The Double Minded Explanation Of Electro-Magnetic Induction

By Vincent Coon

Early in his career, Einstein was concerned with what he called "asymmetries" in Maxwell's electrodynamics [1,2]. He was referring to the fact that Faraday's Induction formula (1) and Ampère's magnetic force formula (5), give different explanations for electromagnetic induction. The explanation depends on the frame of reference.

Here is an example: Imagine a straight conductor with its length perpendicular to a magnetic field of constant strength (see Fig. 1). Imagine also that the magnetic field lines "cut across" the conductor. According to the Faraday induction formula (1), the moving magnetic field induces an electric field in space. The conductor, which is parallel to this electric field, is subject to an electric force. The charges in the conductor tend to move along the conductor's length as a result of the electric force. In short, a moving magnetic field sets up an electric field; which causes charges to move in the conductor.

Now consider the situation again from another point of view - the frame of reference in which the magnetic field is at rest and the conductor is perceived to move (see Fig. 2). The conductor moves through the magnetic field in a direction that is perpendicular to the field and also perpendicular to the length of the conductor. There can be no electric field induced, because the magnetic field is now perceived to be stationary and unchanging, and yet there is the same tendency for electric charges to move in the conductor. Why?

Ampère's magnetic force formula (5), not the Faraday equation, explains this last situation. Ampère's formula relates magnetic force to charge moving in a magnetic field or rather, to a current element in a magnetic field. Because the conductor is believed to be in motion, the charges that are in the conductor are believed to be in motion in the magnetic field. This means that the moving charges of the conductor are affected by the stationary magnetic field. Here the "electromotive force" is magnetic.

It seems that the explanation for induced current (whether involving a electric force or a magnetic force) depends on one's point of view. Is nature really so duplicitous? What if Maxwell's equations are only abstract scaffolding masking a more unified reality? If so, perhaps induction phenomena can be explained without using two different equations and two different fields.

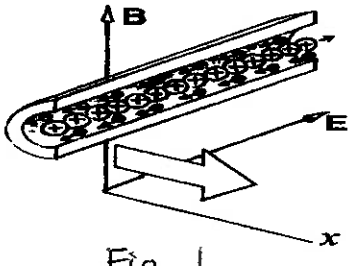

Fig. 1

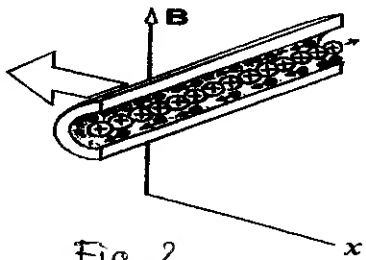

Fig. 2

Maxwell's four electromagnetic equations and Ampère's magnetic force formula in review (using cgs units and fields in vacuum):

curl $\mathbf{E} = -1/c\ \partial\mathbf{B}/\partial t$	(Faraday Induction Law)	(1)
curl $\mathbf{B} = 1/c\ \partial\mathbf{E}/\partial t + 4\pi/c\ \mathbf{J}$	(Maxwell-Ampère Law)	(2)
div $\mathbf{E} = 4\pi\rho$	(Gauss's law)	(3)
div $\mathbf{B} = 0$	(No magnetic field sources or sinks)	(4)
$d\mathbf{f} = 1/c\ I\ d\boldsymbol{l} \times \mathbf{B}$	(Ampère's magnetic force formula)	(5)

E is electric field, **B** is magnetic field, ρ is charge density, **J** is current density, **df** is magnetic force, I is electrical current (charge/second), d***l*** is a conductor element (in centimeters), and c is the speed of light in vacuum.

Whispers from Maxwell's Equations

Some believe that proof of universal light speed comes directly out of Maxwell's equations. Maxwell himself never had this notion [3]. Philosophically, Maxwell's equations are rather adaptable. Maxwell's equations can be made to accommodate both the Lorentz aether theory and Special Relativity. These two theories, despite their mathematical commonality, are philosophically opposed. It seems that you can't lose with Maxwell's equations - they suit more than one theory. On the other hand, Maxwell's equations are not deeply revealing. Maxwell's equations are pretty good at describing how electromagnetism behaves. The equations do not tell us what electromagnetism really is.

When Lorentz based the electromagnetic laws in a stationary aether he postulated a constant light speed with respect to the privileged reference frame. All other physical frames transform when passing through the aether making aether wind undetectable. Thus the Lorentz aether theory attempts to account for the "null" result of the famous Michelson-Morley experiment.

Instead of an absolute rest (stationary aether), Einstein proposed an absolute speed, one that measures the same in all inertial reference frames. Einstein theorized that magnetism doesn't depend on motion in aether, but on the relative motion of arbitrary inertial reference frames. Magnetic and electric fields are relativistically nested in Special Relativity if they are not truly simplified.

There exists a third explanation of magnetism that involves neither an absolute speed nor an absolute space: Magnetism results when there is motion between electric charges - not motion between a charge and an arbitrary inertial reference frame and not between a charge and a stationary aether. This theory of magnetism is based on Galilean relativity of motion and aptly accounts for the basic facts about magnetism. The question, however, may be asked, why should we think of magnetism as the result of moving charges or electric fields? Why can't electric fields just as easily be the result of magnetic fields? Maxwell's equations don't seem to have a preference in the case of electromagnetic radiation, but in nature, magnetism generally takes a back seat to the electric force.

Unless charges are moving extremely fast, the magnetic force is significantly weaker than the

electric force. Look at equation (2). The magnetic field is proportional to $4\pi/c$ **J**. c is large, making **B** small indeed, unless the current is large. Now look at equation (3). **E** is proportional to $4\pi\rho$. The electric field strength is directly related to the charge. There is no large value c dividing the electrostatic source in Gauss's Law. At speeds much less than c one can obtain much greater force from a charge electrically than magnetically. Many do not appreciate the dominance of electric forces in matter. We notice the force between two magnets because we live in a more or less electrically neutral world, where the powerful electric fields in matter nearly cancel.

There is something else that suggests that the electric field is more primary than the magnetic field. Notice that there is a lack of symmetry between the divergence equations. Look at equation (4). There are no magnetic charges (monopoles). Equation (4) is based on common experience. It seems that if you want to make magnetism you have to move electric charges or change electric fields as in equation (2). Even then the magnetic force produced is usually a slight effect, a mere nuance compared to the electrical binding forces between the charges that make up the conductor.

In consideration of these facts we ask whether we really need to think of "electromagnetic" effects in terms of two different but associated fields? Perhaps there is a way of simplifying this double field business. Perhaps Maxwell's equations are whispering to us that in order to unravel and better synthesize the subtle effects of magnetism or subtler still, gravitation, we should first get a better understanding of the cause behind the dominant electric force.

What is charge?

An understanding of the cause of the electric field is served by the following two postulates:

1) Space is not empty, and in particular, the region surrounding a "charged" body is occupied by moving, inertial entities, which are capable of imparting kinetic energy and momentum.

These discrete entities are more fundamental than known particles and though their interaction conserves kinetic energy, momentum and angular momentum we should avoid characterizing them as ideal billiard balls (classical particles).

2) The principle of relativity of motion.

This postulate states that the laws of physics are the same in all inertial reference frames. In other words, no absolute distinction exists between inertial reference frames that are considered to be in uniform linear motion and those that are considered to be at rest (see corollary five of the first law of motion, Newton's Principia). Furthermore, all finite velocities are relative including the speed of light. The round-trip speed of light appears constant only with respect to local fields such as the earth's gravitational field, which acts as a medium through which light propagates locally. No field or medium composed of moving inertial entities should be treated as an absolute reference frame. Such media are mobile because of course they are material, though of a more fundamental classification of matter.

In classical physics the units of mass, length, and time are the basis for all measurable quantities. Charge is no exception. Postulates 1) and 2) allow us to think of "charge" and "electric field" in terms of inertial entities in motion. This is a desirable prospect in line with the belief that nature is ultimately simple and integrated. Let us suppose that the popular concepts we call charge and electric field can be replaced with a more fundamental idea. The idea, that every electric particle is composed of a specialized center or nucleus and a halo of dynamic inertial entities. The nucleus may in fact be a

It is an Aristotelean God who rules from an empyrean in absolute space.
The true Hebrew God, The God of Yehezqel (Ezekiel) is not adverse to dwelling
in a portable temple or to setting his throne atop a chariot

Deut. 33:26

more consolidated organization of the same entities that move in the halo surrounding the nucleus. Beyond this organized halo is the immense plenum of motions that is boundless space. The plenum of moving, inertial entities may provide the centripetal influence and energy needed to maintain the organizations of matter and field. The atmosphere surrounding a tornado provides the centripetal influence necessary to maintain the vortex. In a somewhat analogous way, material bodies and fields may depend on the vast kinetic fullness of space for their existence. Acts 17:28 ; D&C 88:6,60

These discrete, inertial entities need a name. The rich Hebrew word "amon" from אמן or אמון suggests, "faith, trusting, firm, support, builder, architect" [4] and is especially appropriate for the name of something like a particle because the word just happens to have the ending "on". The name denotes "particle of faith" which is appropriate since only the effects of this unseen entity are manifest. Alma 32:27

Any model that attempts to explain charge and electric field in terms of something more fundamental, should account for the following: 1. The electrostatic field of a charged particle is spherically symmetric. At a given radius from the center of the particle, the field acts the same, or very nearly the same, in all directions. 2. The electrostatic force between charged particles very nearly obeys the inverse square law. At twice the radius the field strength is one quarter as strong etc. Incidentally, the inverse square law for an electric field source can be obtained from Gauss's Law (3). 3. There are two modes of electrostatic interaction: attraction, and repulsion. Two electrons or two positrons repel each other, whereas an electron and a positron attract each other. I stress the electrical interaction between particles and anti-particles because some aether models that claims to account for electron-electron, proton-proton repulsion and electron-proton attraction, fail to address the anti-particle cases. 4. Macroscopically and at lower charge densities, electric fields are subject to the linear superposition principle. The electric field that results from the superposition of electric fields is simply the vector sum of the superimposed fields. 5. Relative motion of charges and or variations in electric field intensity gives rise to magnetism.

