

BACKGROUND FOR PURSUING SCALAR ELECTROMAGNETICS

T. E. Bearden
February 1992

Note

This informal paper is augmented and adapted from a letter to a young senior in EE, who was planning to pursue his doctorate, and asked for advice in understanding the scalar electromagnetics area and choosing either physics or EE as a major. The reply back to the student enclosed several formal background papers. [1][2] This paper is a sort of "executive summary" of scalar EM.

To Correspondent

Delighted to see you are interested in the material and the approach; I will try to give you some quick answers to your main questions.

Best is to simply start with my latest book, *Gravitobiology*, from the Tesla Book Co., POB 12183, Chula Vista, CA 91912, phone (619) 426-8213.

Two Kinds of Electromagnetics

Specifically, you must understand that there are two kinds of EM. One is flawed and in the normal textbooks, and you will study it in your education process. The other kind is not in your textbooks at all, but it is in some good technical papers, if you know what they are, what to read, and how to put them together. By the time you get your doctorate, hopefully scalar electromagnetics will be in fashion at most of the leading universities.

For the second, unknown kind of EM, you should read the two Whittaker papers bound in as Annexes to the *Gravitobiology* book. [3][4] They give you the basic theory you need, for the internal EM and for scalar EM potential interferometry. Study them until the material is coming out of your ears in your sleep.

Internal EM Structure of the Scalar Potential

Briefly, Whittaker shows you that a scalar EM potential is comprised of bidirectional EM wave pairs, where the pairs are harmonics and phase-locked together. In each coupled wave/antwave pair, a true forward-time EM wave is coupled to a time-reversal of itself — its phase conjugate replica antwave. The two waves are spatially in phase, but temporally they are 180 degrees out of phase. That combined energy thus stresses the "time dimension", and in fact alters the local rate of flow of time itself. Please note how fundamental that statement is. Everything may be said to exist in time, or "move along in time," or to "be in linear motion along the time axis." When you stress and alter the rate of flow of time, you also affect all those time-present things such as inertia of an object, mass of the object, its angular momentum, clock rates, etc. You directly engineer local general relativity, and you electromagnetically curve local spacetime.

Time Reversal and the Time-Reversed EM Wave

You must understand time-reversal and the time-reversed EM wave [5] itself, including the theory of the phase conjugate mirror and of the pumped phase conjugate mirror (from nonlinear optics.) Yariv [6] Chapter 16 and Pepper [7][8] are key to that understanding. Study these references also until the material is coming out of your ears in your sleep.

Also study Sachs' overview of time reversal in physics. [9] Here you will find that time-reversal still isn't well understood at all, but Sachs does a marvelous job in presenting what is known and used. You should also realize that a time-reversed (TR) wave is seen by the observer in his own "forward time." Hence he sees the wave spatially reversed. In short, he sees the same thing as he would see if a movie ____ of the wave expressed as a forward time wave ____ were simply reversed. So the TR wave ever-converges on its course, rather than diverges. Convergence is the time-reversal of divergence. Apply similar TR processes to other characteristics of a normal wave, by letting the movie film run backward in your mind. Notice particularly what happens to the forward-time entropy of scattered waves ____ it becomes negentropy when you time-reverse the scattered waves. You can recover "order" or "energy" even after it's been scattered in performing work, by phase conjugate reflection. And then you can use it again. Remember, every system is driven, with continual input and output of energy. We are not violating the conservation of energy of a closed system, because we are not talking about a closed system.

Destroy the Mystique of Entropy

Remove in your mind the neo-religious mystique built up around the entropy concept. The two serious postulations (assumptions) of entropy are (1) every component is a forward-time critter, with no time-reversed critters allowed, and (2) random variable statistics is assumed a priori. With the Whittaker decomposition of the scalar potential into a surprising and perfectly ordered set of harmonic biwave pairs, you have blown away the random variable statistics assumption. By phase conjugate mirror production of time-reversed EM waves, you have blown away the forward-time assumption. So entropy isn't what it used to be, and the second law of thermodynamics is not a mystical, irrevocable law of nature at all. To believe that it is, is dogma, not science. Entropy can be transformed directly into negentropy, and negentropy can even be amplified. Specifically, the pumped phase conjugate mirror does exactly that.

Statistical Gravitons and Coupled Photons

Then consider the Whittaker EM biwave structure of the potential again, from the particle viewpoint. The wave is made of photons, and the antiwave is made of antiphotons. Since the wave and antiwave in each set are perfectly correlated, so must be the photons/antiphotons. The waves are passing through each other, so to speak, in the time dimension only. They are perfectly coordinated spatially. Thus so are the photon/antiphoton pairs. That is, the photons and antiphotons are continually coupling and decoupling, in each wave/antiwave pair. Since all the wave/antiwave sets are phase-locked, then one has the unusual feature that this potential in the local spacetime has formed a spacetime lattice, perfectly organized both spatially and temporally. Further, when a photon and antiphoton are coupled, the resulting system has helicity-2. This spin-2 entity is a graviton. However, it is not a hard particle, because it is continually forming and unforming. Hence it is a statistical graviton. Occasionally, more than two photons couple; occasionally the coupling opportunity is missed. We are interested in the average coupling's spin value; that may be

either integral or fractional. What is happening in the Whittaker spacetime lattice with respect to the photon coupling and decoupling is that energy is oscillating back and forth between expression as EM energy/order (photons decoupled) and expression as gravitational energy/order (photons coupled).

The statistical graviton process is not confined to helicity-2 gravitons, since the spin-2 value just represents the average coupling. Spin-2 statistical gravitons represent or produce a flat local spacetime, since the lattice has no surplus or shortage of either photons or antiphotons. Indeed, we may regard the coupled photons and antiphotons as a special sort of "Dirac sea," similar to the Dirac sea of negative energy electrons. Depending upon the helicity, the spacetime may have an excess of deficiency of photons, in which case it is said to be curved. Also, it can thus serve as a source or a sink, depending upon whether the hidden photon sea has a surplus or a deficiency.

Graviton Helicity and Spacetime Curvature

Note that we are often using the term "photons" to mean either photons or antiphotons.

If in the statistical graviton we increase the photon coupling to say 2.1 photons average, then this provides gravitons of spin 2.1. In this case the local spacetime is curved, since it has an excess EM energy density, as compared to normal ambient vacuum. It has an excess of photons, so to speak, and can thus serve as a photon source (an EM energy source). If the averaged coupling is 1.9, say, then the local spacetime is curved in the opposite direction. In that case, the vacuum is deficient in photons, and can act as a sink for EM energy.

An Asymmetrical Vacuum Violates Local Conservation

In a locally curved spacetime, then, one may have either an energy source or an energy sink, depending upon how one makes or engineers this local vacuum/spacetime. In a curved local spacetime, the local vacuum/spacetime interacts directly with a system placed there, and it can be designed to produce either extra energy in the system or absorb energy from the system. A curved local spacetime is a locally asymmetrical spacetime. With this violation of symmetry, most of the conservation laws can be broken locally. One can readily have magnetic monopoles also, in such a locally curved system. [10] These violated laws include conservation of energy, electrical charge, magnetic charge, momentum, etc. The vacuum itself becomes an engine, to perform work upon the system.

Using the Inner Hidden EM Order of Entropy

With the pumped phase conjugate mirror concept, you can decompose negentropic EM scattering stress energy (even heat) into ordered bidirectional sets of Whittaker waves, use these Whittaker waves as pump waves inputting to a phase conjugate mirror(PCM), "tickle" the PCM with a very small "signal" wave input, and get out all of the entropic pump energy back in perfect order, as a powerfully amplified time-reversed phase conjugate replica (PCR) of the little signal wave.

If you look in that fashion at Tesla's magnifying transmitter that he built on Long Island, you will see that he really is treating the earth itself as a pumped phase conjugate mirror, and he is using his transmitter to provide a stimulus wave into the earth. When things are done right (there's also one or two more requirements), when so stimulated the scalar EM potential represented by the heat and pressure energy of the earth's

interior will partially organize itself internally as sets of Whittaker pump waves. The combination of these Whittaker bidirectional EM waves and the highly nonlinear material of the earth then become a pumped phase conjugate mirror (PPCM). Tesla's transmitter is furnishing the "stimulus" wave to cause internal Whittaker bidirectional self-ordering to occur (actually through nonlinear harmonic and subharmonic resonance).

Now suppose the earth has been "stimulated" in this fashion, and has become a PPCM earth. By standard, orthodox, nonlinear optics theory, proved by thousands of experiments and papers in the literature, you can then input a small "signal wave" from a distant transmitter anywhere on earth, at the distant locality, and there you will receive back from the PPCM earth an amplified phase conjugate replica (PCR) wave, with far more energy in it than you put in, in your signal wave. So you can use Tesla's approach to directly organize the enormous heat and pressure energy of the earth, forming them (considered as a scalar potential) into a giant "standing Whittaker pump wave" in the earth, and tap that Whittaker wave anywhere else in the world that you transmit in another little signal wave. In late April to early May of 1985, Frank Golden detected and measured the Soviets doing precisely that, on 27 pairs of EM pump wave frequencies, 12 kilohertz apart. [11] Almost incredible electrical power was being extracted from the earth, to power enormous Soviet directed energy weapons as part of the May Day celebrations for the 40th anniversary of the end of World War II against the Nazis.

Pumped Phase Conjugation as a Negentropic Process

In other words, you can defeat entropy disordering by this pumped PCM means. You do it by turning positive (scattering) (entropic) energy of the pump waves into negative (gathering) (negentropic) energy of the amplified PCR wave. Note that almost all of what you were taught about entropy assumes that all components of the entropic system are time-forward components, and that none of them are time-reversed components. It would be nice if the leading thermodynamics experts would do some real hard work with Whittaker potentials, internal EM biwave structures of scalar potentials, PCMs, pumped PCMs, and time-reversed waves in general, not just at optical frequencies, and not just with obscure electro-optical devices.

Time Reversal and Correction of Disorder

Be sure you understand Yariv's statement of the distortion correction theorem. [12] The principle is awkwardly named, but it contains the gist of engineerable negentropy. Read it and say it over and over, until your mind grasps its fantastic implications. You can easily make a wave that will restore former order after the scattering of that order. Realize also that the time-reversed wave is a general solution to the wave equation. Any kind of wave — EM, sound, mechanical, whatever — can be phase-conjugated/time-reversed in this manner. In his New York lab, Tesla apparently did it first, with mechanical vibration waves, before the turn of the century. [13] His later telegeodynamics [14] actually envisioned the use of time-reversed, laser-like mechanical waves that traveled through the earth's crust to a distant point. He also understood the use of two such beams from separated separate transmitters, so that the beams met and crossed at that distant point, to reproduce — by scalar interferometry — the mechanical effects desired at that point. Whittaker's 1904 paper will show you that interference of two such scalar potentials will indeed produce ordinary force fields in the interference zone. You can fairly readily produce force fields at a distance. By calculation of the form of

potential needed, you can even produce them in the geometric patterns and directions you wish. Ball lightning, e.g., is one of nature's ways of using distance-independent scalar interferometry to produce such stabilized geometrical forms of EM energy. Try finding any other laboratory-testable explanation of ball lightning in the physics and electrical engineering curricula!

Whittaker and the Aharonov-Bohm Effect

You must also understand what the Aharonov-Bohm (AB) effect is. Read carefully the cited AB 1959 paper. [15] You must also comprehend the fact that Whittaker's work in 1903 and 1904 had already anticipated the AB effect, and drastically extended it engineerably and in a distance-independent manner, into the macroscopic world, far beyond the several thousand angstroms to which it has now been laboriously proven by modern physicists.

A Basic Knowledge of Atomic Nuclei

You need to know a little something about atomic nuclei, isotopes, isomers, etc. A variety of introductory nuclear physics or nuclear engineering books have the necessary material in a few chapters.

Vacuum Is a Plenum, Not an Emptiness

You need to also understand what the vacuum is. My own later work will give you an overall grasp of that, and for deeper understanding you can check cited references that appeal to you. [16] [17] [18] [19] [20] I warn you that we've all been so conditioned to think of the vacuum as "nothing" and an "emptiness," that it takes some doing to overcome that deep-set, unconscious bias in one's own thinking.

