Clean Electrical Energy from the Active Vacuum

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Introduction

No electrical engineering department in the Western World presently teaches what powers an electrical circuit, or what actually powers the electrical power grid. None ever has. It also does not appear in a single electrical engineering textbook in the Western world, nor has it ever appeared in one.

All the hydrocarbons ever burned, nuclear fuel rods ever consumed, steam turbines turned, and generators rotated, have not directly added a single watt directly to the external power line and to the power grid. Nor has any windmill, nuclear power plant, battery, or hydroelectric generator or solar cell array. None ever will.

Every electrical circuit ever built — and those built today — are in fact powered by electrical energy extracted by the circuit dipolarity from the local seething vacuum, from active space itself. But our engineers are trained to build circuits which also self-destroy the extraction of that vacuum energy, faster than they power their loads.

The leaders of our scientific community — including the National Science Foundation (NSF), National Academy of Sciences (NAS), and National Academy of Engineering (NAE) — are unaware of what actually powers an electrical circuit or the electrical power line. Scientists have not integrated into classical electrodynamics and electrical engineering — and in their own thinking — the *broken symmetry of opposite charges* — such as of a common dipole or dipolarity — that has been proven in particle physics since 1957 {1,2,3}. Neither have our great national laboratories, etc. made this integration in their official power system thinking. Instead, on energy matters these institutions, organizations, and leaders continue to inappropriately advise the policy makers of the U.S. Government. The government then inappropriately spends the taxpayer's money in the field of energy research, based on that advice.

Consequently, billions of U.S. research dollars are spent annually on an electrical energy science that is archaic and flawed. More billions are spent on energy systems and centralized power grids that are cumbersome, frightfully expensive, and completely vulnerable to modern terrorist attack and natural disasters. These systems are dinosaurs waiting for the terrorist to destroy them.

To "fuel" such power systems, ever more dams, hydrocarbon-burning power plants, pipelines, oil wells, natural gas wells, tanker ships, harbor facilities, refineries, nuclear power plants, and a host of peripheral power systems such as windmills, solar cell arrays, emergency power generators, etc. are required. This great juggernaut also continues to implement a rapacious energy technology which fouls the planet, pollutes the biosphere and destroys much of it. The juggernaut kills off species, is responsible for an

1

uncomfortable and increasing number of human deaths each year from the pollution, and contributes directly to global warming by emitting polluting hydrocarbon combustion products. It places the economy of the United States — so fragilely based on the continued and escalating availability of cheap energy from cheap fuel such as cheap oil and cheap coal — at the mercy of unfriendly states controlling much of the world's supplies of cheap oil. Terrorists are presented with lucrative and strategic soft targets, easily disrupted and destroyed.

The little-recognized basis for such startling technical statements about the powering of electrical circuits has been in particle physics for nearly a half-century. It was evidenced by the award of the Nobel Prize to Lee and Yang in 1957 for their prediction of broken symmetry. The implications of this major discovery — which profoundly impacted all of physics — still have not been incorporated into electrical engineering or the ancient Maxwell-Heaviside-Lorentz electrodynamics taught to electrical engineers.

Consequently, the ubiquitous *vacuum energy* source of all electrical power — for every electrical circuit and electrical power system, small or gigantic — continues to be resoundingly ignored in "energy science and technology", in our universities, and in our leading scientific institutions. The environmental activists, seeking to save the biosphere, have not yet recognized the real problem — the appalling energy advice provided to everyone (including the environmentalists) by the scientific community.

With the above "strong grabbers" to evoke the reader's curiosity and attention, let us explain why such startling and seemingly insane statements are true, how things got that way, and what can be done about it.

Brief History of the Present Classical Maxwell-Heaviside-Lorentz Electrodynamics

In the 1860s James Clerk Maxwell combined electrical fields and magnetic fields into a common model, and launched the present system of classical electrodynamics still being taught today, though in a more limited form. Maxwell's seminal paper {4} was published in 1865, in quaternion-like notation. Quaternion algebra captures many more features and functions of a science which it models, than do either vector algebra or tensor algebra commonly used in electrical engineering.

As an example, with the standard tensor or vector analysis one cannot even "see" the most important functions accomplished by Nikola Tesla in his patented circuits. Quaternion analysis of Tesla's actual patented circuits does show these functions {5}. Consequently, mainstream electrical scientists who use only standard tensor analysis and confidently assume that they understand Tesla's work, are very much mistaken.