The amonic halo that surrounds the "charged" particle must be highly organized because it serves as the medium for both longitudinal electric disturbances and transverse waves such as light. A volume of randomly moving particles, like a gas, will not support transverse waves. Such a medium does not possess enough order or constraint. The high degree of organization of the amonic halo must be comparable to a solid and yet sufficiently permeable to allow haloes to superimpose and to move through each other. The amonic halo must be a veritable "ra-kia", Hebrew for "firmament" or "expanse".

Longitudinal mechanical waves sent out through aether from an oscillating nucleus do not satisfactorily explain attraction and repulsion. A longitudinal wave will not attract or repel another oscillator with the kind of regularity needed to explain the behavior of electric charge. Something more and very special is needed. Spewer, sucker models are not sufficient. Spewers fling out aetheric particles like sprinkler heads and suckers draw in aetheric particles like tiny vacuum cleaners. Spewers will in fact repel each other, but how do you get two suckers to repel? If all charged particles are modeled as spewers, then in order to account for the attraction between say a positron and an electron, one or the other particle must spew negative mass. The conservation of energy and momentum in pair production and in electron-positron interactions shows that both positrons and electrons have positive mass. If positrons having positive mass somehow spew negative mass then two positrons should attract.

We need a better model to describe the intrinsic structure of electric particles and to explain how

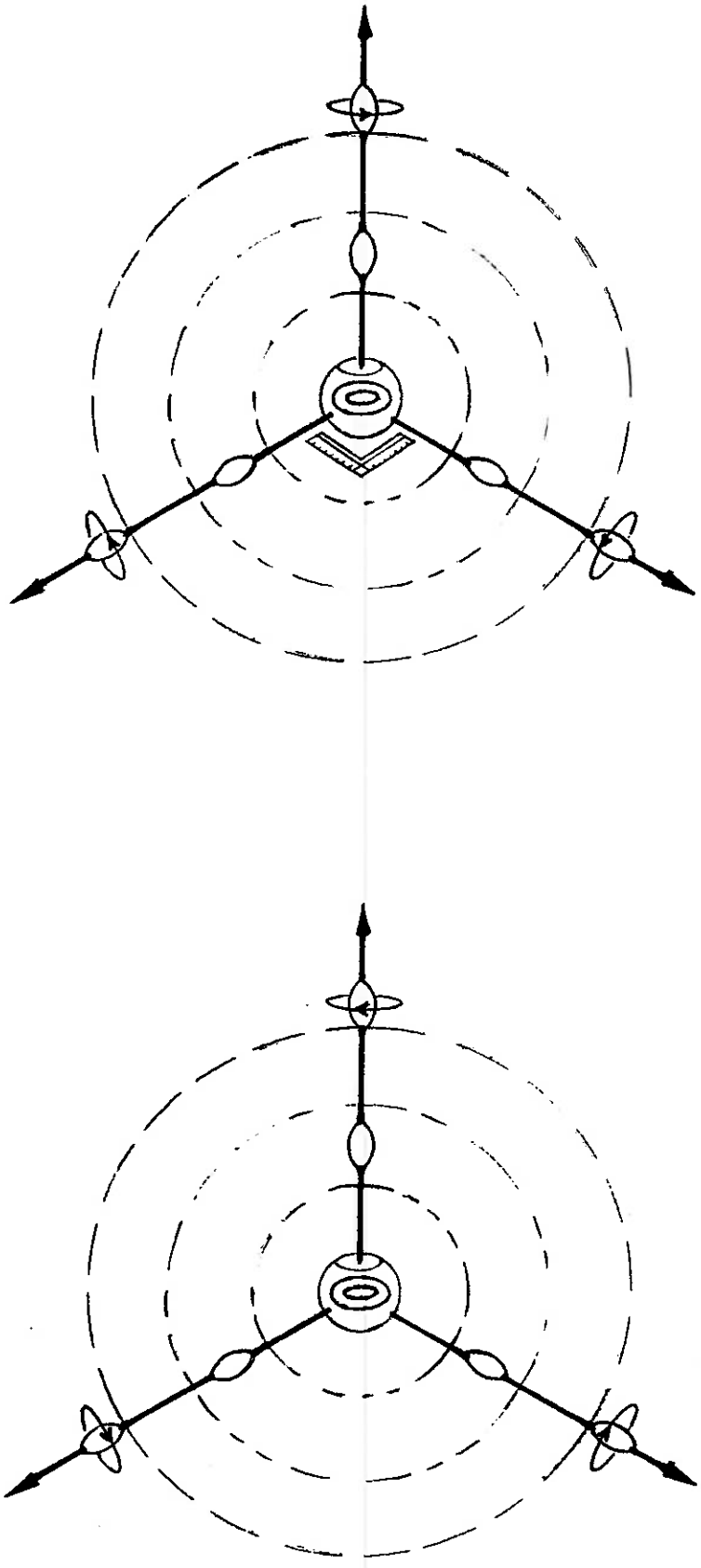

Fig. 3

attraction, repulsion and polarity come about. To this end, consider that there is a special kind of emanation that propagates through the organized amonic halo. This emanation carries with it information in the form of swirling or rotating amons. The rotational sense of the amons is what distinguishes the sending system (nucleus and halo) as "positive" or "negative". This emanation does not need to posses much or any momentum in the direction of propagation. The emanation may be regarded as a kind of solitary wave (soliton) that undergoes a transfusion of amons as it propagates out from the nucleus of the electric particle, through the primary halo, and on through other haloes. When the amonic soliton interacts with a distant system, part of the rotational kinetic energy of the soliton, is converted to an attractive or repulsive action on the system encountered. The rotational sense of the soliton in the direction of its translation constitutes a sort of kinetic token, like a hand sign or handshake. The "handshake" determines how the soliton's rotational energy is to be used in the encounter (see Fig.3).

Energy sacrificed in the process of emitting messenger solitons, is restored environmentally. The environment consists not only of other organized amonic systems but also the energetic plenum of space. Though the processes that maintain the islands of order (matter and field) in our universe, in some sense satisfy the second law of thermodynamics, this need not spell "heat death" to the universe. The sting of entropy is swallowed up in an infinite sea of energy. How does one evaluate increasing entropy in an open universe where there is infinite available energy? Entropy from this point of view may be seen as a blessing rather than a curse. For one thing, entropy in irreversible processes is probably essential for consciously perceiving the direction of time.

Moses 1:4
D&C 104:17

The ammonic halo model accounts for the region of influence surrounding a charged particle and describes what "charge" really is in terms of kinetic geometry (organized motion). Since amonic solitons emanate in all directions from the source, the inverse square law comes into play. The probability of encountering a soliton is directly proportional to the outward soliton flux distributed over a spherical surface at an arbitrary radius from the source. Attraction and repulsion "at-a-distance" is brought about by the exchange of kinetic energy and momentum of amons comprising messenger solitons. The amons that constitute the soliton wavicle, whirl at right angles to the soliton's propagation. Attraction or repulsion depends on the deflection of these swirling amons when the soliton encounters another system. This deflection has a component that is parallel to the movement of the soliton or parallel to the make believe thing we call a field line. Though conservation is obeyed in this deflection, conservation alone cannot explain the deflection. The equations for the amonic interaction have more than one solution; that is, there is more than one way for kinetic energy and momentum to be conserved. There is more than one possible out come! The question then arises, what decides the outcome? Could the answer be "chance", a hidden predestining principle? Or is the answer something more wonderful than either "chance" or determinism?

The agency in matter that faithfully decides the outcome (attraction or repulsion) based on the kinetic token received, must be trans-mechanical, that is, beyond mechanical determination. The term "trans-mechanical" is not used here to imply anything unnatural. The laws of conservation alone are simply insufficient to account for the organization of matter or to determine the outcome of all interactions, especially interactions between entities that are best described as kinetic fractals not Euclidean solids. A kinetic fractal is an organization composed of infinitely divisible, moving parts. These fractal structures of matter do not have well-defined surfaces. They are finite in one sense yet endless in composition and they posses the ability to make limited decisions within the parameters of the Laws of conservation. This ability to decide how energy and momentum are to be conserved is essential to forming and maintaining material structures and should not be viewed as "supernatural" in the sense of something extraneous to matter. Ultimately, we will probably find that "thought" and motion are inextricably related, and that the fundament of what we call

D&C 93:30
D&C 88:13

II Nephi 2:11,13 "all things ... a compound in one"

"consciousness" is intrinsic to, as well as essential for the existence of the material universe.