The Major Physics Disciplines Are Inconsistent

You need to be aware that there are serious conflicts and inconsistencies existing between general relativity, electromagnetics, and quantum mechanics. [21] Physics is not unified, and it is not even consistent. No one, for example, even knows what a photon really is. [22] It is not just a localized particle, that much is sure; it's more like a delta appearing in the calculated constant of each frequency term in an infinite Fourier expansion series. In fact we've got four major photon models, all different, and we just plug in whichever model has been found to give the right answers for a particular application. [23] As another example, the field concept is known to be fundamentally in error, but it is so useful that it continues to be widely utilized. [24]

Force Fields Versus Potentials

The conflict between QM and EM is particularly poignant in regards to what causes electromagnetic phenomena in the first place. [25] In classical EM theory the forcefields are considered the primary causes, and the potentials are just sort of mathematical conveniences. In quantum mechanics, however, you have exactly the contrary view. There, the potentials are the primary causes, and the force fields are secondary effects, created in the charged particle system itself by the interference there of the potentials. Vacuum is pure potential, nothing else. [26] The forcefields do not even exist in the vacuum, but only in the charged particle system itself, with which the potentialized vacuum interacts.

You cannot have the classic EM force field in the vacuum, a

priori. You can't and don't have a force field except when you introduce a charge into a potential gradient. There's never been an E-field or a B-field in the vacuum as such; never has been, and never will be. The classical EM model is flat wrong on that. Even Feynman pointed out in his three volumes of physics that only the potential for the forcefield exists in the vacuum, not the forcefield itself. [27] You've got to understand this point. The inclusion of vacuum forcefields is a major screw-up in classical EM that prevents real understanding of the vacuum's potentialization and local interaction with physical systems.

Take the definition of an E-field: $E = F/q$, where q is charged mass. If you don't have any charged mass, you can't possibly have any force per unit charged mass, from the definition a priori. Try an analogy where E is the number of fish per bucket of water, F is the number of fish in all the buckets of water, and q is the number of buckets of water. If you have no buckets of water at all, for example, you cannot possibly have any fish per bucket of water, a priori. If you have a lot of fish around, but no buckets of water, however, you have the potential for fish per bucket of water, should you bring in some buckets of water and couple the fish to them (put them in the buckets of water).

The Quantum Mechanical Vacuum

To understand what is in the vacuum, you need to appreciate the quantum mechanical view of the vacuum. In that view, spontaneous creation and annihilation of particles occur at an incredible rate. Each particle is formed, then disappears, so quickly that it cannot be individually observed. But it is real while it is existing, because in quantum field theory the exchange of virtual particles generates all the forces of nature. We call such a fleeting or ghostly particle a virtual particle. Of particular interest is that enormous numbers of virtual photons continually appear and disappear in the vacuum. The vacuum is thus a fiery, seething cauldron of incredible EM energy, but the EM energy is essentially disintegrated. At any rate, electromagnetically the quantum mechanical vacuum to first order consists of an incredible flux of virtual photons. [28]

So to be more precise, in the quantum mechanical vacuum you do not have observable charged mass, but you do have virtual charged mass. So you can have a virtual E-field in the vacuum, which is just a potential gradient without the presence of observable charged mass particles. [29] Let's look a bit deeper:

Detected EM Waves Are Electron Precession Waves

Because of the spin of the electron/particle, that potential gradient in the vacuum __ that interacts, e.g., with an electron in a detector probe wire __ is actually oriented longitudinally, at right angles to the present notion of a transverse wave. Let's see why: The conduction electron in the wire is relatively constrained [30] by all the other conduction electrons ahead of it pushing back when it tries to accelerate. Being constrained longitudinally but spinning, it acts then as a gyro, and precesses laterally (from the direction of the disturbing "force". If a vacuum potential gradient "virtual force" pushes on that spinning electron gyro in a wire probe, the spinning electron must move at right angles to the direction of the virtual force, because its movement is mostly precession.

Conduction electrons thus don't move down the wire at the "disturbing force's" signal velocity; instead, they precess sideways, and occasionally "slip" forward down the wire a bit during their precession. They thus "drift" along down the wire at centimeters per second or so __ not even approaching the

signal velocity (i.e., the velocity of the change in potential as the change moves down the wire). The signal velocity down the wire is only slightly less than the speed of light in vacuum, which is about 300,000,000 meters per second. [31][32] The lateral or transverse EM forcefield waves we measure in our probes and instruments — and erroneously model in our theory as existing in the vacuum — are actually electron translation waves in the charged particle system (the detector). Since that translation is precession, the measured EM transverse waves are actually electron precession waves. They are not at all what is in the vacuum. Instead, they are what is in the electron gas in the wires and circuits of our detectors and instruments.

EM Waves in the Vacuum Are Longitudinal

Since the interacting/disturbing virtual E-field (the massless potential gradient) "force" in the vacuum must be oriented at right angles to the detected precession movement of the electrons, then the EM waves in vacuum are actually "waves of potential gradients" and are longitudinal. It appears that Nikola Tesla was quite correct on this, you see, and all the modern textbooks are quite wrong. [33]

So you cannot have an observable E-field in the vacuum, contrary to what classical EM theory and your physics text prescribe, because it would require the presence of observable charged particles, none of which are there. It would in fact require the presence of the mechanical ether, a notion that was destroyed before the turn of the last century. You do have virtual charged particles present in the vacuum, and the gradients in the vacuum/virtual domain are longitudinal, not transverse.

Why Maxwell Assumed Transverse EM Waves

When Maxwell wrote his theory, he used a mechanical model of the ether. [34] In that model, thin but observable mass "fluid" is assumed to comprise and fill the vacuum. Accordingly, Maxwell assumed observable forcefields and transverse EM waves to exist also, since that is what is measured in the electron gas in our probes and detectors. The electron had not been predicted yet, and electricity was considered to be a thin material fluid, as was the "luminiferous ether." Decades later, the notion of a mechanical ether was destroyed experimentally, [35] but Maxwell's mechanical-ether-based EM model — as by then long-since "interpreted" from quaternions into vectors, by Heaviside and Gibbs — was not changed accordingly. With respect to the form of EM waves in vacuum, the Heaviside/Gibbs vector interpretation model has been in error a long time — just as was its Maxwellian quaternionic predecessor — and it's still in error, contrary to what they taught you in your textbooks and classes.

There Is a Mechanism for the Flow of Time

Note in passing that the scattering interaction of the external EM with the electron shells of atoms primarily creates the basic quantum changes that in turn create and control the nature of the macroscopic flow of time. In other words, a quantum consists of action, or "energy times time." It carries not only a piece of energy, but also a piece of time. [36][37][38] Keep that firmly in mind for the following:

A photon is freed EM energy. Its thing is to travel at the speed of light. Mass is trapped EM energy. Its thing is to trap photons and sit there and hold them as a densely packed mass potential. (more on that later).

In the ubiquitous photon interaction with mass — continual

photon absorption by matter and photon emission from it — the energy portion in the absorbed quantum (photon; free EM energy) turns into mass (trapped EM energy). Simply divide the photon's energy by c-squared to get the amount of extra resulting mass. However, absorption of the energy portion of the photon leaves its "time portion" or "time tail" attached to the "excited" mass that absorbed the photon. Thus that (formerly) mass — that absorbed the energy portion of the photon — is now "masstime" and not mass.

Note that mass does not exist in time. Masstime does. Each constituent particle of the atom thus is alternately existing as mass, masstime, mass, masstime, etc. Or in other words, it's flipping between atom, atom-time, atom, atom-time, etc. states. Think deeply about that. Things don't "flow through time" continuously in the manner universally assumed. To the macro observer, of course, the flipping is so rapid that he cannot see it. So he sees the macro world as solid and continuous. At the micro level, physical reality is being created and annihilated, quantum by quantum but at an incredible rate.

Shortly after absorbing the photon, photon emission from that excited atom-time occurs, and a bit of the atom-time's mass (the trapped EM energy) is reconverted back to a new energy part of a photon (freed EM energy). In the photon freeing/formation process, this freed "photon energy part" absorbs/joins the time tail of the atom-time as part of itself. The emission of this photon "tears off and carries away the time tail" from the mass/atom-time, leaving behind mass/atom again, and not (mass/atom)-time. So a mass is continually changing into masstime, then mass, then masstime, then mass, etc. The mass "moves through time" in little jumps, so to speak, at a very high "jumping rate."

The result is that the "time dimension" connected to the mass of the observer or instrument is not continuous, but discontinuous. It's rather like a switch being repeatedly thrown back and forth, between off and on states. A mass's "passage through time" is in that vein. The "time dimension" is continually being created and destroyed, for each particle of mass in the observer/instrument, by photon interaction. By the creation portion, things exist in time, producing causality and a future and a past. By the destruction portion, the future and the past are disconnected and "lost." That's why you can look in a corner, and see the three length (spatial) dimensions, but try as you will, you cannot see the time dimension at right angles to them. It doesn't exist as a continuous dimension; otherwise, you could see into the past and into the future.

Play around with multiple masses and multiple time flows a bit, and you'll discover that there are ways to "see into the future and the past," but's that's way beyond the scope of this present discussion! [Suffice it to say that I know one physicist (PhD) who has extensively experimented with that, and another scientist who has also experimented with it, but I am not at liberty to discuss the results.].

External and Internal Electromagnetics

But to return. To understand scalar EM, as we said, you must understand that there are actually two kinds of electromagnetics. One is — so to speak — only on the external "surface magnitude" of the vacuum potential, and the other is in the interior of the vacuum potential. The exterior kind is spatial in nature; the interior kind is hyperspatial in nature.

- (1) The exterior kind of EM is caused or due to the

potential magnitudes and their gradients, interacting with charged particles (forcefields); that's the "normal" kind. In that kind the theoretical EM model's focus is on the forcefields as causes, with the potentials themselves just regarded as mathematical conveniences. Certainly that "normal" EM does not contain any sort of organized EM structure inside, and composing, the scalar EM potential. It just models the scalar potential at a point as a magnitude, and the vector potential at a point as a magnitude and direction. Notice it thus models only local action; it does not model any sort of action at a distance. The EM action is considered — and described in the classical EM model — as existing at a point in space and time. Further, the local spacetime itself is considered not to have any direct causative EM interaction there. In other words, there are assumed to be no local vacuum engines — no Whittaker activation of mass or the local vacuum.

(2) There's also an internal EM, normally completely inside the scalar potential, which exists as "infolded" harmonic sets of EM antiparallel wave/antiwave pairs. Whittaker 1903 describes that kind of EM. This internal EM was in Maxwell's original quaternion equations, hidden in the scalar component resultant that remained when the directional components of quaternions interacted to form directional zero resultants. The scalar component resultant of the interaction often still remained, and infolded inside itself (i.e., it then consisted of) scalar and vector functions of the yet-present-and-interacting component vectors. [39]

Today that part of Maxwell's original theory just appears in classical EM Heaviside/Gibbs theory as a vector zero resultant, which is erroneously discarded as if it were a complete absence of EM. It is no such thing; it is merely the absence of EM translation of charged particles. It indeed is a patterned EM-induced gravitational stress in local spacetime, and it is a little "vacuum engine" capable of working directly on the atomic nucleus. If you want to know what all the fuss about the difference between Maxwell's 200-odd quaternion equations EM theory [40] and the Heaviside/Gibbs four vector equations curtailment/subset, just look at the difference between a zero vector result and a quaternion resultant, in an interaction where the vector resultant is zero but the scalar component of the quaternion resultant remains. Specifically, look mathematically at the internal functional nature of that remaining scalar resultant — the part that's thrown away in the present theory.

(3) Note that the internal EM is more than just a model of conditions at a point. In addition to that, it prescribes a hyperspatial, bidirectional flow of EM transverse wave energy at the point, into and out of it, into it from afar and away from it back to afar, on an infinite number of phase-locked frequencies. In other words, the internal EM energetically connects conditions at a point with essentially all the other points in the universe. And when we interfere two such scalar potentials, we are actually interfering both of those sets of an infinite number of bidirectional EM waves. (See Whittaker's second paper, 1904). [41] It doesn't matter where the interference zone occurs; it can be a million miles away, or a light-year away. The interference accomplishes "outfolding," and creates "normal" or "exterior" EM effects. Specifically, it creates force fields and patterns of them — both static and dynamic — on charged particle systems. The internal EM

thus prescribes and models action at a distance, and incorporates the "normal" exterior EM as a special case of local scalar interferometry. Whittaker rigorously proved this mathematically.

