Maxwell's Original Quaternion Theory Was a Unified Field Theory of Electromagnetics and Gravitation

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Introduction

James Clerk Maxwell's original electromagnetic (EM) theory, written during the American Civil War, is widely credited with the first successful unification of electrical and magnetic fields. What has escaped notice is that his original quaternion EM theory was actually a unified field theory of electromagnetics and gravitation.[1][2][3][4]

Actually, what is studied today as "Maxwell's equations" do not appear in any of Maxwell's papers and books.[5] In fact, they are due primarily to one man--Oliver Heaviside--who singlehandedly translated Maxwell's theory to its modern vectorial form after Maxwell was already dead.[6]

Previously we have given a detailed background of the events leading to the adoption of Heaviside's version of Maxwell's theory, and the reader is referred to that work for greater details.[7] Suffice it to say that Heaviside only captured a subset of Maxwell's theory, discarding electrogravitation in the process.

In the present paper we will briefly show that the original quaternionic expression of Maxwell's theory captured the ability to interchange electromagnetic and gravitational forces, literally turning one into the other. That ability was captured by the scalar part of the quaternion--precisely the part that Heaviside discarded and that most modern scientists have never examined or studied.[8][9]

Three EM Field Effects on Charged Particles

Two major effects that EM fields produce on charged particles will be of interest to us: (1) translation, and (2) stress.

There are two kinds of EM translation of a particle: First, translation in a straight line, which is generally known as the electric field or E-field, as shown in Figure 1. Second, translation in a swirl or circle, which is generally known as the B-field (Figure 2).

There are also two kinds of EM stress of a particle: First, compressive stress, as shown in Figure 3. The reverse of compressive stress is tensile stress, which is not shown. With this in mind, let us now look at some difficulties in applying vector mathematics to the physical interaction of EM fields, charged matter, and vacuum spacetime.

Problems Inherent in Vector Mathematics

We first point out that, following the truncated Maxwellian theory laid down by Heaviside, Gibbs, and Hertz--now called "classical electromagnetics"--it is the force fields, $\vec{E}$ and $\vec{B}$, which are considered to be the causative electromagnetic agents. Since in the nonrelativistic case these *force* vectors are defined in terms of mass times acceleration, they represent agents of *translation*.

Figure 1. E-field translation (straight-line)

Figure 2. B-field translation (swirling)

Figure 3. G-potential (charge flux stress).

The notion of the "resultant vector" of a system of multiple translation vectors implies that the entire vector system can be replaced by a single vector *insofar as translation (only) is concerned.* In other words, for translation purposes, the single vector "resultant" will accomplish the same translation action as the total system of multiple translation vectors that it replaces.

If the multivector system does not cause translation, then it may be replaced by a vector zero *only insofar as translation is concerned.*

Note that multivector zero translation systems may differ remarkably in their internal translation vector composition--and thus in their internal action on a medium if such is possible. (See Figure 4)

The assumptions--both implied and explicit--in the ubiquitous practice of replacing translation vector systems with a single translation vector resultant should be carefully borne in mind, particularly whenever the abstract vector analysis (the mathematical model) is taken to represent real physical processes. In the physical world, some differences in the assumptions of the abstract model and physical reality are certainly in order and must be recognized.

For example, in the physical world two "force vectors" do not interact with each other unless some mechanism or medium (such as a mass particle) commonly joins the two (force vectors) together in such a fashion that they and the medium (at least at the common point or area of application) form a single "locked-together" system.

Further, in the real physical world, *internal effects in the interlocking medium, mass, or particle* may be produced by the two locked and interacting forces. Internal effects usually consist of opposing pairs of equal and opposite vectors, and these do not contribute to the external translation of the mass. Instead, they contribute to such effects as internal stress and strain of the local mass medium, rotation of the local region, etc.[10]

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The point is, in the use of vector analysis to represent EM forces and effects, certain assumptions are involved in the mathematical model itself. The abstract vector space (the "medium" in which the vectors are assumed to exist) is taken not to be subject to stress, strain, local spin, etc. The vector space medium is assumed not to interact in any fashion with the vectors, nor the vectors with the medium. The vector space itself has no momentum or physical characteristics of its own, and it contains no virtual state particle flux and virtual state energy. It is a totally static medium, rather than the highly dynamic medium we now know vacuum spacetime to be.[11][12]
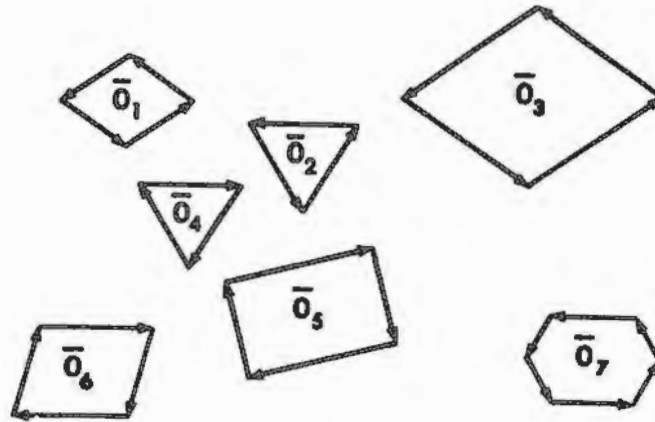

Figure 4. Vector zero resultant systems differ internally.

As can be seen, the application of vector analysis to EM physics carries with it some very strong assumptions contained implicitly within the mathematics itself. Only a few are listed here (Table 1). It should be clearly recognized that the classical EM vector theory implicitly incorporates these unstated assumptions of the vector mathematics itself. Therefore, the classical theory is valid only in those physical cases where the actual physical effects assumed away in the vector mathematics remain minimal or negligible in the physical situations modeled and examined.

As can further be seen, vector analysis itself rules out any dynamism in the abstract vector space and consequently frames an EM theory where dynamic spacetime (curvature) effects do not exist and interact locally. This already rules out electrogravitation (EG, or the translation back and forth between EM and G-potentials and forces). Specifically, such a vector mathematics already ruthlessly specifies the mutual exclusivity of gravitation and electromagnetics.

Nature Is Already Unified But It's Hidden

In nature, such artificial mutual exclusion of EM and G does not occur, because nature is already unified.[13] The same particle that accelerates and reacts to EM forces and principles also reacts simultaneously to G forces and principles. If in a given situation an electrogravitational effect is produced, then the particle will react to it gravitationally.

However, in science we are victims of a strange "positive feedback" effect which for a hundred years has severely distorted the manner in which we can view and experimentally examine electromagnetics and gravity. All our EM instruments have been conceived and developed with the unconscious rigid exclusion of EG, following essentially the "flawed beacon" provided by our classical vector EM

theory as it developed. Most of these instruments are "electron wiggle" detectors, so in EM we have been focused strongly upon the electron and its interactions. Essentially in the foundations of EM theory we have thus been focused upon interactions involving the ordinary type of physical reality created and sustained by photon interaction with electron shells of the atom.

Gravitational aspects occur primarily in and of the nucleus of the atom, since most of the mass of the atom is there. However, this nucleus has a strong Faraday shield of orbital electrons surrounding it, and most EM radiation first interacts with one of these electrons, almost exclusively.[14] Since the electron has minimal mass compared to the heavy nucleus, even appreciable photoelectric interaction with the electron shells still leaves minimized the disturbance of the "mass" or gravitational effects in the nucleus.[15]

Thus our EM concepts and instruments have been strongly conditioned by our "electron-wiggle" detectors, detected currents of electrons in wires, etc. In the vast majority of our presently known and utilized EM phenomena, the nucleus can be and is totally neglected.

Table 1. Some Implicit Assumptions in Vector Analysis

1. Vectors do not interact with vector space (the medium).

2. Vectors need no "physical connector" to interact.

3. Vector space (the medium) contains no hidden subspaces.

4. Vector space (the medium) has no energy, pressure, flux, flux density, hidden fields, curvature, or physical properties.

5. All vector zeros are identical and produce no action on the vector space (the medium).

6. Vector zero and the absence of a vector are identical.

7. A zero-resultant (for translation) multivector system produces no translation. It also produces no non-translation action and is replaceable by a zero vector.

8. A multivector system that has a zero vector resultant has no internal action on the medium (the vector space).

9. Neither the medium (vector space) itself, nor any part of it, has a scalar or vector value.

We See What Filters Through the Photon-Electron Interaction

We may summarize this situation to say that (1) the macroscopic observable reality is largely continually created by radiation interaction with the screening electrons in atoms, (2) all our notions of mass, space, time, and geometry have been profoundly affected and canalized by the universal photoelectric effect, (3) our present EM theory and instruments have been "force-fitted" to the universal photoelectric effect, and (4) the physical reality we observe and conceptualize (and mathematically model) has itself been stripped out of total reality (observed and unobserved); it is an "external shell or level" of physical reality corresponding to the stripping/filtering action of the universal photon/electron interaction.
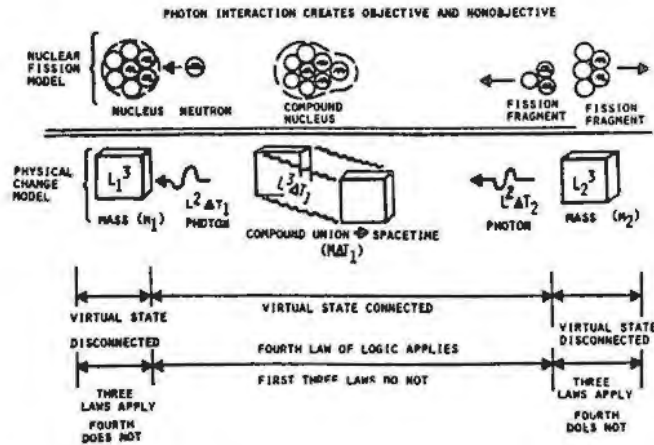
Figure 5. Raindrop model of change.

Rigorously we may say that the common physical reality (macroscopic world) is largely a "slice" of the physical universe as revealed by a photoelectric probe/filter/slicer. Common "observation" and "the observer" by and largely ultimately come down to the absorption of a photon by an orbital electron in an atom, and the consequent re-emission of a photo by that atom. This single process, then--the photon/electron interaction--must produce all the major characteristics of our normal macroscopic universe, including the flow of time, the separation of time from space to leave a spatial residue (spatial observation, so that time is not an observable, etc.) We have previously conceptually addressed the mechanism providing the flow of time [16], and will summarize that mechanism shortly.

Previously we have also pointed out that the normal photon, being composed of (Δ E)(Δt), carries both energy and time.[16][17][18] A time-reversed photon (antiphoton) is composed of (-ΔE)(-Δt), and so it carries *negative* energy and *negative* time.[19]

The reason gravitation has eluded our grasp is because we have dealt only with positive energy and the positive flow of time, engendered by the ordinary photon interacting with the electron. We have neglected the negative energy and negative time produced in the positively charged nucleus.

The Raindrop Model of Physical Change

Figure 5 shows the way each mass marches through time. The absorption of a photon by a mass momentarily connects (Δt) to the spatial mass, forming masstime. During that moment, gravity (which exists in time) and electromagnetics (which also exists in time) are both connected to the mass--and hence cojoined, interlocked, interactive, and unified. Then--the next moment--a photon is re-emitted, tearing away the (Δt) from the temporary masstime and carrying the (Δt) away, leaving behind a spatial mass. At that moment, gravity and EM are no longer cojoined and interlocked, but are "mutually exclusive."[20]

Time-Reversal, Nucleus, Binding Energy, and Antigravity

A similar thing happens in the positively charged nucleus, except that now the charge is reversed, and this constitutes time reversal also. When a photon is time-reversed, both its energy and time contents are reversed--that is, made negative.[21]

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Constant absorption and emission of virtual antiphotons in the nucleus are responsible for its positive charge and for time reversal of the area. The negative energy constantly created (in and of the interchange with the vacuum virtual particle flux) in the nucleus subtracts from the total mass of the nucleons and produces the binding energy (negative energy) that holds the nucleus together. It also produces gravity; because the negative energy between any two "mass lumps" in the overall "vacuum field" means that force must be exerted to keep them apart.[22]

The negative time constantly created in the nucleus by its virtual photon flux exchange with the vacuum is normally small. This is because the violence of the vacuum flux is immense; which means that mostly very high frequency virtual photons are normally being absorbed and emitted. Each of the high negative energy photons thus has very little negative time, since its time and energy content are canonical. This is fortunate, for in negative time, gravity also is reversed and is a repulsion rather than an attraction. If a great deal of excess negative time were produced in the nucleus, a great deal of antigravity would be produced and matter itself would fly apart.

If the surrounding vacuum flux adjacent to the nucleus is artificially structured [23] so that appreciable low frequency photon absorption occurs in the time-reversed nucleus, then appreciable antigravity will be produced.[24] Normally the electron-shell screens of the atom serve to screen out all external low-frequency antiphotons from nuclear interaction, thus preventing natural antigravity.[25] But to return...

In Our Sensors, Atomic Nuclei Are Electron-Shielded

Every atom of every physical instrument is itself involved in the continual time-filtering of reality caused by the photoelectric effect in its screening electron shells. Therefore our instruments themselves are effective filters which mostly produce interactions consistent only with photoelectric reality. Quite simply, their own physical nature means that, if we use ordinary "translation" electromagnetics, the instruments will never measure any indication of electrogravitation, even if electrogravitation is occurring.

Also the electron-screened atoms *outfold* positive energy and positive time, causing the creation and sustaining of our normal entropic reality. They *infold* negative energy and negative time, hiding negentropy and antigravity and separating EM and G from EMG.

Our present electromagnetics-- both theoretically and experimentally--is *severely filtered* to be consistent with the photoelectric level of observed reality.

Focusing strongly upon translation EM force vectors and assuming a lack of vacuum interaction is a direct result of the reality filtering performed by the atoms in our instruments, our bodies, our observation processes, and our conditioned conceptual notions of reality.

Present EM Is Just a Subset

Primarily because of the structure of the atom and the vector mathematics in which our EM theory is imbedded, classical EM theory has selected and addressed a *subset* of unified EMG. In this subset, the EM and the G are mutually exclusive, and EM never turns into or produces G.

Thus we are universally taught to replace a system of two or more translation force vectors with a single "resultant" translation force vector, with no thought of the effects in and on the local medium in and on which the system of vectors acts. If this resultant is a zero vector, we simply discard the entire system of multiple vectors along with any local effects--such as stress, strain, rotation, distortion, change in virtual particle flux of vacuum, change in the charge of each charged particle, etc.--being produced in the medium by the multivector system.

We repeat and strongly stress that, when $\vec{E}$ and $\vec{B}$ translation vector systems (multiple vectors added or multiplied) reduce to a zero vector resultant, rigorously it means only that the system produces no translation result in and on whatever electromagnetic medium--such as a charged particle or the vacuum virtual particle flux--the system acts upon.

However, the zero-vector translation system may well be producing other infolded *non*translation effects such as stress of the medium, either material or vacuum. Since classical EM vectors are defined in terms of translation, then obviously the nontranslation effects of the zero-vector resultant system are ***non-EM*** in nature.

Of course these infolded effects are gravitational, and it is the purpose of this paper to point that out. It is also our purpose to point out that the quaternionic expression of Maxwell's theory captures this infolded electrogravitational system and its effects.

The Vector Cross Product

To show that quaternions capture aspects of EM turning into gravitation, we need only examine the difference between a cross product operation in quaternions and the same operation in vectors. The example--cross multiplication of two identical nonzero translation vectors--is specifically chosen so that the vectorial cross product yields a zero vector. The example is also chosen so that the vector magnitude is a periodic function of time, and the "stressing weight" of the multivector system also is a periodic function of time. In this manner we will be able to directly show the relationship between EM and G, and between electromagnetic waves and gravitational waves.

In a conventional 3-dimensional vector $\vec{v}$, one may have three vector components, such as (in Cartesian coordinates):

$$\vec{v} = a\vec{i} + b\vec{j} + c\vec{k} \tag{1}$$

and $\vec{i}$, $\vec{j}$, $\vec{k}$ are unit vectors in the directions of the x, y, and z axes respectively and a, b, and c are constants.

Obviously, if the x, y, and z components of vector $\vec{v}$ are zero vectors, then

$$\vec{v} = \vec{0} \tag{2}$$

We shall be interested in the vector product of two identical translation vectors $\vec{v}$ where

$$|\vec{v} \times \vec{v}| = \|\vec{v}\|^2 \sin\theta | = |A^2 \sin\theta| = |\vec{R_t}| = |\vec{0}| \tag{3}$$

where A is the length (magnitude) of vector $\vec{v}$, θ is the angle between the two vectors (in this case zero), and $\vec{R_t}$ is the ***translation resultant***. We further suppose that vector $\vec{v}$ represents an electric force vector in vacuum.

The translation vector resultant R_t in this case is equal to the zero vector. This result states that the system $(\vec{v} \times \vec{v})$ will not produce external translation of a charged particle. It has nothing to say about possible *internal* stress effects in the medium due to the presence of the two interacting vectors $\vec{v}$. To address that issue, we must examine the situation differently.

In classical electromagnetic theory, it is assumed that all the electromagnetics have now vanished since the *electromagnetic vector resultant* is a zero vector. This is true, of course, insofar as translation--and *only* translation--is concerned. Nonetheless, EM students universally are taught to totally replace the $(\vec{v} \times \vec{v})$ system with the zero translation vector, simply discarding any other nontranslation action without further qualms.

This erroneous procedure is equivalent to assuming that, not only have all *EM translation* actions vanished, but all *other* actions--such as EM stressing of the medium--have vanished also or are totally insignificant.

However, this is not necessarily always true. While equation (3) indicates that all the *translation effects* of the system $(\vec{v} \times \vec{v})$ have vanished, it need not necessarily mean that all *non-translation effects* have ceased.