If "fundamental particles" of matter are in fact kinetic fractals, the interactions of which are not completely determined by conservation laws, then no material object is intrinsically solid. Whether or not an object seems "solid" has to do with how kinetic energy and momentum are conserved in the aggregate when body meets body. Tangibility is not essential to conservation. Two material bodies passing through each other conserve kinetic energy and momentum! When hand contacts wall and is prevented from passing through wall, most of the matter of the wall and hand have agreed to conserve energy and momentum in a way that we described using the adjective "solid". There is no true "force" involved, because force is defined, as a continuous rate of change of momentum (dmv/dt) and the exchanges that constitute "field" interactions in matter are actually discrete, discontinuous and directed by decision.

There are three electrostatic conditions namely positive, negative, and neutral. These are based on two varieties of charge. Why are there only two types of charge? Why not three? Why not positive, negative, and lets call the third "alternative"? Each kind of charge repels its like and attracts its other. So alternative would attract both positive and negative and repel alternative. For some reason this condition does not exist in nature. Why? The kinetic geometry portrayed in Fig. 3, allows only two possible arrangements of pure charge. These arrangements are represented by left and right hand rules corresponding to soliton spin and movement - hence there is only "positive" and "negative" charge.

What is magnetism?

The amonic halo model directly leads to an explanation of the effect we call magnetism. Magnetism is an enhancement of electric attraction or repulsion due to relative motion between charges and electric fields. There is no need to pursue any special field geometry besides the electric field. The pseudo vector field used to model magnetism is a useful mathematical contrivance, but it is only cosmetic and masks the underlying cause of magnetism. Since the so-called electrostatic force is the result of kinetic interaction, it follows that when there is relative motion between two amonic systems, the electric force between them becomes augmented or enhanced. The total kinetic energy of the interacting amons is the sum of their rotational kinetic energy and their kinetic energy due to the relative motion of the emitting system. Usually the endowment of translational energy is quite small compared to the rotational energy of the amonic solitons. In addition to the kinetic energy enhancement, it is necessary to consider distortions of the region of electric influence surrounding a source. One kind of distortion is the consequence of relative motion between sources and electric fields. Acceleration of charges causes another kind of distortion to take place in electric fields. Electric field distortions are involved in induction effects. These phenomena will be described later.

The following case delineates the effect of Magnetism and is the basis for explaining the behavior of more complicated arrangements. Consider the case of two parallel straight conductors each carrying electric currents. We will consider only the amonic systems that make up or extend from the conductors themselves. Various effects due to the presence of other amonic haloes or field media are ignored at present. Because the electric field of a point-like source obeys a $1/r^2$ law, it follows that the electric field of a long, straight line of charge obeys $1/r$, in which r is the perpendicular distance from the line charge to an arbitrary point in space. The electric force between two, very long, line charges each of total charge q and length L ($L>>r$) is simply $2q^2 L^{-1} /r$ (see, for example, Purcell's E and M text, pg. 27). This is a repulsive force. If one of the line charges were of opposite charge then the line charges would attract with a force $-2q^2 L^{-1} /r$.