Zero-Translation-Vector-Resultant Systems

You must also do some thinking about the scalar envelope nature of a series of finite, nonzero, interacting translation vectors which result in a zero-vector resultant for translation. They still form an internally active system, and their action cannot be ignored if one is to grasp the total physics of the situation. Not all vector zeroes are equal — it is a serious fallacy of vector analysis to equate them, and also to equate all of them as "total absences." [42] There's a great deal of difference in two identical tanks, one of which is truly empty, and one which is filled with a gas under enormous pressure. Neither is translating, but which one would you prefer to cut into with a cutting torch? As an example, the resultant system of two equally forceful elephants pushing fiercely against each other may not translate, so they will do no external translation work on an external system. But they do struggle fiercely against each other, and put a lot of stress in there, and each is constantly working furiously. The system isn't doing external translation work, but it's doing a whale of a lot of internal work, of one elephant on the other. [That, after all, is what internal stress is — it's a condition of internal work being continually performed on the parts of a system, without external translation of the system.]

Internal EM Energy As Continual Internal Work

Now two matched fleas pushing together would be the same sort of "zero vector translation" system as the system of two matched elephants. But if one thinks that all vector zero resultants are really equal, and really are the total absence of work and force, just try standing between the elephants and then between the fleas, and compare your two experiences. I think you can immediately see a great difference in the two systems! I also think you can see that you really shouldn't neglect the internal energy trapped in that zero-translation-vector system. Many learned professors challenged with standing between two straining elephants, to test their notion that the zero vector system is a "total absence of force" type of zero and is to be simply discarded, just don't seem to see the humor in the issue posed. Instead, they are quite apt to become rather furious at the suggestion of putting the issue to such a practical and definitive test. Ah, me! They really will not submit their pronouncements to scientific verification or validation by a simple experiment! [I am particularly fond of challenging the ones who call me all the dirty names, to test it with the two elephants.]

But in a physical system, you might ask, how can the system, just sitting there doing nothing externally, be continually performing internal work, which requires continual scattering of energy inside itself? Simple. All systems are open, driven systems — driven by the VPF of vacuum. Such a system, in equilibrium in its driving flux exchange flows, can easily be constantly performing internal work. Again, it's like sticking a paddlewheel in a river, without connecting any external load to the shaft. The system will just sit there and continually do internal work, but it will not be doing any external translation work. Nontranslating systems are just "idling" systems, so to speak, driven by the VPF exchange with the vacuum. The vacuum is driving everything, everywhere, anyway.

What Electrical Charge Really Is

Nowhere in classical EM does it tell you what electrical charge is or what causes it. For that question, you will have to dig the answer out of quantum mechanics and quantum field theory. Briefly, the electrical charge of a mass is really its violent exchange of virtual photons with the vacuum. The charged mass of the particle is continually absorbing virtual photons from the surrounding vacuum, and re-emitting them back to the vacuum. Actually, the magnitude of the electrical charge is simply a measure of the volumetric intensity of this virtual photon flux (VPF) exchange. Also, it is fixed only for a fixed vacuum VPF intensity, in which it is embedded. It's really discrete, not quantized. If you change the local vacuum VPF flux intensity (by simply adding, e.g., a positive or negative electrostatic scalar potential), you create a "locally excited vacuum," a "locally curved spacetime," and an altered magnitude of the charge on a fundamental charged particle located in that excited (potentialized) vacuum. If you want to get a Nobel prize, then perform some experiments along this line, to demonstrate that the electrical charge of a particle is discretized as a function of local vacuum VPF intensity, but it is not quantized, and write it up and publish it in a leading journal. Of course if you do your experiments in an unexcited (i.e., normal ambient) vacuum, you'll get the same answer everyone else has before you. Tesla, however, certainly held a very different view, and considered the electron as having a variable charge. [43] A lot of things in your EE book were simply assumed, back there at the beginning.

What Unorthodox Researchers Mean By "Free Energy"

Regarding your present "free energy is impossible" education, don't believe a lot of what you were told. If they didn't even get the definition of energy correct — and they didn't — then you might suspect they really are not too sure just what kind of energy is free for the taking and what kind is not. Many of them certainly don't seem to recognize that there's absolutely no such thing as a closed system, anywhere in the universe. Everything is open to a virtual particle flux exchange with the vacuum, and every system is driven by that flux and its energy. Indeed, every system is just a complex order in equilibrium in that VPF of vacuum, with violent input and output continually. All we mean by "free energy device" is a device that incorporates some sort of "gating mechanism" to gate out a bit of that violent VPF energy circulation in and out of the system. We just wish to gate some of the vacuum energy that runs in to the nucleus — catch it there before it runs back out to the vacuum, and "gate" it out to the external circuit and the load before it is allowed to scatter and run back permanently to the vacuum. It's no different than wishing to put a paddlewheel in a river, with a sluice-box arrangement to divert some of the river's water to the load (the paddles) and get shaft power from the rushing water, before the water is allowed to spill off the paddles and return permanently back to the river.

Local Energy Conservation Can Be Legitimately Violated

"Conservation of energy" ruthlessly depends upon time symmetry; if time stress is made asymmetrical (as in potentialization/curvature of the local vacuum/spacetime and deliberately altering its Whittaker structure), then local conservation of energy is violated, and the local vacuum will serve as a sink or a source, depending upon which way it's potentialized. You can easily violate local conservation of energy by curving local spacetime, if you understand Whittaker's two papers. [44] He already shows you that, in the potential at a point, you've got bidirectional EM wave flows of energy, in and

out, from all the rest of the vacuum in the universe. That exchange of the vacuum is mostly with the nucleus of the atom, for that's where most of the mass potential is. If you "gate" a little bit of the inflowing EM Whittaker wave energy out to the external circuits of a device, you will extract and use EM energy directly from the vacuum source. As I showed in the Sweet vacuum triode write-up, there's at least one major way of doing just that sort of gating — and the device proves it.

On Self-Powered Permanent Magnet Devices

And they told you a magnet won't turn itself, didn't they? Well, that's not always true. They never heard of a kinetic (activated) magnet, which by definition traps-in a special vacuum engine function to drive it. Floyd Sweet activates the magnets in his vacuum triode by a special proprietary process, after which it can gate energy out of the vacuum into the external load circuit. Until the nuclei are activated to function as controlled vacuum engines, the device is just an inert, solid state pattern of materials, and quite useless as a generator. Also, check the Einstein-de Haas effect for rigorous proof of additional considerations in a magnet other than magnetic forces. [45] In the standard Einstein-de Haas experiment using a coil, substitute the linear field region between two permanent magnets for the coil's field region, and you will see what I mean. The Einstein-de Haas effect is only a little bitty white crow, but it's quite sufficient to prove that not all crows are black. But what if you could make the crow grow?

Further, Howard Johnson goes after a self-powered permanent motor in a slightly different fashion. Imagine a "rotary wheel" motor, where one permanent bar magnet is used on the rotor and one on the stator. Suppose the stator magnet has its north pole facing the rotor, and the rotor magnet has its south pole facing outward. As the rotor magnet's south pole approaches the stator magnet's north pole, it is magnetically attracted and accelerates toward it, producing forceful torque and shaft horsepower. During the approach phase, energy is stored in the flywheel as mechanical energy. Now just as the magnetic south pole on the rotor is passing the stator's north pole, suppose you have cleverly produced or "activated" a little region of time-reversal on the back side of the stator's "north" pole. In the time-reversed region, the north pole of the stator functions precisely as if it were a south pole, to an external observer (to the just-departing rotor south pole, for example.). Consequently, the rotor finds itself repelled on away from the stator, accelerating yet again in the same rotational direction as before. This stores additional energy in the flywheel. As can be seen, you are now in an "over-unity" condition, and you can power an external load continually.

In a real-world device, you may not get total time-reversal at the backside of the stator magnet's north pole, but only partial time reversal. So to the departing south pole of the rotor magnet, the north pole backside of the stator magnet will appear to be a much-weakened north pole. It will still extract back some of the shaft energy previously stored in the flywheel during the approach phase, but not all of it. Hence the device is still in an "over-unity" condition, and energy — though not as much as before — can be continually extracted from it to power an external load.

In both cases, using time-reversal we have created a region of local time asymmetry, so we can locally violate conservation of energy. In this fashion, you can legitimately build a permanent magnet motor that appears to be "self-powered." The entire secret is how you achieve the time asymmetry in the exactly

needed place. But even with this over-unity condition, you are not violating overall conservation of the universe as a whole. Remember, all systems are driven. This self-powered permanent magnet motor is actually extracting and gating energy from the local now-asymmetrical flux exchange of the atoms/nuclei of the magnet material with the vacuum. It's still a special sort of paddlewheel in a special sort of river. Time asymmetry, achieved by using a time-reversing material and process, furnishes the stream and standard techniques will furnish the "paddlewheel."

Remember the principle: Conservation of energy ruthlessly depends upon time symmetry. If you're going to locally violate conservation of energy, you must establish and utilize a local time asymmetry. And that can be done; at our present elemental level of knowledge of vacuum engineering, it's quite tricky, and everything must be precisely so and highly nonlinear but it can be done. And it's really no more mystical than putting a sluice-box arrangement in a flowing stream, diverting some of the water to a waterwheel, and extracting shaft horsepower.

We emphasize, however, that you cannot, cannot, cannot make a self-powered permanent magnet motor with "ordinary" magnets and an "ordinary" time-symmetrical vacuum, no matter how strong the magnets, or what exotic form you twist them into. You can make one with activated magnets and an extraordinary asymmetrical vacuum, which have locked-in time asymmetry regions.

Vacuum, Spacetime, Frame, and All That

You also have to make the notion of "spacetime" less mysterious. It's just vacuum, by the way, and potential, and energy. It's also used in two different senses: (1) In general, when a specific frame has not been imposed or selected, and (2) in specific, when a specific frame has been imposed and selected.

When the specific frame is imposed, you've already assumed that you know the conditions and ordering of the vacuum for the whole universe, that the distance between every two points (and the time between them) has been rigorously measured and determined and fixed, etc. You've already assumed the fundamental operation of the entire universe, its physics, everything! So beware of thinking just in a fixed frame. In that sort of thinking, you've got a lot of built-in, sweeping, global assumptions that will elude your recognition unless you're careful. Many scientists don't realize this. They think in one frame at a time, and then make grand pronouncements about the entire nature of the universe, not realizing that they already assumed those answers in the first place.

So watch out for the trap of assuming that "space" and "spacetime" and "vacuum" are all synonymous with "frame" and "spacetime frame." They're not. Vacuum per se doesn't have any fixed length and time; the observer's mass reaction with the vacuum potential determines and makes those quantities.

The Speed of Light Is Not a Universal Constant

The speed of light in vacuum is also not a universal constant. [46] Sorry about that. The speed of light in a given, specific vacuum of specific potential magnitude is constant. Note that to first order the vacuum is just electrostatic scalar potential and therefore just virtual photon flux. The intensity of VPF flux is the electrical charge density. So the speed of light in a given, specific vacuum of specific electrical charge is constant. But if you change the vacuum's ambient electrical charge density i.e., change the value of that vacuum potential's magnitude you can make light passing through go faster or slower, depending

upon whether you decreased or increased the vacuum charge density. [47]

In fact, you can make local time go much faster or much slower, if you take the time to substantially activate the mass potential, because the VPF exchange between vacuum and mass (nucleus) is far greater in the mass potential than in any other kind of potential. I was once involved in an unplanned experiment where, after several hours of Frank Golden's charging the area with two powerful scalar EM wave generators, we messed up all the clocks in the area — grandfather mechanical pendulum clocks, electric watches and clocks, mechanical windup clocks and watches, battery-operated clocks, everything — because we altered the ambient "mass potential" of the area. We charged up or activated all the local mass, and in doing so we made a zone in which time flowed at a somewhat different rate. There were other phenomena which I am not at liberty to discuss. It required four days for the activation to discharge, and things to return to normal.

The Multiple Nature of "the" Ambient Vacuum

Another problem is that "the" ambient laboratory vacuum we normally have or consider is really jillions and jillions of vacua, simultaneously, in interference with each other. Spacetime, to the first order you see, is just electrostatic scalar potential. (It's just scalar potential, to nth order, without restriction to considering just virtual photons and electromagnetics.). Since that potential isn't adequately defined in physics or EE either, I'm sending some papers with proper definitions.

Actually, scalar potentials (Vacua! Spacetimes!) from charged particles — both static and dynamic — all over the universe are continually interfering in each differential volume of the observer's spacetime. Whittaker's first paper tells us how the hidden EM energy flows between any point and every other point in the universe, right through each of these potentials from distant sources. By Whittaker's 2nd paper (1904), the local interference of these potentials generates continual scalar potential gradients — EM forcefields, if you will, when you stick a measuring charge in the gradient to provide observable charged particle translation [which is what the E-field, e.g., is defined in terms of]. The rapidity of the interfering changes in the local vacuum potentials is phenomenal, but the interference is totally deterministic. However, all the fine-grained information is totally lost to the observer. Hence it appears to him to be statistical.

