between the positive particles and the negative particles in the conducting wire, in order to provide a net source charge for the electrostatic force. In doing so, however, he has created the equivalent for length contraction as what the clock paradox is in the case of time dilation, and since Purcell's theory contradicts the Lorentz transformation, then when relativists promote these two theories simultaneously, as they tend to do, the result is a total morass of confusion. Purcell's theory must therefore be categorically ruled out as a prelude to gaining a better understanding of the Lorentz transformation.

Conclusion

IX. The luminiferous medium involved in the Lorentz aether theory is specifically Maxwell's sea of tiny aether vortices. The mathematical forms, $\mathbf{B} = \gamma\mathbf{v}\times\mathbf{E}/c^2$, and $\mathbf{E} = \gamma\mathbf{v}\times\mathbf{B}$, which emerge from a Lorentz transformation, arise through aether hydrodynamics in connection with vortex rings that constitute magnetic lines of force. Magnetism, contrary to popular opinion, is not a relativistic effect.

The Lorentz factor, $\gamma = 1/(\sqrt{1 - v^2/c^2})$, only becomes significant as an asymptotic effect implying the existence of an upper speed limit for matter in motion through the luminiferous medium. As the speed of light is approached, the input energy from the accelerating force goes increasingly into both the mass and the surrounding magnetic field, as opposed to increasing the speed.

The claim that Maxwell's equations have been subsumed by Einstein's theories of relativity is patently false. The connection between Maxwell and Lorentz is through the aether, and when we remove the aether, as Einstein did, we remove the linkage between Maxwell and Einstein, leaving Einstein with no physical basis whatsoever to justify his theories. With Einstein's interpretation, we have no rest frame upon which to base the Lorentz transformations and we end up in an absurd universe where waves propagate in empty space, and where two clocks can both tick slower than each other, [23]. Meanwhile, all experimental results which are claimed for Einstein's relativity would appear to actually be a vindication of the Lorentz aether theory, specifically in connection with Maxwell's sea of molecular vortices.

Lorentz didn't believe that the luminiferous medium is entrained within the Earth's magnetic and/or gravitational fields as the Earth orbits the Sun. He objected to Stokes's entrained aether idea, [24], on the grounds that vortices would form high up at the interface, and hence

impact on stellar aberration. Lorentz, however, need have had no worries about such vortices forming, since vortices are actually the essence of the electromagnetic wave propagation mechanism in the first place, and they already exist everywhere.

Appendix A
(Three-Dimensional Aether Hydrodynamics)

The gradient of the scalar product of two vectors can be expanded by the standard vector identity,

$$\nabla(\mathbf{A}\cdot\mathbf{v}) = \mathbf{A}\times(\nabla\times\mathbf{v}) + \mathbf{v}\times(\nabla\times\mathbf{A}) + (\mathbf{A}\cdot\nabla)\mathbf{v} + (\mathbf{v}\cdot\nabla)\mathbf{A} \qquad (35)$$

Let us consider only the vector $\mathbf{A}$ to be a vector field. If $\mathbf{v}$ represents arbitrary particle motion, the first and the third terms on the right-hand side of equation (35) will vanish, and from the relationship $\nabla\times\mathbf{A} = \mathbf{B}$, we will obtain,

$$\nabla(\mathbf{A}\cdot\mathbf{v}) = \mathbf{v}\times\mathbf{B} + (\mathbf{v}\cdot\nabla)\mathbf{A} \qquad (36)$$

Hence,

$$(\mathbf{v}\cdot\nabla)\mathbf{A} = -\mathbf{v}\times\mathbf{B} + \nabla(\mathbf{A}\cdot\mathbf{v}) \qquad (37)$$

Since by the theorem of total derivatives,

$$d\mathbf{A}/dt = \partial\mathbf{A}/\partial t + (\mathbf{v}\cdot\nabla)\mathbf{A} \qquad (38)$$

it then follows that,

$$d\mathbf{A}/dt = \partial\mathbf{A}/\partial t - \mathbf{v}\times\mathbf{B} + \nabla(\mathbf{A}\cdot\mathbf{v}) \qquad (39)$$

