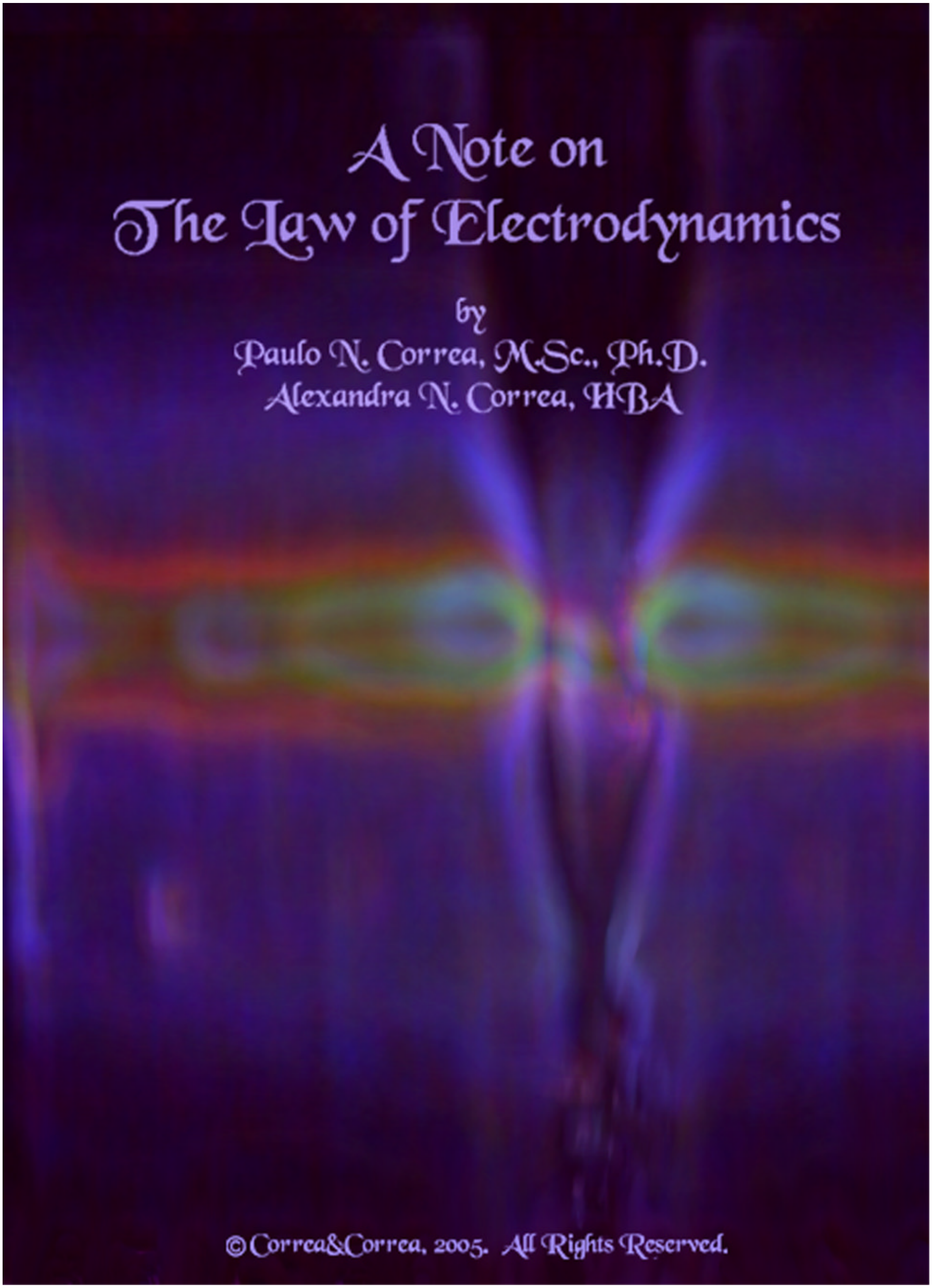

A Note on The Law of Electrodynamics

by
Paulo N. Correa, M.Sc., Ph.D.
Alexandra N. Correa, HBA

ISBN 1-894840-37-2

Published in Canada by
AKRONOS Publishing @aetherometry.com

A Note on the Law of Electrodynamics

By

Paulo N. Correa, M.Sc., Ph.D. & Alexandra N. Correa, Hon. B.A.
Aurora Biophysics Research Institute

Revised & Edited by Malgosia Askanas, Ph.D.

ABRI Monographs

A Note on the Law of Electrodynamics

1. Where Ampère went wrong

The recent IE issue dedicated to the Ampère Law of Electrodynamics [1] is one more departure from Eugene Mallove's guidance of that magazine. It is, in fact, remarkable that neither the issue nor the papers of Neal Graneau and others (Thomas Phipps, William Cantrell) make any mention of the alternative formulations of the law of Electrodynamics that Maxwell thought were equally possible - if not more likely to be correct than Ampère's - and, in particular, developments of these other formulations such as the one proposed by Harold Aspden [2].

This omission is further underlined by the fact that Harold Aspden has published papers specifically reviewing the Graneaus' water-arc and wire explosions [3-4], where he has demonstrated how his force law can effectively account for the anomalous longitudinal forces observed by the Graneaus in those experiments. The absence of mention is even more notable because this #63 issue of IE is also the first one that no longer carries Harold Aspden's name as a member of the Scientific Board.