Generation of Zero-Point EM Fluctuations

Note that, in the differential of local spacetime vacuum that we are examining, "the" vacuum/potential is actually incredible numbers of dynamically changing vacua/potentials, all in violent interferometry a la Whittaker's second paper. In other words, "the" ambient vacuum is really not just "a" single vacuum, but many, many, many dynamic vacua all at once, and all in interference. By Whittaker 1904, their interference (as scalar potentials) is what deterministically produces the local highly noisy virtual EM field gradients — the zero-point EM energy of the quantum mechanical vacuum.

Puthoff's Cosmological Feedback Principle

Puthoff referred to this vacuum situation of individually deterministic but conglomerated statistical local EM fluctuation effects, from the potential energies of the distant charged

particles of the universe, as a cosmological feedback principle. You should also read Puthoff's articles, as cited in my papers, and perhaps some of his references dealing with the exploding field of stochastic electrodynamics (SED). The only present problem with SED is that its practitioners have not yet discovered Whittaker's two papers (1903 and 1904), and therefore do not incorporate nature's highly organized internal electromagnetics.

Adding a Potential to "the" Vacuum Potential

When you make "a" potential, you make "a single" spacetime/vacuum. That's sitting on top of (adding to the magnitude of), or lowered into (decreasing the magnitude of), the conglomerated "ambient vacuum potential" that is the "normal vacuum." That added scalar EM potential is a beautifully organized, EM, spatiotemporal lattice, per Whittaker's 1903 paper. It's filled with organized, phase-locked, EM energy waves; it is not a random mishmash at all. You must understand that. You can organize and engineer local spacetime itself, and even do it at a distance.

Solution to the Missing Chaos of Quantum Mechanics

In fact, when you add a potential to the ambient vacuum (to the ambient vacuum potential), you add something that is perfectly ordered to the statistical "ambient vacua." Thus you have added hidden order into the local statistics. That's the missing chaos in quantum mechanics — the hidden order that everyone's been desperately looking for.

Spacetime Is Energy

At any rate, the ambient vacuum is "spacetime," and is (to first order) a conglomerated scalar EM potential, of very high value. Please read that statement again. Then read the definitions of energy, scalar potential, and electrostatic scalar potential, that we have included in a footnote to this paper. Notice that vacuum/spacetime is pure energy — and to first order, pure EM energy. So we are like a bird on an electrical high line; we live directly in an extremely high potential, but not in a potential gradient. That's a flat spacetime; it has the same ambient "potential" magnitude everywhere. If you change the ambient potential of the local vacuum from point to point in the neighborhood, that's a curved local spacetime. Imagine ST curvature as a change in the "virtual ambient pressure" of the local vacuum. That "ambient pressure" can be increased or decreased, hence the two "curvatures." Simple as that. You can curve it in two ways: (1) increase the local ambient value of the vacuum potential, or (2) decrease the local ambient value of the vacuum potential. So local ST curvature really isn't any big deal. And you can do it on the lab bench.

Trapped EM Energy Is Gravitational Potential

As is well-known in general relativity, it is the trapped energy in mass that is responsible for its exhibiting gravitational attraction. Again, Einstein's $E = mc(\exp 2)$ is a prescription for the amount of electromagnetic energy that is trapped in a mass m . An electrostatic scalar potential is just one where the EM energy is trapped (see the first Whittaker paper, 1903, for the EM wave form in which it is trapped). So if trapped energy is gravitational in mass, it is gravitational in the potential as well. In GR, all potentials are therefore gravitational. In fact, there is no such separate thing as "the" gravitational potential; "the" G-potential is made from a conglomerate of other fields/field effects, which is Sakharov's hypothesis [48]. To

first order, the G-potential is a function of the trapped local EM energy density of the vacuum.

The Quantum Potential: Action At a Distance

You must also at least get acquainted with the quantum potential, and its place in hidden variable quantum mechanics theory. The quantum potential (QP) is a potential added to the Schrödinger potential. It provides an instantaneous connection between separated components, even over great distances. The QP appears to have no point source, in sharp contrast to the classical potential. The QP field is not radiated in the classical sense. In general the QP between two particles (or two components of a system exhibiting a macroscopic QP) does not produce a vanishing interaction between the particles (or components) as their spatial separation becomes very large. The QP contains an instantaneous connection between separated components of the system, rather than the retarded connection provided by the classical potential. Thus with a QP, two widely separated components of a physical system may be strongly and directly connected. The QP of a system depends on the quantum state of the system as a whole, even when its parts are greatly separated. In the case of a QP established by separated electronic equipments, the QP depends on the "structured graviton" state of all the radiative components, circuits, devices, transmitters, etc. [49] [50]

As Trapped EM Energy, Mass Is a Special Scalar EM Potential

Since (see definitions in the footnotes to this paper) trapped EM energy is also a scalar EM potential, then it follows that the mass (of the nucleus or a fundamental particle) can be regarded as, and is, a special kind of very, very intense scalar EM potential. I call it the mass potential to differentiate it because of its fantastic strength. Not only is the mass potential a scalar EM potential, but it is also a gravitational potential. Note that the concept of the mass potential is a unifying field concept, for unifying gravity and EM fields.

The beauty of the mass potential concept is fourfold: (1) Now mass has a universal kind of organized EM internal structure, given by Whittaker's 1903 paper, that comprises the mass in the first place, (2) the hidden internal EM structure of the mass potential can be changed and engineered at will, electromagnetically, by external means and directly, (3) we now have direct electrogravitation, opening up the vista of directly engineering antigravity (as Sweet has already proven in his vacuum triode device) [51], and (4) the internal structure of the nuclear mass potential can be deliberately altered in a nonequilibrium manner vis a vis its virtual photon flux (VPF) exchange with its local vacuum, as can be the VPF of the local vacuum itself. In that case, you have created a local vacuum engine in the altered Whittaker vacuum/potential, and you have also created an activated interacting engine of the altered atomic nucleus (its mass potential), fed by vacuum energy, and gating the energy out of the atom to do marvelous things to do whatever you've been clever enough to design it to do in the first place! You can transmute elements, materialize and dematerialize matter, alter and change a radioactive nucleus's energy balance and characteristics so that it is inert, etc.

Gravitational Energy Is Negative Energy

Finally, you must be aware that gravitational energy is negative energy, since it is "withdrawn" from the EM scattering energy domain, and scattering EM energy has been designated as positive. You can understand that G-energy is negative, in this fashion,

after Nahin [52]: 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 positive 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. [53] Maxwell was much perplexed by this problem, as was Heaviside and as have been many other physicists.

Engineering Physical Reality Itself

In summary of this scalar EM approach, there are literally no limits that cannot be overcome. It just requires us to now explore and develop the phenomenology, advance the theory and approach, learn how to design and implement what we wish the activated mass and activated vacuum to do, etc. We can change the so-called "laws of nature" in an area or even for the whole earth as we wish, using this approach. It doesn't matter whether we're ready for it or not; the Creator has now laid in our hands the power to alter and engineer physical reality itself, as we may wish.

Nonlinear Oscillation

One also needs to be aware of nonlinear oscillator theory. [54] One will encounter in scalar EM the effects of nonlinear oscillation, including harmonic and subharmonic oscillation, self-oscillation, etc. The organized graviton structure of a scalar potential is organized (and in fact phase-locked) in terms of both harmonic and subharmonic oscillation.

Mind and Matter and Their Interaction

Without further amplification, we will also state that mind, matter, thought, and the deepest living biological control functions also utilize the Whittaker internal electromagnetics, and have done so since the beginning. We now know where the software is, how it is filed, and how to go about engineering it directly. We have already advanced the precise mechanism for Sheldrake's morphogenetic field, and explained how it generates a change in a species in a complete evolutionary "jump." We state without further elaboration that specific, testable mechanisms for parapsychology can also be extracted from the scalar EM approach. What is involved here is not only a unification of the branches of physics, but also a unification of physics and metaphysics.

Biological Effects of EM Fields and Radiation

As is well-known, the question of whether or not EM fields and radiation may contribute to incidences of leukemia, brain tumors, and other health changes is unresolved. Four decades of the best technical efforts of many able researchers, together with the entire body of experimental data they have gathered, has been unable to technically and decisively resolve the issue. The studies and experiments have continued to be contradictory and inconsistent, and replication of results has continued to be difficult and often impossible. What the experimental results actually show is that there are uncontrolled and unknown EM variables in the experiments, hence in the experimental model being applied either consciously or unconsciously by the experimenters.

The standard experimental model (SEM) that EM/bioeffects researchers apply, either wittingly or unwittingly, rests on two major postulates, that: (1) the present theoretical model of electromagnetics is correct and complete, and sufficient to

characterize both the EM stimulus to the biological system and the causative mechanism for biological effects, and (2) the gross EM dosage/response model — energy deposition, or "heat" by another name — used in the measurement instrumentation adequately characterizes EM stimulus/bioresponse, for measuring and interpreting the factors and results of the experiments.

Both fundamental postulates are seriously in error, and the standard experimental model is therefore seriously invalid. Using the SEM by rote for four and a half decades has resulted in the present state of confusion, inconclusiveness, conflict, and indeterminacy in the field. Mostly what the experimenters have really shown to date is that: (1) their own experimental model is hopelessly flawed, (2) their instruments and instrumental methods are inadequate, and (3) the classical EM theoretical model is inadequate for their experimental tasks.

Living systems have long used the internal EM Whittaker channel for deep cellular control of the organism. By manipulating this channel, Kaznacheyev [55] showed EM induction of cellular death and disease into environmentally protected cell cultures. [56] Priore [57] demonstrated — under rigorous scientific controls [58] — absolute cures of terminal tumors and leukemias in laboratory animals. Popp [59] also discovered the master cellular control system, including its virtual photon storage characteristics, without knowing of the internal Whittaker storage channel and mechanism.

Quantum mechanically it has been known since 1959 that the EM potentials are the primary causes of electromagnetic phenomena, [60] and the force fields are only secondary — the exact opposite of what has been assumed in the classical EM theory utilized by present experimenters in the SEM. Whittaker's fundamental decomposition of the scalar EM potential into an internal harmonic set of paired bidirectional planar EM waves provides a rich set of experimentally and theoretically unaccounted and uncontrolled hidden EM variables involved in all EM bioeffects experiments to date. The scalar EM potential is an organized spacetime lattice of perfectly ordered EM energy, passing through it in a Whittaker wave structure. Living systems alter this internal EM Whittaker channel (this spacetime lattice structure) and communicate through it for mind, thought, personality, long-term memory, and deep control of cellular and body functions. All the deepest biological control systems are in the Whittaker channel. To understand environmental-EM bioeffects, you've got to understand how the local environmental EM (both internal and external) affects and alters the Whittaker channel, and hence the deep biocontrol systems utilizing it.

These hidden Whittaker EM variables are real; that is testable and unassailable. The unknown Whittaker EM variables also account for most if not all the serious deficiencies and problems of the entire experimental field to date. Scalar interferometry of Whittaker potentials alone, e.g., can reproduce any kind of normal EM, [61] and the potentials can pass deep into the body before that interference occurs. So Whittaker potential interferometry can produce much deeper EM fields in the body than present field theory and dosimetry would indicate. Even worse, the Whittaker potentials interact in the nuclear mass potential of the body — and that is where the signals and functions for deep cellular control, immune system control, etc. are located. Interfering EM signals (multiphoton effects) in the external environment create sporadic Whittaker potentials, with "noisy" and often abnormally strong EM hidden variable structures. Repetitious noise patterns in the Whittaker channel gradually "activate" or "charge up" the Whittaker channel of the organism. Thus a sort of long-term "electronic jamming" of the deep control

systems of the body can result. Gradual degradation of the immune system and of the cellular control system can result. Thus there does exist a mechanism for long-term, cumulative damage to the biological system.. The basic probability of the multiphoton mechanism occurring for long-term effects cumulation and slow bio-degradation is primarily a function of the signal density in the specific environment, regardless of individual signal strength or frequency. This "electronic smog" effect is presently unknown in biophysics, and it has not been accounted for at all in the present experiments and studies in the EM bioeffects field. Long-term presence of specific multifrequency mixtures then can produce more specific short-term, medium-term, and long-term effects, in addition to the general degradation cumulating from sheer local environmental signal densities.