Using the vector identity for the curl of a cross product in conjunction with the same reasoning as per the derivation of equation (36) above, we can safely conclude that,

$$\nabla\times(\mathbf{v}\times\mathbf{B}) = -(\mathbf{v}\cdot\nabla)\mathbf{B} \qquad (40)$$

Hence taking the curl of equation (39) leads to,

$$d\mathbf{B}/dt = \partial\mathbf{B}/\partial t + (\mathbf{v}\cdot\nabla)\mathbf{B} \qquad (41)$$

since the curl of a gradient is always zero, hence eliminating the $\nabla(\mathbf{A} \cdot \mathbf{v})$ term. Then with reference to equation **(40)**, if we take the curl of Maxwell's equation **(1)** at the beginning of the article, which is broadly the same as equation **(39)**, we obtain,

$$\nabla \times \mathbf{E} = \partial \mathbf{B}/\partial t + (\mathbf{v} \cdot \nabla)\mathbf{B} \qquad \textbf{(42)}$$

This time it was the electrostatic term that was eliminated by the fact that the curl of a gradient is always zero. From equation **(41)** this is equivalent to,

$$\nabla \times \mathbf{E} = d\mathbf{B}/dt \qquad \textbf{(43)}$$

which when the negative sign is added to take account of Lenz's Law, is a complete total time derivative version of Faraday's Law covering for both convective and time-varying electromagnetic induction. Faraday's Law is therefore equivalent to Maxwell's electromotive force equation, known today as the Lorentz Force.

Appendix B
(The Lorentz Transformations)

In 1897, Ulster physicist Sir Joseph Larmor presented equations in a paper which was published in *Philosophical Transactions of the Royal Society* [11]. On page 229, Larmor wrote $x_1 = x\epsilon^{1/2}$, where the more familiar gamma factor, γ, appears in the form $\epsilon^{1/2}$. He probably meant to write, $x_1 = x'\epsilon^{1/2}$, where $x' = (x - vt)$. He also wrote $dt_1 = dt'\epsilon^{-1/2}$, where $t' = t - vx/c^2$. These equations approximate to what we know today as the Lorentz transformations. Then in the year 1900, on page 174 in his article entitled ***"Aether and Matter"*** [12], Larmor transformed x_1, y_1, z_1, and t_1 into $\epsilon^{1/2}x'$, y', z', and $\epsilon^{-1/2}t' - (v/c^2)\,\epsilon^{1/2}x'$.

In 1905, Einstein re-derived the Lorentz transformations in the form,

$$x' = \gamma(x - vt) \qquad \textbf{(44)}$$

$$y' = y \qquad \textbf{(45)}$$

$$z' = z \qquad \textbf{(46)}$$

$$t' = \gamma(t - vx/c^2) \qquad \textbf{(47)}$$

Appendix C
(The Advent of Four-Vectors)

On page 907 of his 1905 Bern paper, [14], Einstein purported to subject Ampère's Circuital Law and Faraday's Law to Lorentz transformations. He wrote these two curl equations out in a perfectly dual format, using Gaussian units, which expose the speed of light, and he expanded them into their three Cartesian components, hence resulting in six equations in total. The primed versions were then displayed on pages 907-908 as seen below, with the solutions shown within the curved brackets. However, even though these solutions are correct, it should not have been possible for Einstein to have arrived at them by using the kinematical Lorentz transformations, which he had derived on page 902. With these transformations alone, he would not have been able to introduce the beta factor, v/c, so symmetrically. It's only by invoking the concept of 4-D space-time that the beta factor multiplies out correctly. Meanwhile, the appropriate mathematical tool, known as *four-vectors*, invented by Poincaré, [20], wasn't published until after Einstein had already published the solutions below in the form,

$$1/c.\partial \mathrm{E}_x/\partial t' \qquad\qquad = \partial/\partial y'[\gamma(\mathrm{B}_z - v/c.\mathrm{E}_y)] - \partial/\partial z'[\gamma(\mathrm{B}_y + v/c.\mathrm{E}_z)]$$

$$1/c.\partial/\partial t'[\gamma(\mathrm{E}_y - v/c.\mathrm{B}_z)] = \partial \mathrm{B}_x/\partial z' \qquad\qquad - \partial/\partial x'[\gamma(\mathrm{B}_z - v/c.\mathrm{E}_y)]$$