But the absence is also specious, given that both Graneaus attended the Berlin 2002 Conference, where we presented a synopsis of our work on the autogenously pulsed abnormal glow discharge (aPAGD) and interrupted vacuum arc discharge (IVAD), and the observation and utilization of the anomalous cathode reaction forces developed under interrupted circuit conditions, in accordance with Aspden's force law; and given that Neal Graneau told us in person, at the time of that Conference, that he had 'failed to beat us' to the punch with respect to the isolation of the suitable plasma regimes and our various patents for the utilization of anomalous cathode reaction forces.

It would appear that the omission of the prior published experimental and theoretical record betrays a form of bad faith, to say the least. While some think that suppression of scientific data is the result of a conspiracy or conspiracies, and is only perpetrated in mainstream publications, the fact is that it's an everyday life activity practiced by scientists and researchers themselves - mostly according to their perception of the 'laws of marketing' - and one from which the present management of IE is obviously not exempt.

Be that as it may, our note aims at underlining the nonsense, or 'contrasenses', inherent in Ampère's law of electrodynamics - while noting that the founder and former Editor of IE, the brilliant Eugene Mallove, was *fully cognizant of this nonsense*. The present note will foreshadow the publication of some of our 1997-1998 work that we intend to bring out soon in the form of a book dedicated to the foundations of a new theory and law of electrodynamics, with emphasis on Aspden's work and our own experimental studies with the aPAGD and IVADs, but predominantly concerned with Aetherometry proper. In that forthcoming book we analyze all the electrodynamic force laws of interest which have been proposed to date - including Ampère's, and Peter Graneau's variation on same.

But before getting carried away, we would like to emphasize that Maxwell's own efforts were spurred on by his doubts regarding the validity of Ampère's formulation. In a very recent note, Harold Aspden draws this out rather pointedly, so we quote him directly:

> "Maxwell was concerned that Ampère's law of electrodynamics might not be a valid interpretation of experimental fact because it relied partly on empirical data and partly on assumption. He addressed the options available. The key point was that it was known how electric currents interact where one of the currents flows though wire around a closed circuit but it was not known how two discrete electric charges in motion might interact as a function of their motion. To define the law of force there had to be an assumption. Ampère had assumed total balance of action and reaction but one can have total balance of action and reaction for that closed circuit current condition without satisfying the precise formulation specified by Ampère.
>
> In today's terminology the Lorentz force law suffices and meets the necessary balance criteria for such closed current circuit conditions, but an additional term, as formulated by Maxwell, is needed to cover the general case and that still depends upon an assumption. That additional term, expressed in vector form is simply:
>
> $$(\mathbf{v}.\mathbf{r})\mathbf{v}'$$
>
> times ee'/r^3, where a charge e in motion at velocity $\mathbf{v}$ acts on a charge e' distant $\mathbf{r}$ from e and moving at velocity $\mathbf{v}'$. The effect of this term integrates to zero for the closed circuit current condition

Maxwell realized that this additional term could have any factor, positive or negative, large or small, and still comply with the empirical conditions. He opted for the factor being +1 because he knew that this would give an overall formulation for which the two charges in motion could interact without giving rise to an anomalous unidirectional net linear force that might suggest the interaction induced a linear push on something.

Instead, though it was not mentioned, that would lead to the two-charge interaction itself developing a turning couple as if it were exerting a twist action on that same something. Ampère's law had avoided both of these possibilities.

Given the belief in the existence of an aether in Maxwell's time and the fact that the motion of those charges is referenced on a frame of reference signifying a property of the aether, that 'something' did have a basis, one that could provide the balancing force along with the associated energy." [5]

Phenomenologically, Ampère's law could appear to work in closed circuits. The problem was its validity in open or interrupted circuits, or, more properly, in circuits where currents are carried by fluxes of charge carriers of different masses, and longitudinal forces are observable.

Aspden, once again, succinctly explains the shortcomings of Maxwell's formulations that led him to propose his own formulation of the law of electrodynamics:

"What I realized when I came onto the scene was that it would have been preferable for Maxwell to opt for the version with the minus sign preceding that (**v**.**r**)**v**' term, simply because that would avoid the twisting problem. Also, though introducing that out-of-balance net linear force, I could see that such a formulation, for **v** parallel with **v**', would, in combination with the Lorentz component, result in a law for which mutual force action between the charges was of the simple inverse square of distance form acting along the line joining the charges.

Such a law made more sense especially as, at the time I discovered this, my thoughts were on linking electromagnetism and gravity.

The formal analysis, however, then had to take account of the possible interaction of charges of different mass, such as heavy ions interacting with electrons, and that added the factor (m'/m), where m' is the mass of charge e' and m is the mass of charge e, these charges being, of course, expressed in electromagnetic units."

Maxwell sought to avoid a law that would suggest the transfer of linear momentum or force to the Aether, and hence questioned Ampère's formulation. Instead, the Graneaus seek to restore the validity of Ampère's law and impugn Lorentz's law, by putting their emphasis on a trigonometric function which, in their words, "was the pinnacle of Ampère's empirical discoveries" and "permits" development of a "longitudinal repulsion force" that depends "on the mass distribution of the circuit". Neal Graneau's paper, the new feature of that IE issue [6], may not do a very convincing job of demonstrating this. Originally written to dispel the doubts of one of the co-authors of his 2001 paper [7], the IE paper has a number of critical flaws.