Specifically, equation (3) does not necessarily exclude the existence of a *gravitational interaction* of the two vectors, since they both may still be present, be dynamically varying within the vacuum medium without translating it, and be constantly varying and structuring the *local energy density of the vacuum medium*. Equation (3) only states that *the interaction occurring, if any, is simply no longer EM-translational in nature*.

Vector analysis, however, cannot resolve this quandary, for (in it) all zero vectors are identical and have no "internal causative action" such as stress on the abstract vector space. Hence vector analysis itself conceals and ignores any further hidden action of the dynamically substructured zero-vector EM system.

In this manner, the use of a vector mathematics model for EM theory automatically focuses only on the translation effects upon charged particles, and specifically excludes internal stress (gravitational) effects due to the interlocked and interacting EM forces.

The Same Situation In Quaternions

Let us examine the same situation in quaternions, where each of the two corresponding quaternions q̂ is given by

$$\hat{q} = w + a\hat{i} + b\hat{j} + c\hat{k} = w + \hat{v} \qquad (4)$$

Note that, in the quaternion q̂, w is a scalar component added to the usual three vector-like components aî, bĵ, and cк̂--or, in other words, w is added to v̂. For comparison to equation (3), the quaternion product of (q̂×q̂) yields (neglecting the negative sign of the final product) and with w=0,

$$\hat{q} \times \hat{q} = v^2 + \vec{v} \times \vec{v} = a^2 + b^2 + c^2 + \vec{0}_t \qquad (5)$$

We compare equation (5) with equation (3). As can be seen, in the quaternion operation the three vector translation components have still interacted to produce a zero-translation vector resultant $(\vec{0})_t$. However, the quaternion operation has also captured an additional scalar function of the interactants. The quaternion cross product in fact also produces a nonzero *scalar resultant* that itself is the ordinary product of the amplitudes of the primary vectors that enter into the operation. [In fact, the scalar part of the quaternion product is equal to the vector dot product of the two vector portions; in this case, $(\vec{v} \cdot \vec{v})$].

Suppose now that the vector $(\vec{v})$ represents the magnitude at a point of one of the two force components--say, the E-field--of a monochromatic continually passing electromagnetic sine wave. We then may represent vector v̂) as

$$\vec{v}(t) = A_0 \sin \omega t \hat{j} = E_0 \sin \omega t \hat{j} \qquad (6)$$

Now let

$$\hat{q}(t) = A_0 \sin \omega t \, \hat{j} \tag{7}$$

then

$$\hat{q}(t)\,\hat{q}(t) = \hat{S}(t) = -[A_0^2 \sin^2 \omega t + \vec{0}(t)] \tag{8}$$

As can be seen in equation (8), the vector part of the quaternion has produced the same zero-translation vector but the quaternion has captured the infolded stress as $A_0^2 \sin^2\omega t$--and this is a *scalar wave* which we will refer to as S(t). (See figure 6.). So a scalar wave S is produced by the cross product of the quaternions, and vector analysis ignored this aspect.
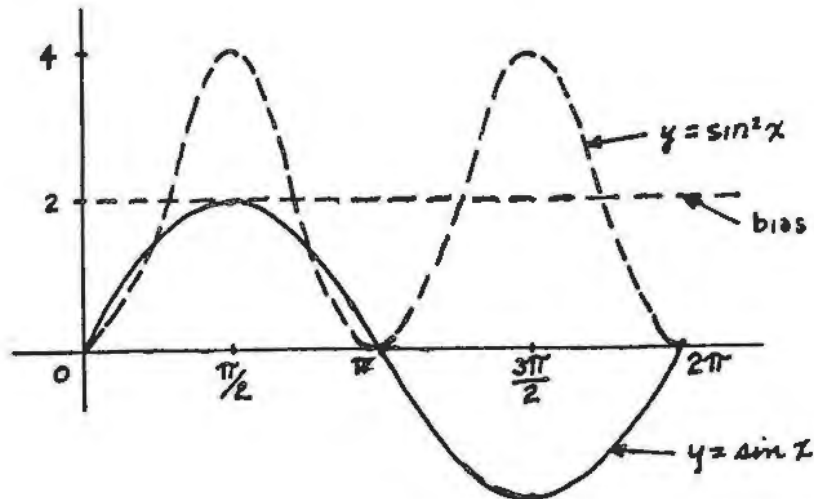

Figure 6. Sine-squared wave vs sine wave.

Since the translation vector portions interacting in the cross product yield a zero vector resultant, the system of two crossed vectors does not translate in space, but is fixed in local position. By ordinary conservation of energy, each translating vector $\vec{v}$ brings an amount of energy to the fixed local interaction area that is proportional to the square of its amplitude A. The A-squared term of wave S therefore is proportional to the energy brought into the local interaction area by one vector $\vec{v}$ acting upon (urging) the other vector $\vec{v}$.[26] Since energy must be conserved, the local energy density of the medium has been increased by an amount directly proportional to the A-squared term.

Wave S in equation (8) represents a *scalar EM* (electrogravitational) stress wave--an oscillation of the local curvature of the vacuum, since it is varying the amplitude of the local energy density of vacuum as a periodic function of time.

Standing Scalar EM Waves

Suppose we have produced wave S as a standing wave. This wave is scalar, since it has no EM translation force field resultant. It is oscillating about an increased potential bias. It is periodically oscillating the local energy density of vacuum. *Rigorously it is a powerful local gravitational wave.* What is being oscillated or varied is the intensity (volumetric density) of the virtual particle flux of the local vacuum.

Now let us suppose that standing wave S is formed in a material medium. Since S has no EM force resultant, it does not interact with the electron shells of the atom. Instead, it passes through the electron-shell "Faraday cage" surrounding the nucleus and interacts with the highly nonlinear nucleus. What is now oscillating is the EM potential (charge) of the nucleus itself. The energy density of the charged nucleus--and hence its EM potential--is being oscillated as a periodic function of time. The oscillating potential, however, is deterministically substructured (internally polarized) by the infolded EM multivector system.

The local virtual particle flux of vacuum is accordingly polarized and structured. To differentiate this deterministically structured potential from a natural potential having random internal particle flux, we designate it as an *artificial* potential, and note that it is directly equal to the zero-vector resultant translation system $\bar{0}_t$.

The (electrogravitational) scalar EM wave S interacts with the nuclei of atoms. Its medium in a material is the atomic nuclei, not the electron shells. If it is a traveling wave instead of a standing wave, its medium is still the atomic nuclei, not the electron shells. Such a traveling scalar wave readily goes through the vacuum, the earth, the ocean, etc.

Unless special processes such as interferometry are utilized, normal EM "electron wiggle" detectors do not "see" this scalar EM wave since it normally does not translate electrons. Certain detectors (such as those containing mixtures of noble gases) will produce detectable ionization effects when exposed to scalar EM waves. Once such a weak detection effect occurs and produces ordinary EM, cascade discharge stages can be utilized to amplify the weak EM and produce sensitive detectors. In addition, certain effects in semiconductors are fairly sensitive to time stress (relativistic changes in time itself), and these effects can be utilized to produce normal EM outputs which are readily displayed on an indicator.[27]

Two Kinds of Electromagnetics

Thus there are *two kinds of electromagnetics and two kinds of electromagnetic waves*: (1) the normal translation force vector kind, which translates charged particles and interacts primarily with the electron shells of an atom, and (2) the artificial scalar potential kind, which does not translate charged particles, and interacts primarily with the atomic nucleus.[28]

The normal electromagnetics is involved with positive time, positive energy, and photon interaction with negative charges. The second kind of electromagnetics is involved with negative time (time reversal), negative energy (such as binding energy of the atom)[29], and photon interaction with positive charges.

At appreciably high frequencies (e.g., in the several megahertz range), normal vector electromagnetics has extreme difficulty penetrating media such as the ocean, since it so richly interacts with the externally charged particles in the oceanic ions.

The scalar kind of electromagnetics, however, readily penetrates media such as the ocean, since it only slightly interacts with the externally charged ions. It easily penetrates the earth as well.

Random Vs. Deterministic Structuring of Potential

It should be noted that the scalar EM wave is a wave of pure potential, but of a very special nature. In simplest form, *it is a wave in the equal but opposite phase-locked amplitudes of pairs of antiparallel EM force vectors*. This is a wave of oscillating "artificial" potential, which acts very differently from a wave of natural potential as follows.

First, a natural electrical potential (say, the electrostatic scalar potential) consists of a change in the random virtual photon flux of vacuum. By an electrically charged particle, we mean a particle of mass that is a little dynamo, in that it is continually in an exchange of virtual particle flux with the surrounding vacuum. That is, the charged particle is actually *imbedded* in the vacuum flux--further, it itself has a tiny "electrostatic scalar potential," due to its charge. The normal vacuum virtual particle flux is random; so, in a natural potential which does not structure the vacuum, single tiny E-field force vectors are continually arising in random fashion on any charged particle within the potential's region of altered flux. Consequently, one treats the natural potential simply as a special sort of altered *pressure* or stress (which may be positive or negative, compared to the ambient vacuum). A charged particle embedded in the natural electrostatic scalar potential thus moves along the gradient of the potential, since (crudely) there is higher "pressure" on one side of the finite particle than on the other.

Second, the artificial potential is quite different. It always has two virtual particle flux components: one is random, and the other is deterministically structured. The artificial potential always has the same *random* virtual particle flux as the ambient vacuum or a deliberate bias from it; consequently, there is no "random" pressure difference (gradient) in any direction on an embedded charged particle. However, the artificial potential also has an additional internally directionalized (polarized) stress structure which, on an imbedded charged particle, produces equal and opposite antiparallel E-field force vectors that coherently vary in magnitude. The artificial potential thus produces an additional *structured charge flux* on an embedded charged particle, in addition to the particle's normal unstructured random charge flux. It varies the overall charge of the particle; however, it itself does not translate the particle.

Structured Charge Is Infolded Information

This is most important. The artificial potential does not produce a translation gradient in virtual particle flux, hence it does not translate an imbedded charged particle. Instead, it produces an additional deterministic, structured change in the particle's actual charge flux intensity, added to the particle's normal statistical charge flux.

This structured charge represents *physical information* inside electrical charge itself--but of a physical, causative nature.[30][31] It represents *structured gravitational charge* and *deterministic, structured curvature of local spacetime*. It represents *vacuum engineering*. It represents *engineering of the virtual particle flux of vacuum* (and of the virtual particle flux of charged matter as well). It violates the present assumption of constant fixed charge for charged particles. It also violates one of the present axiomatic assumptions in quantum mechanics: that microphysical changes are always randomly statistical at base.[32] It allows direct engineering of the Schroedinger equation. It allows direct engineering of the vacuum, *including the direct addition of patterned energy to specific, selected "ghost forms"[33] in the virtual state flux of vacuum*. This means that transmutation, materialization, and dematerialization are directly possible and practical, as well as hosts of other things presently envisioned only in science fiction.[34]

Engineering Quantum Reality

Today only about a hundred or so physicists throughout the world are deeply involved in pursuing the nature of quantum reality.[35][36][37][38][39] Quantum mechanics seems to imply a strange, eery kind of reality that is--to put it mildly--totally insane.[40]

Presently eight interpretations--eight possible kinds of physical quantum realities--have been advanced (see Table 2). All present quantum experiments fail to differentiate between the eight realities; all eight realities fit the experiments equally well. Most quantum realists presently are attempting to find some particular experiment which will allow them to distinguish between the eight realities. So far as the present author is aware, *none* of the quantum realists is utilizing zero-translation-vector EM resultant systems (electrogravitation) and artificial potentials to *directly engineer quantum reality itself*.

Scalar EM adds a ninth quantum reality, which in fact includes all of the other eight.[41] Further, it allows the direct engineering of quantum reality itself, and it represents a new and bizarre physics more frightening and astonishing than the mind of man has imagined.[42] Finally, scalar EM allows direct engineering of the atomic nucleus itself, using a "surgeon's scalpel" and microsurgery instead of the present "blacksmith's hammer" and blasting.

It is a drastic change to quantum mechanics, for it also represents a deterministic engineering (structuring) of the Schroedinger equation. This means that, theoretically, one can now determine and control whether or not a thing shall even be allowed to arise or persist in physical reality, and *how* it shall be allowed to arise or persist. In short, by engineering and controlling the virtual state, one gains the ability to engineer and control *physical reality itself*.

The potential for all of this was present in Maxwell's original quaternionic EMG theory, but the G aspects were discarded by Oliver Heaviside after Maxwell's death.[43]

Table 2. Eight Kinds of Quantum Realities

1. Copenhagen Interpretation. Part I.
   [There is no deep reality.]

2. Copenhagen Interpretation. Part II.
   [Observer created reality. The world is created by the act of observation.]

3. The world is an undivided wholeness.
   [Includes superluminal phase entanglement.]

4. Everett's many-world's interpretation.
   [Every possibility exists and is real: The universe continually splits into a myriad of alternate universes. Bell's theorem does not apply.]

5. Quantum logic.
   [The world is constructed like a non-Boolean lattice.]

6. Neorealism.
   [The world is made up of ordinary objects. This is the only proposed quantum reality that we can in theory directly experience.]

7. Consciousness creates reality.
   [Faraway minds can alter the fabric of reality, but not the pattern of quantum change woven thereon.]

8. Heisenberg's duplex universe.
   [The unmeasured universe consists of ghostly potential. Many contradictory tendencies coexist. None is completely defined or real until one is selected by measurement occurring.]

Scalar EM Is Electrogravitation

Thus the *quaternion* expression of Maxwell's theory--that is, the theory's original form--captures the transformation of electromagnetic energy into structured gravitational energy. In short, it captures *electrogravitation* and *electrogravitational waves*. Note that, in equation (8), S(t) is a *scalar* EM wave, and a *standing* wave. It is a wave of pure *electrogravitational potential*, and an oscillation in the curvature of local spacetime.

During Maxwell's time, however, the local curvature of spacetime was not yet conceived--although Maxwell himself seems to have anticipated the gist of special relativity.[44] Maxwell wrote the first paper of his theory beginning in 1864, towards the end of the American Civil War; conceptually spacetime itself, along with its curvature, was not to widely appear as we know it today until after the turn of the century--decades after Maxwell's death.

With the quaternion form, however, electromagnetic calculations were quite laborious and difficult because of the complicating scalar component. Only a few rare scientists labored in Maxwell's quaternion theory, protesting all the while.

After Maxwell's death, the modern form of vector analysis was completed, with a major role being played by Oliver Heaviside[45], supported by Hertz[46] and Gibbs.[47] Heaviside singlehandedly "translated" Maxwell's quaternion theory into his new vector mathematics.[48] In doing so, he simply discarded the troublesome scalar component of the quaternion to greatly simplify mathematical calculation. Further, Heaviside detested the "metaphysical" potentials and--along with Hertz--focused attention on the electromagnetic force fields.[49][50] In so doing, Heaviside discarded the electrogravitational portion of Maxwell's theory. This reduced Maxwell's unified field theory to the gravity-free EM subset we know today.

Gravity-Free EM Theory Is Only a Subset

The Heaviside vector translation of Maxwell's theory is a subset of the original theory, and rigorously applies only to those situations in which gravitation and electromagnetics do not interact, but remain mutually exclusive. Specifically, in a zero vector resultant sum or product, the Heaviside-Maxwell theory does not capture the infolding of electromagnetic forces [inside vector zero resultant EM systems] to form structured electrogravitational stress. It only captures EM *translation* [outfolding], and does not capture the case where the electromagnetic energy in opposing EM force field systems is trapped and stabilized in a locally stressed region of vacuum with zero-vector $\overline{E}$ and $\overline{B}$ translation resultants.

We may say that Heaviside captured *vector translation* electromagnetics, but discarded *scalar* electromagnetics--in short, he discarded electrogravitation and vacuum engineering.[51] We may also say that gravitation is simply "frustrated" (infolded) electromagnetics, and electromagnetics is simply "liberated" (outfolded) gravitation.

Whittaker Showed That EM is Scalar

In two papers in 1903 and 1904, Whittaker showed that the Heaviside vector EM theory can be completely replaced by a scalar EM theory.[52] These papers had apparently largely been ignored until the present author realized their fundamental importance. *Together they form an engineerable unified field theory.*

In the latter 1970s and early '80s the present author, basing his work on Whittaker, called the entire area *scalar electromagnetics*, and pointed out the zero vector sum/product of multiple vectors as an artificial electrogravitational potential. He specifically accented the scalar EM wave as an electrogravitational wave and an oscillation in the curvature of the local spacetime.[53] In so doing, he proposed a unified field theory which inadvertently recaptured the essence of Maxwell's original quaternion theory.

In the mid-80s both the present author and Dr. Henry Monteith independently discovered that Maxwell's original theory was in fact an electrogravitational unified theory. Monteith, a theoretical physicist of strong mathematical capability, is presently engaged in a full mathematical expansion and adaptation of Maxwell's quaternion theory, and has verified that the content of modern spinor and twistor theories are captured by his approach.[54]

But to return to the history of classical EM development.

Drastic Curtailment of General Relativity

Shortly before the turn of the century, a short debate occurred, and Maxwell's quaternion theory was totally discarded in favor of Heaviside's "translation."[55] Since then, only Heaviside's subset of Maxwell's theory has been taught in Western universities, and it has been mistakenly represented as Maxwell's complete theory.

As a student, Einstein studied Heaviside's version of Maxwell's EM theory. Thus he accepted the fact that electromagnetics did not produce local curvature of spacetime. That is, Heaviside *translation* electromagnetics only represents the electromagnetic waves where the EM energy is "rapidly passing through" local spacetime, and consequently has only momentary and negligible effect on local spacetime curvature.[56] Accordingly, Einstein could only envision the curvature of spacetime as being due to the weak gravitational force which--for electrons--is only some 10^{-42} times as strong as the electromagnetic force. It would require a huge collection of mass to produce a "mass attraction" gravitational force that is strong enough to curve spacetime measurably.