In his 1865 paper, Maxwell *specifically lists* his 20 equations and his 20 unknowns. His work was strongly contested, because few of the three dozen electrical scientists on earth at the time were capable in quaternion mathematics. Before he died in 1879, Maxwell himself had started rewriting his 1873 book for a second edition, with simpler equations.

In the 1880s Oliver Heaviside — a brilliant but self-taught scientist who never attended university — played a major role in converting (reducing) Maxwell's equations to what today is vector algebra, after Maxwell was deceased {6}. Heaviside detested potentials, and stated that they should be "murdered from the theory." The reduction work by Heaviside, Gibbs, and Hertz resulted in the modern four vector equations in some four unknowns. These are taught — along with a further truncation by Lorentz — in every university as "Maxwell's equations". They are in fact Heaviside's equations, further truncated by Lorentz symmetrical regauging {7}.

In those early EM days the potentials were thought to be mathematical figments, and all electromagnetic phenomena were considered to be the result of the force fields. Hence any manipulation of the potentials that left the net force fields unchanged, was thought to result in prescribing identically the same systems. Today that is known to be untrue — e.g., in quantum mechanics and quantum electrodynamics, as well as higher group symmetry electrodynamics— but leading classical electrodynamicists still perpetuate the myth.

Both Maxwell's original theory and Heaviside's truncation prescribe two major kinds of electromagnetic systems: (i) those which are "in equilibrium" with their active environment, so they cannot receive *and use* {8} EM energy from it, and (ii) those which are "out of equilibrium" with their active environment, and so can freely receive *and use* {9} EM energy from it.

The first class of thermodynamic systems (those in equilibrium) may be compared to a rowboat floating in a still pond. It has no "net force" upon it, so if we wish the boat to go, we ourselves will have to "row" it, continually putting in force and energy to do work on the boat to force it forward.

The second class of thermodynamic systems (those in disequilibrium) may be compared to a sailboat on the same pond, with a wind blowing. Here we may have to input a little energy to the rudder to "steer" the boat, but the energy and force for the heavy propulsive power is provided freely by the wind. So our boat now "does more work in moving through the water" than the energy that we ourselves input to steer it can do. Simply put, we do not have to *row* the boat, but only *arrange the sails and steer it with the rudder*. The wind puts in the excess energy and force required to propel the boat, so the conservation of energy law is not violated. In simple terms, we *gate and control* the use of more energy than we ourselves have to furnish.

Such a system can even be completely "self-powering", similar to a windmill in the wind or a waterwheel driving a mill for grinding grain. We have to pay to build the windmill or the waterwheel, and to maintain it, but we do not have to input any energy or force to it ourselves, once it's up and running and the wind is blowing or the water is flowing.

The same is true for EM systems, because Maxwell's theory is a purely material fluid theory. Hence anything a fluid system can do, in theory Maxwellian systems can also do because the equations are the same and prescribe analogous functions.

Before Lorentz regauging, the Maxwell-Heaviside equations are still difficult to solve analytically. Numerical methods are often required. This posed a calculation nightmare back in the mid 1800s, before the advent of modern computers and automated calculations. Today, numerical methods can be accommodated much more easily, using computers.

To reduce the difficulty in solving the Maxwell-Heaviside equations and largely eliminate the need for laborious numerical methods, simpler "Maxwellian" equations were sought. Lorentz further reduced the Maxwell-Heaviside equations by "symmetrically regauging" them {10}. This symmetry constrains the modern gauge freedom principle, whereby the potential (and the potential energy) of an EM system can be freely changed at will. In those systems covered by the reduced theory, the potential energy can still be changed. But it can only be changed in such a manner that the two new free fields produced are equal and opposite. Hence the new fields "fight each other to a draw", changing the *internal stress* of the system but doing no *external work* (which requires a net nonzero force field). This has the effect of bottling up any excess EM field energy that might be received by the system from its environment, into a force-free stress potential inside the system The system can be freely energized by the environment to *stress the system*, but it cannot use the free stress potential energy to perform any external work. To perform work, such a system has to have an additional input of energy where a net force field also emerges. In short, the system has to additionally be asymmetrically regauged so as to result in a net force — which means the extra asymmetrical regauging energy has to be input by the system operator or experimenter, since the Lorentz-regauged system itself prohibits the environment from furnishing such "energy with a net field".