In the original experiment, Graneau had placed the mobile armature in line with two arc gaps, on top and bottom, such that the total gap distance was always constant (see figure 1 of reference [6]), 20 mm. The data of that 2001 paper, which he again presents as figure 2 of the present IE paper, indicates a positive force variation that varies with the size of the bottom gap. So one might assume that, if he is now to study the effect of adding mass to the bottom of that armature (described inaccurately as the effect of "varying electrode mass"), he would choose a fixed distance for that bottom gap while varying the mass. Instead, the experiment effectively consists of varying two parameters *at once*, the size of that bottom gap and the mass added to the armature. Indeed, the distance of the armature system, with or without lower electrode, from what he calls the “fixed circuit”, *where ‘the magnetic induction field’ is formed*, is not fixed but variable - and such that, as he claims, at the distance adopted for the zero mass electrode, it “produces no armature acceleration” [6]. This flaw is terminal, but is further compounded by still others. For instance, the added mass is supported by an aluminum wire that spans that bottom gap. This might at first suggest that one only needs to worry about the top gap, which remains constant in size. But Neal Graneau observes that the supporting wire for the two “effective electrode masses” only lasted the first 4 µseconds of the discharge, and that for most of the discharge (ie 196 out of 200 µseconds), the electrodes were unsupported (and thus attracted to the armature, as its component). Ergo, for most of the discharge, there was a bottom gap occupied by an arc discharge. Now, one assumes that the aluminum wire vaporizes completely in that bottom gap (otherwise the effective size of the bottom gap becomes an undetermined variable), but if one *projects* the gaps of shots a and b, the only ones carrying effectively added masses, *onto that figure 2* of the previous Graneau *et al* paper, one finds that:

(1) Shot 'a', with a total top and bottom gap distance around 25 mm, and a bottom distance around 12 mm, should have developed a near-zero positive force (measured as upward displacement of the armature); yet, it now develops a large force close to the maximum observed in that figure 2 when the bottom gap did not exist or was 0 mm.

(2) Shot 'b', with the same top gap but a bottom gap of some 30 to 35 mm (to judge from the photographs of his figure 4), yields a nearly half-maximal positive force, when the theoretical curve presented for the bottom gap in figure 2 suggests that as the top gap is kept constant and the bottom increased, the observed force should be negative and substantial in magnitude.

These glaring methodological and experimental inconsistencies are glossed over and unexplained. A good peer-review would have provisionally killed the paper on these grounds alone, and would have asked that properly controlled experiments be provided in which the size of the bottom gap formed after vaporization of the supporting aluminum wire was also kept constant (note also that Phipps' description of the experiment is erroneous in that it suggests, albeit obscurely, that the two gaps are varied "correspondingly" [8], when, in fact, Neal Graneau's photograph and drawing of the experiment, in his figures 3 & 4, show no such concomitant variation of both gaps). Since Neal Graneau actually provides only two experimental points (see figure 6 and table 1 of the paper), with no statistics, not even an indication of the number of shots carried out, one would be hard-pressed to view it as proof of anything.

Moreover, as can be seen from figure 1 of Phipps' article [9], which presents Neal Graneau's data points along with the curves predicted by the Ampère and Riemann force laws, and as can be seen again from Neal Graneau's representation of the same data in his figure 2 (where only the "Ampère force prediction" curve is shown [6]), *none of the Ampère or Riemann curves fit the experimental data, and the data permits no discrimination whatsoever between them*. In most cases, the data points are so far from the predictive curves that Phipps' argument about repeated arc discharges wearing out the electrodes and distorting the force values would permit one equally to assume that either Riemann or Ampère is right, just offset by the needed amount... Hence, both Phipps' and Graneau's graphs can only be seen as irrelevant in terms of deciding which force law is the correct one (somewhat more amusing is the inclusion of the "Ampère force prediction" curve for negative values of the force, with no experimental data but instead a lonesome theoretical point, in the same figure 2 of Neal Graneau's paper).

If it had been Eugene Mallove editing these papers, or reviewing this issue, one can be sure none of these details would have escaped him. Clearly, the review abilities of the new editors of IE leave much to be desired.

The Graneaus avoid reference to field theory, as Ampère's law - unlike Lorenz's - does not require reference to an electromagnetic field that serves as mediator of the electrodynamic interaction. This, of course, is based on an apriorism, that of instantaneous action at a distance, assumed by analogy with Newtonian gravitation for purposes of "force unification". It may appear, particularly to students of Aetherometry, that this is neither better nor worse than the apriorism characteristic of Lorentz's law, that the interaction is mediated by a field propagating at uniform speed c. Locked into these competing solutions, *both of which are erroneous*, the mainstream consensus - following Einstein's lead - adopted Lorentz's. Equally locked into the same false alternative, the Graneaus put their emphasis on Ampère's marvelous trigonometric expression, with their own figure-eight polar diagram of the Ampère forces, while Phipps admits that to find longitudinal forces it suffices to manipulate an extra factor in the integrand of the Ampère force law (when comparing it, of course, on the basis of its exact differential, to the Lorenz force law...), and build it in as a "feature of the experimental design".

Add to the mix the editorial pomposity of Cantrell, and what do you get? Magik. Here's Cantrell on one hand avowing that the Ampère law gives a force that integrates to zero in all closed circuits (while administering the *bona fide* notion "known by every electrician" that current only "flows in closed circuits" ...thus setting aside entirely Tesla's critical discovery of the 'filamentary currents' of the electric Aether in open circuit) , and on the other hand claiming that it can predict the existence of longitudinal forces. How so? Wait, not as net forces, but as something that "still exists within the metal lattice of the wire"... And the proof? Well, wires burn, don't they, if you put enough current through them... And how do these wires break? Cantrell's answer is: *somehow*, magically, wire breaks occur due to the "self-repulsion" of (magical again) "wire bits" (sic), the same bits that are used for all the possible and imaginary integrations of circuit elements. Grimly enough, Cantrell admits that the trigonometric factor "seems a little odd"; but only does so at first, since he has already concluded that "given this mathematical result" of Ampère's law (ie that it predicts no net longitudinal force), "it is difficult to create a tie-breaking experiment"! You bet. But then, if Ampère's law is this useless to predict net anomalous electrodynamic force, why not consider those laws that predict such anomalies other than by tinkering about with trigonometric factors?