Thus it appeared to Einstein that only in the immediate vicinity of a huge mass--such as the sun or a star--would spacetime be curved sufficiently to produce readily observable effects. Accordingly, Einstein reasoned that the observer's *local* spacetime would never be curved, since neither the observer nor his laboratory instruments would be on or near the surface of a star.

The result was the crippling assumption by Einstein that the local spacetime was always flat: the local frame was always a Lorentz frame. This also saved the conservation laws[57], which by that time were deemed sacrosanct. In fact Einstein did not write a theory of unrestricted anisotropic spacetime at all; instead, he wrote a sort of "special relativity with distant perturbations."

Einstein's assumption of a flat local spacetime in turn has led generations of physicists to assume that (1) local spacetime cannot be readily curved, even in theory; (2) practical laboratory bench experiments in general relativity are impossible a priori; (3) local conservation laws rigorously apply locally; and (4) a stabilized locally-curved spacetime cannot be practicably generated and utilized as a source (or sink) of power.

It is strongly pointed out that none of these assumptions of Einstein's theory of general relativity need hold if scalar electromagnetics is utilized.

Einstein's Final Fruitless Search

Ironically Einstein spent the remainder of his life unsuccessfully searching to unify electromagnetics with his restricted general relativity--never realizing that his own restrictive assumption of a flat local spacetime prevented the very unification he sought.

After all, in KK theory, does not fixed local curvature of spacetime represent a stabilized 5-dimensional gravitational potential (a stabilized 5-potential)? Does not a stabilized 5-potential of necessity require the localized "trapping" of any 5th dimensional bleed-off or bleed-in? Does not this require the localized trapping and blocking of 5th dimensional translation EM? Does not the normal "translation EM" represent the "flight" of the 5-potential in the fifth dimension? Is this not the escape of local curvature at the speed of light? Does this not in turn imply that normal EM represents the situation where local spacetime is flat--except for a fleeting instant--since any local curvature due temporarily to the strong EM force simply translates away at the speed of light?

Classical EM is the swift fleeing away of the local curvature. Assumption of a local flat spacetime is equivalent to assuming that EM forces are always free to flee. How then could Einstein have possibly united the notion of swiftly fleeing curvature with the idea of non-fleeing curvature? He had already opted to always allow local curvature to flee.

To solve the problem and yet retain the notion that the EM forces represent the flight of local curvature (local EMG), obviously one must have the curvature flee in opposite directions simultaneously. That is, in the 5-potential of a local area, EM must be fleeing-in at the same rate it is fleeing-out. If the two flights are equal, then the 5-potential is in equilibrium with respect to 5th dimensional change.

Thus locked-together equal-and-opposite EM forces--*infolded EM forces, or locked-in EM stress*--is the only way in which EM and G can be reunified. But this in turn requires the local anisotropy of spacetime--the stabilized presence of the nonzero local 5-potential. Unfortunately, Einstein's assumption of a flat spacetime excluded precisely the only means of unification of electromagnetics and gravitation.

Note that what we are saying is that the present entire theory of electromagnetics has been made a *"gravity-free" EM. The present highly restricted general relativity has been made an "EM-free" spacetime curvature theory. Obviously the missing ingredient for unification is a process for turning EM-less G into EM, and G-less EM into G.*

That is precisely what scalar EM theory does. By infolding EM we convert EM translation forces into localized stress, which is a 5-potential and hence gravitation. By establishing a single 5th dimensional gradient in the 5-potential, we release the inner EM stress contents of the 5-potential back into the 5th dimension as translation EM.

Note also that the key to the entire process of translation back and forth between G and EM is the multivector zero-resultant system--so long pointed out by the present author as the key to unified EMG theory.

The Soviets Have Developed a Unified Field Technology

While Western physicists have continued to uphold Einstein's general relativity restriction in their zeal to save the conservation laws [58], Soviet scientists have long since removed this artificial assumption. Soviet papers in full and unrestricted general relativity--with concomitant ready violation of local conservation laws--are regularly published by leading Soviet physicists in leading Soviet journals.[59]

The Soviets certainly know about structured electromagnetics[60][61] and have clearly developed the EG induction of disease [62][63][64] and incredibly powerful strategic weapons.[65] Obviously the Soviets have developed an engineerable, practical unified field theory and secretly applied it. Unfortunately, Western scientists and military and governmental leaders still find it difficult to believe that the Soviets could be technologically ahead of us in anything.[66]

Application To 4-Wave Mixing

Most modulations are represented by multiplication between two waves. Suppose we have two equal-amplitude, continuous monochromatic E-field sine-waves, introduced into a nonlinear dielectric medium in antiparallel and antiphased fashion (Figure 7). The translation effects of the two waves are therefore zeroed. Their E -fields sum everywhere to a zero resultant vector spatially, if the waves interlock. Fortuitously, the nonlinear medium will act as a modulator, causing the two waves to "lock together" in the required fashion. Thus the E-fields counterbalance and spatially sum to a zero-vector translation resultant.

However, the infolded spatial energy density of the zero-resultant EM system is rhythmically varying. This zero-vector wave of pure potential is called a "pump wave" in nonlinear optics, and it is related to a special application (pumped phase conjugate mirrors and amplification of time-reversed waves in four-wave mixing).[67]

What does not appear in present nonlinear optics theory is that, in the atomic nuclei of the pumped medium, a standing sine-squared scalar EM (electrogravitational) wave S of timestress (energetic stress on time) will be formed, very similar to equation (8) above. The S-wave will not appreciably react to the orbital electron shells of an atom of the dielectric, but will pass through them directly into the nonlinear nucleus itself.

Quantum mechanically, the nucleus is a region of local sharp curvature of spacetime. It is incredibly dynamic, with particles of every kind continually changing, transmuting, giving off other particles, turning into waves, etc. The nucleus contains violent and dynamic charges and locally fierce currents, with field strength fluctuations reaching 10^{40} and above. The nuclear charges are also in violent virtual particle exchange with the neighboring vacuum--which is what electrical charge *means*. Also, on the average the nucleus is positively charged, so that--on the average--it is *time reversed*.[68] Further, negative energy plays a vital part in the binding energy that is holding the nucleons together.[69] The nucleus and its trapped charge flux also constitutes a fierce, localized EM potential.
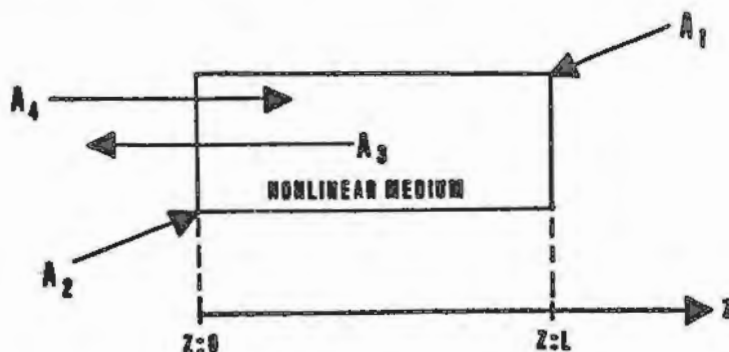

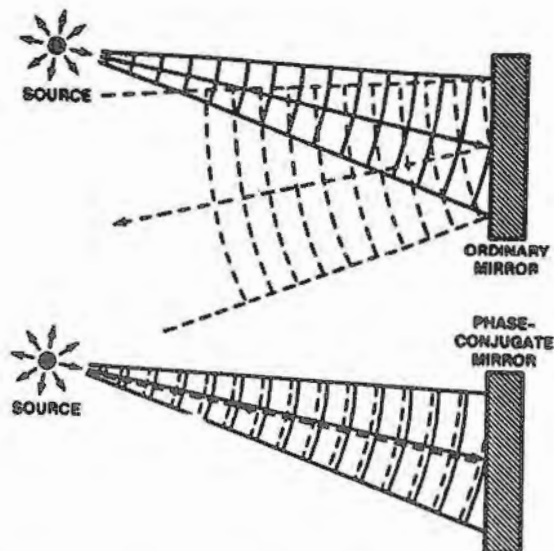Figure 7. Phase conjugation by four-wave mixing.

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Figure 8. Ordinary mirror reflection vs phase conjugate mirror reflection.

The S-wave enters into this kind of nucleus and interacts with it, altering the nuclear potential--on the average--by the "DC bias" amount of the sine-squared wave S. This constitutes an "excited state level" of the nucleus and the nuclear potential. About this excited DC state level, the nuclear potential is varying in sine-squared fashion, from the normal unexcited state level to twice the DC excited state level. This dynamically oscillating potential wave constitutes a *pump wave* acting on the nucleus itself, and it is rhythmically pumping the amplitude of the nuclear potential. The nucleus now functions as a pumped phase conjugate mirror.[70]

Note that the reflection characteristics of a PCM are quite different from the reflection characteristics of a normal mirror, as shown in Figure 8. We may also think of the pumped nucleus as having now been conditioned to function as a parametric amplifier, ready to be given another "signal input."[71]

Now let us introduce yet another small sine wave into the nonlinear dielectric, of the same frequency as each of the two sine-wave components that produced the S-wave. In parametric amplifier theory, this additional sine wave is called the "signal input." In Figure 7, it corresponds to wave A_4.

The signal input will modulate each of the two pump wave components (waves A_1 and A_2 in Figure 7), forming a scalar sine-squared modulation upon the scalar sine-squared pump wave (the S-wave). This signal modulation will be conducted directly into the nucleus of each atom. In positive time, this now constitutes a "signal input" to the "parametric amplifier nucleus (PAN)." The input is absorbed and amplified, up to the level of the pumping energy available in the pump wave that can be "scavenged up and gated" by the PAN.

However the nucleus, being time reversed, also produces a *time-reversed absorption*--which is seen spatially reversed by the external observer as constituting *emission*! That is, in his own positive time, the external observer sees the time-reversed absorption event as an emission event. Further, this is a time reversal--and hence an "emission" to the external observer--of the entire parametrically amplified signal wave. [After all, in reversed time it is the pump wave that was the signal wave and it is the signal wave that was the pump wave. That is, in reverse time it is the externally-seen pump wave that was modulating the externally-seen signal wave--a principle of importance.]

X

0 └— **Z**

E_2 ← ‖ ‖ ‖ → E_1

E_2 ← → E_1

E_1 = incident wave (time-forward)

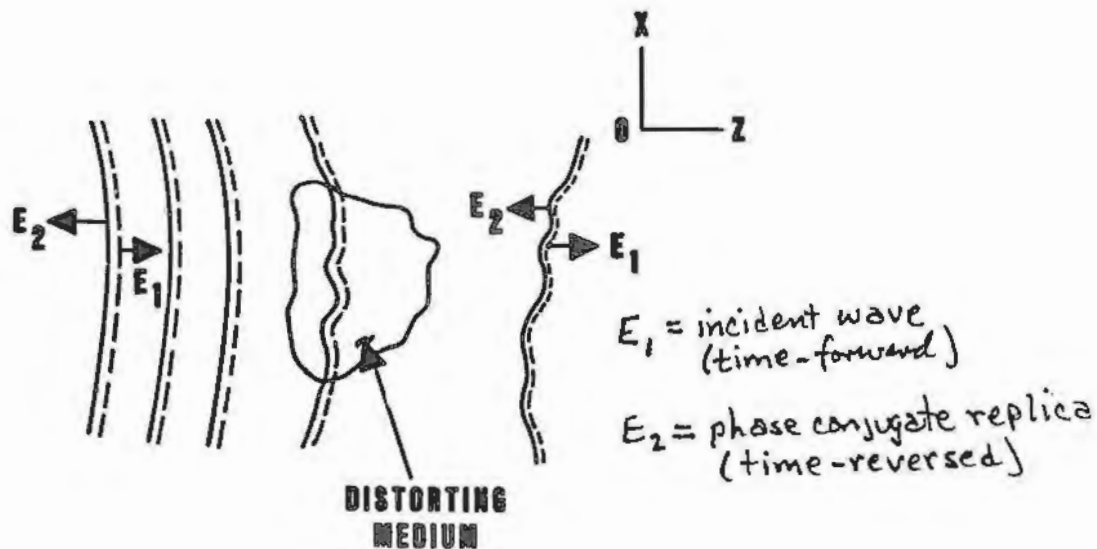E_2 = phase conjugate replica (time-reversed)

DISTORTING MEDIUM

Figure 9. Phase conjugation by a nonlinear, distorting material

So the powerfully amplified signal wave in the parametric amplifier is seen by the external spatial observer to be *emitted from the nucleus* (intra-atomic precursor of wave A_3 in Figure 7). Within the atom, it is emitted from the nucleus as a sine-squared wave, and spatially reverses back through the modulator to accomplish demodulation. A time-reversed and powerfully amplified sine-wave (*not* now sine-squared!) emerges from the atom.

In the pumped nonlinear material, wave A_3--a time-reversed and powerful phase conjugate replica (PCR) of the signal wave A4--is emitted when the pumped mirror is tickled with the signal wave. This amplified PCR wave A_3 passes back along the exact path taken by the original "signal wave" A_4. Figure 9 shows this "backtracking" capability of the PCR wave. (Table 3 adds further details of the unusual characteristics of the PCR wave.) To a time-reversed entity (the PCR wave), that invisible trail ahead of it in space was previously blazed by the initiating signal wave, and that is its *path ahead of it in positive observer time.*

The external observer sees the emitted wave emerge as a powerfully amplified *time-reversed EM wave*, backtracking precisely back along the exact path taken by the signal wave, and appearing everywhere in phase *spatially* with the continuous signal wave.[72] Table 4 gives the accepted statement of this characteristic of the PCR wave, called the "distortion correction theorem." In 4-space, of course, the PCR wave is antiphased with the signal wave in the fourth dimension, time.

Table 3. Phase Conjugate Replica
Time-reversed. Carries negative time. Carries negative energy. "Healing" property. Distortion correction From disorder to order (negentropic) May dwarf input stimulus wave.

Four-Wave Mixing Is Like a Triode

The above process is the mechanism by which four-wave mixing provides a powerfully amplified time-reversed replica of the signal wave (Figure 10).

Since the PCN functions as an amplifier, the entire process can be compared to a triode: The signal wave constitutes the grid signal, the pump wave constitutes the plate voltage, and the nucleus of the atom in the dielectric provides the self-powered cathode. In negative time the former path taken through space by the signal wave provides an "invisible wire" back down which the highly amplified time-reversed PCR wave travels.

We put in the signal wave (grid signal) and get out a 180-degree phase-shifted, amplified phase conjugate replica (amplified plate signal). The difference is that the PCR is phase-shifted in time, not space.
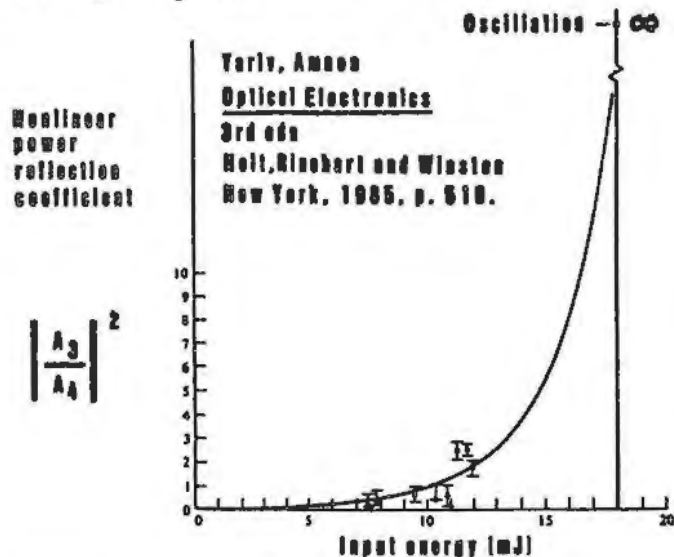

Figure 10. Typical nonlinear power reflection coefficients.

Tesla's Magnifying Transmitter

At the beginning of the 20th century, Nikola Tesla constructed and attempted to complete a giant earth transmitter (Figure 11) on Long Island, New York. Tesla believed that his transmitter would energize the earth itself into giant, amplified standing waves which could be "tapped" at other locations around the globe to provide cheap and amplified electrical power, all fueled by enormous energy freely fed into the standing wave from the earth itself. Tesla's US patent no. 1,119,732, "Apparatus for transmitting electrical energy," on the gist of his magnifying

transmitter was granted on Dec. 1, 1914 after nearly 13 years of struggle with the patent office. His patent no. 645,576, "System of transmission of electrical energy," Mar. 20, 1900 and his patent no. 649,621, "Apparatus for transmission of electrical energy," May 15, 1900 were also directly connected with the magnifying transmitter.

Tesla was unable to complete his magnifying transmitter due to exhaustion of funds. His original backer was one of the most powerful financiers in the world, J. P. Morgan. However, Morgan steadfastly refused Tesla any additional funds after the original $150,000 advanced.

Originally Morgan had believed Tesla was building a world-wide communications broadcasting system, and had not suspected such a startling capability as furnishing cheap energy to everyone throughout the earth.

In desperately trying to obtain additional funding to complete the project, Tesla explained to Morgan his real purpose--with a single transmitter Tesla was going to provide the entire earth with cheap energy. That confession, of course, positively assured that no further funds would ever be forthcoming from Morgan. As Morgan supposedly remarked to Edison at the time, there was no way one could put a power meter on *that* and sell the energy!