In effect, Lorentz modified the equations to select only the far simpler "first class" of Maxwellian systems — those in equilibrium with their external active environment, and thus unable to receive and use any "free energy" from it {11}. This made the resulting equations simpler and much easier to solve analytically. It also inadvertently discarded an entire class of Maxwellian systems — those in disequilibrium with their active environment, able to freely receive excess potential energy and net field energy, develop a net force as a result, and then use that net force to dissipate the excess energy to perform work in an external load.

To ease mathematical solution of the equations, Lorentz *arbitrarily* and unwittingly threw away the electrical windmill and sailboat, and retained only the rowboat. Electrodynamicists and electrical engineers continue to dutifully utilize the Lorentz-regauged subset equations. Consequently, our present electrical power systems — *which are designed and built according to the symmetrized equations* — will not and cannot receive and use EM energy from the many "electrical winds" that can easily be made electromagnetically {12}. By definition, our engineers build only the "first class" of Maxwellian systems, and *never* build a system of the second class. Most no longer even believe that the second class of EM systems exist — *because it does not exist in their archaic 137-year old EM model.* In short, this is the classic case in science where one

branch of the scientific community ardently defends an antiquated and imperfect model, even though better models already exist in other branches of science.

Two Kinds of Systems and Two Kinds of Thermodynamics

There are two major kinds of thermodynamics (the science of how energy is dissipated and converted). First, there is the oldest kind, for systems in equilibrium with their environment. This *equilibrium* thermodynamics applies only to systems which do not *receive and use* {13} excess energy from their environment. In short, it applies to the rowboat, not to the windmill in the wind, the sailboat, the waterwheel, the solar cell, the heat pump, etc. For such a system, one must always input more energy to the system than the work we get back out of the system, because some of our input energy is wasted in the system itself (against friction, internal losses, etc.). So its *coefficient of performance* (work out divided by energy we ourselves input) is always less than unity. Or in short, its COP<1.0. In the real world, we can never break even in such a system {14}, because the systems we build do have internal losses and inefficiencies.

Hence all our conventional EM power systems exhibit COP<1.0, and have done so for more than a century. Lorentz and our present universities see to it that our engineers design and build only those electrical power systems which *self-enforce* equilibrium conditions, thus obeying the "old" thermodynamics.

The second kind of thermodynamics is for systems not in equilibrium with their active environment. As an example, Ilya Prigogine received a Nobel Prize in 1977 for his contributions to this kind of thermodynamics (of systems far from equilibrium with their active environment). In short, this kind of thermodynamics applies to the windmill, the waterwheel, the sailboat, the solar cell, the heat pump, etc. It also applies to one class of Maxwellian systems, but unfortunately that is precisely the class that Lorentz arbitrarily discarded by his symmetrical regauging. Because this type of system can freely receive *and use* excess energy (it has a net nonzero force field) from the environment, it can output more work than the energy we ourselves input. The excess energy (with appropriate net force field resulting) to do the extra work and power the inefficiencies of the system is furnished by the external environment.

The common home heat pump is a beautiful example of a system far from thermodynamic equilibrium with its environment (the outside atmosphere). By extracting heat energy from the surrounding atmosphere and using it to heat the home, the heat pump under nominal conditions has a theoretical maximum COP = 8.22 {15}. To cool the house, the heat pump reverses to extract heat from the interior air and dissipate it to the external atmosphere. Even with its internal losses, a good home heat pump will produce a COP = 4.0 under reasonable conditions (not too cold outside, etc.). So COP>1.0 systems are well-known — except in electrodynamics, where Lorentz arbitrarily discarded them, where the electrical engineers and power scientists continue to discard them, and where all our electrical power systems for more than a century have been designed and built in accord with Lorentz's deliberate reduction of the theory!

The "Perpetual Motion Machine" Conundrum: An Exercise in Very Bad Logic

The erroneous notion that all EM systems (rather than just Lorentz-regauged EM systems) are "restricted by nature" to COP<1.0 has been ingrained in electrical engineers and electrical scientists for more than a century. Accordingly, an iron dogma has arisen around the issue. Yet it is refuted by every single charge and dipole in the universe {16}.