In parting, Cantrell claims that “a minimum size to the current element must be established”, given that the results of the integration by Ampère's force law *fail to converge to a finite value* of their size... Once again, one can only wonder at the probabilistic conundrums that mechanistic thought has led science to, all because of a systematic failure to think functionally, in *physical and* in *mathematical* terms. But such is the new quality of *Infinite Energy*, with Cantrell being “honored to present to you papers from many of the key researchers” (sic) in electrodynamics... Ah, let us not laugh!

Neal Graneau’s paper concludes that “Ampère’s force law has been found to be the most accurate model of all existing electrodynamics”. On the basis of this paper, and one other whose content is now disputed by one of its co-authors, it might seem somewhat premature to break out the champagne, since these authors, Harold Aspden, and published experimental literature on anomalous cathode reaction forces has shown plenty of instances not explained by the Ampère force law, even when that trigonometric factor, that euphemistic 'integrand factor', is ‘manipulated’. In our upcoming book on electrodynamics to which we referred above, we compare the predictive performance of Ampère’s and Aspden’s laws with respect to a systematic variety of physical geometries: out of 9 tests, Ampère’s law failed to predict 1 outcome entirely and gave variously inaccurate predictions in 7.

2. What’s wrong with Electrodynamics: an aetherometric perspective

We do not intend to rewrite here, or summarize, the involved arguments and demonstrations of the book we intend to publish soon on the subject of electrodynamics. But we cannot resist drawing the attention of physicists and electrical engineers to those obvious errors which our recent work has already corrected. These include such basic errors as the wrong dimensionalities obtained by Maxwell for the magnetic and electrical fields [10] and for current, when he proposed that the latter was identical to the square root of force [10]. Two epochal errors now reproduced for over a century, and which have done much to *arrest development of field theory*. Nor can we resist remarking that besides such basic, fundamental errors, another one has been complementarily made by the partisans of mechanical Newtonianism (the adherents of Ampère’s force law) and by the partisans of "electromagnetic field theory" (the followers of Lorentz, including all relativists). To assume that a force propagates instantaneously is as much an error as to assume that it propagates via a field with speed c. In fact, these are two sides of the same error. And the error is simple: the force of the field and the mutual force of any couple of massbound charges propagate at finite velocities indeed, but the field propagation carries the speed of the electrical field (not the electromagnetic speed), and this has exact correspondences to the maximum modal velocity of the charges in the current, and the finite length of their repeating paths (the so-called current elements, each of which is, at the limit, the finite value of the microscopic displacement of each moving charge - ie of the flux of each charge or micro-current).

Furthermore, the error is compounded by the fact that 'field force' and 'force on a particle' are confused, terminally confused and kept undifferentiated. In plainer language still, the force conveyed by the field (primary force) is not the same as the mechanical force mutually exerted by two current elements on one another (secondary force). As the two are confused through formulas that are *imagined* to mean the same thing, arbitrariness reigns in the field. Can then anyone be sure of measurements and interpretations of the electrical interactions in such complex fields of investigation as the electrodynamic interactions of plasmas? No wonder that any integration with Boltzmann's theory of heat appears to be doomed, and the accepted solution is discrepant and inconsistent - as a recent text by Harold Aspden, aptly entitled "A Problem in Plasma Science" [11], puts into evidence in what regards the so-called "temperature of the Sun". This is a problem that already underlies our own theory of radiant and kinetic forms of sensible heat [12-15], and our novel proposal for a linear temperature scale [13].

So, let us conduct a simple demonstration of one of the most fundamental of errors of electrodynamics. Everyone is told that current is the number of charges flowing in a circuit per unit time. The first failure of existing physics is that it cannot resolve the dimensionality of charge, ie express it in fundamental dimensions and units of mass, length and time. Under the suitably vague term "a quantity of electricity Q", Maxwell described the dimensionality of charge in the electrostatic system of units as [16]:

$$Q = m^{0.5}\ \ell^{1.5}\ t^{-1}$$

But his equivalent dimensionality in the electromagnetic system of units was nonsense:

$$Q = m^{0.5}\ \ell^{0.5}$$

So, for the most part, charge became treated as its own dimension, as a point-charge, just as the mass of a particle was treated by the fiction of a single-dimensional point-mass. The concept of charge appeared to be irreducible. Yet, one measures mass-energy and kinetic energy of particles in electron-volts, i.e. in units of charge (e, q) times units of electric potential (volts). It suffices to show that voltage V, and its *linear or nonlinear proportionality* to 'kinetic' velocity, is a function *expressible* in meters per second, for the charge to become, necessarily (ie by the definition of mechanical or kinetic energy E as mass times length squared divided by time squared), a product of mass and length divided by time:

$$q = E/V = m\ \ell^2\ t^{-2}/\ell\ t^{-1} = m\ \ell\ t^{-1}$$

Or, just as well, one might start with Aspden's exact formal demonstration that the dimensionality of charge is indeed what Maxwell thought it was for the electrostatic system:

$$q = m^{0.5}\ \ell^{1.5}\ t^{-1}$$

Now apply the aetherometric mass-to-length conversion and, once more, charge ends up with the dimensionality of a linear momentum expressed in massfree terms (see the middle term in the following expression):

$$m\ \ell\ t^{-1} =\!\int\!= \ell^2\ t^{-1} =\!\int\!= m^{0.5}\ \ell^{1.5}\ t^{-1}$$

It follows, therefore, that the property "charge" defines an electric linear momentum function distinct from the composite "inertial" or "electromagnetic" linear momentum (also of dimensions: $m\ \ell\ t^{-1} =\!\int\!= \ell^2\ t^{1}$) that characterizes the carriers of massbound charges.