It is likely that Morgan also "blacklisted" Tesla to prevent cheap energy, for Tesla could never again obtain funds to pursue his mighty projects. No one, it seems, wanted to risk the wrath of J.P. Morgan and whoever was behind him in the shadows.[73]

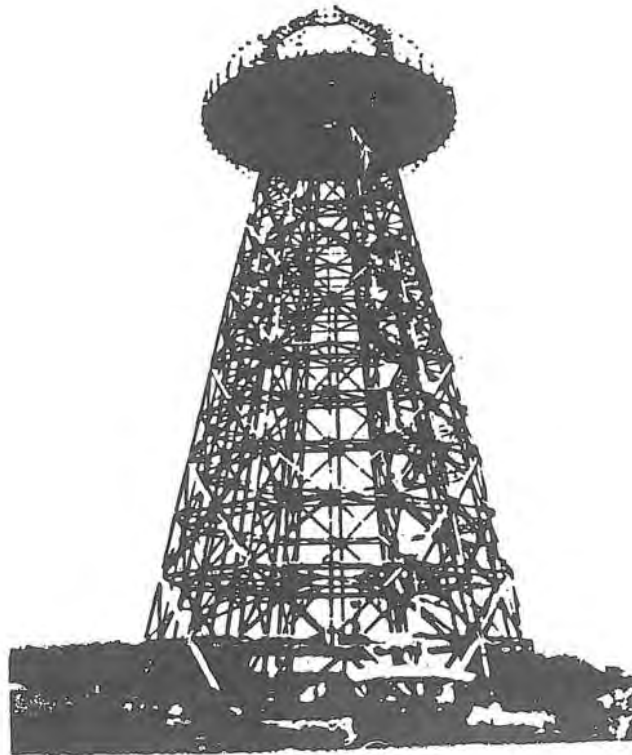Some years later, the tower on Long Island was dynamited and destroyed.

Figure 11. Tesla's Wardenclyffe tower on Long Island.

Establishing a Standing Scalar EM Wave in the Earth

It is my thesis that Tesla had discovered what today is called the time-reversed wave, pumping, and the phase conjugate mirror effect. It is also my thesis that his magnifying transmitter would have worked, just as he said, if he could actually have caused the pumped phase conjugate mirror earth to go into self oscillation.[74] Let us examine how that might be accomplished.

Let us momentarily treat the earth as an isotropic but broadly resonant nonlinear medium.[75] We will consider the earth's deep interior, which is under intense heat and pressure, as a special kind of cathode--very similar to the fashion in which we treated the nucleus of the atom. We will attempt to find a way to transform the earth into a special self oscillating, pumped phase conjugate mirror--a special *triode*. We may then introduce a relatively small "grid signal" and gate a highly amplified energy response from the earth's interior self-powered cathode to an external plate load on the surface. The amplified energy, of course, will be taken from whatever source is furnishing the energy of the self-pumping--in this case, the heat and mechanical stress of the earth.
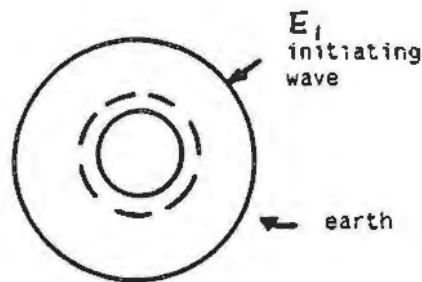
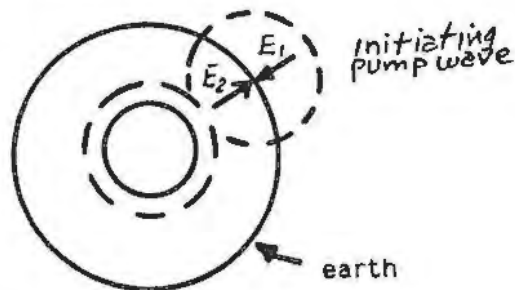

Figure 12. Transmission input to a cathode earth.

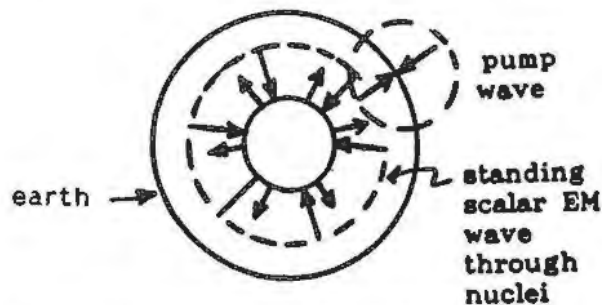Figure 13. Scalar wave: Input plus reaction plus modulation.

Figure 14. Spherical scalar wave in internal earth stresses.

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We visualize a powerful initiation/activation transmitter (Figure 12) operating at a fixed frequency within the earth's resonant frequency band, transmitting a signal vertically into the earth--just as Tesla planned. A deeply buried ground plane is to be used for good earth coupling--again, just as Tesla constructed.[76]

When the transmitter wave is sent vertically down into the nonlinear earth medium, by Newton's third law a "back-EMF" wave is also produced, 180 degrees out of phase. These two waves are locked together (caused to modulate each other) by the nonlinear earth medium (Figure 13). This produces a scalar pump wave, with the earth now able to begin to act as a pumped phase conjugate mirror (PPCM).

The earth also produces a small time-reversed phase conjugate replica (PCR) wave.[77] This PCR wave and a portion of the transmitted wave lock together also, producing a timestress wave. This timestress wave passes into the nucleus of the atoms in the earth medium, timestressing them.

Other heat and pressure stress microfluctuations modulate the timestress wave, producing signal inputs into the atomic nuclei of the stressed matter deep in the earth's interior. The nuclei produce an amplified PCR wave (which is the second time reversal), and this is an amplified normal energy wave in phase with the pumping wave. Thus the original pumping wave power is increased by feedback from the pumping heat and pressure stress energy of the earth. A spherical standing scalar wave now exists in the earth and its internal stresses (Figure 14).

With a more powerful pumping wave now present, the entire process is repeated over and over at increasing power, as the earth is gradually induced into regenerative parametric scalar EM oscillation. In the earth an amplified wave steadily grows until eventually limited by anisotropic effects. This is the earth regenerative feedback effect. For a given transmitter power and hence initiating pump power, the *earth regenerative feedback* effect produces a certain magnitude of greatly amplified pump power in the pumping wave in the earth. It results in the earth building up a scalar EM pump wave of enormously greater power than our initiating transmitter is putting in. This power is taken from the internal heat and stress energy of the deep earth--whose fierce energy is now partly being utilized as coherent pumping energy.

Thus a giant standing pump wave (scalar EM wave) (S-wave) gradually forms in the earth, with most of the power being furnished by the earth itself in scalar EG parametric self-oscillation. Figure 15 shows this effect. Bear in mind that we are still modeling an idealized isotropic medium, and our results eventually must be modified to take into account the earth's anisotropy.

Tapping the Standing Power Wave

Once the self-oscillation of the earth reaches equilibrium and the earth's heat and mechanical stress are steadily furnishing power into the standing S-wave, the earth acts essentially as a self-pumped phase conjugate mirror,[78][79] as was shown in Figure 15. The power surging through the standing S-wave can readily be tapped by applying 4-wave mixing concepts well-known in nonlinear optics.[80][81] As the energy is tapped off, it will be replenished from the "pumping" internal heat and stress of the earth.

In the interior of the earth, the core material is under very great mechanical pressure--which, quantum mechanically, is electromagnetic at base. Also, great heat is present, which again is electromagnetic. Viewed as a phase conjugate mirror, the nonlinear earth medium is strongly pumped by the photon flux from both the heat and the mechanical stress. This pumping photon flux forms a randomized distribution in frequency and amplitude.

Accordingly, "waves" of these photons at the desired pump frequency (the frequency of our initiating transmitter) are continually occurring. When coherent, they add to our initiating wave[82], resulting in amplification and the earth regenerative effect previously pointed out.

Further, spherical symmetry exists. The core of the earth forms a spherical self-pumped phase conjugate mirror, the mid-sphere section of the earth forms another, and so does the mantle of the earth. All three self-pumped phase conjugate mirrors are further cohered together into a single self-pumped phase conjugate mirror (SPPCM) system, phase-locked together by the standing S-wave.
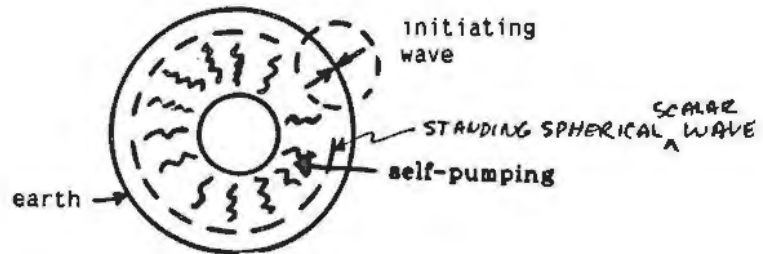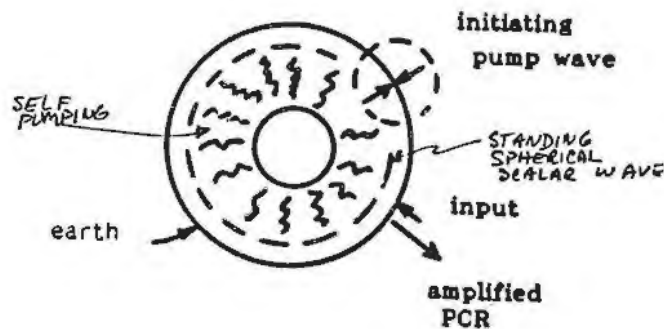

Figure 15. Self-pumped phase conjugate mirror earth.

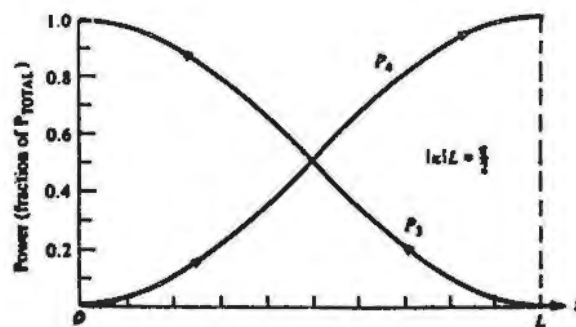**Figure 16. PCR energy extraction from a single site.**

Figure 17. Typical nonlinear power reflection coefficients.

A situation now exists where the phase conjugate mirror earth is self-pumped with extreme power, particularly if we are operating within that broad frequency region from slightly above zero Hertz to one or two megaHertz--as explored and mapped by Frank Golden's important experiments. Again, Figure 15 shows the earth as a self-pumped phase conjugate mirror after initiation is fully completed.

Standard four-wave mixing (FWM) functions can now be applied. When such an SPPCM system is furnished an additional third signal (stimulus) wave, a powerful phase conjugate replica (PCR) wave is produced by the mirror (Figure 16). This PCR appears everywhere in space where the signal wave is or was present.

Accordingly, at a distant surface extraction site at any other point on the earth's surface, a second well-grounded transmitter (part of a transceiver) may be utilized to generate the signal wave into the SPPCM earth. According to the well-known FWM principle, a powerfully amplified PCR wave will be returned from the earth (SPPCM) and will appear in the second transceiver, as shown in Figure 16.

To the distant extraction site, the earth appears as a giant, self-powered triode. The extraction transceiver can "input to the local grid" and "receive from the local plate" freely, without having to furnish any power to the cathode or plate. All that need be done to extract enormous energy is to input the "grid signal" into the earth, and receive the enormous "plate signal" response. The standing S-wave is continuously replenished from the stress energy in the earth itself, so power may be extracted continuously. Or, if the grid signal is pulsed, the plate extraction power is pulsed. In that manner pulses of EM energy of incredible power can be extracted from the earth. This of course enables the powering of fantastically powerful pulsed directed energy weapons.

But to return to smooth and continuous power extraction. At the distant extraction site, a very large, specially tuned LC oscillatory circuit is used to receive the powerful electromagnetic PCR from the earth, with very high amperage and voltage. Connecting transmission lines conduct the extracted EM energy to a separate station where the surging power from the pumped earth is processed by standard techniques and fed onto further transmission lines that connect to a large--even national--electrical power grid.

According to FWM theory, for the oscillation condition the gain of a pumped phase conjugate mirror approaches such a large number that it may be regarded as nearly infinite.[83][84] Figure 17 shows this gain effect. Enormous electrical power could easily be extracted from the earth in this fashion, if the earth behaved strictly as our idealized isotropic nonlinear medium.

Compensating for the Anisotropic Earth

However, the earth deviates from an idealized isotropic medium. Its deviations disrupt the idealized situation so that very appreciable damping of the S-wave occurs, quickly extinguishing the self-pumping feature. Thus large disturbances in and on the earth--such as explosions, earthquakes, tremors, etc.--cause trembling throughout the earth, but do not normally result in 4-wave mixing amplification of the temporary S-wave and coherent earth regeneration. Certain indicators of the basic effect do occur, however, but these are beyond the scope of this paper.

Accordingly, the idealized scheme previously presented must be modified to minimize anisotropic damping. The major task is to establish in the earth the standing EM wave of our frequency choice that essentially acts as a sine wave, allowing the buildup of the S-wave by the earth regeneration effect. So let us consider why a wave breaks up in a nonlinear medium.

The speed of a wave in a material medium depends not only on the medium's characteristics but also at least somewhat upon the amplitude of the wave. Hence, for a sine wave, the peaks travel faster than the lower parts of the wave, overtaking them and causing destructive interference, with consequent wave breakup and severe damping. This exact problem has been met and successfully overcome with ultrasonic sound waves in the ocean.[85] We shall apply the same technique to help overcome our breakup and dephasing problems in the earth.

Briefly, a remarkable phenomenon occurs if *two* sine waves, separated by a frequency difference, are simultaneously transmitted into the nonlinear medium. In this case, we wish to utilize the *difference* frequency between the two transmitted waves, and we wish to have this difference frequency wave propagate through the medium as a sine wave. Accordingly, we pretend that we have transmitted into the earth the *difference* beat frequency between the two waves.

If the medium is not too anisotropic, it can be shown mathematically [85] that the *difference* frequency will be essentially propagated through the nonlinear medium as a sine wave, and will not be subject to breakup and damping. We shall refer to this scheme of dual interference frequencies as *triad usage*. (That is, we use two equally-distorting waves to get a nondistorting "difference frequency" third wave.) With this scheme, we can transmit two waves a fixed frequency apart, and later extract and use the beat frequency as if it were a single sine wave not subject to damping and breakup.

We also apply another means of compensation for anisotropy: circular polarization. It has been shown that standing wave solutions exist for circularly polarized waves in nonlinear situations where such solutions do not exist for any other polarization.[86] Accordingly, we modify our original initiation transmission scheme to include triad usage and circular polarization. We transmit two frequencies into the earth a fixed frequency apart. The difference frequency then will first form a standing EM scalar wave, so that self-oscillation and earth regenerative feedback can now occur, even in the somewhat anisotropic earth.

We also modify our extraction transmission scheme to include triad usage and circular polarization. The highly amplified PCR beat frequency response from the earth is extracted as a sine wave and fed to the transmission lines connecting to the processing station. A convenient beat frequency, for example, might be 12,000 Hz, and the two transmission frequencies might be 500,000 Hz and 512,000 Hz.[87]
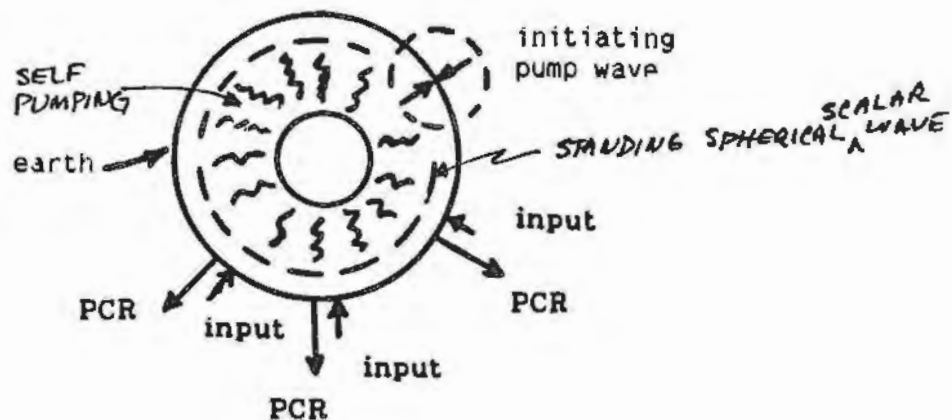

Figure 18. PCR energy extraction from multiple sites.

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At the receiver, the beat frequency oscillator puts out 12,000 Hz at very high voltage and amperage. The voltage may be adjusted by biasing the ground potential of one of the LC oscillators in the two that are beat together at the extraction site. The voltage and amperage received from the earth are varied by adjusting the transmitted voltage and amperage. Standard feedback control techniques are used to provide stability of the output power.

The raw energy as received from the earth is *negative energy*. It may be transformed to positive energy at will, simply by performing an additional phase conjugation. Or, it may simply be used as is. Also, any resistive load produces normal positive energy again from the input negative energy.

At the processing station, the frequency is stepped down to standard 60 Hz power frequency, and the voltage is stepped down to a convenient high voltage transmission line voltage. To the transmission line leading to the power grid, the processing station appears as any other power station.

Power Channel Considerations

Since the earth is spherical, spherical standing scalar EM resonance waves are set up in it. Therefore the oscillation condition for the SPPCM earth exists at every point on the earth's surface. The power (extraction) station can therefore be located anywhere on the earth's surface--including on the bottom of the ocean.

Additional power stations can readily be added to extract additional power from the same standing S-wave in the earth, without increasing the amount of power input at the activation transmitter site, and without adding any additional activation transmitters. All other transceiver sites will automatically be in the oscillation condition for very high gain, so that great power can be extracted from each site. Only a very small transmitted input triad griad signal need be utilized at each of these additional earth power extraction stations. Figure 18 shows the case for multiple-site energy extraction.

