The Conservation Law

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1. Introduction

For more than 150 years, starting with mechanical systems, the fact that certain quantities such as energy, momentum, *etc.* are constant in physical processes has led to an increasing number of conservation laws. With the advent of quantum physics, new conserved quantities, such as baryon and lepton numbers, have been found. In these new cases, the question of just what is being conserved arises. Moreover, it is clear that the same lack of understanding applies to the "classical" laws, since no one understands what "energy" or "momentum" really are, for example.

Recently, much emphasis has been placed on the related transformation symmetry properties, and the realization that gauge transformation symmetries are the source of certain quantum conservation laws. However, in spite of the insight this approach has provided, in no case has true understanding of "what it is" that is conserved been forthcoming.

The following account suggests that, rather than the multiplicity of conservation laws now in use, a *single* conservation law produces all of the effects now ascribed to the many; and further, the nature of the one quantity that is being conserved is indicated.

2. Deterministic Physics

The conservation law is best approached through a deterministic unified field theory which was developed slowly over the last 50 years. At the turn of the century, physics was a highly intuitive unification of mechanics, electricity, magnetism and optics with a cause and effect basis, complemented by a statistical mechanics to deal with the ensembles of thermodynamics and related disciplines. Attempts to extend the cause and effect visualization to atomic and particle structure appeared unreconcilable with new experimental evidence. At that point, a new statistics of ensembles of small machines, called quantum mechanics, convinced most physicists to drop the deterministic approach. The only serious holdout for the old ways was general relativity and the theory of gravitation.

Although that appears to be the state of physics today, it is misleading; because, over the last 50 years, a few investigators have developed a deterministic extension of the old ways into atomic and particle physics, with quantum physics playing the same role that statistical mechanics did in the past.

From early gropings about the electromagnetic field, an extended electron moving in the atom was visualized [1]. Simultaneously, Kirkwood [2] developed a theory of gravitation using a metric similar to that of electromagnetism. Both theories had a fluid medium as the fundamental reference frame [3]. A deeper look into the role of special relativity in a unified field theory [4], and the possibility of large scale Lorentz invariance in a gravitational field [5] enabled Kirkwood to derive gravitational field equations of the same form as Maxwell's equations, thus leading the way to a unification of gravitation and electromagnetism [6].

The theory is now quite advanced, and has been summarized in considerable detail [7]. It is a true unified field theory that gives gravitation, electromagnetism, and the strong and weak forces a single physical mechanism. It puts both special and general relativity on a simple, intuitive basis where cause and effect are obvious. It gives physical visualizations for energy and charge. By slightly augmenting Maxwell's Equations, all of atomic physics is derived deterministically using Newton's laws and standard planetary analysis. Finally, many of the puzzling characteristics of particles, quarks, *etc.* are made clear [7]. The present discussion of conservation is one of the results.

3. The Unified Field

To understand conservation, the essentials of the unified field theory must be sketched briefly, starting from first principles. It is based on the idea that the universe has only three components:

1. Newton's absolute space.
2. Newton's absolute time.
3. A massless, frictionless, fluid.

Here, space is an unwarpable, Euclidean place of large extent; time is the sequence of events, not as they are measured but as they occur; and the fluid is compressible, conserved, has no linear momentum and *does not obey Newton's laws.* It fills all of Euclidean space, can be distorted into particles, and propagates both transverse, t, and longitudinal, ℓ, waves. The equations of motion of this unique fluid complete the theory, giving its absolute density f_a and its velocity $\mathbf{V}$ as a function of time at every point.

Everything in the universe, all particles and waves, are just minute rarefied or condensed regions or ripples in this fluid called "ether". In "empty" space, where there are no particles, the average or datum ether density is $f_d = 8.9876 \times 10^{20}$ descartes (ether/cm^3 in Heaviside-Lorentz units, 1 des = 1062.7 Volts-Mks). At each point in space, the densities f_a and f_d are always positive; but inside particles and waves there is an *incremental* density,

$$f = f_a - f_d\,, \tag{1}$$

which can be positive or negative. H-L units are used throughout.

An electron/positron pair can be formed, for example, by removing some ether from one region and depositing it in another, so that the slightly depleted region (electron) is separated from the slightly compressed region (positron). In this case, the fluid ether would ooze out of the positron and flow into the electron until nothing remained but the datum. In order for the electron and positron to be "stable" particles, something else must prevent this oozing. An important property of the ether is that any minute disturbance in it produces *longitudinal* waves. Now, while *t*-waves carry energy, ℓ-waves do not. During pair production, an energyless, longitudinal *sustaining* wave is set up that goes out of the electron and into the positron to hold their bulk displacements of ether in place. These frictionless ℓ-waves persist as long as the electron and positron remain separate particles. Except for photons and neutrinos, all other particles are one or more essentially spherical layers of bulk ether deformation held in place by their longitudinal sustaining waves [7].

In writing the field equations, the bulk ether distortions must be distinguished from the ℓ-waves, so the velocity and incremental density are separated into two components,

$$f = \bar{\bar{f}} + f_{.}\,, \quad \mathbf{V} = \bar{\bar{\mathbf{V}}} + \mathbf{V}_{.}\,, \tag{2}$$

where the double bar (bulk) indicates a constant (time average) or slowly varying ether deformation and the sub-dot (ℓ-wave) indicates a rapidly oscillating, periodic, longitudinal wave with zero time average. This division is necessary because *the ether is a non-linear medium that acts differently for bulk distortions and ℓ-waves;* so that two sets of equations are required to completely describe the flow pattern, as shown in Figure 1.

In so called "static" fields the configuration of bulk distortion is determined by the *time average* of the product of the $f_{.}$ and $\mathbf{V}_{.}$ ℓ-waves. The interaction between the ℓ-waves and the bulk deformation is given by,

$$\nabla \bar{\bar{f}} = K_S\, \overline{\overline{f_{.}\mathbf{V}_{.}}}\,, \qquad \text{(static)} \tag{3}$$

which shows that if $f_{.}$ and $\mathbf{V}_{.}$ are 90° out of phase, no bulk $\bar{\bar{f}}$ or gradient $\nabla \bar{\bar{f}}$ will be sustained; but if they are in phase, $\bar{\bar{f}}$ can be held in its distorted condition. For convenience, $K_s = 1$ will be used throughout. If a bulk configuration is moving, the "retarded" form (as in retarded potential),

$$\nabla \bar{\bar{f}} = K_S\, \overline{\overline{f_{.}\mathbf{V}_{.}}} - \frac{1}{c_o^2}\frac{\partial \overline{\overline{f_a \mathbf{V}}}}{\partial t}\,, \qquad \text{(General)} \tag{4}$$

must be used.

4. The Field Equations

Because the ether does not obey Newton's laws, the problem of finding its equations of motion appears to be horrendous. Fortunately, all of the bulk equations are well known, although the ℓ-wave equations are not complete. Again, fortunately, the correct ℓ-wave often can be found using an incomplete set of equations. In the study of the conservation law, almost all of

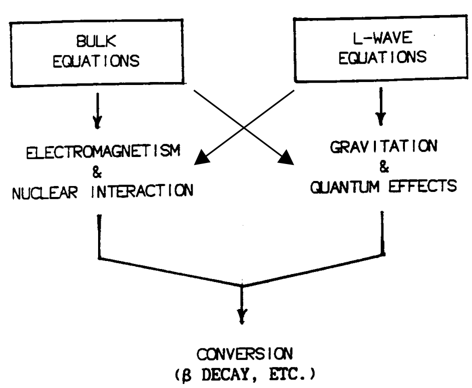

Figure 1. The structure of the unified field theory.