$$1/c.\partial/\partial t'[\gamma(\mathrm{E}_z + v/c.\mathrm{B}_y)] = \partial/\partial x'[\gamma(\mathrm{B}_y + v/c.\mathrm{E}_z)] - \partial \mathrm{B}_x/\partial y'$$

$$1/c.\partial \mathrm{B}_x/\partial t' \qquad\qquad = \partial/\partial z'[\gamma(\mathrm{E}_y - v/c.\mathrm{B}_z)] - \partial/\partial y'[\gamma(\mathrm{E}_z + v/c.\mathrm{B}_y)]$$

$$1/c.\partial/\partial t'[\gamma(\mathrm{B}_y + v/c.\mathrm{E}_z)] = \partial/\partial x'[\gamma(\mathrm{E}_z + v/c.\mathrm{B}_y)] - \partial \mathrm{E}_x/\partial z'$$

$$1/c.\partial/\partial t'[\gamma(\mathrm{B}_z - v/c.\mathrm{E}_y)] = \partial \mathrm{E}_x/\partial y' \qquad\qquad - \partial/\partial x'[\gamma(\mathrm{E}_y - v/c.\mathrm{B}_z)]$$

Appendix D
(The Biot-Savart Law in the Coulomb Gauge)

"The Double Helix Theory of the Magnetic Field" [6], is essentially Maxwell's sea of aethereal vortices but with the vortices replaced by rotating electron-positron dipoles. Within the context of a single rotating electron-positron dipole, the angular momentum can be written as $\mathbf{H} = \mathbf{D} \times \mathbf{v}$, where $\mathbf{D}$ is the displacement from the centre of the dipole and $\mathbf{v}$ is the circumferential velocity. When elastically bonded to other dipoles within the wider electron-positron sea, the displacement $\mathbf{D}$ will be related to the transverse elasticity through Maxwell's fifth equation, $\mathbf{D} = \varepsilon \mathbf{E}$. A full analysis can be seen in the articles *"Radiation Pressure and E = mc²"* [25], and *"The 1855 Weber-Kohlrausch Experiment"* [8]. If we substitute $\mathbf{D} = \varepsilon \mathbf{E}$ into the equation $\mathbf{H} = \mathbf{D} \times \mathbf{v}$, this leads to,

$$\mathbf{H} = -\varepsilon \mathbf{v} \times \mathbf{E}_C \qquad (48)$$

See **Appendix E** regarding why the magnitude of $\mathbf{v}$ should necessarily be equal to the speed of light. Equation **(48)** would appear to be equivalent to the Biot-Savart Law if $\mathbf{E}_C$ were to correspond to the Coulomb electrostatic force. However, in the context, $\mathbf{E}_C$ will be the centrifugal force, $\mathbf{E}_C = \mu \mathbf{v} \times \mathbf{H}$, and not the Coulomb force. If we take the curl of equation **(48)** we get,

$$\nabla \times \mathbf{H} = -\varepsilon [\mathbf{v}(\nabla \cdot \mathbf{E}_C) - \mathbf{E}_C(\nabla \cdot \mathbf{v}) + (\mathbf{E}_C \cdot \nabla)\mathbf{v} - (\mathbf{v} \cdot \nabla)\mathbf{E}_C] \qquad (49)$$

Since $\mathbf{v}$ is an arbitrary particle velocity and not a vector field, this reduces to,

$$\nabla \times \mathbf{H} = -\varepsilon [\mathbf{v}(\nabla \cdot \mathbf{E}_C) - (\mathbf{v} \cdot \nabla)\mathbf{E}_C] \qquad (50)$$