A single activation transmitter with its triad transmission creates a single channel (beat frequency) S-wave which can be tapped by a large number of separated power extraction stations. Together the triad activation station, single triad beat frequency transmission channel, and multiple extraction stations on that channel constitute a *single channel power distribution system*. Further, this channel utilizes Tesla's magnifying transmitter concept. Multiple single channel power distribution systems may be established as desired, but one triad activation transmitter is required for each one.[87]

There are great advantages to using multiple channels of power distribution, but all utilizing the same beat frequency. That way, the distant extraction site transceivers can be made tunable across an entire bandwidth of power distribution channels, and all the utilization part of their circuitry remains on the same frequency (12 khz in our example). In this case, if one of the distant activation/initiation transceivers is disabled and that channel destroyed, the extraction site can readily retune to another functioning channel and continue to extract power as before. For guaranteeing continual power to an external power distribution system powered by the tap, a rather standard electrical grid powered on demand from either of several switchable extraction sites could be utilized.

The reader should recognize at this point that we have given the actual mechanism by means of which Nikola Tesla's magnifying transmitter could actually have worked, just as he stated. It is the thesis of the present author that Tesla had discovered what today are called phase conjugation, phase conjugate mirrors, and mirror pumping. He had also discovered the time-reversed wave, a wave that

continually converges on its guided path through the vacuum like a laser beam, and does not spread its energy. This, of course, was the secret of his wireless transmission of energy at a distance, with essentially no losses.
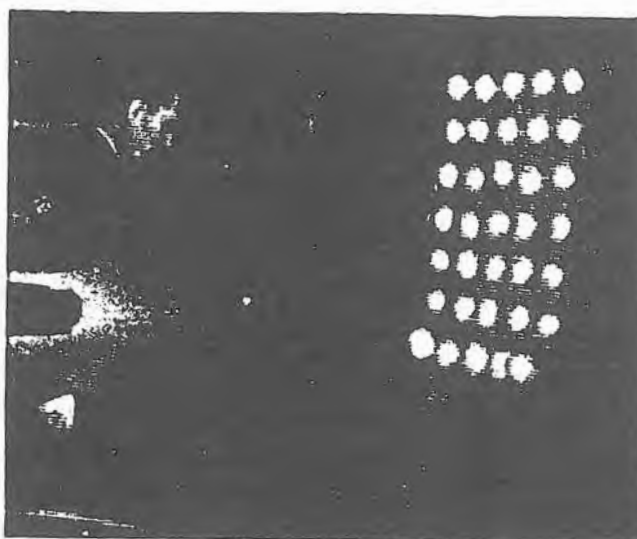

Figure 19. T. Henry Moray adjusts his radiant device.

Portable Power Units and Other Systems

We now point out that the vacuum itself is filled with powerful virtual energy fluxes, penetrating each and every point in space. A charged particle is in a constant, violent virtual flux (VPF) exchange with the surrounding vacuum; according to quantum mechanics, this VPF exchange is what actually constitutes the "charge" of the particle. In the nucleus of the atom, a violent boiling ensues, so that particles are turning one into the other, protons into neutrons and vice versa, incredible numbers of other charged virtual particles are being emitted and absorbed, etc. The nucleus is a violently boiling cauldron, but possesses overall structural patterns of order imposed on that disorder. In a very real sense, the nucleus is the ultimate nonlinear medium.

The stress of a material medium, according to quantum mechanics, is at base electromagnetic in nature. Even mechanical stress forces represent continual streams of virtual photons being exchanged within the material. Since stress is omnidirectional, one can see that a stressed material has continual opposing pairs of virtual particle waves, and these modulate due to nonlinearity of the medium, forming scalar EM pump waves. These scalar EM waves, having zero EM translation vector field resultants, penetrate the electron shells and stress the nucleus. A physical material under extreme stress--electrical, hydraulic, mechanical, or what have you--thus has nuclei which to an extent can act as pumped phase conjugate mirrors. Even if the macroscopic stress is static, microscopically there are highly dynamic virtual energy flows sustained. *These VPF energy flows are due to the nature of a charged particle and its vacuum exchange, and the external experiment need not furnish any additional macroscopic energy input to sustain the flows, once they are established.*

Accordingly, any kind of severe physical stress provides a "hidden river" of VPF flux energy which can be tapped, utilizing proper FWM techniques and measures to offset anisotropic damping.

For example, stressing a mixture of materials such as normally comprise amorphous semiconductors can conceivably be made to work in the same fashion as our SPPCM earth example developed above. The basic "model earth" stressed and utilized may be simply one or more smoothly but powerfully pressed pellets of material, sintered to lock-in stresses in the final pellet (after the methodology of T. Henry Moray).[88] See Figure 19. Or the stress may be continuously and statically applied in a variety of external ways left as an easy exercise for the reader to ascertain.

A signal input (grid input) to the stressed "model earth" medium may be made either electrically through an implanted electrode, by magnetic resonance if ceramic magnetic material is included in the stressed model, by sound, by pulsed infrared frequencies, or any other convenient method. In each case an amplified phase conjugate replica of the input signal can conceivably be obtained, for the proper conditions and the proper resonant input frequency. Again, the advantages of utilizing triad usage and circular polarization in the grid signal are emphasized.

It is conceivable that materials can be found and assemblies developed which will function to establish themselves as self-pumping PCM triodes in the presence of even small heat and pressure differentials in the local environment. If so, then tiny solid-state "triad-usage" grid signals to the devices would directly "scavenge" the disordered heat energy and stress energy continually appearing in the environment. Such units would of course be negentropic.[89]

Of course phase conjugation, time-reversal, multiwave mixing, pumped phase conjugate mirrors, and self-pumping are general mechanisms that may be applied to any kind of wave. Phase conjugation of sound waves, for example, has been accomplished.[90][91] Mechanical oscillations (seismic waves) in the earth can also be produced and processed in this manner, leading to the telegeodynamics originally discovered by the great electrical wizard, Nikola Tesla.[92]

For example, the present author has performed consulting work on one device which utilizes sound to convert the human body to a PPCM-triode and applies "triad-usage" grid input sound signals to "scavenge" long-term, locked-in physical stress from the human body, radiating away the extracted stress energy as PCR sound energy. The device is safe and self-regulating, since *only* excess stress is scavenged and ejected. Patents on this device and its offshoots are expected shortly by the inventor.

Also, Tesla reported plans for a "big eye that can see at a distance." Given even a tiny signal from a distant object or region, pairs of pumped phase conjugate mirrors can be utilized to produce twin laser-like time-reversed beams which will transit even distorting nonlinear media and perform distance-independent holography at the distant region or on the distant object. Adding scanning should produce precisely what Tesla envisioned: at least a crude "TV-like" picture of the distant region or object.

Of course, the effect can be used in time-reversed beam interferometry and weaponized. A small ball of energy (a hologram), for example, can be produced at the distant region or on the distant object. This holographic ball of EM energy can be almost as powerful as one wishes; all that is necessary is to utilize the PPCMs in the oscillation condition and pump them with the power desired in the distant ball of energy. Such a weapon was apparently utilized to strike the Arrow DC-8 aircraft at Gander Air Force Base, Newfoundland on Dec. 12, 1985, destroying the aircraft with a loss of over 150 lives.[93][94][95][96][97]

The energy produced at a distance may be either positive or negative, as desired, merely by adjusting the number of times phase conjugation (time reversal) is applied. Thus both "hot" and "cold" distant explosions are entirely feasible.[98] Indeed, with time-reversed waves, phase conjugation, pumped phase conjugate mirrors, self-targeting, and interferometry, all of the scalar EM weapons previously specified by the author can be developed.[99][100][101]

Conclusion

In this short paper we have presented only a small sample of the implications of Maxwell's quaternionic unified field theory. The final goal so long dreamed of in physics--controlling the very basic mechanisms of nature herself--is now within our grasp.

A great number of other applications for these new effects also exist. For example, there is no discernible reason why internal strata and material composition of the earth cannot be determined by analysis of the PCR spectra received from the SPPCM earth in response to triad-usage stimuli. In this way geolocations of scarce minerals, petroleum, etc. could be readily and accurately determined. In addition, underwater radars and "big eyes" (and through-the-earth radars and "big eyes") could be developed. The implications for undersea and antisubmarine warfare are obvious.

The bottom of the ocean could be meticulously explored and examined in detail, including the subsurface strata under the bottom--all without leaving the surface ship. Practical antigravity is straightforward to achieve with pumped extremely low frequency phase conjugate mirrors; this alone should revolutionize all transportation, and greatly elevate the standard of living of everyone. Chemical and nuclear wastes can be readily processed to render them harmless, since both the molecule and the atom are open to engineering and transmutation by using miniscule scalar EM power. Pollution of our environment could be cleaned up in an affordable and achievable manner.[102] Incredible medical healing potentials have previously been spelled out by the author.[103]

We are literally at the dawn of a new technology, one which will overcome most of the present engineering limitations. This technology will place in our hands the Promethean power to engineer vacuum spacetime and physical reality itself, and to bend nature to our will.

Let us use this new God-given power fully. Let us also use it wisely and with foresight. If we do, then the dawn of a golden age is upon us. If we do not, then Armageddon and the final destruction of the earth lie just a heartbeat away, waiting for inevitable initiation.

Notes and References

[1] Maxwell's first electromagnetics paper was delivered in 1864 and published in 1865. See J.C. Maxwell, "A dynamical theory of the electromagnetic field," *Philosophical Transactions of the Royal Society of London 155*, 1865, p. 459-512 (Presented in 1864). Maxwell's famous treatise was: J.C. Maxwell, A Treatise on Electricity and Magnetism, Oxford University Press, Oxford, 1873. His compact and powerful quaternionic expression of the general equations of the electromagnetic field are given in Article 619, Vol. 2, p. 258 of his *Treatise...*

[2] James Clerk Maxwell was born on June 13, 1831 in Edinburgh, Scotland. In 1847 he entered the University of Edinburgh, then transferred to Cambridge in the fall of 1850. After graduation, he stayed on at Cambridge in a research position. He was elected a Fellow of Trinity College and placed on the staff of college lecturers. In 1856 he returned to Scotland, where he took up a Chair of Natural Philosophy at Marishal College, Aberdeen. In autumn, 1860 he took a new position as Chair and Professor of Natural Philosophy and Astronomy at King's College, London (a position he held to 1865, at which time he resigned.)

Maxwell was economically independent. He was elected to the Royal Society in 1861, while at King's College. From 1865 to 1871 he resided at his ancestral Scottish country home, Glenlair, developing his major ideas into book form. Maxwell returned to Cambridge in 1871, where he became the first holder of the Cavendish Chair of Experimental Physics. There he also supervised the construction and operation of

Cavendish Laboratory. His treatise on electromagnetism appeared in 1873. He held his position at Cambridge until he died on Nov. 5, 1879, at age 48, of a form of stomach cancer--the same ailment that had killed his mother when he was a child.

[3] For an elegant and readable account of Maxwell's life and achievements, see I. Tolstoy, James Clerk Maxwell: A Biography, Canongate, Edinburgh, 1981.

[4] See also H.J. Josephs, "The Heaviside papers found at Paignton in 1957," Electromagnetic Theory by Oliver Heaviside, including an account of Heaviside's unpublished notes for a fourth volume, and with a foreword by Sir Edmund Whittaker, Vol. III, Third Edition, Chelsea Publishing Co., New York, 1971, p. 660. Just how much more powerful was Maxwell's quaternionic expression of EM theory than was Heaviside's vector interpretation, was succintly expressed by Josephs: "Hamilton's algebra of quaternions, unlike Heaviside's algebra of vectors, is not a mere abbreviated mode of expressing Cartesian analysis, but is an independent branch of mathematics with its own rules of operation and its own special theorems. A quaternion is, in fact, a generalized or hypercomplex number..." (Josephs, ibid, p. 660.). For an excellent discussion of the development of vector analysis, see M. J. Crowe, A History of Vector Analysis: The Evolution of the Idea of a Vectorial System, University of Notre Dame Press, Notre Dame, Indiana, 1967.

[5] For confirmation that the Heaviside equations--which presently are erroneously called "Maxwell's equations"-- are not to be found anywhere in any of Maxwell's books or papers, see Josephs, ibid, p. 647. See also Sir Edmund Whittaker, "Oliver Heaviside," *Bulletin of the Calcutta Mathematical Society 20*, 1928-29, p. 202. See also Paul J. Nahin, Oliver Heaviside: Sage in Solitude, IEEE Press, New York, 1988, p. 9, note 3. Today--ironically--most engineers and scientists who study and utilize "Maxwell's equations" have examined neither Maxwell's original work nor the theory of quaternions.

[6] Oliver Heaviside was born in poverty on May 18, 1850 in Camden Town, the youngest of four children. Young Heaviside was forced to drop out of high school and go to work. His aunt, however, had married well, to Professor Wheatstone of King's College, London--who was later to become Sir Charles Wheatstone, F.R.S. By his uncle's influence, Heaviside was appointed to a telegrapher's position at Newcastle in 1868. Gradually Heaviside began to theoretically attack the problems in telegraphy, but was forced by increasing deafness to resign in 1874 and return to live with his parents in London.

Heaviside never possessed a formal university degree, but was much later--in the early 20th century--to be awarded an honorary doctorate. Studying mathematics on his own, Heaviside had begun to write improvements for telegraphy, and in 1873 began using calculus. He also studied differential equations and made regular contributions to the Telegraphic Journal, the English Mechanic, and the Philosophical Magazine, with seven papers by 1874.

Heaviside was astounded by Maxwell's Treatise on Electricity and Magnetism, published in 1873, and Maxwell became his undying hero. Heaviside mastered the manuscript in two years--something few men have done to this day.

With the invention of the telephone in 1877, Heaviside began also to study telephonic transmission. Then Maxwell died in 1879. In 1885-87 Heaviside published in the Electrician a series of articles under the title "Electromagnetic Induction and Its Propagation," where for the first time he gave a clear and modern *vector* exposition of Maxwell's theory. Heaviside was violently opposed to the potentials, however, remarking that they were "metaphysical" and that it was even "best to murder the lot." He focused strongly on the EM force fields as the primary EM causative entities. This attitude was to spread and condition generations of electricians that the EM potentials were only mathematical conveniences.

Though self-educated, Heaviside was a true genius. He also developed the energy flow in the EM field, developed the skin effect, speculated analytically on faster-than-light charged particles, discovered the theory of distortionless signal transmission, and articulated the concept of inductively loaded circuits including self-induction. He had difficulty in getting his papers accepted for publication, since

he made use of unusual methods of his own in solving problems. But in 1892 his collected papers were published in two volumes under the title of Electrical Papers. Later his Electromagnetic Theory also dealt with a number of important problems.

Heaviside, followed by Gibbs, attacked the quaternionist expression of Maxwell's theory, though he held the highest regard for Maxwell himself. By 1892-3 the controversy between the multiplying vectorists and the few remaining quaternionists exploded into a duel to the death, and the vectorists quickly won. Interest in quaternions then dropped sharply and vector EM theory in accordance with Heaviside's interpretation came to be universally accepted.

Heaviside made major improvements in electrical transmission theory, propagation theory, and advanced the operational calculus to study transients. In Electromagnetic Theory (1893-1912) he postulated that the mass of an electric charge would increase as its velocity increased, anticipating one aspect of special relativity. In 1902 he predicted the ionosphere and the earth-ionospheric duct.

Heaviside, ever the outcast and apart from his peers, died in a nursing home at Torquay on Feb. 3, 1925.

[7] T.E. Bearden, "Maxwell's Lost Unified Field Theory of Electromagnetics and Gravitation," presented at the Third International New Energy Symposium, Hull (Ottawa), Canada, June 1988. To be published in the Proceedings.

[8] It is little known that, in his later years, Heaviside may again have turned to quaternion operations, and even developed a "unified" theory of electromagnetism and gravity. These papers were never published, but were reported found in 1957 (some electrical scientists, however, continue to dispute the authenticity of the papers). Little or no adequate review of this unified theory has been made, though several writers have expressed judgements pro and con as to its authenticity, its promise, or its uselessness (e.g., see Josephs, ibid; H.J. Josephs, "History under the floorboards," *Journal of the IEE 5*, Jan. 1959, p. 26-30; H.J. Josephs, "Postscript to the work of Heaviside," *Journal of the IEE 9*, Sept. 1963, p. 511-512; B.R. Gossick, "Heaviside's 'Posthumous Papers',", *Proceedings of the IEEE 121*, Nov. 1974, p. 1444-1446; Paul J. Nahin, Oliver Heaviside: Sage in Solitude, IEEE Press, 1988, p. 305-307.). My own comment is that this (purportedly Heaviside's) unified theory should be examined *experimentally*, not just mathematically, to ascertain whether or not it works. Certainly Heaviside had long considered localization of energy: e.g., in writing in 1893 (Electromagnetic Theory, p. 455) he wrote: "To form any notion at all of the flux of gravitational energy, we must first localize the energy...whether this notion will turn out to be a useful one is a matter for subsequent discovery."

Ironically, then, the man who almost single-handedly "slew" quaternions and Maxwell's quaternion theory, may eventually have returned to them to try to capture the elusive gravity, which--by the present author's thesis--inadvertently he had discarded earlier when he struck down the scalar component of the quaternion and converted it to a vector.