Consequently, if one says "current", and this equates to a number of charges passing a point per unit time, n q/sec, then the very physics of the term "current" implies that it has to have the traditional dimensionality of: q/sec = $m\ \ell\ t^{-2}$ = F. Lo and behold, it is the dimensionality of force! Current *is* a force acting along the direction of motion or flux; which makes better sense than the notion that forces only arise from the interactions of currents, and that they are seldom, or never, longitudinal. Currents, whether in closed or open systems, cannot flow *forward* unless they display a fundamental longitudinal force that arises from the electrodynamic interaction between charges. So much, then, for Maxwell's erroneous notion that current was:

$$i = \sqrt{F} = m^{0.5}\ \ell^{0.5}\ t^{-1}$$

This was only adopted to secure the dimensional result of the law of electrodynamics as being effectively equal to force with dimensionality of ($m\ \ell\ t^{-2}$):

$$F = \mu_0\ (i_1\ i_2)\ (ds_1\ ds_2)\ (n\ r_1^{\ 2})^{-1} = (m^{0.5}\ \ell^{0.5}\ t^{-1})^2\ (\ell^2/\ell^2) = m\ \ell\ t^{-2}$$

But in fact, what this basic expression gives is not force, but the square of force! (the problem is only compounded by other formulations that write the basic law even more incorrectly as $F = \mu_0\ (i_1\ i_2)\ (ds_1\ ds_2)\ r_1\ \Omega\ (n\ r_1^{\ 2})^{-1}$). Indeed, the correct dimensional analysis easily shows that:

$$\mu_0\ (i_1\ i_2)\ (ds_1\ ds_2)\ (n\ r_1^{\ 2})^{-1} = (m\ \ell\ t^{-2})^2\ (\ell^2/\ell^2) = m^2\ \ell^2\ t^{-4}$$

with massfree dimensionality equal to:

$$m^2\ \ell^2\ t^{-4} = \int = \ell^4\ t^{-4} = F^2$$

In aetherometric terms, this clearly indicates that the basic form of the law of electrodynamics describes charge superimposition in *phase Space* ***and*** *phase Time*. Put succinctly, whether the interaction is 'kinetic' (between massbound charges) or 'a field interaction' (between the field and a massbound charge), it is *always a matter of the superimposition of two or more charges*.

It's little wonder, then, that integration with the gravitational force function (having dimensions given by $m\ \ell\ t^{-2}$, and not by its square!) has been of so much trouble to physicists. What the existing formulations of the law indicate is that physicists have not understood properly the electrodynamic interaction. What does it consist of? There are two different situations: the interaction of a massbound charge with an electric field having finite propagation speed, whereby that charge acquires kinetic energy, is accelerated and has a modal velocity in a circuit segment; and the interaction of two massbound charges of a definite charge polarity, variable carrier mass and variable velocity vectors. The primary and the secondary interactions are mixed together in the same physical system, such that the electrodynamic interaction highlights what mainstream physics lacks: the capacity to understand the field-to-charge interaction properly *as also being an electrodynamic interaction between charges* - this time, between *massfree and massbound* charges.

It follows that it is *charge superimposition* in general which all electrodynamic theories appear to misunderstand: how the field charges superimpose with the massbound charges under acceleration by the field, and how massbound charges transfer or effectuate forces. Electrodynamicists of all stripes fail to this day to understand how the field velocities are always different from the velocities of charges involved in secondary interactions, and how neither one obeys any electromagnetic constraint. Hence, they cannot find the physical function that specifies the finite value of a "current element" or, more properly, the 'filamentary lengths' that fulfill a physical function - and are stuck in infinitesimal calculus looking for a buoy that may save them from the arbitrary of the infinitely divisible. For if they knew what they were writing about with the symbols they employ, they would realize that there are simpler expressions for both the field force and the mechanical forces, and that these expressions *already convey the required speeds of propagation and take into account the different masses of the charge carriers*. They would then realize that when a finite "current element" determined by the magnetic properties of the field (and thus the magnetic wave function of the massfree charges composing the field) is employed, the field force carried by massfree charges (ie what Tesla called "the electric Aether") resolves simply to the most basic longitudinal expression for force, so that the electric field force for a single moving charge is microphysically defined as -

$$F = i\,[\mathbf{ds\ H}] = i(H^{-1}\ H) = i = W_{v1}\ W_{v2} = v^2$$

One simple proof of these statements, and why in all other cases the length elements corresponding to the magnetic field must be derived as geometric means of the properties of the interacting or superimposed massbound charges, is shown below, in an excerpt from our upcoming book.