Nonetheless, the great majority of electrical engineers and scientists firmly believe it is physically impossible and against the laws of nature to build an EM system that produces more work output than the energy *we ourselves* input {17}. Proposing such an EM system is considered to be proposing perpetual motion machines that create energy out of nothing.   The engineers and scientists consider the proponent of such EM systems a "perpetual motion nut". Yet the very electrodynamics they themselves use and teach already implicitly assumes that every charge and dipole freely creates — and continuously pours out in all directions — EM energy to change the energy density of spacetime and create their associated fields and potentials. In short, by their own "definition" and accusation, every one of them is already a "perpetual motion nut" of the worst kind.

What *is* true is that it is physically impossible to build a system — electromagnetic or otherwise — that outputs more work (conversion of the form of energy) than *all the usable energy that is input to it and made available to it*, *either by the operator or by the environment, or by both* {18}. As an example, the Bohren experiment {19} — replicable by any good university physics laboratory — always outputs more EM energy than the experimenter inputs (some 18 times as much). As another example, every charge and every dipole in the universe already outputs EM energy continuously, and we do not have to input any energy at all, once either the charge or the dipole is produced and just left alone.

A System Continuously Extracting Energy from the Vacuum Can be Made for a Dollar

Nature readily provides bountiful sources of unending EM energy, free for the taking and using — anywhere, anytime.   They are called "charges" and "dipoles" — and often, *source* charges and *source* dipoles. As an example, simply place an electret or charged capacitor on a permanent magnet so that the electric field of the electret or capacitor and the magnetic field of the magnet are at right angles to each other.   That silly thing will sit there and pour out EM energy in all directions, at the speed of light, so long as you just *leave it alone and do not destroy it*. One year after you create it, its outpouring of energy will have reached a radius of one light year — out beyond the solar system — in all directions. *It will have changed the energy density of that vast volume of surrounding space of one light-year radius*. And it is still pouring out energy at the same rate, steadily changing the energy density of still more space.

Even the "conventional" electrodynamicists agree that a flow of EM energy is continuously emitted from that arrangement {20}. However, the conventional electrodynamics is resoundingly silent on where that steady outpouring of EM energy *comes from* and *how it is input* to the charge or dipole. There is no *detectable* input of EM

energy to the charge or dipole, but there is a detectable and continuous output of energy from it. *Seemingly*, every charge and dipole is creating energy out of nothing, which of course totally destroys the conservation of energy law if true {21}. Since classical electrodynamicists have not been able to solve it, their textbooks have remained very silent on this fundamental problem and its implications. *By their resounding silence, classical electrodynamicists implicitly assume that every source charge and source dipole in the universe is a perpetual motion machine, freely and continuously creating energy out of nothing.*

Either one rejects the energy conservation law entirely, or one explains the source charge problem. There is no middle position, because the source charge is real and it ubiquitously exists. And it ubiquitously pours out that energy.

So we point the finger right back at the self-appointed critics and ask in their own terminology, "Who are the real perpetual motion nuts here? You cannot logically consider and implicitly accept every charge and dipole as a perpetual motion machine, freely creating energy out of nothing at all, and then protest that there can be no such thing as a COP>1.0 EM system!"

All the EM energy in any EM circuit or device comes from those same source charges and source dipoles. *If one cannot explain where and how those charges obtain the energy to keep pouring it out, then one knows absolutely nothing about what truly powers every electrical circuit. Since the energy being received is nonobservable, it must be received in some peculiar and normally unusable form. The charges must then transduce the received energy into usable and observable form, and re-emit it in that new form, so that the circuit can catch some of it and be "energized".*

The source charge problem focuses one's attention on the real problem. Either we must discard energy conservation altogether, or we must admit that every charge and dipole is already a COP>1.0 Maxwellian EM system, freely changing the form of some unusual received energy. It is continuously doing "free" work, since work is the changing of form of energy, and every charge and dipole is freely receiving virtual EM energy and changing its form to observable EM energy, continuously.

The quandary of the source charge and its continuous outpouring of real EM energy has been called "the most difficult problem in classical and quantum mechanics" {22}. Until 2000 there did not appear any classical solution to that long-vexing problem of the association of the fields and potentials — and their energy — reaching across all space, with the source charge that produces them. But the basis for the solution was already present in particle physics since the discovery of broken symmetry in 1957. In 2000 the present author proposed a formal solution {23} consistent with quantum field theory {24}, particle physics {25}, quantum electrodynamics {26}, and re-interpretation {12} of Whittaker's biwave decomposition of the scalar potential {27}. We used the term "giant negentropy" since the charge and dipole continuously and freely absorb, cohere, organize, and re-emit energy from the vacuum.