[9] On the other hand, neither Maxwell nor Heaviside worked completely independently of other researchers who had preceded them. Today the prevailing view in physics--and in most physics textbooks--is that Faraday discovered and formulated the concept of "lines of force," or field lines, and that Maxwell--his mathematical interpreter (Faraday was uneducated and woefully inadequate mathematically)--then tinkered together the equations to explain electromagnetic radiation on the basis of Faraday's field concepts. However, there certainly can be serious grounds for contesting this view. As White states, "The mathematics which Maxwell used to develop Faraday's results came out of a body of work which had as its implicit subject unified field theory. Leonhard Euler, Pierre-Simon Laplace, Joseph-Louis Lagrange, and Karl Friedrich Gauss prepared these mathematical and theoretical foundations, elaborated by Sir William Hamilton, which shaped the positive content of Maxwell's work... As the story goes, Maxwell first elaborated the equations which describe the magnetic effects of an electrical current and the ability of a magnet in motion to induce electricity, and then, by algebraic substitution, came on the wave equations. In fact, James MacCullagh, a collaborator of Sir William Hamilton, and Franz Neumann, a collaborator of Gauss, Wilhelm Weber and Bernhard Riemann, produced these same equations between the years 1839 and 1848, at least a decade before Maxwell began

his scientific career.... Field theory, as it was developed through the work of Euler and Lagrange, elaborated by Gauss,and totally redefined by Riemann, depends upon the concept of potential energy." (Carol White, Energy Potential: Towards a New Electromagnetic Field Theory, with excerpts from two original works by B. Riemann, Campaigner Publications Inc., New York, 1977, p. 19-20.). White gives a critical discussion of the way in which standard textbooks have assigned credit for priorities and conceptual contributions in the foundations of theoretical electromagnetics. Extending Riemann considerations, White focuses strong attention on the potentials and on a new approach to electromagnetics.

[10] Maxwell himself was well aware of the importance of EM stress in the medium, though he had apparently not realized that this represented electrogravitational potential. For example, quoting from his Treatise...., Vol. 1, 3rd edition, New York, 1954: "There are physical quantities of another kind which are related to directions in space, but which are not vectors. Stresses and strains in solid bodies are examples, and so are some of the properties of bodies considered in the theory of elasticity and in the theory of double refraction. Quantities of this class require for their definition *nine* numerical specifications. They are expressed in the language of quaternions by linear and vector functions of a vector." Note that, since Maxwell assumed a material ether, he obviously assumed it to have such stress and strain characteristics, and knew that this situation was captured by the quaternions.

[11] At first glance it may seem shocking to compare the abstract notion of vector space to the vacuum, but that is implicitly what the vector space represents when we apply vector analysis as a model of objects interacting and moving through spacetime. Thus the physical properties of the vacuum are of vital interest to the modeler.

For a good discussion of the modern view of the vacuum, see Jack S. Greenberg and Walter Greiner, "Search for the sparking of the vacuum," *Physics Today*, Aug. 1982, p. 24-32 and I J. R. Aitchison, "Nothing's plenty: the vacuum in modern quantum field theory," *Contemporary Physics*, 26(4), 1985, p. 333-391. See also T. D. Lee, Chapter 16: "Vacuum as the source of asymmetry," *Particle physics and introduction to field theory*, Harwood Academic Publishers, New York, 1981. See also Alan H. Guth and Paul J. Steinhardt, "The inflationary universe," *Scientific American*, 250(5), May 1984, p. 116-118. See also Bryce S. DeWitt, "Quantum gravity," *Scientific American*, 249(6), Dec. 1983, p. 112-129. See also Daniel Z. Freedman and Peter van Nieuwenhuizen, "The hidden dimensions of spacetime," *Scientific American*, 252(3), Mar. 1985, p. 74-81. Very useful discussions are also given in Robert L. Forward and Joel Davis, Mirror Matter: Pioneering Antimatter Physics, John Wiley & Sons, Inc., New York, 1988, passim. Of particular interest also is H. E. Puthoff, "Zero-point fluctuations of the vacuum as the source of atomic stability and the gravitational interaction," *Proceedings of the British Society for the Philosophy of Science International Conference "Physical Interpretations of Relativity Theory*," Imperial College, London, Sept. 1988 (in publication).

[12] For a discussion of artificial structuring of the vacuum (scalar EM, or electrogravitation), see T.E. Bearden, "Extraordinary Physics," AIDS: Biological Warfare, Tesla Book Co., POB 1649, Greenville, Texas 75401, 1988, p. 74-203. Indeed, such structuring has never been tried in particle physics, but has sometimes been a subject for speculation; see T.D. Lee, ibid., passim.

[13] The well-known 5-dimensional Kaluza-Klein (KK) theory also provides a unified field theory of EM and G. In this theory, EM fields are simply 5th dimensional bleed-offs of or bleed-ins to (i.e., the partial gradients of) an overall 5-dimensional gravity potential (the 5-potential). The missing 5th dimension is modeled as highly contracted, and "wrapped around" each point in our ordinary 3-space. We shall use this KK characterization as the basis for our EMG unified field theory discussion.

Primal nature is visualized as unified. Disunifying operations are performed by nature, however, to separate and externalize positive and negative charge, positive and negative energy, positive and negative entropy, and positive and negative time. Primarily this separation is accomplished by the separation of charges in the atom: negative charges outside, positive charges inside. Externally, photon interaction with the negative charge (electron) shield of the atom produces positive energy flow and

positive time flow. Photon interaction with the internal positive charge (nucleus; pumped phase conjugate mirror) of the atom produces negative energy and negative time flow.

In external positive time, continued photoelectric interactions scatter and pass into increasing disorder, leading to the well-known second law of thermodynamics, the law of entropy. In external negative time, continued photoelectric interactions reverse-scatter and pass from disorder back to order, leading to a new corollary to the second law: the law of negentropy. For a beautiful example of a time-reversed wave moving from disorder back to order, see David M. Pepper, "Applications of optical phase conjugation," *Scientific American*, 254(1), Jan. 1986, p. 74-83--particularly the striking photographic demonstration shown on p. 75.

[14] That is, most external **vector** Ē- and B̄-field EM interacts with the atomic electrons (but see note 25 below). This nearly ubiquitous interaction thus normally excludes most photon interactions from occurring where the gravitational interaction is occurring: in the atomic nucleus. **Scalar** EM photons readily pass through the electron shells, however, and interact directly with the nucleus. It follows that scalar EM must include EG, since unified (multiple simultaneous) scalar EM and G interactions occur in the same nonlinear modulating medium--the atomic nucleus. If the nature of G is infolded EM, then the nonlinearity of the nucleus means that infolded EM and outfolded EM are modulated, locked together, and hence unified.

Scalar EM (actually EMG) photons are continually exchanged between all nuclei of the universe. It is accented that, in this view, **the scalar photon is a pair-coupled photon and antiphoton system of spin 2; this system and the graviton are one and the same.**

[15] Much of the stability of our observed macroscopic universe depends precisely upon this fact. In a large assemblage of atoms, most of the photon interaction is with the electron shells of the atom. Incoming energy (photons) normally react with the electrons, resulting in the nuclei just "weaving" a bit, while the electrons change more drastically. Stronger photoelectric interaction produces lattice vibrations, heating, etc. Yet even stronger interactions will result in something like a chemical explosion--which may translate the atoms of the material through space, but still does not appreciably disturb the nuclei. This accounts for the apparent "solidity" of the physical world.

However, if incoming energy is of such form (scalar photons or neutral mass such as neutrons) that it interacts directly with the atomic nuclei, the situation is different. For scalar photon irradiation, the nucleus absorbs the infolded EM pattern in its nuclear potential--which then consists of two components: a normal "disordered" infolded EM part and an infolded "ordered" EM part.

If the scalar irradiation is slight, the nucleus simply reradiates the scalar signals. If influxing scalar irradiation of the nucleus is increased, the subsequent scalar reradiation from scalar-charged materials increases. If the influxing irradiation is sufficiently strong and sharply pulsed, immediate fission of the nucleus occurs.

This mechanism--the constant receipt by the nucleus of scalar EM waves and their absorption and reradiation--is actually the hidden cause of natural radioactivity anyway. Radioactive elements already have nuclei with an imbalance of energy; such nuclei decay readily when struck with lesser intensity scalar pulses.

Note that a neutral **particle** such as a neutron also can readily penetrate the electron shells and enter the nucleus, drastically changing its potential energy. This of course is the standard mechanism for induced nuclear fission. However, it is actually the change of the nuclear potential that causes fission.

At any rate, the presence of substantial scalar irradiation--particularly if powerfully and sharply pulsed--may very well severely upset the stability of physical reality. Further, the infolded EM pattern of the radiation can be deliberately structured to provide the specific upset effect desired.

Note that the infolded (internally structured) pattern of electromagnetics is called the **information content** of the EM fields by Soviet scientists. They have long since used this approach (producing artificially structured EM potentials) to develop an engineering technology, particularly in photobiology applications.

To keep Western scientists guessing, in their open papers the Soviets almost never mention the EM **potentials** as being structured, but only refer to the "fields" in that fashion. Of course, any vector EM force field (E- or H-field) can be replaced by two scalar fields, as can any vector EM force field wave; see E.T. Whittaker, "On an expression of the electromagnetic field due to electrons by means of two scalar potential functions," *Proc. Lond. Math. Soc.*, Series 2, Vol. 1, 1904, p. 367-372. Thus, if it is possible to structure EM fields, then it is certainly possible to structure EM potentials. i.e., a structured potential contains **ordered photons**.

For an example of Soviet attention to the information structure of EM fields, see N.D. Devyatkov and M.B. Golant, "Prospects for the use of millimeter-range electromagnetic radiation as a highly informative instrument for studying specific processes in living organisms," *Soviet Technical Physics Letters*, 12(3), March 1986, p. 118-119; see also N.D. Devyatkov (ed.), Applications of Low-Intensity Millimeter-Wave Radiation in Biology and Medicine (in Russian), IRE Akad. Nauk. SSR, Moscow, 1985. Since the virtual particle flux that comprises a potential's charge is structured by the interactions of local observable particles and their hierarchies, it follows that each type of cellular disease has its particular structured EM radiation content. Hence EM radiation from it has a specific "information content" or signature, exclusively indicative of the disease (including mechanical disorder). It has been shown that the EM radiation structure of the photons emitted by diseased cells is capable of inducing that same disease physiology and symptomology in distant cells that absorb the radiation in diminished interference from visible light. (See Vlail Kaznacheyev, "Electromagnetic bioinformation in intercellular interactions," *PSI Research*, 1(1), March 1982, p. 47-76. See also "Extraordinary Biology," in T.E. Bearden, AIDS: Biological Warfare, Tesla Book Co., Greenville, Texas 1988.) It follows that time-reversing (phase conjugating) the mitogenetic "disease" information signal could provide a "healing" signal for a specific cellular disease condition. (See Bearden, AIDS: Biological Warfare, 1988 for an extended discussion, extensive references, and appreciable details of the Priore device which utilized such an approach to demonstrate nearly 100% cures of terminal cancers, leukemias, and other diseases in laboratory animals.) By subharmonic resonance principles, the optical signals can readily be transformed to the microwave region and their information patterns expressed a la Whittaker.

The weapon implications using modulated electromagnetic carriers are obvious, and it is significant that (1) over-the-horizon (OTH) beams from giant Soviet microwave OTH radars continually intersect over North America, (2) the world's greatest expert in EM induction of cellular disease at a distance--V. Kaznacheyev--is now associated with two secret institutes in the outskirts of Moscow which produce microwave directed energy weapons, and (3) extensive health changes have occurred over the decades in personnel in the US Embassy in Moscow, where weak microwave radiation has been beamed against personnel in the building since the 1950s.

Actual measured EM data inside the Embassy reveals a strong correlation between the locations where induced health problems in Embassy personnel occurred, and the locations where the EM force fields from the Soviet microwave radiation were minimal or absent. (See *Microwave radiation at the US Embassy in Moscow and its biological implications: An assessment*, US Department of Commerce, NTIA-SP-81-12, Mar. 1981. See also A. M. Lilienfeld et al, *Foreign Service health status study: Evaluation of health status of Foreign Service and other employees from selected Eastern European posts*, The Johns Hopkins University, Baltimore, Maryland: Final Report, July 31, 1978.) Since Johns Hopkins researchers applied standard EM force field considerations (i.e., of only the E- and H-fields), they concluded that the EM radiation could not possibly have caused the health changes in personnel.

However, note that the areas inside the Embassy where the microwave EM **force fields** are absent or minimal represents precisely those areas where the microwave **potentials** are persistent. The high correlation of disease induction to those specific areas, strongly indicates that the Soviets deliberately used structured EM potentials in the microwave radiation to induce diseases in Embassy personnel.

If, for example, the microwave radiation had not been a factor, then--other things being equal--anomalous health changes should have been distributed throughout the Embassy without regard to the local strength of the microwave force fields.

As a final supporting point, the radiation inside the Embassy was apparently discovered in the late 1950's when Nixon visited Moscow; it was discovered due to its causing a reading on a **nuclear radiation detector**. Such detectors normally will indicate a reading when exposed to strong scalar EM radiation/waves.

It seems obvious that this microwave radiation and induction of health changes at the US Embassy in Moscow has been a continuing Soviet test stimulus to see (by US response or lack of it at the Embassy site) whether or not we are knowledgeable in uses of scalar EM waves, disease induction technology, and structured scalar EM potentials. Eventual installation of aluminum screens over the Embassy windows merely decreased the EM force field components, **not** the potentials. Obviously we have continually certified our ignorance of scalar EM and photobiology weapons over the decades.

In fact, our intelligence agencies appear to be paying almost zero attention to the astounding implications and developments of photobiology (the effects of the infolded information content of EM potentials and fields on biological systems). As late as October 1988, they had not yet even translated the text of Kaznacheyev's important 1981 book, Ultraweak Radiation in Intercellular Interactions, even though they had had the book for several years.

[16] See T. E. Bearden, "Quiton/Perceptron Physics: A Theory of Existence, Perception, and Physical Phenomena," *NTIS*, 1973, Report AD-763210. See also Bearden, "Extraordinary Physics," ibid., 1988.

[17] T.E. Bearden, "Tesla's electromagnetics and its Soviet weaponization," *Proc. 1984 Tesla Centennial Symp.*, International Tesla Society, Colorado Springs, Colorado, 1984.

[18] T.E. Bearden, Fer-de-Lance, Tesla Book Co., 1986.

[19] Negative energy, in the sense we are using it here, is time-reversed energy. It moves from disorder back to order, and is negentropic. Whenever time is reversed, energy is reversed and vice versa. Note that from this viewpoint there exists a fundamental difference between a forward-time photon and a time-reversed photon, in contradistinction to the present assumption of physics. Also, when time is reversed, the charge of a fundamental charged particle is reversed. Further, in negative time gravity is a repulsion, not an attraction.

[20] This interaction is continually repeated in the incessant progression of photoelectric interaction. The march of a particle through time is caused by the continual connection of a time tail (by photon absorption, advancing the particle a little discreet jump forward in time), followed by photon emission and the tearing off and carrying away of the "time tail." Thus a mass progresses through time in little discrete jumps as "mass, masstime, mass, masstime, ..." and so on. I have previously called this process the "raindrop model of change."

Note that the last half of the photon interaction process--photon emission--creates the past (the masstime emitting the photon is thereby suddenly reduced from its 4-dimensional status since the emitted photon carries away the "time tail" (Δt), which connected the mass to time. Thus photon emission time differentiates the emitting 4-d masstime and leaves behind a timeless 3-d spatial mass. [This is the final step of fundamental observation; that is why "all observation is spatial," and time is not an observable (an axiom of quantum mechanics). The sudden disconnection from time--and from the rest of the temporally existing reality--makes "everything that has happened up to then" the disconnected **past**. It also causes the "collapse of the wavefunction." Since a wave must occupy time in which to exist and keep waving, the severing of time from masstime is an instantaneous annihilation of the wave function.]

The first part of the photon interaction process also creates the future (the spatial 3-d mass absorbing the photon (ΔE)(Δt) is thereby suddenly connected to time and the timestream, which means that the Schroedinger wavefunction is again being propagated forward. Since everything exists simultaneously in time, in this state (masstime) all wavefunctions, and indeed the wavefunction of all the universe and all the probable universes, exist. Everything is connected timewise. This is the indeterminate "future." (After all, do not all possible things and conditions exist in the future of every

present object? Is that indeed not what our primitive notion of "the future" means? Note the implications regarding Everett's many-worlds interpretation (MWI) of quantum mechanics. For a treatment of the MWI, see Hugh Everett, III, *The Many-Worlds Interpretation of Quantum Mechanics: A Fundamental Exposition*, with papers by J.A. Wheeler, B.S. DeWitt and Neill Graham, Princeton Series in Physics, Princeton University Press, 1973.

Note also that the "present" is entirely momentarily frozen, static, and spatial.

Since the "charge" of an electrically charged particle represents a continual absorption and emission of virtual photons at an incredible rate, each of these virtual photon interactions represents a tiny, near-instantaneous connection and disconnection from time, internal to the march of "observable" mass through time via the absorption and emission of relatively enormous "observable" photons. Each virtual photon in the charge flux itself also continually breaks into much finer (more fleeting) virtual charged particles, each of which in turn owes its charge to the emission and absorption of even more fleeting virtual photons--and so on. That is, in quantum mechanics one models "charge" as consisting of nested levels of ever finer (more fleeting) existence. As previously shown by this author, **each of these finer internested levels of virtual state is actually a higher spatial dimension beyond our familiar three. The deeper the virtual state level, the higher the dimension.**

Thus electrical charge internestedly infolds **higher dimensions.** The "times" connected to all these internested higher dimensions are also internested inside the hierarchy of internested virtual photons inside the observable photon. The entire structure is constituted of internested spacetimes. Note that any time interval, no matter how fleeting, always has an incredibly active, infolded structure of smaller time increments.

By internesting zero-resultant EM force vector systems, one can actually construct deterministically structured photons which perform desired dynamic actions in desired specific hyperspaces. In this manner scalar EM can accomplish hyperspatial engineering, using deterministically structured multi-level artificial photons.

[21] Again, from this view, the (time-forward) normal photon is constituted of (and carries) positive energy and positive time, in the form $(+\Delta E)(+\Delta t)$. The (time-reversed) antiphoton is constituted of (and carries) negative energy and negative time, in the form $(-\Delta E)(-\Delta t)$.