Since $\mathbf{v}$ and $\mathbf{E}_C$ are perpendicular, the second term on the right-hand side of equation **(50)** vanishes. In a rotating dipole, the aethereal flow from positron to electron will be cut due to the vorticity, the separate flows surrounding the electron and the positron will be passing each other in opposite directions, and so the Coulomb force of attraction will be disengaged. Hence, the two particles will press against each other with centrifugal force while striving to dilate, since the aether can't pass laterally through itself, and meanwhile the two vortex flows will be diverted up and down into the axial direction of the double helix, [7]. Despite the absence of the Coulomb force in the equatorial plane, $\mathbf{E}_C$ is still nevertheless radial, and like the Coulomb force, as explained in **Appendix F**, it still satisfies Gauss's Law, this time with a negative sign in the form,

$$\nabla \cdot \mathbf{E}_C = -\rho/\varepsilon \qquad (51)$$

Substituting into equation **(50)** leaves us with,

$$\nabla \times \mathbf{H} = \rho \mathbf{v} = \mathbf{J} = \mathbf{A} \qquad (52)$$

and hence since $\mathbf{B} = \mu \mathbf{H}$ then,

$$\nabla \times \mathbf{B} = \mu \mathbf{J} = \mu \mathbf{A} \qquad (53)$$

which is Ampère's Circuital Law in the Coulomb gauge.

Appendix E
(The Speed of Light)

Starting with the Biot-Savart law in the Coulomb gauge, $\mathbf{H} = -\varepsilon\mathbf{v}\times\mathbf{E}_C$, where $\mathbf{E}_C = \mu\mathbf{v}\times\mathbf{H}$, means that we can then write $\mathbf{H} = -\varepsilon\mu\mathbf{v}\times(\mathbf{v}\times\mathbf{H})$. It follows therefore that the modulus $|\mathbf{H}|$ is equal to $\varepsilon\mu v^2 H$ since $\mathbf{v}$, $\mathbf{E}_C$, and $\mathbf{H}$ are mutually perpendicular within a rotating electron-positron dipole. Hence, from the ratio $\varepsilon\mu = 1/c^2$, it follows that the circumferential speed v must be equal to c within such a rotating dipole. In other words, the ratio $\varepsilon\mu = 1/c^2$ hinges on the fact that the circumferential speed in Maxwell's molecular vortices is equal to the speed of light.

Appendix F
(Gauss's Law for Centrifugal Force)

Taking the divergence of the centrifugal force, $\mathbf{E}_C = \mu\mathbf{v}\times\mathbf{H}$, we expand as follows,

$$\nabla\cdot(\mu\mathbf{v}\times\mathbf{H}) = \mu[\mathbf{H}\cdot(\nabla\times\mathbf{v}) - \mathbf{v}\cdot(\nabla\times\mathbf{H})] \tag{54}$$

Since $\mathbf{v}$ refers to a point particle that is in arbitrary motion, and not to a vector field, then $\nabla\times\mathbf{v} = 0$, and since $\nabla\times\mathbf{H} = \mathbf{J} = \rho\mathbf{v}$, it follows that,

$$\nabla\cdot(\mu\mathbf{v}\times\mathbf{H}) = -\mu\rho\mathbf{v}\cdot\mathbf{v} \tag{55}$$

then substituting $v = c$ as per **Appendix E**,

$$\nabla\cdot(\mu\mathbf{v}\times\mathbf{H}) = -\mu\rho c^2 \tag{56}$$

and substituting $c^2 = 1/\mu\varepsilon$, this leaves us with a negative version of Gauss's law for centrifugal force,

$$\nabla\cdot(\mu\mathbf{v}\times\mathbf{H}) = -\rho/\varepsilon \tag{57}$$

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"Long ago he (mankind) recognized that all perceptible matter comes from a primary substance, of a tenuity beyond conception and filling all space - the Akasha or luminiferous ether - which is acted upon by the life-giving Prana or creative force, calling into existence, in never ending cycles, all things and phenomena. The primary substance, thrown into infinitesimal whirls of prodigious velocity, becomes gross matter; the force subsiding, the motion ceases and matter disappears, reverting to the primary substance".
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and note that while the quote suggests that the aether is incompressible, the author of this article suggests otherwise. Magnetic fields are clearly observed to deform when two like-pole magnets are pushed together. The quote in question, in relation to the speed of light, reads,
"The most probable surmise or guess at present is that the ether is a perfectly incompressible continuous fluid, in a state of fine-grained vortex motion, circulating with that same enormous speed. For it has been partly, though as yet incompletely, shown that such a vortex fluid would transmit waves of the same general nature as light waves— i.e., periodic disturbances across the line of propagation—and would

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