the analysis is based on the bulk equations, which can be written,

The Bulk Equations

$$
\begin{aligned}
&\text{(A)} \quad \nabla^2 \overline{\overline{\phi_a}} - \frac{1}{c_o^2}\frac{\partial^2 \overline{\overline{\phi_a}}}{\partial t^2} = -\rho \,, \\
&\text{(B)} \quad \nabla^2 \overline{\overline{\phi_a \mathbf{V}}} - \frac{1}{c_o^2}\frac{\partial^2 \overline{\overline{\phi_a \mathbf{V}}}}{\partial t^2} = -\rho \, \mathbf{u} \,,
\end{aligned}
\tag{5}
$$

where,

$$\rho = -K_S \nabla \bullet \left(\overline{\overline{\phi \mathbf{V}}} \right) . \tag{6}$$

From Eqs.(1) and (2),

$$\overline{\overline{\phi_a}} = \phi_d + \overset{=}{\phi} \tag{7}$$

where $\overset{=}{\phi}$ is the bulk incremental density. If $\overset{=}{\phi}$ is identified as Maxwell's scalar potential and the flow vector $\overline{\overline{\phi_a \mathbf{V}}}$ is identified with Maxwell's vector potential through,

$$\mathbf{A} = \frac{1}{c_o} \overline{\overline{\phi_a \mathbf{V}}} \,, \tag{8}$$

then Eqs.(5) are seen to be Maxwell's equations in potential form. Thus, at last, the meaning of Maxwell's equations has been established as the bulk equations of motion of the ether.

The quantities ρ and $\mathbf{u}$ in Eqs.(5) require some discussion. In Maxwell's equations, they represent "charge" density and velocity. As used conventionally, Maxwell's equations are *macroscopic* [8], *i.e.* charge is a property of particles, such as electrons, and ρ essentially represents a count of individual charged particles per unit volume. The ether Eqs.(5) can also be used that way; but as they are written here, ρ represents a condition in the ether not related to a count of whole, individual particles. In particular, ρ in Eqs.(5) represents a smoothly distributed ether *distortion* that exists even inside of a particle and describes one aspect of a particle's structure. More will be said about ρ later on.

To understand the velocity $\mathbf{u}$, visualize a positron, for example, as a region where the ether is compressed, so that the absolute bulk density $\overline{\overline{\phi_a}}$ exceeds the datum ϕ_d by an incremental amount $\overset{=}{\phi}$. If the positron moves with velocity $\mathbf{u}$, the *apparent* ether flow through a given surface at any point is $\overset{=}{\phi}\mathbf{u}$. However, the actual bulk ether flow is $\overline{\overline{\phi_a \mathbf{V}}}$, where $\overline{\overline{\phi_a}}$ is much larger than $\overset{=}{\phi}$ and $\overline{\overline{\mathbf{V}}}$ is much smaller than $\mathbf{u}$. Thus, since the actual flow and the apparent flow must match so that the same amount of ether is transported,

$$\overset{=}{\phi}\mathbf{u} = \overline{\overline{\phi_a \mathbf{V}}} \,, \tag{9}$$

Eq.(9) defines $\mathbf{u}$ as the velocity of the *incremental* density at each point. Since it is the incremental density and velocity that are actually measured, it is often useful to write Eqs.(5) in the incremental form,

$$
\begin{aligned}
&(A') \qquad \nabla^2 \bar{\bar{\phi}} - \frac{1}{c_o^2}\frac{\partial^2 \bar{\bar{\phi}}}{\partial t^2} = -\rho\,, \\
&(B') \qquad \nabla^2 \left(\bar{\bar{\phi}}\,\mathbf{u}\right) - \frac{1}{c_o^2}\frac{\partial^2 \left(\bar{\bar{\phi}}\,\mathbf{u}\right)}{\partial t^2} = -\rho\,\mathbf{u}\,.
\end{aligned}
\tag{10}
$$

Equations (5) or (10) are solved by first finding the sustaining waves ϕ_ℓ and $\mathbf{V}_\ell$ from the ℓ-wave equations. These are used in Eq.(6) to find ρ, which is then substituted into Eqs.(5) or (10).

5. Ether Conservation

Earlier it was stated that the ether is a *conserved* fluid, and this means that it obeys the familiar continuity equation,

$$
(A) \qquad \nabla \bullet \left(\overline{\overline{\phi_a \mathbf{V}}}\right) = -\frac{\partial \bar{\bar{\phi}}_a}{\partial t}\,, \qquad (A') \qquad \nabla \bullet \left(\bar{\bar{\phi}}\,\mathbf{u}\right) = -\frac{\partial \bar{\bar{\phi}}}{\partial t}\,. \tag{11}
$$

With the use of Eqs.(8) and (9), Eqs.(11) are seen to be the Lorentz gauge condition. Thus, rather than an arbitrary choice for convenience, the Lorentz gauge is the only one that has *physical* significance.

Eqs.(11), which describe ether conservation, are the root of all conservation laws. The following will show that *all other conservation laws are just implicit variations on the conservation of ether.*

6. Charge Conservation

In modern physics, the physical nature of "charge" is unknown, and it is taken to be an *innate* property of charged particles. These obey Coulomb's law, exerting forces on one another directly, a macroscopic effect. In past attempts to extend the theory to the internal structure of the electron, Coulomb's law was applied to the elements of *distributed* charge. This failed, because Coulomb's law is a property of whole particles. When Eqs.(5) are used in their microscopic sense, the charge density just represents one kind of *distortion* in the ether, and the various *volume elements of distributed charge density do not exert forces on each other* except for the intrinsic push of the ether surrounding them. In electrostatics, the specific distortion that defines negative charge is called the "surrounding function" distortion, or $\nabla^2 \bar{\bar{\phi}}$, which gives, at each point, the ratio of the average ether density surrounding the point to the ether density at the point. It can be positive or negative.

If the field is changing, the finite propagation velocity requires the use of the "retarded" charge density; and this effect is included in the definition of charge density given in Eqs.(5A) and (10′). Although it is just as reasonable to think of charge density in terms of the $\phi_\ell/\mathbf{V}_\ell$ waves, as expressed in Eq.(6), the surrounding function distortion picture is the easiest to visualize. The total charge on a particle is found by integrating its distributed charge density over *all space.*

The conservation of charged *particles* is well known and easily derived using Maxwell's macroscopic equations. It has an exact parallel in the microscopic case. To show that the distributed charge distortion in the ether is conserved, add the divergence of Eq.(5B) to the partial time derivative of Eq.(5A) and transpose the signs, with the result,

$$\nabla \bullet (r\mathbf{u}) + \frac{\P r}{\P t} = -\nabla^2 x + \frac{1}{c_o^2}\frac{\P^2 x}{\P t^2}\,, \tag{12}$$

where,

$$x = \nabla \bullet \left(\overline{\overline{f_a \mathbf{V}}}\right) + \frac{\P \overline{\overline{f_a}}}{\P t} = 0\,. \tag{13}$$

So because, and only because, ether is conserved according to Eq.(11), distributed charge distortion is conserved. It is easy to show that this means that moving along with the incremental density, the ratio $r/\overline{\overline{f}}$ is constant, so **u** is the velocity of r as well as $\overline{\overline{f}}$.

7. Energy Conservation

In contrast to the simplicity of charge conservation, energy conservation is complicated. First, it comes in so many forms. Second, no conventional visualization of the internal mechanism is available in many situations. Finally, the whole conventional structure of equivalent energies in the different forms is based on "forces". In the ether, *there are no forces.* Particles flow "downhill", *i.e.* from more to less compacted ether regions. Only when held in position by sustaining waves will the ether not "seek its own level". Here the concept of work (force) will be used as a convenience, and the different forms of energy will be given a visualizable mechanism; but each of these different forms must be dealt with individually as is the custom. There are still certain aspects of energy that are not understood, even in the context of the unified field theory; but the following will help to correct some of the present misunderstanding. Only three types of energy, electric, magnetic and gravitic require discussion here. Most other forms of energy can be understood in terms of those.