Since every charge in every circuit is already continuously negentropic, then our building of entropic circuits using these negentropic charges must involve some characteristic of circuit design where we kill the negentropy. We will explain that aspect shortly.

Our universities should — but do not — focus on the main problem: *How does one then intercept, divert, and collect some of that freely flowing EM energy so easily evoked by every charge and dipolarity, and use it to freely power loads, without disarranging and destroying the actual "power source"?* No university seems to be working on that problem, nor is the Department of Energy, nor are any of the great national laboratories. Nor are any of the great scientific associations.

Yet *that single problem is the only fundamental electrical power problem.* All the rest of the "recognized power problems" are just so much psychological displacement activity so as not to have to disturb the comfortable Lorentz-regauged and crippled classical electrodynamics.

There is no problem at all in obtaining great rivers and gushers of EM energy from the ubiquitous vacuum — cheaply, easily and enduringly. Every charge and every dipole already does that. There is no problem in producing the free "electromagnetic energy winds" needed to power even the greatest loads, any place in the universe, any time. Instead, the only problem is in building a proper "electrical windmill" to divert, collect, and use some energy from such a steady electrical wind — *without destroying the broken symmetry source of the wind (the source dipole)* — and using (dissipating) that collected energy to power our desired load.

All our present closed-current loop circuits are designed {28} to use half their freely collected energy to destroy the source dipole (in the generator or battery). The other half of their collected energy is used to power the external circuit's losses and loads. So more of the freely collected EM energy is used to destroy the "wind" source than is used to power the load. We then have to continually input at least as much energy to restore the source (the dipole) as was used to destroy it. So we must continually input more energy to restore the dipole — that the engineers unwittingly design and build the circuits to deliberately destroy — than the circuit provides to power the loads. All our engineers design and build electrical power systems that destroy their free electrical wind sources faster than they power their loads. Such inane power systems obviously provide COP<1.0, because of the deliberate circuit design used by the engineers.

It is akin to building a magnificent but flawed sailboat, which — once it starts to move in the wind — rapidly and continually lowers its own sails faster than the wind can propel the boat. To keep the boat going, one thus has to continually pay to keep raising the sails that the boat itself keeps lowering. Our electrical engineers and electrical power scientists are busily engaged in perpetuating an analogous electrical power technology, and our scientific community is busily assuring us that they are practicing "the most advanced electrical science".

We actually pay the power company to engage in a giant sumo wrestling match inside its generators, *and deliberately lose*.

The Modern Vacuum: Empty Space Has Unlimited EM Energy

"Vacuum" is what we usually think of as the empty space left after all the air is removed. However, in modern physics it is well-known that space is not such an "emptiness" at all. Instead, it is filled with energetic particles that appear and disappear with extraordinary speed. Hence "the vacuum" in physics is more like a seething cauldron, boiling fiercely {29}. The energy density of this boiling is so great that it literally boggles one's mind {30}. A bit of "empty space" the size of a sugar cube contains enough "seething electromagnetic energy" to power all the electrical loads on earth for millions of years. Obviously, if we can extract just a tiny fraction of this energy in electromagnetic form, we can use it to power our loads for free or nearly so. We need only power the "gating" or "switching" of the flowing energy, and thus cause a great deal of work to be performed, even though we ourselves input little or no energy.

Can the EM Energy of the Vacuum be "Tapped" and Extracted for our Use?

It's widely believed that it is impractical to try to extract very much usable energy from the seething, highly energetic vacuum. Oh yes, the tiny little Lamb shift {31} of the orbit of one electron in a certain atom is admittedly due to vacuum energy interaction. Well, although the Lamb shift is a very small effect of a single electron in a single atom, the *energy density* of that interaction is greater than the surface energy density of the sun {32}!

And, oh yes, the Casimir effect {33} — a vacuum-induced attraction of two conducting plates when separated but close — also is due to vacuum energy interaction, but it too is a very small effect and not practical to consider {34}.