3. The electric aetherodynamics of moving bodies (where Maxwell, Lorentz and Einstein went very wrong): mechanical and field forces

Aetherometry is not only the first theory to correct and integrate all worthy, conventional or alternative, electromechanical force 'laws', but also the first theory to perform this correction and integration in the context of differentiating linear electromechanical force from a field force which is susceptible of being treated integrally as being either electrostatic, electrodynamic, magnetoelectric or gravitational. In all instances, the force functions have the charge or mass 'separation vector' quantized as a function of the reciprocal of the unit-distance (and not as a function of the reciprocal of the unit-distance squared), as already demonstrated, experimentally and analytically [17]:

$$(n\ r_1)^{-1} = (n\ \lambda_{y1})^{-1} = [n(\lambda_{y11}\ \lambda_{y12})^{0.5}]^{-1}$$

Whether the resultant force is one of attraction or repulsion, whether electrical, electrodynamic, magnetic or gravitational, the sign affecting the force is directly produced by the complete lawful expression involving the polarity of charge and the presence or absence of the trigonometric operator. It is therefore little wonder that no satisfactory integration could result from trying to fit the gravitational field force with the wrong expressions for electromechanical linear force, when the functional structure of the gravitational field force is only assimilable to the functions for a field force, beginning with the actual electrodynamic field force.

Returning to the subject of the functions with which Lorentz wrote his force law, the fundamental difference, in his formulation, between the electrodynamic field force and its electromechanical conversion-equivalent lies in the fact that the field force function contains the product of the mechanical force by the ratio $[r_1/(ds_1\ ds_2)^{0.5}]$:

$$F_{ED} = [\mu_0(i_1\ i_2/n\ r_1{}^2)(ds_1\ ds_2)]\ [r_1/(ds_1\ ds_2)^{0.5}] = (F_{MECH})\ [r_1/(ds_1 ds_2)^{0.5}] =$$
$$= \mu_0(i_1\ i_2/n\ r_1)\ (ds_1\ ds_2)^{0.5}$$

or conversely, that the linear electromechanical force results from the product of the field force by the ratio $[(ds_1\ ds_2)^{0.5}/r_1]$:

$$F_{MECH} = (F_{ED})\ [(ds_1\ ds_2)^{0.5}/r_1] = [\mu_0(i_1\ i_2/n\ r_1)\ (ds_1\ ds_2)^{0.5}]\ [(ds_1\ ds_2)^{0.5}/r_1] =$$
$$= \mu_0\ (i_1\ i_2/n\ r_1{}^2)\ (ds_1\ ds_2)$$

Now, the fundamental artifice of both the classical Lorentzian framework and the relativistic framework of electrodynamics, is to supply the current filaments $i_1\ ds_1$ and $i_2\ ds_2$, with paths s_1 and s_2 which are of infinite length, in lieu of providing them with their own 'naturally quantized length unit'. It was only by this artifice that the Lorentz law appeared to legitimize its application to open circuits by treating this type of circuit as just a variant of the closed circuit where effectively s_1 and s_2 could not be measured and were infinite.

Both Lorentz's and Einstein's formulations rely upon Maxwell's relation (where ε is the electric field) -

$$\mathrm{curl}\,\varepsilon = -\frac{1}{c}\frac{d\ H}{d\ t}$$

This relation or expression can easily be shown to be manifestly wrong. This can be done in one of two ways. First, assume like Maxwell and physicists do, that the curl operator does not affect the dimensionality of the expression because no dimension is associated with the curl itself. Then the expression requires that H be a function of ($c\ t\ \varepsilon$), which, in turn, requires H to have the dimensionality of speed -

$$H = c\ t\ \varepsilon = \int= (\ell\ t^{-1})\ t\ t^{-1} = \ell\ t^{-1}$$

since we know that, physically and aetherometrically [10, 17], ε is the effective frequency of the electric field (another obvious necessity that Maxwell failed to grasp: if voltage is expressible as a speed, then volts per meter necessarily resolve into the reciprocal of time). If H were to have the dimensionality of speed, then it would be nonsense to write linear speed itself as -

$$v = \varepsilon / H$$

Moreover, if H were to equal (c t ε), this too would be incompatible with the definition of H adopted by the Bio-Savart version of the electrodynamic law, as well as by Lorentz' and Einstein's version, where

$$H = \int_{s_2}^{i_2} (1/r^3)\ [\mathbf{ds_2}\ \mathbf{r}]$$

because the force is effectively defined as

$$F = i_1\ [\mathbf{ds_1}\ \mathbf{H}]$$

It is remarkable how wrong these formulations are. They entirely lose sight of the actual or lawful function of H. If this 'further definition' of H were in turn correct, we would have:

$$H = (i_2/r^3)\ (s_2\ r) = \int = (\ell^2\ t^{-2}/\ell^3)\ (\ell^2) = \ell t^{-2}$$

where H would now have acquired the dimensionality of acceleration!, just so that

$$'F' = i_1\ s_1\ H = (i_1\ i_2)\ (r/r^3)\ (s_1\ s_2)$$

But this is nonsense, as force would then have the dimensionality of its square (and thus be truly unable to be unified with the concept of gravitational force):

$$'F' = (i_1\ i_2)\ (r/r^3)\ (s_1\ s_2) =\!\int\!= (\ell^4\ t^{-4})\ (\ell^3/\ell^3) = \ell^4\ t^{-4}$$

One might, of course, raise the objection that these abstruse dimensionalities are only nonsensical because of our demonstrations that $\varepsilon =\!\int\!= t^{-1}$, and that $i =\!\int\!= \ell^2\ t^{-2}$, not $\ell\ t^{-1}$ as Maxwell indicated with his relation $i = \sqrt{F}$ [10]. But we note that this is hardly the case, since what one obtains with Maxwell's incorrect dimensionality of current is -

$$'H' = (i_2/r^3)\ (s_2\ r) =\!\int\!= (\ell\ t^{-1}/\ell^3)\ (\ell^2) = t^{-1}$$