7.1. Electric Energy

The most common type of energy is electric. Even the nuclear interaction or so called "strong force" has been shown to have the same kind of interaction energy mechanism [7]. Electric energy is a condition that exists wherever there is an incremental ether density $\overline{\overline{f}}$. Just as the mere presence of a $\overline{\overline{f}}$ distribution automatically produces a surrounding function distortion called charge density r, the same $\overline{\overline{f}}$ distribution produces a second, different, coexisting deformation called the "gradient-squared" or electric energy density, e_e. Faraday first identified it in the electrostatic case as,

$$e_e = \frac{1}{2}\left(\nabla \overline{\overline{f}}\right)^2, \qquad \text{(Static)} \tag{14}$$

and again, if the field is changing, the "retarded" form is used, where [7],

$$\varepsilon_e = \frac{1}{2}\left\{\left[\nabla\bar{\bar{\phi}}\right]^2 - \frac{1}{c_o^2}\left[\frac{\partial\bar{\bar{\phi}}}{\partial t}\right]^2\right\}. \qquad \text{(General)} \qquad (15)$$

This gradient-squared energy distortion is always positive. It is *different* from the conventional electric energy in the general case, and *is the only energy involved in the rest and kinetic energies of all the layered particles* (layerons). At the present stage of understanding, *c*-ons, *i.e.* photons and neutrinos, are the only particles without electric energy [7].

When the field equations are solved for one of the various particles at rest, that particle has finite $\bar{\bar{\phi}}$, even at its center, and its charge and rest energy are found by integrating ρ of Eq.(5A) and ε_e of Eq.(14) over all space, including the center of the particle. In the case of the positron, for example, the distribution of $\bar{\bar{\phi}}$ is a spherically symmetrical "single-hill". Interestingly, this produces co-centered smooth spherical extended shells of ρ and ε_e, but the two have different radii for ρ_{max} and ε_{emax} [7]. When ρ and ε_e are integrated over all space, $q = e^+$ and the rest energy is E_o, as expected.

If the field equations are solved for this same particle moving at constant velocity **u**, Eq.(4) must be used with Eqs.(5A) and (15). It is then found that the $\bar{\bar{\phi}}$ contours have expanded *laterally* into oblate spheroids (only the **E** field contracts longitudinally), indicating that the particle's speed was raised by pumping it with more ether from a driving field; and the result is more ε_e distortion in the lateral regions, so that when ρ of Eq.(5A) and ε_e of Eq.(15) are integrated over all space, $q = e^+$ still, but the energy has increased to $E = \gamma E_o$, where γ is the well known motion factor. *The excess gradient-squared distortion is the positron's* ***kinetic energy*** [7]. Present textbooks imply that the kinetic energy of a moving charged particle is related to its magnetic energy. From the ether viewpoint, although the particle has a magnetic field, it has no magnetic energy. This will be enlarged upon in the subsequent discussion.

It is of interest to examine under what conditions ε_e is conserved. The usual continuity relationship can be expressed as,

$$\nabla\bullet\left(\varepsilon_e\mathbf{u}\right) + \frac{\partial\varepsilon_e}{\partial t} = \varepsilon_e\nabla\bullet\mathbf{u} + \frac{d\varepsilon_e}{dt_{\cdot}}. \qquad (16)$$

where $d/dt_{\cdot}$ is the m.p. (moving point, sometimes called convective or material) derivative,

$$\frac{d\varepsilon_e}{dt_{\cdot}} = \frac{\partial\varepsilon_e}{\partial t} + \mathbf{u}\bullet\nabla\varepsilon_e. \qquad (17)$$

Using Eq.(15), Eq.(16) can be written,

$$\nabla\bullet\left(\varepsilon_e\mathbf{u}\right) + \frac{\partial\varepsilon_e}{\partial t} = \varepsilon_e\nabla\bullet\mathbf{u} + \nabla\bar{\bar{\phi}}\bullet\frac{d}{dt_{\cdot}}\left[\nabla\bar{\bar{\phi}}\right] - \frac{1}{c_o^2}\frac{\partial\bar{\bar{\phi}}}{\partial t}\frac{d}{dt_{\cdot}}\left[\frac{\partial\bar{\bar{\phi}}}{\partial t}\right]. \qquad (18)$$

Expanding the last two terms of Eq.(18), with some simple manipulation,

$$\nabla \bullet (e_e \mathbf{u}) + \frac{\partial e_e}{\partial t} = e_e \nabla \bullet \mathbf{u} + \nabla \overline{\overline{f}} \bullet \left\{ \nabla \left[\overline{\overline{f}} (\nabla \bullet \mathbf{u}) \right] + (\nabla \mathbf{u}) \bullet \nabla \overline{\overline{f}} \right\}$$
$$+ \frac{1}{c_o^2} \frac{\partial \overline{\overline{f}}}{\partial t} \left\{ \frac{\partial}{\partial t} \left[\overline{\overline{f}} (\nabla \bullet \mathbf{u}) \right] + \frac{\partial \mathbf{u}}{\partial t} \bullet \nabla \overline{\overline{f}} \right\} + \nabla \overline{\overline{f}} \bullet \nabla x - \frac{1}{c_o^2} \frac{\partial \overline{\overline{f}}}{\partial t} \frac{\partial x}{\partial t}. \tag{19}$$

Eq.(19) shows that even in the few special cases where the first three RHS terms go to zero, e_e is conserved only because conservation of ether makes the last two RHS terms zero. Several special cases will now be considered to illustrate certain important ideas.

The first is that of a particle moving at constant velocity. Even a neutral particle, like a neutron, has an internal ρ distribution, including both positive and negative distortion, which integrates to zero over all space. Although this ρ distribution is uneven in concentration, if the particle moves at constant velocity, the **u** vector field throughout the particle is constant in both space and time. Thus, all RHS terms of Eq.(19) are zero, and e_e is conserved. When e_e is conserved, the ratio $e_e/\overline{\overline{f}}$ is constant, and **u** is also the velocity of e_e.

A more interesting case is that of an electron in a hydrogen atom. The electron and proton orbit about their center of energy as a rigid body, always presenting the same faces to each other . If they are in circular orbits, their angular velocity is constant, say $\boldsymbol{\omega}$. At each point the velocity field is $\mathbf{u} = \boldsymbol{\omega} \times \mathbf{r}$, which is constant in time. The result is that $\nabla \bullet \mathbf{u} = \mathbf{0}$, $\partial \mathbf{u}/\partial t = 0$ and $\nabla f \bullet \nabla \mathbf{u} \bullet \nabla \overline{\overline{f}} = 0$, so Eq.(19) indicates that e_e is conserved. It follows that all circular orbits will be stable and non-radiating if no other ether condition disturbs the flow. A similar conclusion was reached from a different starting point in Reference 7.

A final case is that of a positron being accelerated in a straight line by a second higher energy positron approaching from the rear. As the accelerating particle's velocity increases, that particle expands laterally by taking on more of the distortion energy e_e from the driving particle. Since the **u** field is changing with time and has divergence, by Eq.(19) energy e_e is *not* conserved. Some of the distortion converts into another form called magnetic energy and is lost by both particles as radiation.

In the previous case of the hydrogen atom, the always present datum fluctuations (zero-point fluctuations) buffeting the orbiting electron are large enough, in all but the ground state, to force radiation to occur. In other situations, similar failures of conservation of electric energy can result when conversion of e_e to magnetic energy occurs.