[22] As Paul J. Nahin [Oliver Heaviside: Sage in Solitude, IEEE Press, New York, 1988, p. 307] points out, there is a crucial difference between the gravitational field and the electromagnetic field. If two like electrical charges are brought together, energy is required to overcome the repulsion, and this energy "goes into the field" to give a positive energy density of space. Two masses, however, attract each other; it takes the exertion of energy to keep them apart. In other words, the field energy is **negative** in this case. Maxwell was much perplexed by this problem, as was Heaviside--and as have been most other physicists who struggled with it, down to and including the physicists of today.

As early as 1898 Carl Barus--in a paper titled "A curious inversion in the wave mechanism of the electromagnetic theory of light," *American Journal of Science* (Fourth Series), May 1898, p. 343-348--showed an interpretation of Maxwell's electromagnetic wave equations that could "make the wave run backward." His paper was ignored, but it may have been the first indication of what today in nonlinear phase conjugate optics is known as the time-reversed EM wave.

[23] For discussion of vacuum structuring near a nucleus, and acting as a semiconductor, see Richard E. Prange and Peter Strance, "The semiconducting vacuum," *American Journal of Physics*, 52(1), January 1984, p. 19-21. In particular, the vacuum in the region close to the nucleus of a superheavy element is analogous to the inversion layer in a field effect transistor. Thus one introduces the notion of the inverted vacuum. Just as a semiconductor may be manipulated by subjecting it to external fields, doping, etc., it appears that so can the vacuum itself be structured and manipulated.

Of course, from our viewpoint the real trick is to charge the nucleus with a specific substructure by irradiation with a flux of scalar photons containing that substructure. This also conditions the surrounding vacuum (the inverted vacuum) with that structure. If one is clever, one can then utilize that region of the vacuum as a coherent energy source feeding the engineered nucleus, and one can then tap the nucleus to extract energy indirectly from the vacuum.

[24] This is easily done by using four-wave mixing in a pumped phase conjugate mirror at ELF frequencies, for example.

[25] Normally for incident ELF waves the electron shells absorb and strip away the E-field portion, leaving at least part of the B-field portion to penetrate and interact with the nucleus.

[26] Taking the Kaluza-Klein view, one EM force vector may be visualized as a bleed-off (escape in the 5th dimension) of a gravitational 5-potential. The **urgency** of a second EM force vector acting on the first is given by the vector dot product; this represents an "interference" with the escape of the 5-potential. Hence it represents an electromagnetic stress in the local region of medium locking (modulating) the force vectors together into a single system. Ergo, it represents a 4-space stress, and hence a gravitational effect.

[27] Hence the basis for certain nuclear radiation detectors' ability to detect sufficiently intense scalar EM radiation. Also, inventor John Schnur has produced a very practical prototype scalar EM wave detector which he is preparing to market as soon as necessary capital can be arranged.

[28] Taking the Kaluza-Klein view, the first kind represents the 5th dimensional escape of the gravitational 5-potential as ordinary electromagnetic field.

The second kind represents an equilibrium condition in the fifth dimension: the bleed-out (escape) **into** the 5th dimension is balanced by a bleed-in (recovery) of an equal amount **from** the 5th dimension. Thus 5-potential is in equilibrium with respect to the 5th dimension (with respect to EM field.)

If now both the bleed-in and bleed-out EM field components are varied equally and oppositely as a function of time, the 5-potential is always in equilibrium at any one time with respect to the 5th dimension (EM field). However, the magnitude of the 5-potential is rhythmically varied as a function of time. The locked-in EM energy density of local spacetime is thus rhythmically varied correspondingly as a function of time--which means that the local curvature of spacetime is rhythmically varied correspondingly as a function of time. Rigorously, this constitutes a powerful **electrogravitational wave**--which I have dubbed a **scalar EM wave**. Applied to the highly nonlinear nucleus, this wave constitutes a **pump wave** in the nonlinear phase conjugate optics sense, and the pumped nucleus is free to act as a pumped phase conjugate mirror for the production of time-reversed EM waves, time-reversed gravity (i.e., antigravity), and time-reversed entropy (i.e., negentropy).

[29] For a detailed exposition of time reversal in physics, see Robert G. Sachs, The Physics of Time Reversal, University of Chicago Press, Chicago, 1987. For a discussion of negative energy with respect to the binding energy of the nucleons in the atomic nucleus, see C. W. Rietdijk, "How do 'virtual' photons and mesons transmit forces between charged particles and nucleons?," *Foundations of Physics*, 7(5-6), June 1977, p. 351-374.

[30] A charged particle (or charged particle assemblage such as an atomic nucleus) thus may possess two types of charge simultaneously: (1) the first (normal) kind and amount, due to 'random virtual particle photon flux exchange', and (2) the second kind, which is an additional charge (positive or negative) that is deterministically structured.

Note that this violates the presently assumed "fixed charge" law for a charged particle. It also violates the 'totally statistical' law of quantum change. It also technically involves chaos. A magic technical rule is this: unstructured charge plus structured charge produces chaos. Said another way, randomness plus hidden structure produces chaos. Said yet a third way, disorder plus hidden order yield chaos.

Dr. Valerie Hunt's epochal work showing chaos--and thus hidden order--in recorded ELF electromagnetic radiation from human bodies is particularly significant. She split the received EM signals into two identical channels, time-delayed one channel by a very slight amount, then recombined (mixed) the nondelayed and delayed signals. The result was that attractors precisely indicative of chaos appeared. This positively proves that human systems produce ordered time-structuring of EM and hence possess scalar EM attributes and functioning. Dr. Hunt's paper was the key presentation at the US Psychotronics Association's 1988 Annual Symposium at Bergamo Center, Ohio.

[31] The reader's attention is again strongly directed to the Soviet Union's concept of the physical 'information content' of the electromagnetic field and to Kaznacheyev's development of the technical use of this deterministic, infolded EM information content to **electromagnetically** induce death and disease at a distance.

Also, in the Kaluza-Klein (KK) view, electromagnetic field is just the bleed-off (escape) of gravitational 5-potential in the 5th dimension. However, since this strange 5th dimension is "wrapped around" each and every point in 3-space, then every spatial point in our world is totally internal to the electromagnetic medium. Thus everything physical is already the hidden internal structure of electromagnetics anyway, at least in the KK view.

[32] Quantum change is statistical; however, it is *chaotic* rather than randomized. Note that this resolves the greatest problem in quantum mechanics today--that of the "missing chaos." Whittaker allows us to directly engineer this hidden order in the already-chaotic QM change. Kindling (exceeding the quantum threshold by time-integrating coherent virtual particle EM vacuum structures from the irradiation of an object with structured scalar EM of a consistent pattern) is capable of producing direct **physical** changes in matter, including transmutation, induction of disease, reversal of disease, etc.

[33] In modern quantum theory, any particle is regarded as a seething inferno of virtual state changes, as expressed by Feynman diagrams. For example, a photon may for an instant break into two electrons, one going forward in time (an electron) and the other (a positron) going backwards in time. In turn, say, the electron may emit another photon, which breaks again, etc. Further, this is not the only thing electrons can break into. Nucleons (protons and neutrons), for example, are continually changing into one another, emitting temporary (virtual) particles which in turn decay, etc. These transmutations are changes in the virtual state and are so rapid that they cannot be observably detected individually. However, these changes are quite **real** and they **are occurring** (we see this flux of excited virtual changes as the **charge** of the particles). Using scalar EM, one can add coherently structured energy to enhance one of the patterned structures in the virtual ghost state, for example, and cause that pattern to emerge into observable form. In any such change, local spacetime has been both organized and "curved," since its energy density was altered in a specific, patterned structure.

[34] In an atomic nucleus, one visualizes the dynamic virtual "ghost form" changes as if the nucleus were **boiling furiously**, and only "on the average" being composed of a certain number of protons and neutrons. That is, the "normal nucleus" represents the equilibrium state of a furiously dynamic system which is in constant but **extremely short** excursions, changing back and forth into any and all other states. For a finite (extremely small but nonzero) fraction of time, the nucleus can be--**and is**--almost anything else you might choose, including any other specific kind of nucleus. Indeed, since these ghost changes are in and of spacetime, not only is the nucleus changing state **in place** in the observer's serial positive time flow, but it also is changing state **to every "where" and to every "when,"** to all parts of the universe, and to all pasts and futures (including those that never were and never will be, observably).

In the virtual state, everything is present anywhere and everywhere, and anywhen and everywhen, for an exceedingly minute fraction of observer time. Each and every particular thing is actually thinly "smeared" throughout infinite dimensional spacetime, and everything throughout infinite dimensional spacetime is thinly "smeared" into any particular thing in our local spacetime.

Physical reality is thus a giant hologram--the whole is in each part, at least in the virtual "ghost form" state.

At any rate, one can think of one of these other states as a "ghost form"--as an ethereally thin "ghost" of the observable equilibrium state. For example, a nucleus of copper is also a ghostly nucleus of gold. For extremely short, near-instantaneous intervals, it actually exists momentarily as a nucleus of gold. Its **stable** or equilibrium state, however, is copper.

In scalar EM, the internal vector structure that is infolded inside the vector zero resultant E- and B-fields is actually a structuring of the virtual state vacuum and local spacetime. If one "organizes" the vacuum spacetime in this fashion, then the incessant, furious and now organized flux energy of the vacuum gradually shifts the "equilibrium state" in that local region to a new state.

So if one appropriately structures a powerful scalar potential and uses it to irradiate and charge copper nuclei with a pattern that strongly favors the gold "ghost form," then one can slowly but steadily transmute the copper into gold. In such case it is useful to sharply pulse the potential and also simultaneously expose the copper sample to high pressure, great heating, and ultraviolet light.

[35] By "quantum reality" we mean what quantum mechanics implies is the nature of physical reality, including the eery, bizarre world of microchange and virtual change.

[36] For an enlightening discussion of quantum reality, see Nick Herbert, Quantum Reality: Beyond the New Physics, Anchor Books, Doubleday, Garden City, New York, 1987.

[37] Very useful and clear discussions on the nature of quantum physics are given in Heinz R. Pagels, The Cosmic Code, Bantam Books, New York, 1983; for a clear and related exposition of the physicist's struggle to understand the origin of the universe, see Heinz R. Pagels, Perfect Symmetry: The Search For the Beginning of Time, Bantam Books, New York, 1985.

[38] One of the most remarkable physical interpretations of quantum mechanics--and the one closest to scalar EM--is provided by the hidden variable theory of David Bohm. See D. Bohm, Causality and Chance in Modern Physics, Routledge & Kegan Paul, London, 1957; Y. Aharonov and D. Bohm, *Phys. Rev.* 115, 1959, p. 485; D. Bohm, *Phys. Rev.* 85, 1952, p. 166, 180. See D. Bohm and B.J. Hiley, *Found. of Phys.* 5, 1975, p. 93; 12, 1982, p. 1001; 14, 1984, p. 255. See D. Bohm and B.J. Hiley, "The Ontological Significance of the Quantum Potential Model, *Phys. Reports* 144, 1987. See Y. Aharonov and D. Albert, "The issue of retrodiction in Bohm's theory," in *Quantum Implications: Essays in Honour of David Bohm*, Ed. B.J. Hiley and F. David Peat, Routledge & Kegan Paul, London & New York, 1987, p. 224; in the same volume see David Bohm, "Hidden variables and the implicate order," p. 33.

[39] The quantum potential (QP) approach used in quantum mechanics is revealing, for it differs from a classical potential (CP). Unlike a CP, the QP appears to have no point-like source. The QP field is not radiated. In general the QP between two particles does not produce a vanishing interaction as their spatial separation becomes very large. The QP contains an instantaneous connection rather than the retarded connection provided by the CP. Thus two systems very distant from each other may still be strongly and directly connected. Further, the QP of a system depends on the quantum state of the system as a whole, even when its parts are greatly separated.

Thus quantum mechanics shows that for a certain class of wave function, particles that are spatially separated with no classical potential connecting them are not really totally separated--they are connected through the quantum potential. As Schroedinger showed, quantum mechanics includes a kind of nonlocality--an instantaneous "action at a distance," quite at odds to classical interpretations.

J.S. Bell produced an inequality which must be satisfied by a certain class of experiment if a theory being tested is to be called "local." When the experiments are performed, they violate Bell's inequality (the culmination of these experiments is presented in A. Aspect et al, *Phys. Rev. Letts. 49*, 1982, p. 1804.) Bell's theorem is a proof that no local model of reality can underlie the experimental facts of quantum mechanics.

In passing, we briefly address Eberhard's proof that superluminal signalling is impossible. Essentially Eberhard's proof is based on the quantum mechanical assumption that quantum change is statistical, which implies that the quantum potential has a randomized structure. If one defines a quantum measurement as a **statistically discernible** difference, then the would-be superluminal signaler is in trouble if quantum change remains statistical. The reason is that there is no statistical difference between time-averaged random sequences that he can then detect. However, we point out that scalar electromagnetics allows the production of an artificial potential, and this artificial potential can be utilized to produce a nonrandom virtual substructure sequence in the quantum potential. A distant receiver can now be devised that can coherently integrate the virtual information sequence until it breaches the observable state, resulting in receipt of a time-averaged deterministic signal that carries unequivocal information. Thus in the scalar EM view, superluminal signaling indeed appears possible with further development.

[40] Nick Herbert, ibid.

[41] Since physical reality itself can be engineered by scalar electromagnetics, then it follows that--at least theoretically--reality can be manipulated to get any one of the eight. One recalls again the old example of five blind men and the elephant. In a sense we are all blind men, struggling to grasp the nature of something we cannot see with our ordinary senses.

[42] Here we are paraphrasing Leonid Brezhnev's 1975 characterization of erstwhile forthcoming scalar EM weapons--weapons he described as "more frightful than the mind of man has ever imagined." Apparently these weapons were so awesome that even the Soviets thought to ban them. That same year Soviet Foreign Minister Andrei Gromyko introduced to the United Nations General Assembly a draft treaty banning the development of new and frightful weapons of mass destruction, and urged the nations of the world to sign it. See *Prohibition of the Development and Manufacture of New Types of Weapons of Mass Annihilation and of New Systems of Such Weapons*, draft treaty introduced by Gromyko at the United Nations' 30th session of the General Assembly, New York, September 23, 1975. The first article provided that the types of these new weapons would be "specified through negotiations on the subject."

Actually, at the time the Soviets had already been developing and deploying such weapons for 25 years; they were the same weapon Khrushchev reported in development, to the Presidium in January 1960, calling the new weapon a "fantastic weapon" which, if used unrestrainedly, could wipe out all life on earth. See Max Frankel, "Khrushchev says Soviet will cut forces a third; sees 'fantastic weapon," *New York Times*, January 15, 1960, p. 1.

[43] Maxwell's <u>A Treatise on Electricity and Magnetism</u> appeared in 1873. Maxwell died on November 5, 1879. Heaviside, learning mathematics on his own, began using calculus in 1873. By 1874 he had published seven papers--then discovered Maxwell's treatise, which he studied and mastered on his own. In 1885-87 Heaviside published in the *Electrician* a series of articles under the title "Electromagnetic Induction and Its Propagation," where for the first time he gave a clear and modern **vector** exposition of Maxwell's theory. See also note 6.

[44] Maxwell actually anticipated relativity. For example, quoting J.C. Maxwell, <u>Matter and Motion</u>, London, 1877: "We cannot describe the time of an event except by reference to some other event, or the place of a body except by reference to some other body. All our knowledge, both of time and space, is essentially relative." Note particularly that Maxwell understood that both **space** and **time** were relative.

[45] See Michael J. Crowe, <u>A History of Vector Analysis: The Evolution of the Idea of a Vectorial System</u>, Notre Dame Press, Notre Dame, Indiana, 1967 for a definitive exposition of the development of vector analysis.

[46] Hertz developed an interpretation of Maxwell's theory that was similar to that of Heaviside, but gave Heaviside credit for being first. Like Heaviside, Hertz also discarded the potentials as having any physical significance, and focused upon the force fields.

[47] Josiah Williard Gibbs was a relatively obscure theoretical physicist and chemist. He was an American genius, working alone, and professor of mathematical physics at Yale University. Statistical mechanics was created by Maxwell, Boltzmann, and Gibbs. Gibbs' treatment in applying thermodynamics to physical processes was later applied to quantum mechanics. Modern vector theory was largely completed by Gibbs and Heaviside, and is sometimes referred to as "Gibbs-Heaviside vector algebra." Nahin (ibid., p. 194-5) points out that Gibbs independently worked out the algebra of vectors, including the scalar dot product, the vector cross product, the three differential operations (curl, divergence, and gradient), etc. In 1881 he privately printed the first part of his Elements of Vector Analysis, and in 1884 he privately printed the second half. In letters to *Nature*, Gibbs, who died in 1903, made important defenses of the vector theory against the onslaught of Tait and the quaternionists. See letters in *Nature*, 43, April 2, 1891, p. 511-513; *Nature*, 44, May 28, 1891, p. 79-82. In the first referenced letter, for the first time Gibbs pointed out that vectors could in principle be applied to spaces of four or more dimensions.

[48] As Nahin points out [Paul J. Nahin, ibid., p. 9, note 2]: "...it was Heaviside who first wrote the electromagnetic field equations in modern vector form."