At first sight, this tallies with the correct dimensionality of force, if $i = (F)^{0.5}$

$$'F' = (i_1\ i_2)\ (r/r^3)\ (s_1\ s_2) = i_1\ s_1\ H =\!\int\!= (\ell\ t^{-1})\ (\ell\ t^{-1}) = \ell^2\ t^{-2} =\!\int\!= m\ \ell\ t^{-2}$$

and with the (aprioristic) contention that the dimensionality of H is the same as that of ε. But see the nonsense that results: not only does Maxwell's relation

$$\text{curl}\,\varepsilon = -\frac{1}{c}\frac{d\ H}{d\ t}$$

yield nonsense for both the 'electric field strength'

$$\varepsilon = H/ct =\!\int\!= \ell^{-1}\ t^{-1}$$

and the 'magnetic field strength'

$$(H =\!\int\!= t^{-1}) \neq (\varepsilon =\!\int\!= \ell^{-1}\ t^{-1})$$

but, more importantly, whether we treat ε lawfully as t^{-1} or unlawfully as ℓ^{-1}, Maxwell's relation

$$H = c\,t\,\varepsilon \Rightarrow \ell\ t^{-1} \text{ or dimensionless, since } (\ell\ t^{-1})\ (t\ \ell^{-1}) \text{ is a ratio with 0 dimensions}$$

can never hold. Ergo, Maxwell's theory can be proven wrong at this basic a level.

Now, one can take the second path, and argue, as we have in fact done, that the curl (also written as ∇) does have a hidden dimensionality. Yes, as Maxwell described it, the curl is a dimensionless operation whereby a vector quantity is deduced from its potential [18]. But the extension of this operator to vector displacements leads one to conclude otherwise, that the curl operator must have physical dimensionality - specifically because it is applied to the work that can be extracted from a force field, where the 'cross product' of the curl ∇ with the force F integrates *the work of a particle* moving around a loop (the periphery of a patch of surface), and the entire operation provides *the net work per unit area* A, as:

$$W = \nabla \times F\ \delta A$$

Invariably and of necessity, this implies that the operator ∇ has to have the dimensionality of ℓ^{-1} [10], if (1) the dimensionality of work is that of energy, $W =\!\int\!= m\ \ell^2\ t^{-2}$, as is required by the function for work as a line integral:

$$W = \int F\ dA/dx = \int_i^j F\ dx = \int_{vi}^{vj} mv\ dv =\!\int\!= m\ \ell^2\ t^{-2}$$

and (2) if Stokes' theorem is to hold. But none of this saves Maxwell's proposition, for now the curl of the electric field acquires the dimensionality -

$$\nabla\varepsilon =\!\int\!= \ell^{-1}\ t^{-1}$$

and thus, according to $\nabla\varepsilon\ c\ dt = dH$, H will have acquired the dimensionality of

$$H =\!\int\!= \ell^{-1}\ t^{-1}\ (\ell\ t^{-1})\ t = t^{-1}$$

and everything that we said above about the ineptitude of this dimensional equivalence (denoted above as 'H'), and about the nonsense that results therefrom, will again apply.

If we now backtrack to what Aetherometry has taught us about ε and H as well as current i, we can readily see how, for a singular instance in an endoreference system, force with respect to current is indeed -

$$F = i\ (s\ H)$$

because H is a linear density of wavelines and thus the reciprocal of a combined wavefunction for the two wavelengths that are intrinsic to the charge momentum function. Hence -

$$F = i\ (s\ H) =\!\!\int\!\!= (\ell^2\ t^{-2})\ (\ell/\ell) = \ell^2\ t^{-2}$$

where the correct dimensionality of H is employed as $H =\!\!\int\!\!= \ell^{-1}$. It is because this is so, that the electrodynamic force on either charge of a mutual charge reference system is referred to its kinetic energy and configuration, such that its full field effect is effectively described as -

$$F_{ED} = \{i_1\ [\mathbf{ds_1}\ \mathbf{H_1}]\ i_2\ [\mathbf{ds_2}\ \mathbf{H_2}]\}^{0.5}$$

because the terms ds_1 and ds_2 *are quantized by* H_1^{-1} and H_2^{-1} (such that their dimensionality is effectively canceled when multiplied by H_1 and H_2) such that -

$$ds_1 = x_1\ H_1^{-1}$$

and

$$ds_2 = x_2\ H_2^{-1}$$

This means effectively that, when $x_1 = 1$ and $x_2 = 1$, the equation

$$F_{ED} = [i_1(s_1\ H_1) * i_2\ (s_2\ H_2)]^{0.5}$$

reduces to

$$F_{ED} = (i_1\ i_2)^{0.5}$$

which is precisely the spine function of the electrodynamic field force. Hence, it is only for an endoreferenced system of charges that the electric field force is defined as -

$$F = i\ [\mathbf{ds\ H}] = i\ (H^{-1}\ H) = i = W_{v1}\ W_{v2} = v^2$$

because the electrodynamic force that results from the superimposition of moving charges does not subsume the second current term under H or H_1, as if $H = (i/r^3)\ (s_2\ r)$, but instead *superimposes the two contributing forces so that the resultant field force is expressed as the square root of their product*. Hence, if the distance between two charges is the unit length and the quantum number is unity, x = 1 - that is, if the length of the circuit path or the length of the current filament is finite and limited to its natural unit length, H^{-1}, so that the filament lengths are defined by $x_1 = 1$ and $x_2 = 1$, we effectively have -

$$F_{ED} = \{i_1\ [\mathbf{ds_1\ H_1}]\ i_2\ [\mathbf{ds_2\ H_2}]\}^{0.5}\ n^{-1} = (i_1\ i_2)^{0.5}\{[(x_1\ H_1^{-1})H_1]\ [(x_2\ H_2^{-1})H_2]\}^{0.5}\ n^{-1} =$$
$$= (i_1\ i_2)\ [(x_1\ x_2)^{0.5}\ n^{-1}] = (i_1\ i_2)^{0.5}$$