Then the assertion is often made — particularly by electrical power engineers, who normally are not well-acquainted with modern physics — that thermodynamics prohibits extracting and using vacuum energy. That is quite untrue, as we have explained, and as Cole and Puthoff have rigorously demonstrated {35}. *Thermodynamics does not explain how to do it practically, but it does permit it technically.*

The principle of superposition of charge and the field effects of charges, ubiquitously assumed and verified in countless classical experiments, also tells us a magnificent thing: *The source charge production of its associated fields and potentials is additive and coherent as the source charge is increased . Within reason, doubling or tripling the amount of energy-collecting and transducing charged particles (source charges) at a given point will give double or triple the resulting potentials and fields (gathered EM energy and local EM energy winds) produced by that source charge collection, and so on.*

So the proven broken symmetry of opposite charge collections — such as on the ends of a dipole or dipolarity — need not be a small effect at all! We can use as many unit charges

9

as we wish in each one of those "separated opposite charges" in a dipole, so long as we hold the charges apart with a proper restraining dielectric.   In a normal electrical circuit (as between the terminals of a generator or battery), we can have many positive and negative charges involved, so that the EM energy extracted from the vacuum can be very powerful. In other words, the dipole can readily be made essentially as powerful as we need for our usual specific purposes. We can easily produce a megawatt or even 1,000 megawatts of energy flow per second, by making a bigger dipole consisting of more separated charges.

All we have to do is pay to make the dipole once. Then leave it alone and do not allow it to be destroyed by the inane way that engineers normally build their circuits and power their loads.

The latter problem — which is the only real problem preventing the engineers from easily producing all the cheap, clean electrical power they wish, without burning fuel, consuming fuel rods, building pipelines, building dams, etc. — is not being furiously funded and worked on as a national Manhattan Project. Indeed, the very notion continues to be castigated and ridiculed by the "defenders of the faith". And that is perhaps the greatest scientific travesty of our times. It simply reveals the "soft underbelly" of our present energy science, which does not even include what powers its circuits.

Can an Electrical Power System Output More Energy than We Input to It?

Hopefully, by now the reader will exclaim, "Of course! Just pay to make a source dipole." Prepare a suitable interception and collection external circuit which will dissipate its collected energy in a load, without destroying the source dipole faster than it powers the load. That's all there is to it. The only remaining problem is in that single phrase, "without destroying the source dipole faster than it powers the load".

Since that is the problem and the only problem preventing a total solution to the energy crisis forever, every university, every power company, the National Science Foundation, the National Academy of Sciences, the Department of Energy, and every major research lab should be working on it. But of course none of them is working on it, interested in it, or funding it.

The problem calls for "out-of-the-box thinking", to use a prevailing buzzword.. Simply consider a charged capacitor or a permanent magnet. That beast is freely extracting and pouring out real EM energy, from the active vacuum, continuously. So how do we intercept some of the energy flow, convert the intercepted energy to, say, oscillating EM energy, and then use that energy to power a load — all without destroying the magnet or killing the charge in the capacitor?

This is the problem, and work on it by our sharp young graduate students and post-docs is something which the National Science Foundation and the National Academy of Sciences should fund as the highest priority. They do not even recognize the fundamental problem, much less fund work on it.

These agencies' lack of recognition of this, the primary electrical energy problem, is a sad commentary on our present scientific acumen.

Why Don't Present EM Systems Power Themselves?

By now the reader hopefully will be able to see that our systems don't power themselves because our engineers specifically design them so they *cannot*. The mindset of the scientists and engineers themselves is the greatest foe to cheap clean electrical energy, a clean biosphere and a decentralized power system using no fuel. The closed current loop circuit for power systems is considered to be hallowed, as if Moses had brought it down from the mountain with him, carved on those stone tablets. It isn't and he didn't.

To quote Nikola Tesla, who made practical generators and motors possible with his discovery of the rotating magnetic field: "*Today's scientists have substituted mathematics for experiments and they wander off through equation after equation and eventually build a structure which has no relation to reality.*" Understand, a good model is essential to technology. But if the model is inadequate, then it should either be corrected or a new model should be substituted that is adequate. However, our electrical power engineers and most of the scientific community have developed a mindset where the closed current loop circuit, Lorentz symmetrical regauging and COP<1.0 electrical circuits are considered to be iron laws of nature. They are not such at all, but merely the self-limited and self-enforced contrivances of human beings.