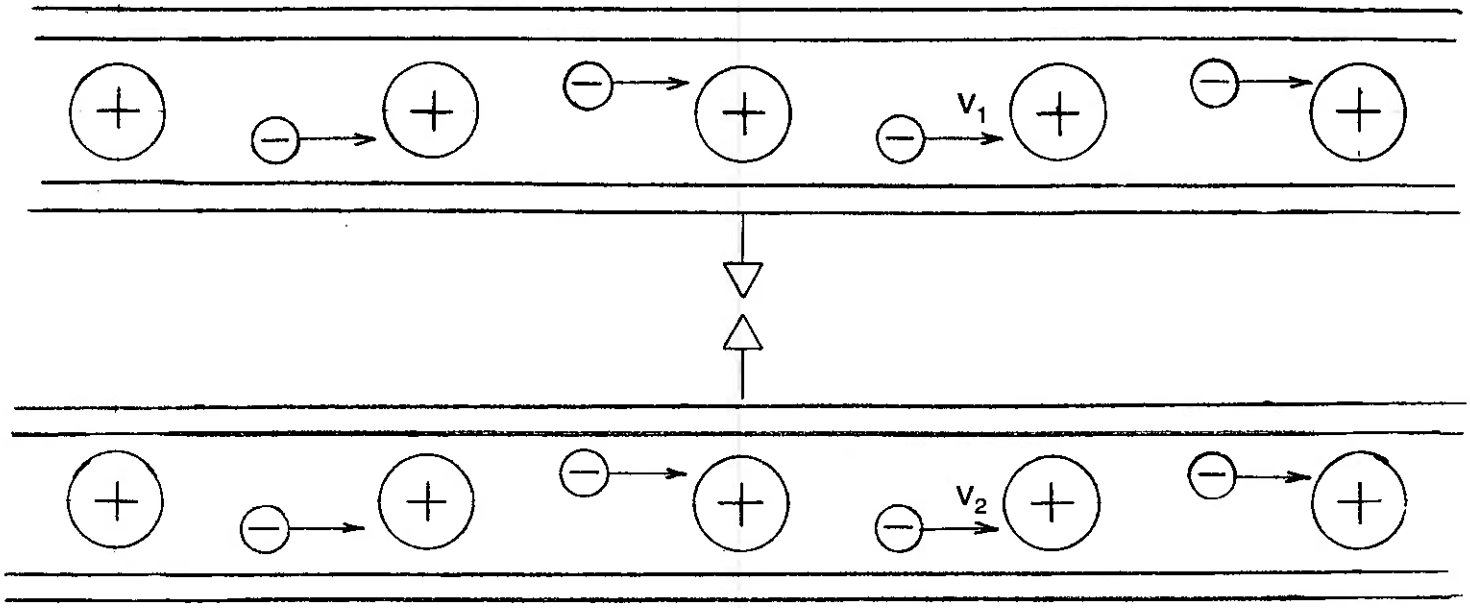

Fig. 4

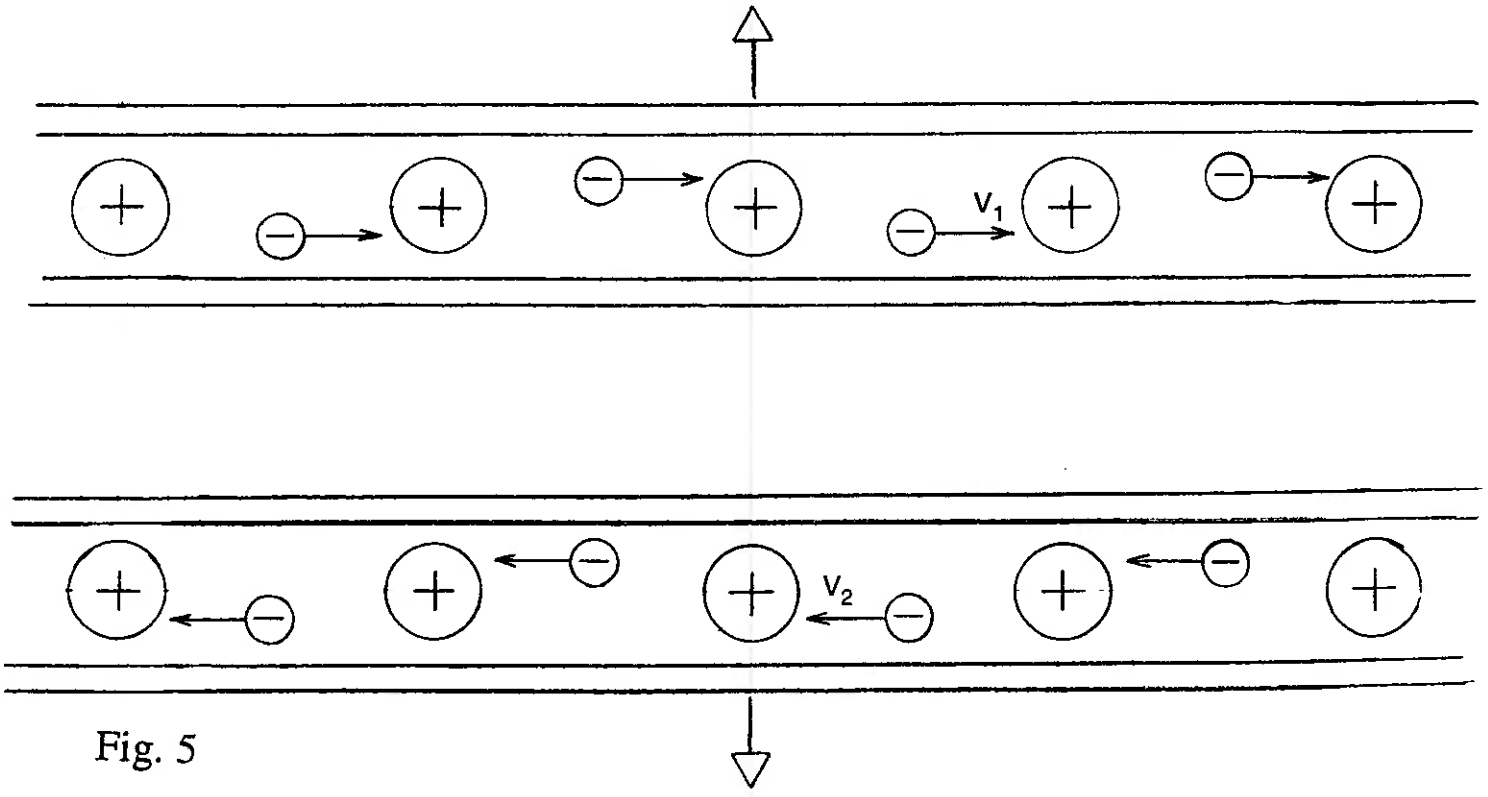

Fig. 5

Since conductors are composed of more or less equal amounts of + and - charge, the net electrostatic force between two long parallel conductors is practically zero. If, however, there is relative motion between charges and electric fields, as a result of electric currents in both conductors, then the 1/r electric forces become enhanced. The electric forces of attraction and repulsion no longer cancel exactly and we have a net electric force, which we call magnetism. To calculate this net electric force let us consider two cases. In the first case, the electrons or "charge carriers" in both conductors travel in the same direction relative to the lab frame (see Fig.4). v_1 and v_2 represent the average drift speeds of the electrons in conductors 1 and 2 respectively. These drift speeds are measured with respect to the lab frame. The enhanced electric repulsion between electrons depends on the relative motion between electrons. The greater the relative motion between the electrons the greater will be the repulsive force which is perpendicular to their motion. If there is no motion between electrons and no other medium, then from the point of view of the electrons, there shouldn't be any enhanced electric force between them because, of course, the electrons are at rest with respect to each other, regardless of any motion they may have with respect to the lab frame. If v_2 is greater than or equal to v_1 then $v_2 - v_1$ is the magnitude of the motion between the electrons of conductors 1 and 2.

Because the enhanced electric force of repulsion (F_r) between the two electron currents is a function of kinetic energy and the relative kinetic energy, in the rest frame of an electron, is given by $\frac{1}{2} m(v_2 - v_1)^2$, it follows that F_r is proportional to $\frac{1}{2} (v_2 - v_1)^2$. Thus $F_r \propto q^2 L^{-1}(v_2 - v_1)^2/r = q^2 L^{-1} (v_2^2 - 2v_2v_1 + v_1^2)/r$. q is the total flowing charge. q^2 includes a mass quantity m which relates to the mass of the interacting amons. $(\text{charge})^2$ has units of $(\text{mass})(\text{volume})/(\text{time})^2$. The relative motion between electrons and a positive conductor lattice results in an enhanced electric attraction between the electrons and lattice ions. The enhanced force between the electron current of conductor 1 and the lattice of conductor 2 is proportional to $-q^2 L^{-1}v_1^2/r$. Similarly the electric force between the electron current of conductor 2 and the lattice of conductor 1 is proportional to $-q^2 L^{-1}v_2^2/r$. The total attractive force, F_a, between the two conductors is therefore, proportional to $-2q^2 L^{-1}(v_2^2 + v_1^2)/r$. The net force acting on the conductors is $F_r + F_a \propto -2q^2 L^{-1}v_2v_1/r$. The overall force is such that the conductors tend to attract. The fact that the conductors tend to attract each other does not mean that the electron currents, independent of the conductors, attract each other. The electron currents repel each other with an enhanced electric force or with a regular electrostatic force if $v_1 = v_2$. In the present scenario, with the electrons flowing in the same direction relative to the lab frame, the repulsion between electron currents is less than the attraction between currents and positive lattices. Hence two parallel conductors, with electron currents flowing in the same direction, tend to attract.

The second case has the electron currents in the two parallel conductors, flowing opposite to each other in the lab frame (see Fig. 5). Here the repulsion between electrons is proportional to $q^2 L^{-1}(v_2 + v_1)^2/r$ because the relative speed between the two electron currents is now $v_2 + v_1$. The enhanced electric attraction due to the relative motion between electron currents and conductor lattices is the same as in the first case. Again the net force is $F_r + F_a$ which turns out to be proportional to $q^2 L^{-1}v_1v_2/r$. The only distinction between this force, and the net force in the previous case, is that it is opposite in sign. Two electron currents flowing in opposite directions in the lab frame will tend to cause the parallel conductors to repel, because the electro-kinetic or enhanced electric repulsion between electron currents is greater than the electro-kinetic attraction between electron currents and conductor lattices.

In order to convert the above proportionalities to equations, expressions such as $2q^2 L^{-1} v_1v_2/r$ need to be multiplied by some coefficient, which has units of inverse speed squared. This will allow the expression to truly express units of force (amon impact momentum per second). Let c^{-2} represent

the needed coefficient. Thus $F_{net} = 2q^2v_1v_2/(rLc^2)$. It turns out that c is the speed of electric influence with respect to the amonic halo (the medium through which the influence propagates). In more complicated situations, c is the speed of electric propagation relative to a composite medium made up of the numerous superimposed haloes. The finite speed c is not a universal invariant but depends, for one thing, on the density of the local amonic medium or field. Even advocates of General Relativity will concede that the speed of light is slower in the vicinity of a massive body. An unsophisticated explanation for the slowing of light in a gravitational field is that underlying the field is a tremendously refined material medium, an optical medium comprised of "particles" more fundamental than atoms or even electrons. The density of this medium is greatest in the immediate vicinity of a body hence the speed of light is slower there. D&C 131:7-8; Heb. 11:3; Rom. 1:20

Instead of using "q"s and "v"s in our electro-kinetic force formulas we can convert to "I"s and "L" that is, to currents and conductor length, by taking advantage of the fact that (charge)(speed) = (current)(length).

Now for a truly delightful realization: The general expression for the net electro-kinetic force between two parallel conductors of length L, with currents I_1 and I_2 respectively becomes $F_{net} = 2I_1I_2 L/(c^2r)$. This is precisely the expression for "magnetic" force between two parallel current bearing conductors as derived by the Biot-Savart and Ampère force laws (see for example Purcell pg. 211). The forces between more complicated arrangements of current bearing conductors (coils etc.) can also be accurately predicted using the enhanced electric force explanation. This explanation replaces the need to think of magnetism as the consequence of a magnetic field, which is somehow distinct from the electric field.

Electric and magnetic fields cannot be directly measured. Only the "forces" or influences ostensibly associated with fields can be measured. Iron filings sprinkled around a magnet do not establish the existence of a magnetic field. The magnetic field is a mathematical construct or contrivance which when operated on by a cross product, correctly predicts the measured force. Correct, that is, in a great many cases. If there is any thing that is truly flowing around a magnet, the flow is not in the direction of the abstract magnetic field lines. The electric presence responsible for magnetism moves perpendicular to the mapped magnetic field, that is, the amonic haloes move with the charge carriers. The "magnetic force", which is really electric, acts in the direction of the electric field lines even if those field lines nearly cancel macroscopically.

On earth, the forces between amonic systems are affected by motion with respect to the composite medium surrounding the earth. Other cosmic fields or media permeate the earth's medium. The previous explanation of magnetism is a simplification of the effects that exist in nature, but more complicated electric phenomena can be accounted for using the amonic halo model.

There are instances in which haloes may move or flow somewhat independent of their nuclei. Across a parallel plate capacitor there is little or no flow of charge as the capacitor charges and discharges. There is, however, an amonic halo movement which reaches across the plates and which extends a region of "magnetic" influence around the capacitor. Maxwell's "displacement current", which tries to account for magnetism around a charging or discharging capacitor, can be thought of a current composed of moving amonic haloes. Whole charges (nuclei + haloes) do not have to move across the capacitor gap in order to set up a region of enhanced electric influence around the capacitor.