7.2. Magnetic Energy

Unlike electric energy, which is a simple, localized distortion condition at each space point, magnetic energy is only partially localizable and comes in two different forms. In delineating magnetic energy, great care must be taken to avoid some of the misconceptions of the conventional theory of magnetic fields. For example, to the extent that it can be considered localized, magnetic energy density is given by,

$$e_m = \frac{1}{2c_o^2} \left\{ \left[\nabla \times \overline{\overline{f_a \mathbf{V}}} \right]_r^2 + \frac{1}{c_o^2} \left[\frac{\partial \overline{\overline{f_a \mathbf{V}}}}{\partial t} \right]^2 \right\}; \qquad \text{(General)} \tag{20}$$

where the subscript *r* in the first term indicates serious restrictions in applying that term, which implies that energy is stored in any region where there is vorticity in the flow. For, while the ether has no linear momentum, *per se*; being a frictionless fluid, it has angular persistence. Once a vortex is formed, it will continue forever unless physically stopped. Therefore, in situations where work is required to generate a vortex and where that work is *recoverable* in stopping the vortex, the first term in Eq.(20) gives the correct energy stored. Conversely, where a vortex exists that required no work to generate it and where no work is *recoverable,* Eq.(20) is not applicable.

The long solenoid is typical of the magnetic behavior of *closed circuits*. The maximum ether flow is at the location of the driving current. Near the center of the closed loop, the ether flows in a vortex as a *rigid body*; but further out the vortex reverses or the flow slips, and at great distances from the coil the flow tapers off to zero.

In steady state, the solenoid current consists of a large number of charged particles moving around the coil; each representing a certain small ether flow, just as it would as a free particle moving at the same velocity. The sum of all these particle flows is miniscule compared with the vortex flow in the field. So, when the current is made to flow in a *closed loop* of many turns, the field mechanism causes a very large ether flow vortex to form [7]. The work done on the charges during current buildup is very much greater than that needed to overcome the coil losses and supply the moving particles 'kinetic energy. The concept of non-radiation magnetic energy comes from this large extra input energy that can be retrieved by slowing the charges making up the current.

It is not obvious that the energy of this *closed loop* current can be localized as electric energy density is. The vortex cannot occur without the outside, slipping flow, and it cannot be separated from the moving charges if it is to be retrieved. On the other hand, there are advantages in considering magnetic energy to be localized in the vortex. This poses the problem that some ether vortices exist where no interaction can be used to raise, store or retrieve energy. Particle spin is one example.

During formation, intrinsic vortices form that remain a part of particles until they are annihilated. In two and three layer particles (bions and trions), each layer can have its own spin vortex and spin orientation. Unlike the vortex surrounded by a closed loop of moving charge, which charge can be used to increase or decrease the enclosed vortex, the spin vortices are permanent unless annihilated by a matching counterspin. Consequently there is no storage of *retrievable* work, so the spin vortex cannot be said to store energy. On the other hand, there is a mechanism in the ether that causes a spinning, charged particle to align itself in a magnetic field. If that particle is forced to reorient in the field, a torque is required and energy must be supplied. This energy can be recovered. Here, the effect is macroscopic, acting on the whole particle and not changing the spin vortex itself.

The criterion for using the vortex term in Eq.(20) is that the energetic vortex must be *in excess* of the establishing charges 'flow field. The constant velocity positron or electron have internal vortex flow, but do not establish an excess vortex. Thus they have no magnetic energy [7].

With these cautions about the application of the concept of localized magnetic energy, Eq.(20) can be used for all *recoverable* vortex energy. One important example of this, not associated with a closed loop of moving charge, is propagating radiation, which will be discussed after a few remarks about the second term in Eq.(20).

The energy density e_e and the vortex term of e_m do not describe the condition of energy while it is being converted from one form to another. For example, if a solenoid has no current flow, and a current is built up, electrons carry electric energy distortion from the source into the coil. This drives the ether enclosed in the solenoid into vortex motion; but in the transition from the electrons ’e_e to the e_m of the vortex, the energy is transiently carried in space in the form of the second RHS term of Eq.(20). If a second coil is wound around the first, that primary flow acceleration can act on electrons in the secondary and transport energy to them. This is called the *transformer* effect, which also appears in the important case of propagated radiation.

Before completing the discussion of magnetic energy, it is instructive to review the current status of Electrodynamics. Conventionally, a magnetic field is defined as **B** in the Lorentz force equation,

$$\mathbf{F} = q\left(\mathbf{E} + \frac{1}{c_o}\mathbf{u}\times\mathbf{B}\right), \tag{21}$$

which is strictly macroscopic, applying only to *whole charged particles*. Even when it is written with ρ replacing q, the density ρ only represents how many whole charged particles per cubic centimeter are present. When microscopic charge density is considered, Eq.(21) cannot be used and has no replacement. *There are no "forces" acting on charge distortion elements.*

From the ether viewpoint, the magnetic field is defined more broadly to be wherever the bulk flow vector $\overline{\overline{f_a\mathbf{V}}}$ (or **A**) is not zero, even if **B** = 0. This gives the field $\overline{\overline{f_a\mathbf{V}}}$ precedence over "force" **B** as the physical root of the phenomena. It also pinpoints a source of confusion in conventional theory. In terms of the ether variables,

$$\mathbf{E} = -\left(\nabla\overline{\overline{\phi}} + \frac{1}{c_o^2}\frac{\partial\overline{\overline{f_a\mathbf{V}}}}{\partial t}\right), \quad \mathrm{B} = \frac{1}{c_o}\nabla\times\left(\overline{\overline{f_a\mathbf{V}}}\right). \tag{22}$$

Eq.(21) indicates that the field **B** does not exchange energy directly with charged particles, since **F** is always perpendicular to **u**. However, Eq.(22) shows that work between charged particles and magnetic fields occurs through $\partial\overline{\overline{f_a\mathbf{V}}}/\partial t$, and making that term part of the electric field vector introduces the dubious alien idea of "electromotive force".

In the ether, the "force" on a charged particle is given by the Lorentz force equation,

$$\mathbf{F}_c = q\left\{-\nabla\overline{\overline{\phi}} + \frac{1}{c_o^2}\mathbf{u}\times\nabla\times\left(\overline{\overline{f_a\mathbf{V}}}\right) - \frac{1}{c_o^2}\frac{\partial\overline{\overline{f_a\mathbf{V}}}}{\partial t}\right\}, \tag{23}$$

where the $\nabla\overline{\overline{\phi}}$ term represents the simple "downhill" *flow* of the particle, the $\nabla\times\left(\overline{\overline{f_a\mathbf{V}}}\right)$ term gives the interaction with the vorticity and the last term shows that the particle accelerates, where the flow is changing, to maintain its state of motion relative to the primary inertial system, which is the moving ether itself.

Customarily, Eq.(21) is used with Maxwell's "force field" equations. For the case of free charges in space (absence of matter), they can be derived from the bulk Eqs.(5), with the result,

$$\nabla \bullet \mathbf{E} = \rho - \frac{1}{c_o^2}\frac{\partial \xi}{\partial t}, \quad \nabla \times \mathbf{B} = \frac{1}{c_o}\left(\rho \mathbf{u} + \frac{\partial \mathbf{E}}{\partial t}\right) + \frac{1}{c_o}\nabla \xi \tag{24}$$

and the identities,

$$\nabla \bullet \mathbf{B} = 0\,, \quad \nabla \times \mathbf{E} = -\frac{1}{c_o}\frac{\partial \mathbf{B}}{\partial t}\,. \tag{25}$$

Eqs.(24) reduce to the usual forms only because ether is conserved. Both Eqs.(24) and (25) are valid macroscopically and microscopically. Looked at conventionally and macroscopically, there can be no magnetic effect where $\mathbf{B} = 0$; and wherever $\mathbf{B} \neq 0$, there is supposedly magnetic energy density proportional to $\mathbf{B}^2$. On this basis, it is not possible to understand the Aharanov-Bohm experiment; and explaining the transformer effect (mutual inductance) or the 4/3 problem requires the introduction of mysterious new concepts such as lines of flux, emf, non-electromagnetic forces inside particles, *etc.* Only by introducing the potentials ϕ and $\mathbf{A}$ can some, but not all, of these problems be solved conventionally. On the other hand, all of these problems are resolved if the ether view of what is physically represented by electric and magnetic energies is adopted.