[49] Heaviside and Gibbs strongly opposed the elusive idea of Maxwell's EM potentials, and focused electromagnetics upon the force fields, as did Hertz. So strongly did they imprint electromagnetic scientists that the potentials were only mathematical conveniences, that it was not until 1959 (see Y. Aharonov and D. Bohm, "Significance of electromagnetic potentials in the quantum theory," *Physical Review*, Second Series, 115(3), August 1, 1959, p. 485-491.) that scientists were goaded once again into facing the unpleasant fact that the potentials were the primary reality and the translation force fields were simply made from them by physical operations. Even so, this latter view was still not fully accepted until the mid-1980s, and it is only recently that the potentials--so beloved and emphasized by Maxwell himself--are once again accepted as the heart and soul of electromagnetics. Even so, this is still fully accepted only by a handful of scientists. See S. Olariu and I. Iovitzu Popescu, "The quantum effects of electromagnetic fluxes," *Reviews of Modern Physics* 57(2), April 1985 for an exhaustive discussion of the Aharonov-Bohm effect (which proves the primary physical reality of the potential) and a large number of references. See also Bertram Schwarzschild, "Currents in normal-metal rings exhibit Aharonov-Bohm effect," *Physics Today*, 39(1), January 1986, p. 17-20 for confirmation that the AB effect has been proven to the satisfaction of all but the most diehard skeptics.

[50] See notes 26 and 28 for the relationship of the EM force fields to gravitational potential. Note that infolding opposing streams of virtual particle charge flux into an EM vector zero translation resultant produces a "scalar" EM that infolds both forward-time and reversed-time effects into the artificial 5-potential that results. Hence scalar EM forms an underlying linkage between mass, gravity, electromagnetics, space, and time.

[51] A few scientists, however, still concern themselves with the notion of structuring and engineering the vacuum, and at least speculate on some of the possibilities. For example, see "Possibility of vacuum engineering," in Chapter 25: Outlook, T.D. Lee, Particle Physics and Introduction to Field Theory, Harwood Academic Publishers, New York, 1981, p. 826.

[52] E.T. Whittaker, "On the partial differential equations of mathematical physics," *Math. Ann. 57*, 1903, p.333-335; "On an expression of the electromagnetic field due to electrons by means of two scalar potential functions," *Proceedings of the London Mathematical Society*, Series 2, Vol. 1, 1904, p. 367-372.

[53] Scalar EM waves can be made extremely complex, with dynamic hierarchies of vector force components infolded into vector zero resultants. The vector zero resultants can also be internested as well, which allows one to design systems that reach into successively lower internested levels of virtual state--which in turn is the same as reaching into successively higher hyperdimensions. We have previously referred to any specific dynamic vacuum-structuring pattern as a **vacuum engine**.

[54] See Henry Monteith, "Dynamic Gravity and Electromagnetic Processes: Parts I and II," July 1988 (in publication); "Visualization and Duality in Mathematical Physics," Sandia National Laboratories, Albuquerque, April 15, 1986. Monteith has extended quaternion theory to include the hyperbolic quaternion. He also has shown that his extended quaternion theory contains both spinor and twistor theory as subsets, and that it is a full theory of anisotropic spacetime. Presently he is preparing a major book on this subject, and he may very well be the scientist who writes the great new unified EM-G field theory so long sought by physicists.

[55] For a detailed account of the history of vector analysis, see Crowe, ibid.

[56] Specifically, at any local region Heaviside's translation EM force fields represent momentary bleed-in and immediate bleed-out of change to the appropriate potentials. In vacuum, of course, this bleed-in and bleed-out occurs at the speed of light.

[57] For a strong and pertinent critique of present US scientific bias in general relativity, see Ruggero Maria Santilli, Ethical Probe on Einstein's Followers in the USA: An Insider's View, Alpha Publishing, POB 82, Newtonville, MA 02160, 1984. For a proof that electric field and gravitation are not mutually exclusive, see R.M. Santilli, "Partons and gravitation: Some puzzling questions," *Annals of Physics*, 83(1), March 1974, p. 108-157.

To see the limiting assumptions imposed on general relativity that result in the severely restricted "ordinary general relativity" taught in almost all Western universities, see Charles W. Misner, Kip S. Thorne and John Archibald Wheeler, Gravitation, W. H. Freeman and Co., San Francisco, 1973, p. 19-21, 71-72, 367-369. Among other things, these arbitrary restrictions are thought to save the conservation laws. When they are removed, the conservation laws can be violated.

In fact, even Einstein's crippling assumptions really do not save the conservation laws after all, in spite of the prevailing Western belief that they do. For a strong statement in this respect, see A. A. Logunov and Yu. M. Loskutov, "Nonuniqueness of the predictions of the general theory of relativity. The relativistic theory of gravitation.", *Sov. J. Part. Nucl.*, 18(3), May-June 1987, p. 179-187.

Logunov presents some most interesting information. As early as 1917 Hilbert pointed out the fact that in general relativity conservation laws for energy, momentum, and angular momentum are in principle impossible. See D. Hilbert, Gottingen Nachrichten, 4, 1917, p. 21. He stated: "I assert...that for the general theory of relativity, i.e., in the case of general invariance of the hamiltonian function, energy equations...corresponding to the energy equations in orthogonally invariant theories do not exist at all. I could even take this circumstance as the characteristic feature of the general theory of relativity." Unfortunately Hilbert's remark was not understood by his contemporaries, and neither Einstein nor other physicists recognized that general relativity inherently violated all conservation laws.

Logunov also points out that, faced with Schroedinger's demonstration that all components of the energy-momentum pseudotensor of the G-field outside a massive sphere can be made to vanish, Einstein made the remarkable and thoroughly erroneous reply that "Gravitational fields can be specified without introducing stresses and energy density." [A. Einstein, Collected Scientific Works, Vol. 1 [Russian translation], Nauka, Moscow (1956), p. 627.]

Logunov also demonstrates that Einstein's 1918 conclusion that general relativity contains conservation laws is erroneous, though it is frequently cited as the work in which the energy-momentum problem was solved. Logunov proposes the outright abandonment of the general theory of relativity and proposes a 4-space relativistic theory of gravitation to replace it.

Any discussion of conservation laws deeply involves symmetry, observation, and nonobservation. For a succinct discussion of the concise relationship between symmetry, conservation laws, and nonobservables (and asymmetry, violation of conservation laws, and a nonobservable becoming observable), see "Chapter 9: General Discussion, Part IIA: Particle Physics: Symmetry," in T.D. Lee, ibid., 1981, p. 177-188.

[58] See Misner, Thorne and Wheeler, ibid.; also see Santilli, ibid.

[59] For example, see A.A. Vlasov and V.I. Denisov, "Einstein's formula for gravitational radiation is not a consequence of the general theory of relativity," *Theoretical and Mathematical Physics*, 53(3), June 1983 (English translation; Russian publication Dec. 1982.), p. 406-418. Quoting: "...in general relativity there are no energy-momentum conservation laws for a system consisting of matter and the gravitational field."

See also V.I. Denisov and A.A. Logunov, "New theory of spacetime and gravitation," July 1982, p. 3-76. This paper (p. 3) points out that "...the gravitational field in general relativity is completely different from other physical fields and is not a field in the spirit of Faraday and Maxwell."

A 1984 Soviet paper by senior Russian physicist C.Yu. Bosgoslovsky, "Generalization of Einstein's relativity theory for the anisotropic spacetime," is also very relevant. See also V.I. Denisov and A.A. Logunov, "The inertial mass defined in general relativity has no physical meaning," preprint p. 0214, Institute of Nuclear Research, USSR Academy of Science, Moscow, 1981.

[60] Soviet scientists have particularly focused on the infolded structure of electromagnetic waves, referring to this structure as the **information content** of the fields. They have intensely applied this approach to the study of biological systems; for example, see N.D. Devyatkov and M.B. Golant, "Prospects for the use of millimeter-range electromagnetic radiation as a highly informative instrument for studying specific processes in living organisms," *Soviet Technical Physics Letters*, 12(3), Mar. 1986, p. 118-119.

[61] See also N. D. Devyatkov (ed.), Applications of Low-Intensity Millimeter-Wave Radiation in Biology and Medicine [in Russian], IRE Akad. Nauk. SSR, Moscow 1985.

[62] Thousands of dramatic photobiology experiments by V. Kaznacheyev and his colleagues were also highly significant. Each type of cellular disease has its particular EM radiation structure; Kaznacheyev showed that the EM radiation structure (the EM information) emitted by diseased cells is capable of inducing that same disease physiology and symptomology in distant cells (see Vlail Kaznacheyev, "Electromagnetic bioinformation in intercellular interactions," *PSI Research*, 1(1), March 1982, p. 47-76. See also Kaznacheyev and Mikhaylova's 1981 book, Ultraweak Radiations in Intercellular Interactions [in Russian].)

[63] Kaznacheyev, "Electromagnetic bioinformation...", ibid. Kaznacheyev and Mikhaylova, Ultraweak Radiations..., ibid. Also see *Microwave Radiation at the US Embassy in Moscow and its Biological Implications: An Assessment*, U.S. Dept. of Commerce, NTIA-SP-81-12, March 1981; see also Am M. Lilienfeld et al, *Foreign Service Health Status Study: Evaluation of Health Status of Foreign Service and other Employees From Selected Eastern European Posts*, the Johns Hopkins University, Baltimore, Maryland: *Final Report*, July 31, 1978 (see note 15 above for an assessment of the Soviet microwave induction of disease at the US Embassy in Moscow).

[64] See also Note 15 above. The weapons implications for microwave induction of disease at a distance are obvious. Since 1976, for example, giant Soviet microwave over-the-horizon (OTH) radar beams have repeatedly intersected over North America. The US Department of Defense's Soviet Military Power, 1985, p. 45 shows this clearly. If the beamed potentials of the "Woodpecker"--as they are nicknamed--OTH radars were to be deliberately structured with disease patterns, those patterns could conceivably be induced in some percentage of the distant targeted populace. Beck, for example, has reported the phaselocking of 10-Hz pulsing on the Woodpeckers on 15 different frequencies. He has also experimentally shown that it is possible to entrain human brain waves with such a 10-Hz signal, as have Bise and Bielek. Persons in the targeted area who would have their brain waves entrained to the Woodpecker signals, could thus have up to 15 different frequency channels (the radar carriers) phaselocked into the EM oscillations of their brains and nervous systems. Accordingly, complex EM wavefronts could be formulated, translated into structured scalar EM, and coherently inserted into their distant brains and nervous systems by appropriate Soviet modulation of the phaselocked carriers. Precisely such technology was probably what was utilized in the induction of health problems in US Embassy personnel in Moscow.

[65] See papers, books, and videotapes by T.E. Bearden, published by the Tesla Book Co., POB 1469, Greenville, Texas: *Solutions to Tesla's Secrets and the Soviet Tesla Weapons*, 1981; *Soviet Weather Engineering Over North America*, 1-hr. videotape, 1985; *Star Wars Now! The Bohm-Aharonov Effect, Scalar Interferometry, and Soviet Weaponization*," 1984; *Fer-de-Lance: A Briefing on Soviet Scalar Electromagnetic Weapons*, 1986; Chapter 4: "Extraordinary Physics," AIDS: Biological Warfare, 1988, p. 74-203. See also Bearden, "Tesla's Electromagnetics and Its Soviet Weaponization," *Proc. 1984 Tesla Centennial Symp.*, International Tesla Society, Colorado Springs, Colorado 1984; Bearden, "Soviet Phase Conjugate Weapons: Weapons that use Time-Reversed Electromagnetic Waves," *Bulletin*, Committee to Restore the Constitution, POB 986, Ft. Collins, Colorado 80522, Jan. 1988.

[66] In fact, Soviet mathematicians have always been the best nonlinear mathematicians in the world. That capability is particularly important in the development of a new technology based on a highly nonlinear unified field theory of electromagnetics and unrestricted gravitation.

[67] For a good introduction to nonlinear optical phase conjugation and four-wave mixing, see David M. Pepper, "Nonlinear optical phase conjugation," *Optical Engineering*, 21(2), March/April 1982, p. 156-183. See also Chapter 16: "Phase Conjugate Optics," in Amnon Yariv, *Optical Electronics*, Third Edition, Holt, Rinehart and Winston, New York, 1985. See also B. Ya Zel'dovich et al, *Principles of Phase Conjugation*, Vol. 42, Springer Series in Optical Sciences, Theordor Tamir, Ed., Springer-Verlag, New York, 1985.

[68] See Sachs, ibid.; Lee, ibid; Pepper, "Nonlinear optical phase conjugation," ibid.

[69] See C.W. Rietdijk, "How do 'virtual' photons and mesons transmit forces between charged particles and nucleons?", *Foundations of Physics*, 7(5-6), June 1977, p. 351-374. For a beautiful consideration of negative energy in a theory of gravitation, see Frederick E. Alzofon, "Antigravity with present technology: Implementation and theoretical foundation," in *AIAA/SAE/ASME Joint Propulsion Conference*, 17th, Colorado Springs, Colorado, July 27-29, 1981, New York: American Institute of Aeronautics and Astronautics Report #AIAA-81-1608, 1981.

[70] For discussion of a pumped phase conjugate mirror, see Pepper, "Nonlinear optical phase conjugation," ibid; Yariv, ibid; Zel'dovich et al, ibid.

[71] For a useful discussion of the theory of parametric oscillation, see V. V. Migulin et al, Basic Theory of Oscillations, Ed. V. V. Migulin, translated from the Russian by George Yankovsky, Mir Publishers, Moscow, 1983 (revised from the 1978 Russian edition).

[72] This effect provides the basis for what is called the **distortion correction theorem** in phase conjugate optics. See Yariv, ibid., p. 500-501.

[73] Although Morgan himself was a powerful financier, there apparently were far more powerful secret world financial interests behind him, whose interests he served. See Eustace Mullins, "When imitation is not flattering," *CRC Bulletin*, Fort Collins, Colorado, November 1988, p. 3.

[74] In self-oscillation, a pumped phase conjugate mirror furnishes its own pump wave energy from the energy of the surrounding medium. In such case one may have a "self-powered triode," and need only furnish the "grid" signal in order to obtain the amplified output power from the self-oscillating pump wave. For examples, see Mary J. Miller et al, *Optical Letters*, 12(5), May 1987, p. 340-342; Mark Cronin-Golomb et al, *Applied Physics Letters*, 41(8), October 15, 1982, p. 689-691. Tesla's magnifying transmitter in fact was directed toward initiating self-pumping in the phase conjugate mirror earth. We refer, of course, to a driven, open-loop system that is tapped.

[75] Golden has performed fundamental measurements of the scalar EM resonant response of the earth by two entirely different methods, and obtained frequency maps in both cases which are in precise agreement.

[76] Tesla's magnifying transmitter on Long Island, New York utilized construction (steel shaft and stairs) that penetrated 120 feet into the earth. An excellent ground plane was provided. Many large radio transmitters today do produce scalar waves in the earth and under the sea, per Golden's direct measurement.

[77] This initial small time-reversed replica is essentially due to a universal process, since almost all nonlinear media produce at least a small time-reversed replica wave in response to a normal wave input.

[78] For a deeper discussion, see T.E. Bearden, "Extracting electromagnetic energy from the nonlinear earth as a self-pumped phase conjugate mirror," presented at the PACE Third International New Energy Technology Symposium, June 25-28, at Maison du Citoyen, Hull (Ottawa), Canada. [In publication, *Proceedings...*]

[79] In the oscillation condition, gain can be very high. Therefore an appreciable amount of power can conceivably be taken from the earth's deep internal stress (heat and pressure), since--randomly and continually--fortuitous coherent frequency microcomponents in these stresses are acting as the self-oscillating "pump" wave.

[80] See Pepper, "Nonlinear optical phase conjugation," ibid.

[81] See Yariv, ibid.

[82] Essentially this is a process that kindles and initiates at a threshold, very similar to lasing.

[83] Infinite gain merely means that up to all the available energy in the pump wave will be output in the amplified PCR wave.

[84] Note that only a fraction of the earth's internal heat and pressure energy is available in the regenerative pump wave in self-oscillation at a particular frequency.

[85] Owen Flynn, "Parametric arrays: A new concept for sonar," *Electronic Warfare Magazine*, June 1977, p. 107-112.

[86] See A.Ya. Terletskii, "Some exact wave solutions of nonlinear electromagnetic field equations," *Sov. Phys. Dokl.*, 19(6), December 1974, p. 344-345. [Russian original in *Dokl. Akad. Nauk. SSR*, 216(4), June 1974, p. 763-766]. Of particular importance is the dependence of the traveling wave's velocity on its amplitude and on the external magnetic field.

[87] A difference of 12 kHz was utilized by the Soviet Union in placing 27 different resonant power extraction channels (or "Tesla power taps") into the earth, in and around May Day, 1985, as detected and measured by Frank Golden.

[88] Which was the approach utilized by Dr. T. Henry Moray in his radiant energy device. In 1939 Dr. Moray was obtaining 50-kilowatts of electrical power from the vacuum, employing a 55-pound energy device. See T. Henry Moray, The Sea of Energy, 5th edition, History and biography by John Moray, Forward by Thomas E. Bearden, Cosray Research Institute, 2505 South 4th East, Salt Lake City, Utah 84115, 1978.

[89] In a nonlinear, distorting medium, time-reversed waves initiated by a distorting ordinary wave will proceed from disorder back to order. Hence the initiated time-reversed wave is negentropic. For an example, see David M. Pepper, "Applications of optical phase conjugation," *Scientific American*, 254(1), Jan. 1986, p. 74-83. See particularly the striking photograph on page 75. See also A. Yariv and T. L. Koch, "One way coherent imaging through a distorting medium using four-wave mixing," *Optical Letters*, Vol. 7, 1982, p. 113.

[90] F.V. Bunkin et al, "On sound phase conjugation with amplification of phase-conjugated wave," *Kvantovaya Elektron. 8*, 1981, p. 1144 [English translation: *Sov. J. Quant. Electron. 11*, 1980, p. 687.

[91] A.P. Brysev et al, "Model realization of a NbLi parametric phase-conjugating sound amplifier," *Pis'ma Zh. tokhn. Fix. 1*, 1982, p.546.

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1988 INTERNATIONAL TESLA SYMPOSIUM

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