Submitted for consideration to a major 1992 scientific symposium is a paper pointing out the fundamental difficulties with the standard experimental model, and the exact Whittaker nature of the uncontrolled hidden variables responsible for negating over four decades of painstaking scientific experiments. Also the paper points out the precise things that have to be done to correct the SEM, the instrumentation, and the EM theoretical model, so that future experiments will be decisive, consistent, and replicable.

If the paper is accepted, then in August 1992 we will place into the scientific literature precisely what is wrong with the EM bioeffects field to date, and will attempt to correct the entire field by stimulating it to account for and measure the internal EM Whittaker variables that are presently hidden and uncontrolled. With such correction, hopefully we can avoid yet another four decades of indeterminate, inconclusive, inconsistent, and contradictory experimental effort, and also remove much of the present researcher frustration.

Aristotelian Logic and Excessive Worship of Mathematics

One will also desperately need to change one's mindset on Aristotelian logic — which nature often violates — and one must get rid of the false notion that "mathematics contains fundamental truth, *a priori*." Mathematics is just a game and a model — though a very, very useful one — based on assumptions (postulates) which we ourselves formulate and build-in to it. The only real "truth content" of the mathematics is judged by the validity of the postulates. Mathematics is no better or worse than the concepts assumed as its basis. If there's any truth in it, it's only what we ourselves have put into it. That's the reason for the experimental method in science; the only way a theory can be falsified or validated is by experimental examination and test.

So get rid of the artificial mystique of "mathematics is truth, and the purest activity of the human mind." That's dogma and religion, not science. It is a must to read Morris Kline. [62] Also read about G. Spencer Brown's extension of logic to include complex numbers. [63] Then read my own fundamental correction to Aristotelian logic by addition of a fourth law and an applications rule. [64] With this background, one should be free from the "Aristotelian trap" and the unwarranted "worship of mathematics" trap. We need the mathematics as a useful tool; but we must not think that to be highly mathematical is to necessarily have an advanced grip on the truth. In physics today, too often one loses the real physics because of the over attachment to the beauty of the mathematics.

The physics of a theory is embodied in the fundamental concepts associated with the mathematical symbols, not in the mathematical

manipulation of those symbols. The mathematics isn't the physics; the math is just the manipulation of the physics. Don't confuse the fundamental physics of a theory with the mathematics of the theory. The mathematics can be great, and the physics still quite wrong.

Background For a New Paradigm

The above "blast" should give you a feel for my work, and the background for the area. In your normal studies, you will also get a course in special relativity, certainly by the time you get your master's degree. If you major in physics, you will also take one or more courses in general relativity in the curriculum for the doctorate. For either the master's or doctorate degrees, you will probably have at least one introductory course in quantum mechanics, or perhaps more. That's quite sufficient for understanding in this area and working in it. To assist a shift in mindset, however, one also needs to read particularly at the beginning a lot of popularized Scientific American type articles on quantum mechanics, the vacuum, zero-point energy of vacuum, etc. Also read the popularized books by Heinz Pagels and Nick Herbert's Quantum Reality. Read them at least two or three times. Read Paul Davies' books; even though popularized, he is a master craftsman, and able to clearly state the gist of the broad array of present physics. In all of your reading, it's just as important to notice what is wrong, awkward, assumed, or imperfect as it is to notice what is known correctly. If you haven't read a good book on foundations of physics, at least read Lindsay and Margenau. [65]

Personals

As far as your career plans, it would be best to either seek your Doctorate in EE as you plan to, with a minor in physics, or else major in physics with a minor in something else such as EE. Just keep your mind open and not brainwashed, in either case. If you stay open-minded, most of your learning is going to occur after your doctorate anyway.

Thanks for your interest, and the best of luck to you. And yes, more and more youngsters, grad students, post-docs, and even a few senior professors are turning to this scalar potential EM, and I'm absolutely delighted. As they digest the Whittaker papers and the other papers, gradually they'll start to work and change physics. That's the only way we're going to get a new science. As Max Planck pointed out, essentially the only way you get a new physics is when the old physicists who so adamantly oppose and block it die off. The future will be determined by the young.

NOTES AND REFERENCES

1. E.g., T. E. Bearden and Walter Rosenthal, "On a testable unification of electromagnetics, general relativity, and quantum mechanics, Proceedings of the 26th Intersociety Energy Conversion Engineering Conference (IECEC '91), Aug. 4-9, 1991, Boston, Massachusetts, p. 487-492.
2. E.g., Floyd Sweet and T. E. Bearden, "Utilizing scalar electromagnetics to tap vacuum energy," Proceedings of the 26th Intersociety Energy Conversion Engineering Conference (IECEC '91), Aug. 4-9, 1991, Boston, Massachusetts, p. 370-375.
3. E. T. Whittaker, "On the partial differential equations of mathematical physics," *Mathematische Annalen*, Vol. 57, 1903, p. 333-355. In this paper Whittaker proved that all scalar

EM potentials have an internal, organized, bidirectional EM plane-wave structure. Thus there exists an electromagnetics that is totally internal to the scalar EM potential. Since vacuum/spacetime is scalar potential, then this internal EM is in fact "internal" to the local potentialized vacuum/spacetime. For discovery of the Whittaker-type structure in sonic potentials, see Richard W. Ziolkowski, "Localized transmission of wave energy," Proc. SPIE Vol. 1061, Microwave and Particle Beam Sources and Directed Energy Concepts, Jan. 1989, p. 396-397. For a mention of this same type of bidirectional EM wave Whittaker structure in the potential connected with the Schrödinger equation, see V.K. Ignatovich, "The remarkable capabilities of recursive relations," American Journal of Physics, 57(10), Oct. 1989, p. 873-878. So far, American physicists have shown by their nonreaction to Ignatovich's paper that they have not yet realized that this is a methodology for directly engineering quantum change, and hence physical reality itself.

4. E. T. Whittaker, "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. In this paper Whittaker showed that all the classical electromagnetics can be replaced by scalar potential interferometry. This ignored paper anticipated the Aharonov-Bohm (AB) effect by 55 years, and drastically extended it as well. Indeed, it prescribes a macroscopic AB effect that is distance-independent, providing a direct and engineerable mechanism for action-at-a-distance. It also provides a testable hidden-variable theory that predicts drastically new and novel effects.
5. See Carl Barus, "A curious inversion in the wave mechanism of the electromagnetic theory of light," American Journal of Science, Vol. 5, Fourth Series, May 1898, p. 343-348. Even though Barus actually discovered the "backward-traveling" Maxwellian EM wave in 1898, modern Western scientists essentially ignored his work, and did not rediscover the time-reversed EM wave until it appeared in the open Soviet literature. See also Robert A. Fisher, Ed., Optical Phase Conjugation, Academic Press, New York, 1983, p. xv. In 1972 two Soviet scientists, from the P.N. Lebedev Physical Institute in Moscow, visited Lawrence Livermore National Laboratory and mentioned to U.S. scientists Dr. B. Ya. Zel'dovich's observation of an extremely curious "distortion undoing" property of the stimulated Brillouin backscattering process in a CS₂-filled waveguide. This of course was nonlinear optical phase conjugation and its production of a time-reversed EM wave, the strange new EM wave that "reversed disorder and restored order." Thereafter, U.S. scientists gradually began working in optical phase conjugation. Most of them, however, still have difficulty with the fact that the phase conjugate wave is a true time-reversed wave. Many do not understand the difference between true time reversal (true phase conjugation) and pseudo-phase-conjugation.
6. Amnon Yariv, Optical Electronics, 3rd edn., Holt, Rinehart and Winston, New York, 1985. See particularly Chapter 16: "Phase Conjugate Optics — Theory and Applications."
7. David M. Pepper, "Nonlinear optical phase conjugation," Optical Engineering, 21(2), March/April 1982, p. 156-183. On p. 156, Pepper specifically notes that "...these processing techniques can, in principle, be extended to other portions of the EM spectrum (e.g., rt, radio,

microwave, radars, UV, etc.); and can also involve other fields (e.g., acoustic waves), given the proper nonlinear medium." In other words, phase conjugation is a universal nonlinear phenomenon, unknown until recently. Pepper's paper is presently the best all-around introduction to nonlinear optical phase conjugation in the English language.

8. See also David M. Pepper, "Applications of optical phase conjugation," *Scientific American*, 254(1), Jan. 1986, p. 74-83. See particularly the striking photographic demonstration of time reversal of disorder on p. 75.
9. Robert G. Sachs, *The Physics of Time Reversal*, University of Chicago Press, Chicago, Illinois, 1987.
10. For the theoretical proof, see E.V. Smetanin, "Electromagnetic field in a space with curvature new solutions," *Soviet Physics Journal*, 25(2), Feb. 1982, p. 107-111. A classical particle can have both a magnetic moment and a nonzero magnetic charge density in a curved spacetime.
11. There is a good reason for using two frequencies. To first (rough) order, the earth may be approximated as an isotropic nonlinear material. In that case, a sine-wave transmitted into the earth will simply break up, due to the nonlinearities. However, if two sine waves separated somewhat in frequency are input into the earth, but one pretends that one transmitted the difference frequency between them, the difference frequency will act as if it were a sign wave transmitted through a linear, nondistorting medium — even though the individual two waves suffer all sorts of distortion, breakdown, etc. This is a way of "linearizing" a nonlinear situation if it isn't too nonlinear.
12. Yariv, ibid., p. 500-501. Go back also and take a relook at the photo on p. 75 of Pepper, *Scientific American*, 254(1), Jan. 1986. Do you see that, if a heat source scatters EM energy into a surrounding phase conjugate mirror, you will get some of the scattered energy re-ordered and returned to the source?
13. An amusing lay description of Tesla's experiment with the accidental build-up of "earthquake-like" resonance in the buildings and area surrounding his New York laboratory, from induction by a tiny electromechanical oscillator, is contained in Margaret Cheney, *Tesla: Man Out of Time*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1981, p. 115-116. Slightly more light is shed on the incident by John J. O'Neill, *Prodigal Genius: The Life of Nikola Tesla*, Angriff Press, Hollywood, California, 1981, New Printing, p. 155-165.
14. See John J. O'Neill, *Prodigal Genius*, p. 164-165. Tesla stated that his telegeodynamic oscillator, so small it could be slipped into a pocket, could be attached to any part of the Empire State Building and in 12 to 13 minutes would bring the building to full resonance, and destroy it. O'Neill could not make out the decimal point in his notes, so could not be sure Tesla stated it would require 0.25 HP or 2.5 HP. We point out that it must have been 0.25 if it was to be slipped into a rather large pocket. A 2.5 HP electric motor of the time would rather definitely not fit in one's pocket! See also Cheney, *Tesla: Man Out of Time*, p. 116-117, 275.

Tesla indicated that his telegeodynamics could project enormous energy through the earth, essentially without loss. In other references he indicated that the energy would travel in beams to distant points on the earth, producing desired effects there. He also indicated that he was utilizing a unique form of resonance not presently understood by science. Suppose we assume that Tesla had discovered the mechanical analogue of the nonlinear optical pumped phase conjugate mirror. Then his "oscillator" actually involved mechanically pumping (by opposing mechanical waves or blows) a suitable nonlinear mechanical phase conjugation mirror material. If timed at a mechanical resonance frequency of the material, and attached to a building, an interesting phenomenon would occur. The scalar EM potential base waves for rhythmic scalar mechanical stress waves have an affinity for traveling through the atomic nucleus and its immediately adjacent vacuum. Recall that, in QM, all mechanical forces are generated by exchange of virtual photons, so opposing forces in a mechanical stress are caused by bidirectional virtual photon exchanges. It is "scalar electromagnetic" at base. As the scalar EM stress potential wave travels through its vacuum/nuclei medium, the normal electron orbital vibrations (including those caused from covalent bond vibrations, lattice vibrations, and temperature vibrations) constitute "signal wave inputs," causing the gating and emission of phase conjugate replica waves from the pumped nuclei out into the material lattices. If the stress pumping is at a resonance frequency of the material/nuclei, or a harmonic or subharmonic of it, then nonlinear oscillation theory together with E.T. Whittaker's bidirectional EM wave composition of the scalar stress potential will result in a phase-locked buildup or accumulation of the gated PCR energy from the activated vacuum/nuclei internal medium by constructive interference of the continually-gated PCR EM energy into the material lattice at its resonant frequency. In that case a "forced resonance" condition occurs in the building, surrounding earth, etc., and this scalar mechanical stress resonance spreads and builds, to enormous power — even to the destruction of the building or to an earthquake.