Finally, energy flow is handled conventionally by the use of Poynting's theorem, which can be derived in the usual way from Eqs.(24) and (25), leading to,

$$\nabla \bullet \mathbf{S} + \frac{\partial e}{\partial t} + \rho \mathbf{u} \bullet \mathbf{E} = -\nabla \xi \bullet \mathbf{E}\,, \tag{26}$$

where,

$$\mathbf{S} = c_o \mathbf{E} \times \mathbf{B}\,, \quad e = \frac{1}{2}\left(\mathbf{E}^2 + \mathbf{B}^2\right). \tag{27}$$

Here again, because ether is conserved, Eq.(26) reduces to the usual form. There is no question about the validity of Eqs.(26) and (27), since they constitute an identity derived directly from the field equations. The problem with Poynting's theorem is that, contrary to common practice, $\mathbf{S}$ and e do **not** represent energy flow and density except in very restricted

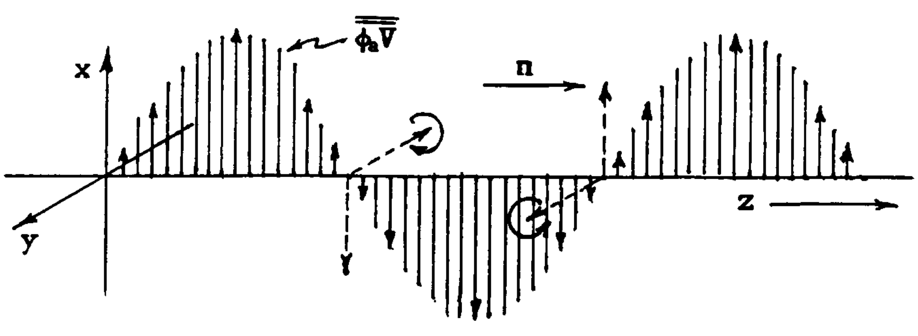

Figure 2. The flow pattern of plane wave radiation.

cases. The strange descriptions of energy flow cited in the literature result from use of the theorem as an energy conservation law when it cannot be.

Butler [10] points out that, although the field and force equations of electrodynamics are covariant under Lorentz transformations, as all valid physical laws must be, Poynting's theorem fails this test in many cases. Generally, energy and momentum form a covariant 4-vector; but, except in very special circumstances the quantities e and $\mathbf{S}$ in Eq.(27) do not. So even though the relationship in Eq.(26) holds, e and $\mathbf{S}$ cannot be identified as energy density and flow unless they form a covariant 4-vector. Butler has shown that the condition for this is the total absence of free charge, *i.e.* $r = 0$ in Eqs.(24) and (26). This means that only in the case of radiation can e and $\mathbf{S}$ represent energy density and flow. There are a few spurious non-radiation cases, where free charge and currents are present *but at rest*, that allow e and $\mathbf{S}$ to transform properly, but appear to predict strange energy flow patterns. However, the correct flow is not given by e and $\mathbf{S}$ in these cases, but it can be found by carefully considering the physical condition of the energy as it flows from the sources. So only in the case of radiation will Eqs. (26) and (27) represent conservation of energy, and the implications of this from the ether viewpoint will be discussed next.

It is well known [11] that, except in very special circumstances, a system of charges and currents, varying in time and confined to a region of dimensions $d << l$, radiate energy which, at distance $r >> l$, is essentially plane wave. Figure 2 shows the flow pattern of one sinusoidal component of this transverse radiation. As shown, the wave propagates in the z direction with velocity $\mathbf{u} = c_o\boldsymbol{n}$, $\boldsymbol{n}$ being a unit vector. The flow vector $\overline{\overline{f_a\mathbf{V}}}$ is constant over any x,y plane, and varies sinusoidally along the axis of propagation. Where the flow is maximum, there is no energy density; but e_m increases towards the regions of null flow, where the vortex and transformer energies are maximum. At each plane along the wave, the energy is half vortex and half flow acceleration. The wave shown is linearly polarized, but it is possible to generate similar waves that corkscrew circularly polarized.

This picture of ether wave propagation *differs* from the conventional, because the position is taken here that radiation is solely a magnetic phenomenon, requiring only one vector field $\overline{\overline{f_a\mathbf{V}}}$ to describe it. The density $\overline{\overline{f}}$ is zero, and the above description says that the amplitudes of the vortex and acceleration components of the wave are equal, *i.e.*,

$$\left(\nabla\times\left(\overline{\overline{f_a\mathbf{V}}}\right)\right)_a = \left(\frac{1}{c_o}\frac{\partial\,\overline{\overline{f_a\mathbf{V}}}}{\partial t}\right)_a , \tag{28}$$

so that, from Eq.(20),

$$e_m = \frac{1}{c_o^2}\left(\nabla\times\left(\overline{\overline{f_a\mathbf{V}}}\right)\right)^2 . \tag{29}$$

The two components are also perpendicular to each other and to $\boldsymbol{n}$, so that,

$$\left(\nabla\times\left(\overline{\overline{f_a\mathbf{V}}}\right)\right)\times\frac{1}{c_o}\frac{\partial\,\overline{\overline{f_a\mathbf{V}}}}{\partial t} = \left|\nabla\times\left(\overline{\overline{f_a\mathbf{V}}}\right)\right|^2\mathbf{n} . \tag{30}$$

Now, combining Eqs.(20), (26), (27), (29) and (30),

$$\nabla \bullet (e_m \mathbf{u}) + \frac{\partial e_m}{\partial t} = \nabla \bullet \mathbf{S} + \frac{\partial e_m}{\partial t} = -\nabla x \bullet \mathbf{E}\,. \tag{31}$$

Thus, since ether is conserved, magnetic radiation energy is conserved.

This discussion of magnetic energy is incomplete, but only one further topic, atomic radiation, will be added. Radiation mentioned so far does not completely describe atomic or similarly generated radiation. As an example, consider a hydrogen atom in an excited state, with its electron orbiting the nucleus. It has been shown that the extended nature of the electron allows atomic structure to be derived simply from Eqs.(5) and (6) and Newton's laws, using ordinary planetary analysis [12]. So, in this excited state, the circulating current represented by the orbiting electron produces a *vortex* centered on the nucleus with its axis perpendicular to the orbit plane. During radiation, as the orbit shrinks, in each revolution small bits of electric energy are converted to transverse vortex and transformer energy and travel outward along the orbit vortex axis at the velocity c_o. The combination of the original orbit vortex and the radiation produce a traveling cylindrical vortex [13], with spin 1, that goes along with the radiated wave. The energy wave is transverse, circularly polarized and confined in diameter to the propagated vortex, which is laterally about the size of the original orbit. The combination constitutes a photon, a true c-on particle. The ordinary circuit, antenna, or free charge radiation described earlier *does not have a spin vortex, and therefore is not quantized into particles.*

The other c-on, the neutrino, is just the propagating spin vortex removed from, or created to counter the spin of, one shell of a layeron particle such as an electron or proton, *etc.* Since it has no transverse wave component, it is extremely difficult to interact with by any means.

7.3 Gravitic Energy

Understanding the nature of gravitic energy is made difficult by lack of the ℓ-wave equations for $f_{.}$ and $\mathbf{V}_{.}$. Although, by using auxiliary relationships, the gravitic flow field of a large, neutral body has been found, the exact mechanism of formation and motion of such fields is still unknown. At this time, no localized gravitic energy can be defined. In fact, one approach suggests that all exchanges in gravitic interactions are actually exchanges of electric energy. To illustrate some of the problems, the gravitic field of a large, neutral body will be described, based on Kirkwood's gravitation theory [2,4-6] with minor modifications.