We should always remember one succinct statement by Evans {36}: *"No theory can falsify a successful and repeatable experiment, but a single successful and repeatable experiment can falsify any theory."*

We borrow a quote from Tesla on another subject {37}and hope that it comes true with respect to the present dogma that only COP<1.0 electrical power systems are possible: "*… 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.*"

What Is Significant About More Modern Kinds of Electrodynamics?

The present Lorentz-regauged Maxwell-Heaviside theory effectively assumes an inert vacuum — falsified for half a century by quantum mechanics and particle physics — and no curvatures of local spacetime — falsified for nearly a century by general relativity. Since the active vacuum and the local curvature of spacetime — and their dynamics — are the "active external environment" for an electrical power system, then *present power engineers and classical electrodynamicists assume away any and all net interactions of the system with its external active environment*. That is how the COP>1.0 Maxwellian systems are arbitrarily discarded, and only electrical power systems that self-enforce COP<1.0 are designed, built and permitted. To then drum into the students' heads that this travesty represents a "law of nature" is ludicrous. It has become *disinformation*,

propaganda and *dogma*, and it violates the very spirit of scientific inquiry and scientific reasoning.

The proper scientific frame of mind is skepticism tempered by open-mindedness. If one is skeptical and dogmatic, one is not scientific, regardless of one's pedigree. If one is open-minded and not skeptical, one is scientifically naïve.

Meanwhile, much more modern systems of electrodynamics have been developed in particle physics and elsewhere. In modern theory, the models are based very powerfully on the theory of groups. Groups have symmetries, designated by such expressions as U(1), SU(2), O(3), etc. The higher the group symmetry utilized by an algebra, the greater range of physical phenomena to which the algebra can apply and can model.

A particularly good higher group symmetry electrodynamics, in this author's opinion, is the O(3) electrodynamics founded by Evans and Vigier and further expounded by Evans {38}. Evans has shown that O(3) electrodynamics is a part of the Sachs unified field theory electrodynamics {39}. Thus O(3) electrodynamics can be used not only for modeling "normal" electrodynamic but also for modeling "exotic" unified field theory. Further, it can be used for engineering, so it permits the development of a drastically extended electromagnetic technology which can eventually engineer many new phenomena {40}, including antigravitational effects {41}. At least one highly successful antigravity experiment was performed by Sweet, in an experiment designed by the present author {42}. The weight of an object was steadily reduced by 90%, on the laboratory bench.

Why Don't the Electrical Engineering Departments Teach a More Modern Science?

Here the reader's assessment is as good as anyone else's. After more than a century, the standard Lorentz-regauged Maxwell-Heaviside dogma has become so ingrained in electric engineering thought that everyone accepts these equations without question. To use an appropriate phrase from Einstein, it is as if we "imbibed it with our mother's milk." Behind the scenes, of course, there are also very powerful financial interests — which Winston Churchill just loosely referred to as the "High Cabal" — with income of some trillions of dollars per year at issue. These groups do not wish the present energy science and technology changed into something dramatic and cheap such as "fuel-free" electrical power systems extracting their energy from the vacuum. It has already been decided that the path of so-called "progress" in power systems for the future will consist of fuel cells and the more difficult hydrogen technology. This will keep the environmentalists off the cartels' backs, and allow them to show "progress" being made to clean up the biosphere.

The bottom line is that it's still all about money and power, and "who's going to be the big monkey". Primate dominance is still one of the primary motivations in humankind, including in scientists and the scientific community.

The terrible bias in electromagnetic science toward that flawed old energy model is guaranteed by the "scientific momentum" and inertia that the dogma has built up over more than a century. Science does not change its cherished dogmas by sweet reason, but by a vicious and sustained cur dog fight — and even then only after the "old dogs" die off and get out of the way. As Max Planck put it {43}:

> *"An important scientific innovation rarely makes its way by gradually winning over and converting its opponents: it rarely happens that Saul becomes Paul. What does happen is that its opponents gradually die out, and that the growing generation is familiarized with the ideas from the beginning."*

Arthur C. Clarke said it this way {44}:

> *"If they [quantum fluctuations of vacuum] can be [tapped], the impact upon our civilization will be incalculable. Oil, coal, nuclear, hydropower, would become obsolete — and so would many of our worries about environmental pollution."*
> *"Don't sell your oil shares yet — but don't be surprised if the world again witnesses the four stages of response to any new and revolutionary development: 1. It's crazy! 2. It may be possible -- so what? 3. I said it was a good idea all along. 4. I thought of it first."*