But since the oscillator itself has certainly not input such a large amount of energy, from whence does all the extra energy come? The answer is contained in Sweet and Bearden, "Utilizing scalar electromagnetics to tap vacuum energy," IECEC '91, *ibid*. The activated nuclei, in this mechanical scalar oscillator case, actually involve an oscillation modulated upon the virtual photon flux exchange between the activated local vacuum and each activated nucleus, similar to the type of oscillation that Sweet traps in the barium nuclei of his vacuum triode. This scalar oscillation onto the activated nucleus converts that nucleus to a pumped phase conjugate mirror (PPCM). Covalent bond oscillations and material lattice vibrations introduce "signal wave" inputs into the pumped nucleus through the EM coupling with its electron shells. Amplified phase conjugate replica (PCR) waves are thus emitted by these PPCM nuclei, in response to the signal wave inputs. According to standard PPCM theory, these amplified PCR waves will thus leave the nucleus and travel out through the electron shells into the material lattice, being scattered there. This process effectively gates energy from the vacuum/nucleus VPF exchange into the PCR waves, which "backtrack" the signal wave input path, back out into the material lattices, etc. If the pumping is at the fundamental, a harmonic, or a subharmonic of the resonance frequency of the materials,

then the scattered energy will accumulate "in phase" and the materials and building will be in increasing resonance. Thus the building and the local earth will begin to build up increasing, rumbling oscillations, as the increasing PCR waves from the PPCM nuclei scatter increasing energy into their constituent materials. The enormous energy involved is actually organized and gated from the excited local vacuum itself.

As to Tesla's telegeodynamics and making mechanical waves that are laser-like and travel through the earth, one need only apply the known principle of the forward-going PCR wave. In other words, one deliberately inputs, say, two small signal waves. The PPCM material acts as if a single signal wave had been input, as a vector resultant wave. The resulting amplified PCR wave thus "backtracks" the resultant. If the resultant signal wave input is a sharp laser-like incoming beam, then the responding amplified PCR wave will be a sharp laser-like beam in the reverse direction. In such manner, a laser-like mechanical oscillation beam can be launched through the earth. The laser-like portion is based on a laser-like scalar potential beam that travels through the vacuum and atomic nuclei as its natural medium. Such a beam should travel through the earth or through the ocean with ease, since the scalar wave is gravitational, and not affected by the ionized electron shells of seawater, e.g. Note that, by slightly varying the signal wave input resultant, one can "steer" the PCR wave through its medium (the vacuum/atomic nuclei), much as a phased array radar steers its beam through space. It strongly suggests that one can make an underwater scalar radar or a "through the intervening earth" scalar radar, as well.

15. Y. Aharonov and D. Bohm, "Significance of Electromagnetic Potentials in the Quantum Theory," *Physical Review*, Second Series, 115(3), Aug. 1, 1959, p. 458-491. For an extensive discussion of the Aharonov-Bohm effect and an extensive list of references, see S. Olariu and I. Iovitzu Popescu, "The quantum effects of electromagnetic fluxes," *Reviews of Modern Physics*, 57(2), Apr. 1985. For confirmation that the AB effect has been proven to all but the most diehard of skeptics, see Bertram Schwarzschild, "Currents in normal-metal rings exhibit Aharonov-Bohm effect," *Physics Today*, 39(1), Jan. 1986, p. 17-20.
16. See Timothy Boyer, "The classical vacuum," *Scientific American*, Aug. 1985, p. 70; Walter Greiner and Joseph Hamilton, "Is the Vacuum Really Empty?", *American Scientist*, Mar.-Apr. 1980, p. 154; I.J.R. Aitchison, "Nothing's plenty: The vacuum in modern quantum field theory," *Contemporary Physics*, 26(4), 1985, p. 333-391; Jack S. Greenberg and Walter Greiner, "Search for the sparking of the vacuum," *Physics Today*, Aug. 1982, p. 24-32; Richard E. Prange and Peter Strane, "The semiconducting vacuum," *American Journal of Physics*, 52(1), Jan. 1984, p. 19-21. See also R. Jackiw and J.R. Schrieffer, "The decay of the vacuum," *Nuclear Physics B* 190, 1981, p. 944.
17. Nick Herbert, *Quantum Reality: Beyond the New Physics*, Anchor Books, Doubleday, Garden City, New York, 1987 is particularly recommended.
18. An excellent and thorough reference is Romon Podolny, *Something Called Nothing — Physical Vacuum, What is It?*, Mir, 1986.

19. See particularly H.E. Puthoff, "Source of vacuum electromagnetic zero-point energy," *Physical Review A*, 40(9), Nov. 1, 1989, p. 4857-4862; "The energetic vacuum: Implications for energy research," *Speculations in Science and Technology*, 13(4), 1990, p. 247-257; "Gravity as a Zero-Point Fluctuation Force," *Physical Review A*, Vol. 39, 1989, p. 2333; "Ground State of Hydrogen as a Zero-Point-Fluctuation-Determined State," *Physical Review D*, Vol. 35, 1987, p. 3266.
20. T.D. Lee, Chapter 25: Outlook, "Possibility of vacuum engineering," *Particle Physics and Introduction to Field Theory*, Harwood Academic Publishers, New York, 1981, p. 826. The application of the extended Whittaker scalar EM is in fact the method of accomplishing the very vacuum engineering speculated upon by Nobel Laureate Lee.
21. Here I particularly recommend B.J. Hiley and F. David Peat, Eds., *Quantum Implications: Essays in Honour of David Bohm*, Routledge & Kegan Paul, London and New York, 1987. You should of course also be aware of what Bohm's hidden variable theory is all about, and its connection with consciousness. See D. Bohm, *Phys. Rev.* 85, 1952, p. 166, 180; *Causality and Chance in Modern Physics*, Routledge & Kegan Paul, London, 1957; "Hidden variables and the implicate order," in *Quantum Implications: Essays in Honour of David Bohm*, Eds. B.J. Hiley and F. David Peat, Routledge & Kegan Paul, London & New York, 1987, p. 33. See also D. Bohm and B.J. Hiley, *Found. Phys.* 5, 1975, p. 93; *Found. Phys.* 12, 1982, p. 1001; *Found. Phys.* 14, 1984, p. 255. See also Y. Aharonov and D. Albert, "The issue of retrodiction in Bohm's theory," in *Quantum Implications: Essays in Honour of David Bohm*, ibid., p. 223. For a discussion of what nonlocal theory may really entail in terms of modular variables, see Yakir Aharonov, "Non-local phenomena and the Aharonov-Bohm effect," *Quantum Concepts in Space and Time*, Eds. R. Penrose and C.J. Isham, Clarendon Press, Oxford, 1986, p. 41-64. For other important discussions see Lee Smolin, "Stochastic mechanics, hidden variables, and gravity," ibid., p. 147-173; and Abner Shimony, "Events and processes in the quantum world," ibid., p. 182-203. For a new viewpoint on emission processes, see Robert M. Wald, "Correlations and causality in quantum field theory," ibid., p. 293-301; and Serge Haroche and Daniel Kleppner, "Cavity quantum electrodynamics," *Physics Today*, Jan. 1989, p. 24-30. See David Bohm, *Wholeness and the Implicate Order*, Routledge and Kegan Paul; London, Boston, and Henley, 1980.
22. Even Einstein — who was awarded the Nobel Prize in part for explaining the photoelectric effect — never understood what a photon was. In his later years Einstein wrote: "All these 50 years of pondering have not brought me closer to answering the question: what are light-quanta?". The quotation is contained in P. Speziali, Ed., *Albert Einstein-Michele Besso Correspondence 1903-1955*, Hermann, Paris, 1972. There are formidable problems with the photon concept. E.g., the "energy" of a photon is not localized, but is distributed over the entire volume of the field and there is, in general, no use in attaching a coordinate to the photon. A photon in general cannot be described by a wavefunction, but only for special cases. In geometrical optics as well as Maxwell's electrodynamics, there is no room for photons. The complex one-photon wavefunction should not be identified with the electromagnetic field. For a given photon number, the electric or magnetic fields at a point cannot be measured as a function of time. For states with a fixed photon number, the expectation value of

the electric field is zero even for a very large photon number, so that in this case the correspondence principle cannot be used. For additional strong anomalies in the concept of a photon, see J. Strand, "Photons in introductory quantum physics," American Journal of Physics, 54(7), July 1986, p. 650-652.

23. Richard Kidd et Al, "Evolution of the Modern Photon," American Journal of Physics, 57(1), Jan. 1989, p. 27-35. Note particularly that detection is actually binary, but one-half of each detection/measurement is normally discarded [actually, it is just hidden and listed as simply "Newton's third law reaction force."]. See also R. Chen, "Cancellation of Internal Forces," American Journal of Physics, 49(4), Apr. 1981, p. 372 for the fact that the internal EM energy is always involved in interactions, but usually never taken into account.

Indeed, the so-called "photon interaction" is usually a spin-2 graviton breakup interaction. The graviton fissions (the photon and antiphoton decouple). The photon half normally interacts with the electron shells. The antiphoton half "burrows back into" the nucleus and interacts with it, providing the Newtonian third law recoil and the conservation of angular momentum, energy, etc. The ubiquitous presence of the Newtonian third law reaction force is direct and positive evidence for the fact that not only a photon interacts, but an antiphoton interacts also.

Consider. Quantum field theory requires that every mechanical force be generated by virtual photon interactions. Therefore, to be consistent, Newton's third law reaction force must be generated by photon interaction. Since the 3rd law force is considered to be universal, it means that the "photon interaction that is a reverse of the normal photon interaction" is universal, and this "reversed photon" interaction must normally accompany each normal photon interaction. We point out that the only type of photon that would consistently produce the exact opposite force from the photon interaction would be a phase conjugate or time-reversal of that photon. I.e., there must have been two photons present in the interaction: the normal or time-forward photon, and the time-reversed or antiphoton. This is actually implied by a quantum field theory statement of Newton's third law.

However, the point can be even more rigorously proven. In a phase conjugate material, one can trick the antiphoton into exiting out of the atom, instead of interacting in the nucleus. In that case, according to the "photon interaction is normally graviton interaction" principle, the agent that normally generates Newton's third law recoil did not reach the nucleus, and so the recoil should be absent. And it is absent, in actual experiments. Such a phase conjugate mirror does not recoil if it emits a phase conjugate replica wave (phase conjugate photons, or antiphotons). And it doesn't recoil no matter how powerful that antiphoton emission is — no matter how many antiphotons it emits. On the other hand, if the same material emits an ordinary photon, it does recoil, and Newton's third law is present. This experiment directly establishes that most photon interactions actually are graviton interactions — paired photon/antiphoton interactions.

24. To see just how arbitrary and postulational are present "definitions" of mass and force, see Robert Bruce Lindsay and Henry Margenau, Foundations of Physics, Dover

Publications, New York, 1963, p. 283-287. Note on page 283 that a "field of force" at any point is actually defined only for the case when a unit mass is present at that point. See also Richard P. Feynman, Robert B. Leighton, and Matthew Sands, The Feynman Lectures on Physics, Addison-Wesley, New York, Vol 1, p. 2-4, for a definition of the electric field in context of its potentiality for producing a force. The modern view of the field is that, because of vacuum fluctuations, rigorously one no longer speaks of "the" field, but of the probability of a particular field configuration. See Charles W. Misner, Kip S. Thorne, and John Archibald Wheeler, Gravitation, W.H. Freeman and Co., San Francisco, 1973, p. 1191. Note that this view is still in error when one considers electron precession in the interaction of vacuum "fields" and the electron gas inside a detecting probe wire.

25. Aharonov and Bohm, Physical Review, 1959, ibid.
26. Energy should not be defined as the capacity to do work; that is wrong. Accomplishing translational work is something that can be done by dispersing energy (order), but that is not its definition.

Energy is any ordering, either static or dynamic, in the virtual particle flux (VPF) of vacuum.

Work is just the scattering of energy — the disordering of this VPF order. Note that the present definition of energy used in physics thus is a statement that "order is the (capacity to do) disordering of order." In that form, the illogical aspects of the statement can be seen. It is still correct, however, to state that "energy has the capacity to do work. Certainly, if you scatter or disorder the order, you will have disorder. With the word "has" substituted for "is," the sentence becomes just a statement about energy; it is not posing improperly as its definition. However, it now requires that a new definition for "energy" be found. The new definition was presented above.