Likewise, these relations explain the expression for the electromechanical conversion-equivalent force as a function of the interacting currents -

$$F_{MECH} = \mu_0(i_1\ i_2/n\ r_1^2)\ (ds_1\ ds_2) =\int= \mu_0\ (i_1\ i_2)\ [n(\lambda_{y11}\ \lambda_{y12})\ (x_1\ H_1)\ (x_2\ H_2]^{-1}$$

Hence, the aetherometric formulation of the lawful functions for the field and mechanical forces proposes that distances and lengths are quantized as a function of the energy configurations of the interaction, field energy and kinetic energy. The distance D between the moving charges is quantized as a function of $r_1 = \lambda_{y1}$ or $r_1 = (\lambda_{y11}\ \lambda_{y12})^{0.5}$, that is, as a function of the combined resultant of the mass-equivalent wavelengths of the interacting kinetic energies of the charges. Whereas the finite paths of the interacting charge fluxes are quantized as a function of the intrinsic magnetic 'field' functions [10] of the moving charges:

$$s = x\,H^{-1} = x\,(\lambda_{y1}\,\lambda_{y2})^{0.5} = \{(x_1\,x_2)[(\lambda_{y11}\,\lambda_{y21})^{0.5}\,(\lambda_{y12}\,\lambda_{y22})^{0.5}]\}^{0.5}$$

Accordingly, not only must the paths of the moving charges be finite, but they are also quantized by the mean geometric wavelength of the overall set of wavelengths which are constitutive of the interacting charges. Hence, both distance and length are quantized as a function of the wavelength functions involved in the energy configurations of the superimposed charges.

What then is the lawful relation of the variable H to c? It certainly involves ε; but instead of being

$$'H' = c\,t\,\varepsilon$$

it is

$$H = v/\varepsilon = \beta\,c/\varepsilon$$

so that, quite simply and most adequately,

$$\varepsilon = \beta\,c\,H^{-1} = v\,H^{-1}$$

which means that Maxwell's, Lorentz's and Einstein's relation for H is entirely wrong. It now is also obvious where Maxwell, and then Lorentz and Einstein made their critical mistake: in assuming that current had the form of speed, when in fact it has the form of speed squared - being, in its most basic form, a flow of charges per unit time, which effectively means that current is proportional to ($q * sec^{-1}$):

$$i = n\,q\,sec^{-1} = \int = n\,\mathbf{p}_e\,sec^{-1}$$

REFERENCES

1. Infinite Energy (IE), Issue 63, 2005.

2. Aspden, H (1969) "The Law of Electrodynamics", J Franklin Inst, 287:179.

3. Aspden, H (1985) "A new perspective on the Law of Electrodynamics", Phys Lett, 111A:22.

4. Aspden, H (1986) "Anomalous electrodynamic explosions in liquids", IEEE Trans Plasma Sc, PS-14:282.

5. Aspden, H (2005) "A problem in plasma science", research note, October 30.

6. Graneau, N (2005) "The role of mass distribution in the demonstration of Ampèrian longitudinal electrodynamic forces", IE, 63:32.

7. Graneau, N et al (2001) "Experimental confirmation of longitudinal electrodynamic forces", Eur Phys J, D 15:87.

8. Phipps, T (2005) "Experiments verifying Ampère longitudinal forces via "force modulation" methods", IE, 63:10, p. 13.

9. Ibidem, p. 14.

10. Correa, P & Correa, A (1999) "The aetherometric approach to the fundamental problem of magnetism", Akronos Publishing, Concord, Canada, ABRI monograph AS2-15.

11. Aspden, H (2005) "A problem in plasma science", @: www.aetherometry.com/aspden_plasma_science_problem.html

12. Correa, P & Correa, A (1998, 2001) "The thermal anomaly in ORACs and the Reich-Einstein experiment: implications for blackbody theory", Akronos Publishing, Concord, Canada, ABRI monograph AS2-05.

13. Correa, P & Correa, A (1998, 2001) "Decoding the thermal and nonthermal equivalents of the org as a unit of aether energy", Akronos Publishing, Concord, Canada, ABRI monograph AS2-07.

14. Correa, P & Correa, A (1999) "The indirect 'ORgone effect' of Tesla radiation: solar spectra for ambipolar Aether and Blackbody radiation", Akronos Publishing, Concord, Canada, ABRI monograph AS2-17A.

15. Correa, P & Correa, A (2000) "The cosmic background microwave radiation as evidence for cosmological creation of electrons with minimum kinetic energy and for a minimum of cosmic ambipolar massfree energy", Akronos Publishing, Concord, Canada, ABRI monograph AS2-17C.

16. Maxwell, JC (1891) "A treatise on electricity and magnetism", Vol. 2, republished in 1954 by Dover Publications, NY, NY, p. 267, §s 625-626.

17. Correa, P & Correa, A (1999) "Aetherometric treatment of the energy radiation output by Tesla coils (3): 1° massfree electric-and-magnetic waves, 2° massbound capacito-inductive waves and 3° electromagnetic waves", Akronos Publishing, Concord, Canada, ABRI monograph AS2-16.

18. Maxwell, op. cit., Vol. 1, p. 29, §25.