Induction effects

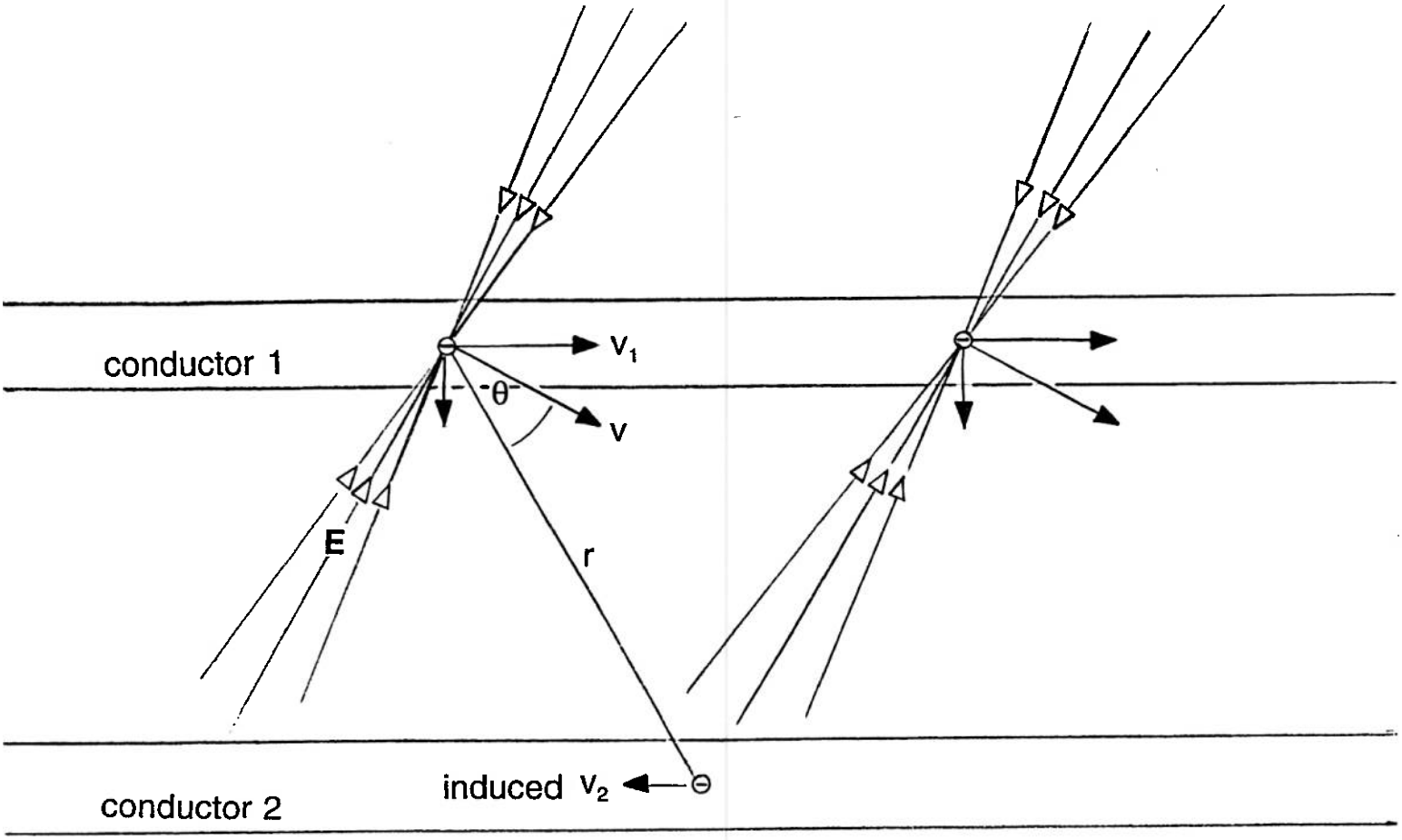

Fig. 6

When two charged bodies move through each other's region of electric influence, each region becomes transformed. The transformation alters the distribution and magnitude of the mutual electric force acting between the moving charges. The distortion is slight when the motion between systems is much less than c. At speeds approaching c, the region of electric influence "pancakes", that is weakens significantly in the direction of motion and strengthens transversely. Let θ represent the angle between the direction of relative motion and a line connecting the centers of the two systems. The magnitude of the electric force as a function of motion v and angle θ is approximately given by $q_1q_2r^{-2}(1 - v^2/c^2)(1 - \sin\theta\, v^2/c^2)^{-3/2}$. We interpret v to mean relative motion between charges. q_1 and q_2 are the charge magnitudes and r is the distance between their centers. The above expression is mathematically identical to one developed by Liénard and Wiechert [5]. The Léinard-Wiechert equation for the transformed field of a moving charge was derived in the Victorian era and is not exclusively the property of Special Relativity.

It is more correct to use an effective velocity in place of v in the Léinard-Wiechert equation. The product of a "field dominance coefficient" ($0 \le$ ר ≤ 1) and the relative velocity v gives an effective transforming velocity (רv). The Hebrew letter raysh (ר) signifies "field dominance". רv should be substituted for v for the simple reason that transforming effects depend not only on speed relative to a field medium but also on the transforming ability or "dominance" of the medium. The transforming ability of an amonic medium must depend on distance from the center. Whether the charge is thought to move or the medium, the same transformation occurs.

If the fields of electrons possess different ר values compared to the fields of atomic nuclei, then the fields of nuclei and electrons may transform to different extents. The fields of electrons passing through the fields of an ion lattice may weaken in the direction of the current more than the fields of the lattice. As a result, atomic nuclei may repel each other in the direction of the current. This effect may contribute to the net longitudinal force that occurs between atoms of a current bearing conductor.

It is presumed that there is a density gradient of the field medium. Transmission intensities in a medium may fall off as $1/r^2$ from a point source, but this does not mean that the medium's density follows an inverse square law. Charges moving at a considerable distance from each other may negligibly transform each other's fields (ר$\approx$ 0). On the other hand, charges moving at high speed with respect to each other and in close proximity, may transform each other's field significantly (ר$\approx$1).

Consider two parallel conductors, one initially with a steady current (conductor 1) and the other conductor initially without current (conductor 2). The parallel conductors are moved closer together causing an induced electromotive force to occur in conductor 2. If the conductors are moved apart, the direction of the induced current reverses. This effect is caused by the electric fields of the charge carriers in conductor 1 becoming reoriented with respect to conductor 2. The fields of the steady current in conductor 1 become reoriented such that a push is caused on the charge carriers of conductor 2, and a pull is caused on the lattice of conductor 2 (see Fig. 6). These forces have components that are parallel to conductor 2. Charge carriers tend to move one way and the conductor lattice tends to move in the opposite direction.

Now if the separation between conductors 1 and 2 is fixed and conductor 2 is moved parallel to the current in conductor 1, a charge separation will result across the thickness of conductor 2. The electro-kinetic force causing this charge separation is brought about by the difference in relative motion between conductor 2 and the current in conductor 1 compared to the relative motion between conductor 2 and the ion lattice of conductor 1.

Varying the current in conductor 1 will also produce an induced electric force in conductor 2. Because electric influences propagate at finite speeds and because the amonic haloes have inertia, the sudden acceleration of charges tends to distort their electric fields such that an electric force component, parallel to conductor 2, is produced. In this case, the field lines of the changing current behave like the flexible antenna on a jeep. When a jeep lunges forward, the antenna lashes backward. When a jeep suddenly brakes, the antenna swishes forward. Likewise the lashing field (amonic haloes) of the accelerating current in conductor 1 induces a changing current in conductor 2.

Contrary to conventional dogma, induction effects are explained without recourse to magnetic field equations. The magnetic field is a figment. The influence that drives charges in induction effects isn't a magnetic force from one point of view and an electric force from another point of view. The driving influence is always electric.

What is gravitation?

There are several effects tending to cause neutral or nearly neutral bodies to attract. Not all of these effects are good candidates for explaining gravitation. Occasionally the idea is put forward that because electric charges in matter tend to orient themselves attractively; this must explain gravity. Actually gravitation cannot be explained electrostatically because dipole, quadrupole, or multipole electrostatic forces do not follow the inverse square law. The electric dipole force is a $1/r^3$ force, the quadrupole force is $1/r^4$ etc.

It has also been proposed that gravitation is the consequence of material bodies shadowing or shielding randomly moving aether particles. The idea is that two bodies partially block or shade each other from the impinging aether that surrounds them and thus are pushed together as if by outside gas pressure. This explanation does not require the force between bodies to be proportional to their masses. A very dense hollow shell would be as good an aether blocker as a dense solid body of comparable size. The effect ostensibly depends on the extent to which aether particles penetrate matter. There is another difficulty with the "shadow" explanation of gravity. In order to be in or near equilibrium, bodies must reflect (re-radiate) as much mass and energy as they receive. If the gravitational pressure we experience is the result of something like photons hitting the surface of the earth, there must be an enormous flux at the earth's surface. This energy has to go somewhere. The earth is not gaining mass or heating up dramatically. The earth must therefore be in equilibrium with the chaotic plenum. If the earth blocks photon-like aether particles, she also re-radiates them. Radiating bodies tend to repel each other, assuming that the radiation has momentum and interacts with matter. The net effect of blocking and reflecting (except for close proximity cases) is no net force between bodies.

Another gravitational hypothesis asserts that all material objects are expanding in space at a rate proportional to their size (not necessarily their mass – a problem!). Things seem to remain the same size by comparison but because matter is expanding, objects in space tend to get closer. If this is what gravity is, how does one account for orbital equilibrium given that the centers of mass of moving expanding bodies tend to move in straight lines? It seems space must also bend in the vicinity of inflating objects in order to explain why one expanding body in motion should want to orbit another. Abraham Facsimile No. 2 Fig. 5.

What we call gravitation is probably a medley of effects. One of these effects involves the density gradient of the amonic haloes surrounding material bodies. Electric fields in matter may effectively cancel but this does not mean that the kinetic medium or presence responsible for electric effects

ceases to exist. The amonic medium of a star or planet is denser in the vicinity of the cosmic body than farther away. Wavicles such as light tend to bend towards the denser medium. The speed of light is reduced in the denser medium. The precession of planetary orbits is explained by assuming that "gravitational" influences do not act at a distance instantaneously but travel at precisely the same speed as electrical influences in the local field medium. General Relativity does not need to be invoked though it makes similar predictions.