To get around the lack of ℓ-wave equations, advantage is taken of the powerful control ether conservation has on ether motion, as expressed by,

$$\nabla \bullet (f_a \mathbf{V}) = -\frac{\partial f_a}{\partial t}\,. \tag{32}$$

It has been shown [7], by substituting Eqs.(1) and (2) into Eq.(32), that the bulk and ℓ-wave components of ether deformation are *separately* conserved, as expressed by the bulk Eqs.(11) and the ℓ-wave equation,

$$\nabla \bullet \left(f_a \mathbf{V} \right)_\ell + \frac{\partial f_\ell}{\partial t} = 0 \,. \tag{33}$$

Here, the *separated* ℓ-wave flow component is,

$$\left(f_a \mathbf{V} \right)_\ell = \overline{\overline{f_a}}\,\mathbf{V}_\ell + f_\ell\, \overline{\overline{\mathbf{V}}} + \left(f_\ell \mathbf{V}_\ell \right)_\ell \,, \tag{34}$$

and two other useful *separated* relationships, the bulk ether velocity and acceleration at each point in the field, are given by,

$$\overline{\overline{\mathbf{V}}} = \frac{\overline{\overline{f_a \mathbf{V}}} - \overline{\overline{f_\ell \mathbf{V}_\ell}}}{\overline{\overline{f_a}}} \,, \qquad \overline{\overline{\mathbf{a}}} = \frac{\partial \overline{\overline{\mathbf{V}}}}{\partial t} + \overline{\overline{\mathbf{V}}} \bullet \nabla \overline{\overline{\mathbf{V}}} + \overline{\overline{\mathbf{V}_\ell \bullet \nabla \mathbf{V}_\ell}} \,. \tag{35}$$

The gravitic flow field of a large, uncharged, spherical body can be found by solving Eq.(33). It is assumed that the field has no vorticity, *i.e.* $\boldsymbol{\omega} = 0$. An uncharged body has no electric potential, so $\overline{\overline{f}} = 0$ everywhere and $\overline{\overline{f_a}} = f_d$. Since, $\nabla \overline{\overline{f}} = 0$, Eq.(3) indicates that $\overline{\overline{f_\ell \mathbf{V}_\ell}} = 0$. The field is assumed to be radial, so conservation of ether demands that the net bulk flow $\overline{\overline{f_a \mathbf{V}}} = 0$. The two preceding constraints applied to Eq.(35) give $\overline{\overline{\mathbf{V}}} = 0$. All of these conditions inserted into Eqs.(34) and (33) reduce Eq.(33) to,

$$f_d \nabla \bullet \mathbf{V}_\ell + \nabla \bullet \left(f_\ell \mathbf{V}_\ell \right)_\ell + \frac{\partial f_\ell}{\partial t} = 0 \,. \tag{36}$$

This is still an exact equation that is satisfied by at least one simple solution for f_ℓ and $\mathbf{V}_\ell$. Combined with the other bulk conditions, the field is given by (H-L units) [7],

$$f_\ell = \frac{3}{2}\frac{f_d}{\omega}\sqrt{\frac{GM}{\pi r^3}}\cos \omega t, \qquad \mathbf{V}_\ell = \hat{\mathbf{r}}\sqrt{\frac{GM}{\pi r}}\sin \omega t,$$
$$\overline{\overline{f}} = 0, \qquad \overline{\overline{\mathbf{V}}} = 0, \qquad \boldsymbol{\omega} = 0. \tag{37}$$

Thus, a large spherical, neutral body of mass M has a zero time average, oscillating *standing wave* field that moves in and out with *zero net ether flow*. The average ether velocity is zero, but substituting the Eqs.(37) into Eq.(35) shows that the average *acceleration* field is not zero, but inward and equal to [2],

$$\overline{\overline{\mathbf{a}}} = \overline{\overline{\mathbf{V}_\ell \bullet \nabla \mathbf{V}_\ell}} = -\hat{\mathbf{r}}\frac{GM}{4\pi r^2} \,. \tag{38}$$

This ether acceleration flow produces all of the overt effects of gravitation on objects situated in the field, since *the natural state of any object is to move to oppose its time average acceleration with respect to the ether.*

Considering the source, the fact that the electron and positron are completely described without a gravitic field, and the layerons appear to be combinations of similar layers arranged concentrically [7], makes it likely but unproved that the larger particles are also non-gravitic. The implication is that the oscillations in Eqs.(37) are caused by some motion of either nucleons, electrons, or both, as a result of their joining in constructs of atomic size or larger. It is well known that the atomic magnetic quantum number indicates that the atomic electrons keep as far from each other as possible on the average, with a resulting tilt of their orbits. Thus, inside the atom, there could also be a shifting of these orbits *outwards*;

and this could produce an additional small in-out motion needed to generate the gravitic field. It is not obvious, in this case, why the amplitude should be proportional to the number of nucleons. Nevertheless, some combination of particles generates the field.

Assuming that some such mechanism accounts for the source field, is there localized gravitic energy? So far as is known, the ℓ-waves are energyless [7]. Thus, it is unlikely that the $f/\mathbf{V}$ standing wave field has any energy stored in the space around the source. Later, it will be clear that the *negative* "binding" energy of the conglomerates forming the source mass is related to exchanges of electric energy. Without the final ℓ-wave equations, little more can be said about the source field directly.

Serious differences between the Newtonian and relativistic interpretations of gravitic energy appear when the motions of small test bodies in a large source field are examined. Here, the relativistic approach will be described using the ether picture.

The equation of motion for any small body, charged or neutral, moving in a general ether flow field, is written as seen by an "outside" absolute observer whose clocks and rods are not influenced by the velocity field $\boldsymbol{V}$ or the particle velocity $\mathbf{u}$; so that observer is an *inertial system observer*. Newton's second law takes the form [2,7],

$$\frac{\mathrm{d}(m\mathbf{u})}{\mathrm{d}t} = \mathbf{F}_c + \mathbf{F}_k + \mathbf{F}_{ext}\,, \tag{39}$$

where $m = \gamma m_o$, $\mathbf{F}_c$ is the Lorentz force given by Eq.(23), $\mathbf{F}_{ext}$ is any external force (*e.g.* a string or jet engine), and the Kirkwood force is,

$$\mathbf{F}_k = m\left[\bar{\bar{\mathbf{a}}} + 2\bar{\bar{\mathbf{w}}} \times \left(\mathbf{u} - \bar{\bar{\mathbf{V}}}_e\right)\right] + \bar{\bar{\mathbf{V}}}_e \frac{\mathrm{d}m}{\mathrm{d}t}\,. \tag{40}$$

For a charged particle in an electromagnetic field, the Lorentz force far exceeds the Kirkwood force and $\mathbf{F}_k$ is negligible. If no electromagnetic field is present, the motion of any charged or neutral particle is determined by the Kirkwood force, $\mathbf{F}_k$; although the effect of radiation reaction must be considered at high speeds.

The quantity $\bar{\bar{\mathbf{V}}}_e$ in Eq.(40) is the *effective* velocity of the *primary inertial system* at each point in the field, so that the motion factor becomes,

$$g = \frac{1}{\sqrt{1 - \dfrac{\left(\mathbf{u} - \bar{\bar{\mathbf{V}}}_e\right)^2}{c_o^2}}}\,. \tag{41}$$

In most situations, the *primary inertial system* velocity is $\bar{\bar{\mathbf{V}}}$; but, in the gravitic field represented in Eqs.(37), $\bar{\bar{\mathbf{V}}} = 0$ and the field manifests itself through $\mathbf{V}$. It has been pointed out that the *primary inertial system* in such a field can be defined using a test body that starts from rest at an infinite distance from the source mass M and free-falls towards it [2]. Since $\bar{\bar{\mathbf{V}}} = 0$ everywhere, the body starts in the *primary inertial system* of the "outside" absolute observer; and, as long as it free-falls, it continues to be at rest in the same inertial system, *i.e.* $g = 1$. It is also true [2] that a test body shot *upwards* from the test mass M at the escape velocity travels outwards in free-fall slowing to zero velocity as $r \to \infty$; and this body is also at rest in the primary inertial system, with $\gamma = 1$. Thus, the overall primary inertial system is represented in Eqs.(40) and (41) by the velocity field,

$$\overline{\overline{\mathbf{V}}}_e = \pm\hat{\mathbf{r}}\sqrt{\overline{\overline{\mathbf{V}}}^2} = \pm\hat{\mathbf{r}}\sqrt{\frac{GM}{2\pi r}} \quad \text{for} \quad \frac{\mathrm{d}r}{\mathrm{d}t}\begin{cases} > 0 \\ < 0 \end{cases}. \tag{42}$$