Electromagnetic energy is any ordering, either static or dynamic, in the virtual photon flux of vacuum. In other words, for a field energy, one selects — for the ordering — only the type of particle in the VPF that is the quantum particle of that field.

A potential is any ordering, either static or dynamic or combination thereof, in the virtual particle flux of vacuum. Note that, according to this definition, a potential is pure energy, *a priori*. It is also totally ordered internally — which is a new concept for physics. But we must be careful. Because of the nature of the virtual particle flux comprising it, the potential is a collection of nearly individual virtual energies — a collection of the individual energies of a host of individually moving virtual particles. Each particle is still almost totally separate from each other, most of the time. In other words, as an informal analogy, potential is a sort of mostly disintegrated energy, which only has just a touch of integration, enough to allow it to be referred to as a single "collection" or "ordering." Note also that the ordering itself is an open system. Virtual particles are continually entering, leaving, or appearing and disappearing in it. The ordering is like a whirlpool in a river: The form or ordering may be stable, but the water molecules are continually passing through the stable, ordered form.

A scalar potential is any static (stationary) ordering in the virtual particle flux of vacuum. A vector potential is any dynamic (nonstationary) ordering in the virtual particle flux of vacuum. Note that both scalar and vector potentials have totally ordered interiors. Scalar potentials and vector potentials are simply different subsets of the energy domain. And notice that both are simply stable forms in a dynamic medium, like two swirls in a river. So to speak, one swirl is stationary with respect to the observer on the bank; however, internally it is quite highly dynamic, with water molecules continually flowing into and out of the stabilized form. The second swirl is moving with respect to the observer on the bank; however, internally it also is quite highly dynamic internally, with water molecules continually flowing into and out of the stabilized form. The difference here is whether or not there is movement of the stable exterior form with respect to the observer. Both are open systems, continually being supplied with energy flowing in, and continually emitting energy. Also note that both kinds of EM potentials possess ordered internal Whittaker bidirectional wave structures.

An electrostatic scalar potential is any static (stationary) ordering in the virtual photon flux of vacuum. Its ordered structure is an ordered lattice of spacetime/vacuum, and consists of a Fourier expansion of harmonic transverse EM plane waves, coupled to the phase conjugate of the expansion in 1:1 ratio. Scalar interferometry between two or more scalar EM potentials is just the multiple simultaneous interferometry of the constituent Whittaker waves. Incredibly dynamic interference of potentials/vacua/spacetimes from all the charged particles of the universe is continually occurring in "the" ambient vacuum — that is, in the quantum mechanical vacuum. The quantum mechanical vacuum concept is just the modification of the classical "empty vacuum" concept to take into account the spontaneous creation and annihilation of virtual particles, required by quantum mechanics and the Heisenberg uncertainty principle.

"A" vacuum is a spacetime and, to first order, a scalar potential. "The" ambient vacuum is a violently changing and interfering collection of potentials from moving particles all over the universe; i.e., "the" ambient vacuum is really an incredibly large number of conglomerated, interfering vacua/potentials. The conglomeration implication for vacuum/spacetime of these definitions, or of the gist of them, has previously been pointed out by W. Misner, K.S. Thorne and J.A. Wheeler, *Gravitation*, 1973, p. 399. Quoting: "...The terms 'gravitational field' and 'gravity' refer in a vague, collective sort of way to all of these entities. Another, equivalent term for them is the 'geometry of spacetime.'" Our comment is as follows: In other words, the notion of the geometry of spacetime is also a vague, conglomerated concept, and it also must not be primary, but must be composed of other field effects and things — which of course is Sakharov's hypothesis that gravitation is not even a primary field of nature, but is always due to interactions and effects of other fields.

The above definitions are all precise. To the best of my knowledge, most of them have not previously appeared in physics in such an exact form. To explain why more precise definitions are so important, we quote a statement by Einstein: "...the scientist makes use of a whole arsenal of concepts which he imbibed practically with his mother's milk; and seldom if ever is he aware of the eternally

problematic character of his concepts. He uses this conceptual material, or, speaking more exactly, these conceptual tools of thought, as something obviously, immutably given; something having an objective value of truth which is hardly ever, and in any case not seriously, to be doubted. ...in the interests of science it is necessary over and over again to engage in the critique of these fundamental concepts, in order that we may not unconsciously be ruled by them." Quoted from Albert Einstein, "Foreword," to Max Jammer, Concepts of Space: The History of Theories of Space in Physics, Harvard University Press, Cambridge, Massachusetts, 1969, p. xi-xii.

27. See Richard P. Feynman, Robert B. Leighton and Matthew Sands, The Feynman Lectures on Physics, Addison-Wesley, New York, Vol. I, 1963, p. 2-4 for a statement that the electric field exists at a point in the vacuum in the context of its potentiality for producing a force, should a charge be placed at that point. Maxwell's original theory was modeled on a mechanical ether, where the ether was a material medium. If that were truly the case, then force-fields would exist in the material-ether medium. Accordingly, they were so modeled by Maxwell. With the subsequent elimination of the material ether, Maxwell's EM force-in-the-material-ether model was rendered incorrect, but the model has never been recast, to this date.
28. Calculations of the energy density in the vacuum range to enormous values on the order of $10^{exp}100$ grams per cubic centimeter, expressed in mass units. To convert this mass density to energy density, simply multiply by the square of the speed of light.
29. Recall again Feynman's statement. In the vacuum, one just has a force-field-free gradient in the potential until one places an observable charge in there for the potential gradient to couple to. With such charged particle(s) in place, the local interaction and coupling of the potential gradient with the charged particle(s) produces (and in fact constitutes) an electromagnetic force field.
30. Notice that, considering the electron gas as a fluid, a longitudinal pressure gradient does move nearly instantly down the wire, without concomitant electron movement as longitudinal current. So the potential gradient does race longitudinally down the wire at nearly the speed c. In our detectors and instruments, however, we still detect the lateral electron precession waves, however. Obviously we need some instruments of greater subtlety.
31. For an explanation of the electron drift velocity, see any good sophomore physics text. E.g., see David Halliday, Robert Resnick, and John Merrill, Fundamentals of Physics, Third Edition Extended, Volume Two, John Wiley & Sons, New York, 1988, p. 649-650. The effective or averaged velocity of the electrons in the electron gas in a copper conductor, e.g., may be about $1.6 \times 10^{exp} 6$ meters per second, where the electrons are considered as free particles in a gas. However, when an electric field is applied to the conductor, the average velocity of the electrons down the wire may be only about $4 \times 10^{exp}(-5)$ meters per second. This field-induced motion down the wire is many orders of magnitude less than the average velocity of each moving electron (without respect to its direction). As can be seen, the electrons just gradually "drift along slowly" down the wire on the average, fully justifying the term "drift velocity." Most of the movement of the electrons in the wire is in a

radial (precession) direction.

32. The change in potential that travels down the wire is in fact a change in the intensity of the local vacuum's virtual photon flux exchange with the atoms of the wire, particularly with their atomic nuclei. It is this VPF exchange between vacuum and nucleus (and to a far lesser extent, between vacuum and the electrons) which is the "medium" for the true signal. Thus the signal is simply a traveling change in the vacuum/atom VPF exchange "potential", with only a slight delay due to interaction with the charges in the nuclei. The signal is primarily a change in the virtual state conditions, rather than in the observable state conditions. However, to "observe" this signal, the embedding or "coupling" interaction of the traveling potential gradient with the conduction electrons is important. This coupling produces translation force fields, i.e., acceleration changes in the translating electrons. We actually detect these electron translation changes. In other words, we actually detect electron wiggles, and infer or assume what must have been in the vacuum to interact with the electron gas and cause its waves or "wiggles." It is strongly accented that any detector detects only its own internal change; it detects nothing "external" at all.
33. Tesla was adamant that EM waves in the vacuum were not Hertzian, but were waves of rarefaction and compression, as are sound waves. For example, see Nikola Tesla, "Pioneer Radio Engineer Gives Views on Power," New York Herald Tribune, Sep. 11, 1932. Quoting: "...I showed that the universal medium is a gaseous body in which only longitudinal pulses can be propagated, involving alternating compressions and expansions similar to those produced by sound waves in the air. Thus, a wireless transmitter does not emit Hertz waves which are a myth, but sound waves in the ether, behaving in every respect like those in the air, except that, owing to the great elastic force and extremely small density of the medium, their speed is that of light." In a later article, "The True Wireless," Electrical Experimenter, May 1919, p. 87, Tesla wrote: "...The Hertz wave theory of wireless transmission may be kept up for a while, but I do not hesitate to say that in a short time it will be recognized as one of the most remarkable and inexplicable aberrations of the scientific mind which has ever been recorded in history." Four years before E.T. Whittaker's epochal 1903 paper describing the internal structure of the scalar potential as consisting of a phase-locked harmonic series of special bidirectional EM standing waves, Tesla experimentally discovered the "standing potential waves". On July 3, 1899 and on through the evening into the morning of July 4, Tesla observed standing potential waves from a traveling thunderstorm, even after the storm had traveled a distance of several hundred miles. He recorded this significant discovery in his laboratory notes on July 4, 1899. See Nikola Tesla, Colorado Springs Notes 1899-1900, Nolit, Beograd, Yugoslavia, 1978, p. 61-62.

In his magnifying transmitter, Tesla was not depending upon ordinary Hertzian waves, or earth-ionospheric duct transmission of power. These would not allow magnification of the power worldwide. For example, in Nikola Tesla, "My Inventions: Part V. The Magnifying Transmitter," Electrical Experimenter, June 1919, p. 176, Tesla stated that "...this wireless transmitter is one in which the Hertz-wave radiation is an entirely negligible quantity as compared with the whole energy." On p. 178 of the same article,

Tesla stated that "The transmitter was to emit a wave-complex of special characteristics..." In "The True Wireless," Electrical Experimenter, May 1919, p. 29, Tesla mentioned his use of a unique form of resonance in connection with his wireless transmission of energy, by stating that one "...must not view it in the light of present day science." On p. 62 of the same article, he stated that his "...transmission through the earth is in every respect identical to that through a straight wire." For a direct and "uncommon" explanation of how Tesla's magnifying transmitter actually worked, see T.E. Bearden, "Extracting electromagnetic energy from the nonlinear earth as a self-pumped phase conjugate mirror," Proceedings, PACE's Third International New Energy Technology Symposium, Jun. 25-28, 1988 at Maison du Citoyen, Hull (Ottawa), Canada, 1988.

34. For a comprehensive discussion of ether theories, see E.T. Whittaker, A History of the Theories of Aether and Electricity, Philosophical Library, New York, 1951. This is the same Whittaker whose 1903 and 1904 papers provide the missing linkage needed to unify EM, GR, and QM today.
35. By Michelson's interferometry experiments to measure the speed of light. See R.S. Shankland, "Michelson: America's First Nobel Prize Winner in Science," The Physics Teacher, Jan. 1977.
36. Ironically, a world-renowned Nobel Laureate — whom I greatly admire and with whom I interacted face-to-face for about three hours — was completely unable to comprehend that a photon carried time, even though he was quite aware that its dimensions were energy multiplied by time! He in fact was adamant that it could only carry energy, not time. Many other physicists have exhibited the same bewilderment when queried on this question. The point is this: It is not, repeat not, the energy of the photon that is quantized. It is the photon's overall action/angular momentum that is quantized. Making up the photon, the energy and time components are canonical. For stable rate-of-time-flow conditions, the energy and time in a photon are discretized.
37. Years ago, we crudely used this to generate a fundamentally new definition of mass, and also to explain the mechanism for the "flow of time." See T. E. Bearden, Quiton/Perceptron Physics: A Theory of Existence, Perception, and Physical Phenomena, National Technical Information System, Report AD-763210, 1973. The paper is crude, and should be rewritten when possible. But it gets the main point across. It also derives Newton's laws of motion, relativistic form; the square law of gravitation; and a new defining equation for mass in terms of trapped action flux.
38. Specifically, the photon and antiphoton actually differ internally. The photon is composed of $(+DE)(+Dt)$, or a piece of positive energy and a piece of positive time, welded together without a seam. The antiphoton is composed of $(-DE)(-Dt)$, or a piece of negative energy and a piece of negative time, welded together without a seam.
39. Maxwell in fact writes: "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 of these, 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." [James Clerk Maxwell, *A Treatise on Electricity and Magnetism*, unabridged third edition, Volume 1, Dover Publications, New York, 1954, p. 10.] However, even though Maxwell utilized a mechanical model of the ether, he apparently never focused on the exact internal vector patterning of a scalar stress potential as a highly significant, engineerable property. On page 30 of his Treatise, e.g., he shows three figures illustrating his conception of directional actions at a point in space, involving vectorial convergence, rotation, and a combination of the two. However, I have found no evidence that he realized the significance of the precise pattern of the internal vector structure of a quaternion multiplication's remaining scalar component when the vector or directional components of that multiplication interact to a zero translation resultant. In other words, I have been unable to find any recognition by Maxwell that a zero-vector-resultant translation system was highly significant, particularly in its gravitational implications. However, my search of Maxwell has certainly not been exhaustive, and evidence to the contrary may yet be surfaced.