The bending of light and the slowing of physical processes near massive bodies is consistent with the amonic halo model but there is something more that this theory offers - an electrical explanation for gravitational attraction. Electro-gravitation is akin to the effect of magnetism in that both effects are electro-kinetic in origin. Both magnetism and gravity are the result of enhanced electric influence due to relative motion between electric sources and fields. Magnetism can be much stronger than gravitation because the motions between charges in magnetic cases (electric currents and magnetized materials) are more ordered. Electro-gravitation arises in systems where there is random motion between electric fields and sources, thus matter in general exhibits gravitation. The principle cause of electro-gravitation is simply this; Matter is not a static collection of charge. Charges in matter are always moving with respect to other charges and with respect to electric fields. When repelling charges approach each other they tend to slow down. As the charges pass each other they regain speed. As attracting charges approach each other they speed up with respect to each other and then lose speed as they pass. If the attracting and the repelling charges are given the same initial speed, when the charges are at a maximum distance from each other, then the average speed between repelling charges will be less than the average speed between mobile charges that attract. What this means is, on average there is more relative motion between electrically attractive components in matter than between repulsive components. Since the electric interaction is enhanced ever so slightly by relative motion ($v<<c$) this means that on average, attraction between electric components in matter is slightly greater than repulsion. The average attraction between two "neutral" spherical bodies containing charges is proportional to $-q^2u_a^2/(cr)^2$ where u_a is the average speed of attracting charges relative to each other. Here we consider that the centers of the two bodies are a distance r apart. The average repulsion between the bodies is proportional to $q^2u_r^2/(cr)^2$. u_r is the average speed of repelling components relative to each other. Since $u_r < u_a$ the net attraction between two spherical bodies is proportional to $q^2c^{-2}r^{-2}(u_r^2 - u_a^2)$. Note that gravity obeys the inverse square law precisely because it is electric in origin. A gravitational field can be thought of as a turbulent sea of opposing electric fields. Except for a slight magnification of attraction due to kinetic enhancement, the $1/r^2$ electric force between neutral bodies practically chancels.

Electro-gravitational force increases with material amount. Even "neutrons" are combinations of electric particles. Neutrons therefore have "gravitational mass". The more atomic matter an object is made out of, the more + and - charge it contains and hence the more "gravitational mass" it possesses. Having said this, we must be careful not to insist that an object's inertial mass is exactly equivalent to it's so called "gravitational mass". The effective inertia of a body may depend somewhat on its environment and motion relative to field media. A host of conditions may affect an objects effective inertia and its "gravitational mass". The effective inertia of a body may involve "electromagnetic mass", and a body's gravitation may be affected without changing its material amount. Ultimately electro-gravitation is the result of "charges" in random relative motion. Because the amonic systems that underlie "charges" and "electric fields" are composed of inertial entities in motion, the virtual property called "charge" can be understood in the context of discrete entities that impart kinetic energy and momentum. There really is no such thing as "charge" apart from mass in motion.

So-called, "electromagnetic mass" is akin to inductance. "Electromagnetic mass" may be thought of as an inertial enhancement caused by "electric forces" acting on accelerating "charged bodies" in a field medium. If you push on an object in one direction and at the same time someone weaker than you pushes against the object and you, the object accelerates as if it has more mass. The object, of course, has some intrinsic mass of its own that must be known in order to calculate the object's acceleration. Knowing only the forces that act on an object is not enough information to determine the object's acceleration.

Intrinsic mass relates to the number of like unit structures comprising matter. In a truly integrated universe, all inertial bodies are made of the same thing on some level. It is the structural commonality of all physical things that allows them to interact. If two objects have nothing in common, there can be no basis for defining their interaction. Like interacts with like! Dec 88:40

Intrinsic mass exists independent of Newton's Second Law. In a universe where there is no real force and consequently no continuous acceleration, intrinsic mass (material amount) comes into play in the instantaneous exchanges of discrete unit entities. In short, even though $m = F/a$ fails to exist because force (F) fails to exist, $m = P/v = 2E_k / v^2$ still applies to the real microcosm.

Gravitation is therefore a pseudo force not because of equivalence with accelerating reference frames, but because in a universe comprised of discrete inertial exchanges, "force", though macroscopically useful, does not exist. Indeed it may be said that the universe is not held together by *force*. The universe is really held together by *choice*, that is, by discrete, discontinuous exchanges guided by decisions that operate within mathematically describable constraints.

To account for gravitation it is estimated that $(u_r^2 - u_a^2)$ need only be on the order of $10^{-16}cm^2/sec^2$ perhaps even less. This represents an extremely small difference between the average speeds u_a and u_r, a difference which one does not expect to be fixed. There is evidence suggesting that the gravitational constant can vary slightly [6]. Gravitation depends on more things than are represented in the Newtonian equation. Temperature, atomic excitation, atomi structure and arrangement may affect "gravitational forces". There may be ways of weakening electro-kinetic attraction or perhaps there are ways of strengthening electro-kinetic repulsion. The superconductor research of Podkletnov seems to evince the connection between electricity and gravity [7].

Lorentz-like effects

Besides the Lorentz aether theory, there are other explanations for the alleged null result of the Michelson-Morley experiment. There is the ballistic photon hypothesis, which argues that light particles, like projectiles, require no special medium for propagation. According to the ballistic hypothesis, Michelson-Morely type interferometers should detect no change in light speed, because photons are ejected at the same speed in all directions relative to the source. The ballistic photon hypothesis does not explain the fact that light arriving from double stars seems to have the same speed regardless of whether a companion star is moving towards or away from us. Nor does the hypothesis address the claims that Michelson-Morely types experiments reveal a slight light speed anisotropy under the right conditions. The Michelson 1881 and Michelson-Morely 1887 experiments actually gave slightly positive results, not the "null" results commonly reported. The experiments of Miller aimed to show that the fringe shifts detected earlier by Michelson and Morely were outside of experimental error.

Another hypothesis that attempts to account for the "null" results of the Michelson-Morely experiment is the entrained aether hypothesis. This model assumes that the earth drags the luminiferous

medium so that the speed of light at the surface of the earth is insulated from extraterrestrial aether wind. The late Charles M. Hill showed, that there is strong experimental evidence for light speed anisotropy [8] in non inertial frames, and that there is a problem with the entrained aether hypothesis [9]. By carefully monitoring the signals from millisecond pulsars and comparing them to atomic clocks stationed on the earth, it is possible to show that the rates of clocks on earth, compared to the regular signals from a distant radio star, depends on the rotational speed of the earth and on the speed of the earth in orbit around the sun. If the planet was wrapped in an occluding medium, it is difficult to understand how the rates of earth bound clocks could be affected by the Earth's orbital motion. Hill and others concluded that the Lorentz aether theory must correctly explain the Michelson-Morley experiment. There is a better explanation that also seems to accounts for the slight positive results (sidereal systematic fringe shifts) of Miller's experiments.

While it is true that the field surrounding the earth moves with the earth, the medium responsible for this field does not shut out the field of the sun or the fields of grander cosmic systems. Rather than the aether being dragged by the earth, we may consider that the earth's medium is a dynamic extension of the earth's own material – the kinetic substrate of the earth's composite field! By assuming that amonic haloes can penetrate each other macroscopically we make allowance for the linear superposition of field forces.

An important distinction should be made between fields and the media that give rise to them. In the most abstract sense, fields are mathematical constructions associated with regions of influence in space or regions of influence surrounding material bodies. The region of electrical or gravitational influence spreading out from a body may extend through more than one ammonic medium. Shielding an instrument from the effluence of a particular ammonic medium may not be the same as shielding the instrument from the influence of the field. In many cases it is permissible to use the terms field and ammonic media synonymously but not in every case. We see that fields can pass through each other to some extent. Hence there must be field currents or field winds. The Earth's own field does not shut out these winds.

Michelson-Morley is not entirely explained with the entrainment of the earth's medium because outside fields (media) penetrate the earth's collective field. The earth must be subject to physical transformations as she moves through the field of the sun, the galaxy etc. It is proposed that an object moving with respect to the Earth's medium undergoes a Lorentz-like transformation that depends on the speed of the object relative to the Earth's medium. Similarly, the transformation acquired from other media depends on the object's speed with respect to these media. The important distinction between this kind of transformation and the kind described by Special Relativity is that here we are talking about a "field referred" (a term used by the late Dr. Petr Beckmann [10]) transformation which means that the transformation depend on motion relative to the field (or rather the portable medium responsible for the field) in contrast to the "observer referred" transformations of Special Relativity. A field-referred transformation is different from the transformation proposed in the Lorentz aether theory, which bases its effects on motion with respect to an absolute reference frame – the stationary aether. In the amonic halo theory, bodies are transformed Lorentz-like as they move relative to gravitational fields (amonic media), but the fields themselves are in motion relative to other fields and systems. Fields are not absolute reference frames. Thus, a kind of Galilean relativity reins throughout the universe – a relativity which admits no absolute reference frame or absolute finite speed, but which allows for clock-rates and meter sticks to vary depending on motion with respect to fields.