In Eq.(40), $\overline{\overline{\mathbf{a}}}$ is found from Eq.(35), and in many situations d*m*/d*t* can be determined by inspection. However, in the presence of an external force, it is useful to use [7],

$$\frac{\mathrm{d}m}{\mathrm{d}t} = -\frac{m}{c_o}\left[\left(\mathbf{u} - \overline{\overline{\mathbf{V}}}_e\right)\bullet\nabla\overline{\overline{\mathbf{V}}}_e\right]\bullet\left(\mathbf{u} - \overline{\overline{\mathbf{V}}}_e\right) + \frac{1}{c_o^2}\left(\mathbf{u} - \overline{\overline{\mathbf{V}}}_e\right)\bullet\mathbf{F}_{ext}, \tag{43}$$

a form of the energy equation, as can be seen by multiplying both sides by the constant c_o^2. Note that E = mc_o^2 does not signify that energy and mass are different, *equivalent* physical properties. They are *identical,* being the same distortion expressed in units that differ by c_o^2. Eqs.(39)-(43), and a slightly modified form that allows for the photon's constant energy and zero rest mass, have been used to derive all of the particle, clock, and light bending effects predicted by general relativity without invoking warped space or tensor analysis [2,7].

The nature of gravitic energy can be further pursued by studying a small, neutral test body moving radially in the field of a large mass M. Substituting Eqs.(37) into Eqs.(39) and (40), the motion is described by the reduced equation,

$$\frac{\mathrm{d}}{\mathrm{d}t}\left(\gamma m_o\mathbf{u}\right) = -\hat{\mathbf{r}}\left\{\frac{Gm_oM}{4\pi r^2}\left(\frac{1}{\gamma}\right) - \left(1 - \frac{GM}{2\pi c_o^2 r} + \frac{1}{c_o^2}\sqrt{\frac{GM}{2\pi r}}|\dot{r}|\right)F_{ext}\right\}, \tag{44}$$

where $\boldsymbol{F}_{ext}$ is radially outward. Only three specific cases are needed to describe the gravitic energy problem.

The first is a test body fixed in the earth's field. Since $\mathbf{u} = 0$ ($\dot{r} = 0$),

$$\gamma = \frac{1}{\sqrt{1 - \dfrac{\overline{\overline{\mathbf{V}}}_e^2}{c_o^2}}} = \frac{1}{\sqrt{1 - \dfrac{GM}{2\pi c_o^2 r}}}, \tag{45}$$

and Eq.(44) reduces to,

$$F_{ext} = \gamma m_o\frac{GM}{4\pi r^2}. \tag{46}$$

Present day interpretations of energy in relativity are a strange mix of Newtonian ideas and relativistic motion factors. Conventionally, the work (energy) required to *slowly* raise such a test body from the earth's surface to infinity is defined as,

$$W = \int_{r_{ea}}^{\infty} F_{ext}\,\mathrm{d}r = m_o c_o^2\left(\frac{\gamma_s - 1}{\gamma_s}\right), \tag{47}$$

where γ_s is the value at the earth's surface.

In gravitic energy situations, γ is usually so close to unity that it is useful to introduce the increment $\delta = \gamma - 1$ instead. To get some idea of the size of the energies involved, Eq.(47) becomes $W \cong \delta_s m_o c_o^2 = \delta_s E_o$, where $\delta_s \cong 7\times 10^{-10}$. Thus, energies involved in test body motion are smaller than the body's rest energy by a factor of about 10^{-9}, and essentially a negligible fraction of the source body energy. With this in mind, if a test body is

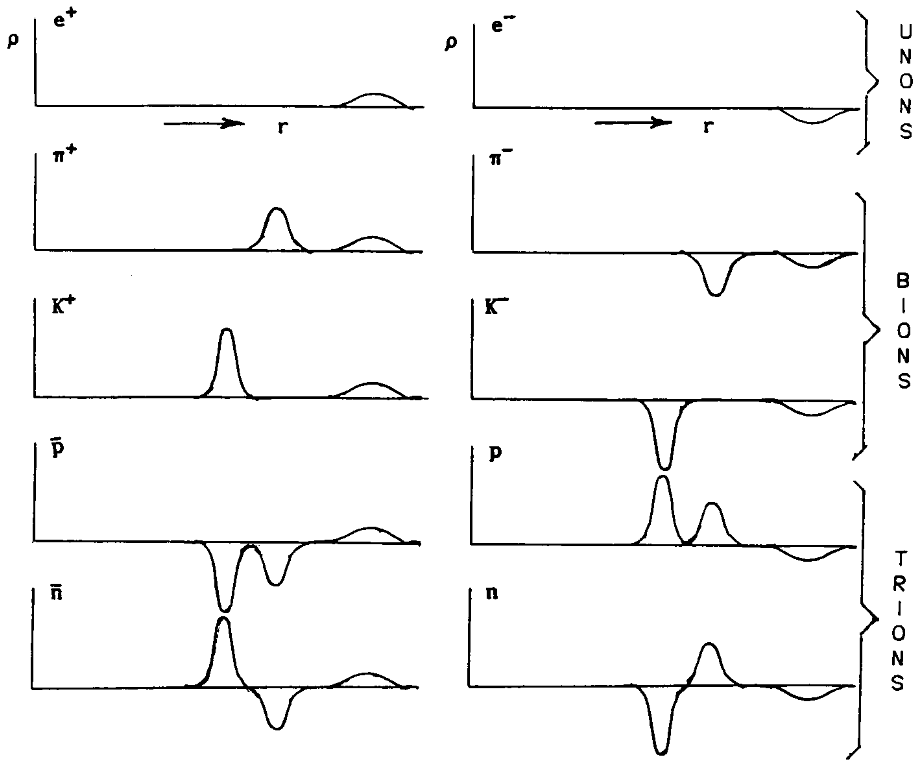

Figure 3. Examples of layeron particles.

slowly *lifted* from the earth's surface to outer space, using an hypothetical elevator attached to earth, work or energy dE_o (Newtonian) or slightly *less* than dE_o (relativistic, Eq.47) is required conventionally. Actually the test body energy is *lowered* from gE_o to E_o, and the elevator gives dE_o back to the source.

The second case is that of a test body free-falling in the field from infinity to the earth's surface, neglecting air friction. Since $F_{ext} = 0$, if the initial velocity is $\mathbf{u} = 0$, then the test body remains at rest in the *primary inertial system* all the way down, so that $\mathbf{u} = \overline{\overline{\mathbf{V}}}_e$ and, from Eq.(41), $g = 1$. This reduces Eq.(44) to,

$$\frac{\mathrm{d}\mathbf{u}}{\mathrm{d}t} = -\hat{\mathbf{r}}\frac{GM}{4p\, r^2}, \tag{48}$$

which checks with Eq.(38). Just before making contact with the earth's surface, the test body velocity is,

$$\mathbf{u}_s = -\hat{\mathbf{r}}\sqrt{\frac{GM_{ea}}{2p\, r_{ea}}}\,. \tag{49}$$

In test body cases, the slick Newtonian approximation obscures the true problem. It describes a free-falling mass as converting "potential" to "kinetic" energy and carrying the latter to the source body, which ultimately absorbs the "kinetic" energy as heat. However, in connection with Eqs.(48) and (49), the free-falling body (E_o at ∞) is at rest in an inertial system, its $\gamma = 1$, undergoing no physical change all the way to the ground, After the inelastic collision with the earth,the test body's energy is γE_o, so it has *gained* energy δE_o. This is borne out by the observed change-of-clock-rate and red-shift in a gravitic field. In addition, there is an *equal* amount of heat generated, so a total of $2\delta E_o$ suddenly appears in the collision. Clearly it comes from the source, not the test body, meaning that all of these energies are *electric*, localized in the bodies and conserved. Since the "binding" energy is just that lost to heat, it also is localized and electric in nature. So, the "kinetic" and "potential" energies of Newton are just artificial bookkeeping tricks to allow easy calculation of the heat energy generated, ignoring the relativistic energy increase of the body after it is stopped.