40. Maxwell's theory is actually some 200-odd quaternion equations scattered throughout his 1873 book. See James Clerk Maxwell, *A Treatise on Electricity and Magnetism*, Oxford University Press, Oxford, 1873. The third edition is by Dover, 1954.
41. Whittaker, 1904, *ibid.*
42. There are at least two quite different kinds of zero, and mathematics uses the zero concept in two entirely different fashions. An example is in arithmetic. When we write a number, a zero in a digit's position means the absence of any digit there. It means the total absence of any digit there. In other words, it corresponds to an "empty set." We also use the zero standing alone as "the definite absence of any single number." However, here there is a great difference, because at the same time it's also the indefinite presence of multiple numbers. Specifically, e.g., $0 = 3 + 2 + (-5)$, etc. In our arithmetic operations we regularly replace the "zero as absence of any single number" by "zero as the presence of multiple numbers whose sum is zero." In other words, this type of zero refers to absence only of any singular number. In this zero case, the sum of a group of two or more numbers that are present can be zero, while the numbers still remain. In vectors, of course, the directions refer to translations. So a zero vector need not be an "empty set." It's an "empty set" insofar as use of any single finite translation vector to represent the combined finite translations of the interacting vectors. None such can be there, because the overall system doesn't translate. But the zero vector resultant is not an empty set with regards to the actual continued presence of the multiply interacting vectors. They are still there and, if they represent forces, they produce a specifically patterned stress, or stress potential. A zero-vector resultant system of finite vector components, in vacuum, is a specific template and a specific vacuum engine doing continuous internal work on the medium. Simply speaking, the total energy in the stress can be taken as a function of the sum of the squares of the magnitudes of the internal vector components. Note that the internal energy patterning, however, is specific both in individual magnitudes and directions. So for zero-vector translation

resultant systems, the system is a scalar stress system — non-translating — in terms of its total magnitude, but that scalar stress system is specific in terms of its hidden internal translation vector structure. Also, note that two stress systems can have identical stress magnitudes (the same amount of internal energy), but its internal components may vary drastically, both in individual directions and individual energies directed in those directions.

43. Tesla considered that an electrical charge was carried by the electron, but was distinct from the electron itself. He considered electricity to be a fluid thinner than any form of matter, with highly specific properties of its own, completely separate from matter. He considered the charge of the electron to be due to a surface layer of electricity covering it, and it could receive many layers, giving it multiple charges, all of which could be dissipated. See John J. O'Neill, *Prodigal Genius*, Angriff Press, Hollywood, California, 1981, p. 249-250.
44. For appreciable curvature and hence use of the vacuum as an appreciable EM energy source or sink, one must alter the mass potential of the atomic nucleus. In other words, that is where most of the potential energy is, and it has an internal Whittaker EM biwave structure which can gradually be appreciably activated and altered. See, for example, Ingram Bloch and Horace Crater, "Lorentz-invariant potentials and the nonrelativistic limit," *American Journal of Physics*, 49(1), Jan. 1981, p. 67-75. When the trapped EM energy in the mass potential is altered to a degree of notable size with respect to the particle's rest energy, ordinary Newtonian mechanics and the Schrödinger equation may be inadequate, even if v/c is small.
45. E.g., see David Halliday, Robert Resnick, and John Merrill, *Fundamentals of Physics*, Third Edition Extended, Volume Two, John Wiley & Sons, New York, 1988, p. 1024. See also Chapter 2 of Peter Galison, *How Experiments End*, University of Chicago Press, 1987 for a detailed description of the Einstein-de Haas experiment of 1915, and of the related experiments that followed it. Also note particularly that the suspended static magnet case does not appear to have been carefully examined; instead, almost all the work was with alteration, or change of the magnetization. I am aware of Soviet work, however, that flatly states that a magnet carefully and axially suspended vertically develops a macroscopic turning moment. See again Halliday, Resnick, and Merrill, p. 1024. Is there a cancellation angular momentum that cancels the macroscopic angular momentum effect? If so, from whence does it come? Can it be evaded? Think about it.
46. Our approach to scalar EM requires that the value of c be a function of the VPF intensity of the vacuum. In fact, some of the very best measurements clearly show this fact. See, for example, Bryan G. Wallace, "The great speed of light in space coverup," *Scientific Ethics*, 1(1), Feb. 1985, p. 2-3. According to Wallace's findings, significant unexplained systematic variations exist in all measured interplanetary radar data, and the Jet Propulsion Laboratory is apparently forced to use empirical correction factors to uphold the constancy of the speed of light. See also M.E. Ash, I.I. Shapiro, and W.B. Smith, *Astron. J.*, Vol. 72, 1967, p. 72. Direct experiments on Einstein's second postulate, in the 1961 interplanetary radar contact with Venus, challenge whether relativity is correct. Variations of over 30,000% of the best possible general relativity fit the MIT Lincoln

Lab could generate were measured. The variations were not random but contained diurnal, lunar, and synodic periodic components. See also Bryan G. Wallace, "The Unified Quantum Electrodynamic Ether," Foundations of Physics, Vol. 3, 1973, p. 381. Wallace details measurements strongly challenging the Einstein assumption of the constant velocity of light, and deals with the nature of the ether. Wallace's analysis of such data strongly challenging the constancy of the speed of light in vacuum has been largely suppressed by leading scientific journals.

47. The huge collection of charged particles in the mass of the earth, and the local scalar EM potential resulting from them, results in an ambient vacuum potential in the earth laboratory that is higher in magnitude than the ambient vacuum potential in deep space far from planetary and stellar masses. Just as sound travels faster through steel than air, light should travel faster in a hard vacuum in the earth laboratory than it does in deep space. Indeed this is true. See, for example, B.N. Belyaev, "On random fluctuations of the velocity of light in vacuum," [in Russian], Izvestiya Vysshikh Uchebnykh Zavedenii, Fizika, Vol. 11, Nov. 1980, p. 37-42.
48. A.D. Sakharov, "Vacuum Quantum Fluctuations in Curved Space and the Theory of Gravitation," Soviet Physics Doklady, Vol. 12, 1968, p. 1040.
49. Thus the probability that a quantum potential will be formed between separated electronic systems, etc., is a function of the overall signal density of the environment, rather than specific signal characteristics. I have previously proposed a self-targeting mechanism that directly creates the quantum potential, via the hidden Whittaker biwave EM communication inside the scalar EM potential. See T.E. Bearden, Gravitobiology, Tesla Book Co., POB 12183, Chula Vista, CA 91912, 1991, p. 33-37. An example of the quantum potential effect also apparently happened during the U.S. air attack on Libya in April 1986. See Mark Thompson, "Mixed signals may have misguided U.S. weapons," The Washington Post, Jan. 22, 1989, p. A4 for a description of the incident.
50. For various papers treating the quantum potential, but without any notion of the mechanism that creates one, see Quantum Implications: Essays in Honour of David Bohm, Eds. B.J. Hiley and F. David Peat, Routledge & Kegan Paul, London & New York, 1987. Also, particularly see the various papers on this subject in Quantum Concepts in Space and Time, Eds. R. Penrose and C.J. Isham, Clarendon Press, Oxford, 1986.
51. Floyd Sweet and T.E. Bearden, ibid.
52. Paul J. Nahin, Oliver Heaviside: Sage in Solitude, IEEE Press, New York, 1988, p. 307.
53. 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.
54. For example, see "Nonlinear Forced Oscillations," in Modern Mathematics for the Engineer, Edwin F. Beckenbach, Ed., McGraw-Hill, New York, 1956, p. 18-20 for a particularly simple and succinct introduction. More complete coverages

are readily available. Our comment here is that, in the graviton theory advanced in this paper, gravitons comprising a scalar EM potential are already linked spatially and harmonically/subharmonically, to compose a spatiotemporal lattice.

55. The following references should prove useful: Vlail P. Kaznacheyev and L.P. Mikhailova, Ultraweak Radiations in Intercellular Interactions, [in Russian], Novosibirsk, 1981; Vlail P. Kaznacheyev, "Electromagnetic Bioinformation in Intercellular Interactions," PSI Research, 1(1), Mar. 1982, p. 47-76. [Although the PSI Research journal is now defunct, the referenced article in it contains a considerable amount of the information referenced in Kaznacheyev's book.] See also V.P. Kaznacheyev et Al, "Distant intercellular interactions in a system of two tissue cultures," Psychoenergetic Systems, 1(3), Mar. 1976; Vlail P. Kaznacheyev et Al, "Apparent information transfer between two groups of cells," Psychoenergetic Systems, 1(1), Dec. 1974; V.P. Kaznacheyev, "Information function of Ultraweak Light Flows in Biological Systems," in Problems in Biophysics, Novosibirsk, 1967, p. 7-18 [in Russian].
56. For decades the Soviets induced anomalous health changes and diseases in personnel in the U.S. Embassy in Moscow, utilizing microwave radiation. Studies by Johns Hopkins researchers established that the anomalous health changes only occurred in personnel located in areas that had zero EM force fields. In other words, they occurred only where the potentials — if any — would have been gradient-free, and hence persistent, and without bleed-off. Specific Whittaker structures introduced into the persistent potentials could directly account for the results, a la Kaznacheyev's cytopathogenic effect. Note that, in nonlinear systems, the phenomenon of nonlinear resonance would imply that subharmonics of the specific Kaznacheyev optical signals from damaged cells could be utilized to produce the cytopathogenic effect. In other words, microwaves could be utilized to produce the same results. See T.E. Bearden, Gravitobiology, Tesla Book Co., Chula Vista, California, 1991 for more complete details, mechanisms, and extensive references.
57. In the 1960s and 70's French inventor Antoine Priore, working with some of the finest French medical scientists, positively proved that killer diseases such as cancer, leukemia, sleeping sickness, etc. can be cured with unorthodox electromagnetics. This was not anecdotal material, but rigorous scientific experiments properly performed and reported in the French medical journals. For a complete resume of the Priore affair, see Jean-Michel Graille, Le Dossier Priore, De Noel, Paris, 1984 (in French). For a substantial synopsis, see Christopher Bird, "Appendix I: The Case of Antoine Priore and His Therapeutic Machine: A Scandal in the Politics of Science," in T.E. Bearden, AIDS: Biological Warfare, ibid. p. 346-375. See also Priore references, ibid., p. 333-339. For an excellent lay summary of the Priore Affair, with some details of the working of Priore's machine, particularly see David M. Rorwick, "Do the French have a cure for cancer?", Esquire Magazine, July 1975, p. 110-111, 142-149.
58. As an example, one eminent French scientist who worked with Priore was Dr. Robert Courrier, then Secretaire Perpetuel of the French Academy of Sciences, and also head of the Biology Section of the Academy. Courrier personally presented Priore's astounding results to the French Academy.

Pautrizel was also another eminent French scientist who extensively worked with Priore, and wrote several technical papers on the results, and these papers are printed in the standard French medical literature.

59. See Fritz Albert Popp, "Photon Storage in Biological Systems," in Fritz Albert Popp et Al, Eds., Electromagnetic Bio-Information: Proceedings of the Symposium, Marburg, September 5, 1977, Urban & Schwarzenberg, Baltimore, 1979, p. 123-149.
60. Aharonov and Bohm, Physical Review, 1959.
61. Whittaker, 1904, *ibid*.
62. Specifically, it is absolutely essential to read Morris Kline, Mathematics: The Loss of Certainty, Oxford University Press, New York, 1980
63. See, for example, G. Spencer Brown, Laws of Form, Julian Press, New York, 1972.
64. See Appendix III: "A Conditional Criterion for Identity, Leading to a Fourth Law of Logic," in T.E. Bearden, AIDS: Biological Warfare, Tesla Book Co., POB 12183, Chula Vista, CA 91912, 1988, p. 428-443.
65. Robert Bruce Lindsay and Henry Margenau, Foundations of Physics, Dover Publications, New York, 1963.