Bodies moving relative to the earth's field, manifest an increase in inertia and a foreshortening in the direction of motion in the medium. Clocks and other physical processes are slowed, because of an

increase in inertia. The clock-rates of clocks near the earth or in satellites change as their velocities change in other media such as the fields of the Sun and Galaxy. The motion-ward foreshortening of physical objects is due to the reduction of electric forces between atoms and molecules as they collectively pass through field media.

A field-referred Lorentz-like contraction of physical reference frames accompanied by Lorentz-like clock-rate slowing goes a long way to accounting for the nearly null result of the Michelson-Morley experiment. There is no need for Special Relativity with its absolute speed, its schizo-chrony (relative simultaneity) and its limitation to inertial reference frames. The clock-rate of a clock may vary with motion in a field but there is no need for reference frames to disagree about which events occurred when, once a synchronization standard is chosen. Besides, there is no empirical confirmation of relative simultaneity, and all confirmed predictions of Special Relativity are accounted for in this field-referred model - the amonic halo model.

What does the Michelson-Morely experiment actually prove?

Though the Michelson-Morely experiment did not detect a fringe shift of the magnitude expected by the stationary aether theory, a slight fringe shift was in fact detected within experimental error. Morely and Miller continued investigations with improved equipment. Miller showed that the fringe shift was definitely systematic and correlated in sidereal time. The fringe shift was certainly not due to temperature gradients as some have opined. Miller's interferometer experiments were more precise, more painstaking and exhaustive than any earlier interferometer experiments. Unfortunately, his work though published in a reputable scientific journal, has not received the recognition it deserves.

Let us assume for the sake of argument that the result of an M–M experiment is practically null (no fringe shift); what does this prove? It only proves that the round-trip speed of light (not the one-way speed of light) is practically constant with respect to an earthbound frame. The experiment does not prove that the speed of light is a universal constant!

What transformation is required to account for this "null result"? A quasi-Galilean transformation will do - a transformation that involves velocity-dependent clock-rates and motion-ward contraction but with no relative simultaneity. No relative simultaneity means that all observers agree about the comparison of each other's clocks and measuring rods. The evaluation of the clock-rate of a moving clock and the length of a moving meter-stick depends on the observer's synchronization standard. The observer's synchronization standard defines which events in space occur simultaneously.

Understand that the Lorentz contraction is not something that can be seen or photographed. Photons reaching an observer's eye or camera aperture originated at different times from the moving object. Consequently, the Lorentz contracted object will not appear foreshortened to the observer. The lengths of moving meter sticks are inferred by the synchronization standard of the observer's reference frame.

The intensity and prevalence of a field must have some bearing on its transforming ability. We do not expect the gravitational field of the earth, to significantly transform the sun or the sun's field overall. We expect the earth to be transformed while orbiting in the sun's field. In the absence of outside influences, two identical bodies passing through each other's field should transform each other (fields and all) identically. The transforming ability of a field depends on factors that also affect the field's intensity. However, we should not presume that the

transforming ability or "field dominance" falls off at the same rate as field strength. The Amonic halo model proposes that the permeable presence responsible for Lorentz-like transformations is a natural extension of matter – a cloud or halo of discrete entities. "Force-like" transmissions from the source through the halo obey $1/r^2$.

A source at rest in a gravitational field of uniform intensity emits light that propagates at the same speed in all directions with respect to the source and field, provided that the source and field are not moving in another field. If relative motion exists between the source and another field, the one-way speed of light against the field flow (up stream) is less than the speed of light in the direction of the flowing field (down stream). Of course these one-way light speeds cannot be measured with any assurance without synchronized separated clocks - a feat that depends on knowledge of a signal's one-way speed in the first place. Even though the one-way speed of light depends on direction in a flowing field, a Michelson interferometer stationed in the rest frame of the light source, may not show a significant fringe shift. A fringe shift means that the round-trip speed of light depends on direction. If the rest frame of the light source is transformed Lorentz-like as it moves through the superimposed field, then the different one-way light speeds will not result in any change in round-trip light speed. The interferometer will detect no fringe shift even though the light speed in the direction of the field flow is different from the light speed in the opposite direction.

Consider the coordinate transformations that two field-bearing bodies in relative motion induce on each other. We will omit effects that are strictly dependent on field potential (slowing of clocks at rest in a gravity well) as we model the kinematics. We are presently concerned with the effects that moving through a field has on clocks and meter-sticks. It is useful to measure the motion of one system relative to the other from the vantage of a third reference frame who's standards are not affected by the fields of the other two systems. Let S and S' designate the two field-bearing systems. S* is the unaffected system that is removed from but at rest with respect to S. The coordinate transformation of S' relative to S* is given by (6,7).

$$x' = (x^* - v^*t)\gamma(\text{ר}v^*) \qquad (6)$$

$$t' = t^*/\gamma(\text{ר}v^*) \qquad (7)$$

Here $\gamma(\text{ר}v^*) = [1 - (\text{ר}v^*/c)^2]^{-1/2}$ in which v^* is the speed of S' relative to S* and ר is the field dominance coefficient of the S field. As explained before, $0 \le \text{ר} \le 1$ indicates the transforming ability of a field, in this case, the transforming ability of the S field. ר approximates the extent to which light tends to propagate in the S field. ר depends on position in the S field. If $\text{ר} \approx 0$ then light from a source stationed in S' is negligibly affected by the S field. If $\text{ר} \approx 1$, the speed of light in S' is optimally affected by the S field. Of course, the S reference frame is transformed by the S' field in relative motion. From the vantage of S* the situation is described by (8,9).

$$x = x^*\gamma(\text{ר}'v^*) \qquad (8)$$

$$t = t^*/\gamma(\text{ר}'v^*) \qquad (9)$$

ר' is the field dominance coefficient of the S' field. We may now describe S' coordinates in terms of S coordinates, and in terms of v^*, ר' and ר. In the following equations, $\gamma^{-1}(\text{ר}v^*)$ is the same as $1/\gamma(\text{ר}v^*)$:

$$x' = [x\gamma^{-1}(\text{ר}'v^*) - v^*t\gamma(\text{ר}'v^*)]\gamma(\text{ר}v^*) \qquad (10)$$

$$t' = t\gamma^{-1}(\text{ר}v^*)\gamma(\text{ר}'v^*) \qquad (11)$$

The velocity v* is still evaluated from the unaffected reference frame S*. Reference frame speed evaluates differently in S or S' depending on transformed standards. You will note that if ר = ר' then the clocks of S and S' "tick" at the same rate and the scale of S and S' meter sticks agree even though there is relative motion between S and S'. If ר = ר' is not zero then both S and S' will be clock-rate retarded and meter stick contracted relative to S* even though S is at rest with respect to S*. In both S and S' the round-trip speed of light with respect to its source, is constant. This is not to say that the speed of light is independent of the motion of the source. The speed of light in fact, depends on direction. The transformations (6,7), (8,9) or (10,11) lead to a null result in Michelson-Morely type experiments. Here's how:

Imagine an M-M interferometer stationed on S. As the S' field sweeps by in the +x direction and transforms S, the velocity of light in the +x direction increases while the velocity of light in the –x direction decreases. What is the speed of light in S in the ±x directions, according to a distant observer at rest in S*? According to S* the speed of light in the +x direction is $c^*_+ \approx c + \text{ר}'v^*$ and the speed of light in the -x direction is $c^*_- \approx c - \text{ר}'v^*$. It should be emphasized that these light speed are only first order approximations. From equations (8,9) we obtain the parallel velocity equation $dx/dt = \gamma^2(\text{ר}'v^*)\, dx^*/dt^*$. Therefore the speed of light in the +x direction according to S is $c_+ \approx (c + \text{ר}'v^*)\gamma^2(\text{ר}'v^*)$. The speed of light in the –x direction according to S standards is $c_- \approx (c - \text{ר}'v^*)\gamma^2(\text{ר}'v^*)$. The round-trip or equivalent speed of light is given by the formula $c_{eq} = c_+c_-/c_{av}$, where c_{av} is simply the average of the ± light speeds or $(c_+ + c_-)/2$. It follows that $c_{eq} \approx c$. Now, the speed of light along any fixed axis perpendicular to x is c (according to S) therefore an M-M interferometer stationed in S reveals no significant fringe shift as the apparatus is oriented in various directions.

Similarly, an M-M experiment conducted in S' will give a "null" result. In this case $dx'/dt' = (dx^*/dt^* - v^*)\gamma^2(\text{ר}v^*)$. The previous equation follows from equations (6,7). Remember that S' moves with speed v* in the +x* direction relative to S*. Again we introduce linear approximations of light speed: According to S* evaluation of the light emitted from the S' source, the speed of light in the +x' direction is $dx^*/dt^* \approx (c+v^*) - \text{ר}v^* = c + (1-\text{ר})v^*$. According to S* standards, the speed of light in the -x' direction is $dx^*/dt^* \approx (c-v^*) + \text{ר}v^* = c - (1-\text{ר}v^*)$. Therefore, an observer in S' evaluates the speed of light in the +x' direction to be about $(c + \text{ר}v^*)\gamma^2(\text{ר}v^*)$ and the speed of light in the –x" direction to be about $(c - \text{ר}v^*)\gamma^2(\text{ר}v^*)$. It follows that the round-trip speed of light relative to a source stationed in S' is approximately c in all direction. The results of the Michelson-Morely experiment are accounted for without requiring the speed of light to be a universal constant. The findings of Miller clearly show that the speed of light is not invariant.