The third case is that of a test body *shot* vertically from the earth's surface with a velocity the negative of that given in Eq.(49), again neglecting air friction. With $F_{ext} = 0$, and substituting Eqs.(38), (42), and (43) into Eq.(44), it follows that,

$$\mathbf{u} = \overline{\overline{\mathbf{V}}}_e = \hat{\mathbf{r}}\sqrt{\frac{GM}{2\pi r}}\ , \tag{50}$$

$\gamma = 1$, and the body decelerates to 0 as $r \to \infty$. From the instant it is free, its energy is E_o, with *all other energy adjusted out through the driving mechanism*. Being at rest in the inertial system, it rises with no energy change, either "kinetic" or "potential", and escapes with energy E_o.

At present, most of what conventionally appear to be gravitic energy phenomena actually are localized electric energy exchanges. Without the final ℓ-wave equations and a few new solutions to certain other presently intractable accelerating charge problems, the final word on localized, stored gravitic energy cannot be said. Furthermore, until solutions of accelerating ℓ-wave fields are available, it is premature to say they cannot transmit energy. However it comes out, it is clear that ether conservation will play the major role.

8. Other Conservation Laws

The previous discussion of energy conservation went into great detail because the conventional theories of the quantities being conserved required revision. Most other conservation laws can be understood by considering those same revisions. For example, momentum and inertia derive from the fact that it takes *time* for electric energy distortion in a particle to physically redistribute itself into another particle and be separated from the first. Ether conservation is again central to the process. Even in cases involving presently unexplained phenomena such as baryon and lepton number conservation, it is simple to show ether conservation to be the basis. A brief sketch of the ether theory of particles is required to complete the picture.

From the ether viewpoint, *there are no point particles*. Particles are extended ether configurations that can act as relatively concentrated units for some significant time. If the structure cannot change without outside influence, the particle is stable. If it can redistribute itself into a new form (*i.e.* "convert"), it is unstable. In the simplest organization of particle categories, no distinction between stable and unstable particles is made; and stability is just another property.

Based on the available information, there are only two different classes of particles:

1. Layered particles (layerons)
2. *c* particles (*c*-ons)

The layered particles are, at rest, spherically symmetrical distortion distributions, supported by sustaining waves and made up of one or more co-centered, spherical charge density concentrations, such as those sketched in Figure 3. Examples of 1, 2, and 3 layered particles are the positron, pion, and proton respectively. The only truly stable layerons are the electron/positron and the proton/antiproton; all other layerons are pseudo-stable and will convert (decay). The *c*-ons are constructs that can be stable only by maintaining their velocity at the speed of light, *i.e.* photons and neutrinos; and they convert only through annihilation.

Conversion occurs when a single pseudo-stable particle redistributes to a less distorted configuration, or during a cataclismic collision in which splatter produces a number of by-products. In analyzing which interactions are possible and which are not, it has been found that certain numbers assigned to particles are always conserved, leading to baryon and lepton number conservation. What is conserved in these interactions is ether.

A simple example of this is one used by Feynman [14]. Proton-proton bombardment is used to produce anti-protons by the reaction,

$$P + P \rightarrow P + P + P + \overline{P}\,; \tag{51}$$

but not by,

$$P + P \not\rightarrow \; P + P + \overline{P} \quad \text{or} \quad P + P \not\rightarrow \; P + \overline{P} \tag{52}$$

Violation of baryon number conservation is the conventional explanation. However, from Figure 3, P and $\overline{P}$ have opposite charge distortions and the $\overline{\overline{f}}$ ether density patterns are also opposites. Thus, $P + \overline{P}$ represents zero net ether increment, whereas $P + P$ represents a *large* ether increment. To conserve ether, there must be the original $P + P$ increment and no more. $P + \overline{P}$ adds no more. Both of the interactions of Eq.(52) violate ether conservation. In fact, if vortex conservation is included, all of the cases of baryon and lepton conservation, as conventionally described, are seen to be cases of *ether conservation*.

Conclusion

All conservation laws can be traced back to the single conservation of ether law. In the future, new conservation laws can be found by examining phenomena in light of the ether physics involved. This results in a considerable simplification of the physical picture.

Acknowledgments

The author wishes to thank R.L. Kirkwood and L.O. Heflinger for their considerable aid in discussing and working out special cases used in arriving at the present picture.

References

[1] Dishington, R.H. and King, B.G. (1947) Energy dynamics of the electromagnetic field, *Electrical Engineering*, **66**, 1016.

[2] Kirkwood, R.L. (1950) PhD. Thesis, *Stanford U. Physics Dept*.; (1953) The physical basis of gravitation, *Phys. Rev*., **92**, 1557-1562; (1954) Gravitational field equations, *Phys. Rev*., **95**, 1051-1056.

[3] Dishington, R.H. (1960) Rate of strain invariants in the kinematics of continua, *The Physics of Fluids*, **3**, 482; (1965) Rate of surface strain tensor, *Amer. J. Phys*., **33**, 827-831.

[4] Kirkwood, R.L. (1960) Special relativity in a unified field theory, *Project RAND*, D-7210, 1-36.

[5] Kirkwood, R.L. (1962) Lorentz invariance in a gravitational field, *The RAND Corp*., RM-3146-RC, 1-58; (1970) Lorentz invariance in a gravitational field, *J. Math, Phys*., **11**, 2983-2989.

[6] Kirkwood, R.L. (1972) A metric space formulation of Newtonian fields, *Int. J. Theor. Phys*., **6**, 133-153; (1973) The physics of a metric space with a time variable, *Int. J. Theor. Phys*., **7**, 391-414.

[7] Dishington, R.H. (1989) *Physics*, Beak Publications, Pacific Palisades, CA; (1993) The extended electron and the vacuum, *Physics Essays*,**6**, 110-121; (1993) The atom, *Hadronic J. Suppl*., **8**, 395-414; (1995) Cause and effect in special relativity, in M. Barone and F. Selleri (eds.), *Advances in Fundamental Physics*, Hadronic Press, Palm Harbor, FL, pp. 187-202.

[8] Rohrlich, F. (1965) *Classical Charged Particles*, Addison-Wesley Publ. Co., Reading, MA, p. 12, p. 62.

[9] Feynman, R.P., Leighton, R.B. and Sands, M. (1963) *The Feynman Lectures on Physics*, Addison-Wesley Publ. Co., Reading, MA, **2**, p. 28-3.

[10] Butler, J.W. (1969) A proposed electromagnetic momentum-energy 4-vector for charged bodies, *Amer. J. Phys*., **37**, 1258-1272.

[11] Jackson, J.D. (1962) *Classical Electrodynamics*, John Whiley & Sons, New York, p.268 ff.

[12] Dishington, R.H. (1993) The atom, *Hadronic J. Suppl*., **8**, 395-414: (1993) In F.Selleri (ed.), *Fundamental Questions in Quantum Physics and Relativity*, Hadronic Press, Palm Harbor, Fl., pp. 97-116.

[13] Evans, M. and Vigier, J.P. (1994) *The Enigmatic Photon*, Kluwer Academic Publishers, Dordrecht.

[14] Feynman, R.L., Leighton, R.B. and Sands, M. (1964) *The Feynman Lectures on Physics*, Vol. 2, Addison-Wesley Publ. Co. Reading, MA, p.25-4.