Accounting for Miller's observations

If the round trip speed of light is nearly the same in all directions for a given field, how does one account for the sidereal periodic fringe shifts observed in the experiments of Dayton Miller? [11] Here, we must carefully scrutinize the approximations made in the previous scenarios. When a light source passes through a field, the one-way speed of light emitted in various directions, depends on the field and the velocity of the source with respect to the field. Previously we relied on a linear approximation to describe the speeds of light in the ± x directions from a source stationed in S and swept by the S' field. Similarly, we made a linear approximation of the speeds of light in S', passing through the S field. We showed that in both cases, the round trip speed of

light leads to a "null" interferometer result. Since these were only first order approximations of light speed, we may imagine that an interferometer could be built that would be sensitive to other terms – and reveal variances in round trip light speed. Such an interferometer was built - the interferometer employed in Miller's experiments.

Miller's experiments indicated an "aether drift" of about 10 km/sec in a direction transverse to the earth's orbital plane. The earth's tangential velocity around the sun is almost three times this magnitude or about 30 km/sec. Why didn't Miller's interferometer detect a significant ether drift due to the earth's orbital motion? The field-referred transformation presented above, gives the answer: Miller's "aether drift" represents an effective drift speed. The actual relative speed between the earth and the cosmic field-bearing medium is significantly greater than the earth's orbital speed. The Transformations that the earth undergoes relative to extraterrestrial field media minimizes fringe shifting. At speeds much greater than the earth's orbital speed, linear approximations using a field dominance coefficient become less adequate. Despite a Lorentz-like contraction and slowing of earth bound clocks, the round trip speed of light in the lab frame of Miller's apparatus was not constant in all directions.

Enclosing an M-M type interferometer in a chamber evidently lessens the ability to detect light speed anisotropy. The flow of field bearing media seems to be affected by physical obstructions such as thick wall and metal chambers. Unlike others who have conducted aether drift experiments, Miller was careful to deal with the issue of shielding in his research. Because the earth is not an inertial reference frame, even advocates of Special Relativity should not expect the speed of light to be perfectly isotropic at the earth's surface. The Michelson-Gale experiment (1925) demonstrated that the rotation of the earth does have an effect on the propagation of light. More recently Saburi, while attempting to synchronize widely separated atomic clocks using microwave signals relayed from a geostationary satellite, found that eastbound and westbound signal speeds are not the same. Westbound signals actually travel faster than eastbound signals due to the earth's rotation. [8] The tangential speed of the earth's surface, due to the planet's spin, is over 300 m/sec at the equator. As a consequence of the earth's rotation, the speed of light at the earth's surface can differs in various directions by hundreds of meters per second. Not withstanding this fact, there are a variety of recent, earth-based experiments that claim to demonstrate light speed invariance to a degree far better than the earth (as a non inertial frame) can possibly allow. Contrast these statements from a Classical Electrodynamics text: "...Michelson and Gale demonstrated that the rotation of the Earth – in contrast to the translational motion – does have an effect on the propagation of light..." and then six pages later, "...All the experiments agree that the propagation of light is unaffected by the motion of the laboratory..." [12] How is it possible that researchers can conclude that the speed of light in the laboratory is practically invariant, when other experiments clearly show that the speed of light is at least affected by the earth's rotation? It is important to note that "aether drift" experiments conducted since Miller surround the apparatus with some kind of solid enclosure. These enclosures may reduce media flow to the point that the transformation induced on the lab frame and apparatus is sufficient to make light speed variations undetectable. Thus heavily shielded "aether drift" experiments detect little or no light speed anisotropy including the light speed variations that are known to exist due to the earth's rotation.

Though the dynamic media responsible for field effects are somewhat permeable, they must also be highly organized. Only highly organized media could support transverse waves such as light. An amonic medium constitutes a "rakia" or firmament through which transverse electric disturbances propagate. Though invisible and permeable to atomic matter (the elements), field media are not unstructured or immaterial. Sidereal space is a confluence of amonic haloes. I am

D(C 93:33

pleased to call this immense suffusion of moving media, the *Mithras* – named after the Zoroastrian/Persian divinity that embodies *light*. It is important to differentiate between an aether usually considered to be an absolute reference frame and the *Mithras* of space. The *Mithras* is the cosmic composite of portable substrata or extensions of matter. Does the *Mithras* extend through all space? Are there regions where transverse light does not easily propagate owing to a scarcity of field presence? Does light requires field media for its existence or is light quasi-ballistic, with its speed only regulated by field media?

D&C 88:7-12

D&C 121:30-31

Beyond the field firmaments of the super-clusters, there may reside chaotic seas of ultra-fundamental particles in unregulated relative motion. If "space" is not emptiness but a plenum of infinite motion, we may come to regard matter and field as organized "space" or rather organized motions. It is probably more correct to consider "space" and "time" as merely descriptive aspects of one thing – motion, and that neither "space" nor "time" exists apart from motion.

In the absence of field media, Galilean relativity invokes no speed limit. The sizes of fractal-like subatomic entities approach the infinitesimal and their distribution of relative speeds has no bound. In other words, matter breaks down at last into infinitely fast, infinitesimal entities (*supernal motions* if you will) that are the common denominator of all things including the transcendent. Though superluminal exchanges exist within and between all objects, the field media that fill the visible universe, act as speed regulators to ordinary objects and observable particles. Still there may be regions in the vast "voids" of space where order is exceedingly scarce. Super fast entities from the dark outer seas of chaos may crash into the shielding firmaments of our universe. From time to time these entities may be large enough and possess enough relative speed that upon colliding with the firmaments, a burst of gamma rays is produced more intense than any thing else in our universe. This may explain some of the enigmatic "gamma ray bursters" that have baffled astronomers since the late 1960s.

D&C 88:37-38

A closing note on the value of scientific models:

All scientific models, theories and laws are subject to revision. I once heard an elementary physics lecturer, on a PBS program, remark that Einstein's Special Theory of Relativity, even though it is still called a "theory" is really an unassailable fact because it agrees with so many experiments and everyone who is not a crank accepts it. While comments like this may persuade the lay public or even a class of college students, a genuine scientist should remain cautious. It seems that one of the best-kept trade secrets in science is that numerous theories can exist all of which claim to account for the same set of facts. Many theories once popular and highly endorsed have been revised or replaced altogether. It is also true that no matter how much experimentation we perform and no matter how much we revise concepts, scientific understanding will always rely on what Einstein called "this profound faith," that the world of existence is rational or in other words, comprehensible to reason.

At a certain point Einstein became less confident of his own theories and was willing to express his uncertainty. In a letter to Maurice Solovine, dated the 28th of March 1949, Einstein remarked *"You imagine that I look over my life's work with calm satisfaction. But from nearby it looks quite different. There is not a single concept of which I am convinced that it will stand firm, and I feel uncertain whether I am in general on the right track."*

We must have faith that by combining reason with laboratory revelations, we can improve our understanding of the universe, and we should always remember that this is a faith.

References

[1] Albert Einstein, "On the Electrodynamics of Moving Bodies", *Annalen der Physik, 17* (1905).

[2] Fred Doran, "What was the reason for 'On the Electrodynamics of Moving Bodies'?", *Special Relativity Letter*, vol.1, no.2, (May 1997).

[3] Edward M. Purcell, Electricity and Magnetism, Berkeley Physics Course Volume 2, Second Edition, McGraw-Hill, Inc. (1989), p.330.

[4] The Brown-Driver-Briggs-Gesenius Hebrew-Aramaic Lexicon, Christian Copyrights, Inc. (1983).

[5] Jerry B. Marion, Mark A. Heald, Classical Electromagnetic Radiation Second Edition, HBJ Publishers (1980), pp.210-212.

[6] G. T. Gillies, "Status Of The Newtonian Gravitational Constant", Gravitational Measurements, Fundamental Metrology and Constant, NATO ASI Series C: Mathematical and Physical Sciences - Vol.230, Kluwer Academic Publishers (1988), pp.193-197.

[7] E.E. Podkletnov, "Weak gravitational shielding properties of composite bulk $Yba_2Cu_3O_{7-x}$ superconductor below 70 K under e.m. field", Moscow Chemical Scientific Research Center, modanese@science.unitn.it

[8] Charles M. Hill, "The Velocity of Light In Moving Systems", *Phys. Essays*, vol.3, pp. 429-435 (1990).

[9] Charles M. Hill, "Timekeeping and the Speed of Light-New Insights from Pulsar Observations", *Galilean Electrodynamics, vol.6, no.1, p.3 (1995).*

[10] Petr Beckmann, Einstein Plus Two, The Golem Press, Box 1342, Boulder, CO. (1987).

[11] Dayton C. Miller, "The Ether-Drift Experiments and the Determination of the Absolute Motion of the Earth", *Reviews of Modern Physics*, vol.5, pp.203-242 (July 1933).

[12] Hans C. Ohanian, Classical Electrodynamics, Allyn and Bacon, Inc. Chap 6, pp. 158, 161-164, (1988).