It's a part of human nature to strongly resist new ideas, and particularly *upsetting* ideas. Even Sigmund Freud, the founder of modern psychology, pointed it out in these words:

> "*There are three steps in the history of a great discovery. First, its opponents say that the discoverer is crazy; later that he is sane but that his discovery is of no real importance; and last, that the discovery is important but everybody has known it right along.*"

Just now, COP>1.0 energy science and notions are still largely in that first stage prescribed by Freud, just a little bit into the second stage, and struggling to get on into and through the second stage and into the third.

A key problem is that all science must be patronized (funded). Someone must pay for the labs and the scientists, the equipment, the operations, etc. The scientific community is organized to strongly *control* that funding, and *control what it can be spent for*.

When the research money is strongly controlled, scientific research itself is strongly controlled. So the real reason that this type of research does not happen is that managerial and control scientists are rewarded — often handsomely — for adhering to the status quo, and doing only "incremental improvements" rather than gigantic leaps. Scientists, graduate students and post-docs are in fact destroyed or severely punished if they "wander off" into that old "perpetual motion machine nonsense" called COP>1.0 EM systems. The scientific "system" is set up that way, very much like a cartel, and it is self-enforcing and self-replicating. *Scientists are allowed to work on only what they can attract funding for*. They are only funded to work — mostly — on comfortable and already established things.

So ultimately the blame lies directly with the leaders of the scientific community, such as the National Science Foundation and the National Academy of Sciences, and the manner in which they advise the U.S. government to tailor its energy research money. Also, as a result the U.S. Patent Office still is very shy about granting any kind of patent that mentions or implies COP>1.0 EM systems. Such is simply assumed to be against the laws of nature and involving "perpetual motion nonsense", *a priori*.

<u>Doesn't Present Circuit Theory Accurately Predict All Circuit Behavior?</u>

Not on your life! Circuits do continue to exhibit anomalous behavior, and behavior that is not understood. Even many of the basic effects are not well-understood. For example, there are about 200 known magnetic effects, and only about 100 are well-understood. The level of understanding of the remainder varies from "somewhat" to "not at all".

For nonlinear circuits, the phenomenology can get very anomalous. E.g., quoting Ogorzalek {45}:

> *"All real systems are nonlinear in nature. This simple observation is true also for electrical and electronic circuits even though many of them are designed to perform linear transformations on signals. …in many cases the designed circuit, when implemented, performs in a very unexpected way, totally different from that for which it was designed. In most cases, engineers do not care about the origins and mechanisms of the malfunction; for them a circuit which does not perform as desired is of no use and has to rejected or redesigned.…"*
> *"…electrical and electronic circuits constitute a group of real physical systems in which observations and measurements are relatively easy to make. ..Such an 'experimental comfort' enabled thorough studies confirming the existence of strange unexpected behavior in almost every type of electronic circuit – oscillators, filters, instrumentation circuits, power supplies, PLLs, electric machines, microwave circuits, electro-optic systems, etc. The main problem remains in interpreting experimental data."*

As another example, the "open path" discovered and utilized by Gabriel Kron {46}, one of our great electrical scientists, is still unknown today. Kron was never allowed to reveal the full exposé of his open path, where he could produce current between any two parts of a circuit, even though not connected. Lynn and Russell {47} pointed it out this way:

> "*Kron has never published details of his method of making the polyhedron self-organizing, although his published results show that in this state it has some remarkable properties, associated with harmonic integrals on multiply connected spaces.*"

For the uninitiated, in a multiply-connected space some energy can be in two or more places at the same time. Contrary to our intuition, some parts of physics really do work this way. Obviously, if one inputs 100 joules to one point in space, and it remains there

yet also appears simultaneously in another point in the observer's singly-connected space, this appears to be "creation of energy" to the observer. It is not. Instead, it is a broken symmetry in energy conservation in singly-connected space, resulting in a higher symmetry in multiply-connected space. Conservation of energy laws need not take such a simple form as our naïve intuition would have us believe at first blush, or that almost all the textbooks proclaim,

Energy in multiply connected spaces is often referred to as a *quantum potential*. Bohm's great hidden variable theory of quantum mechanics {48} uses the quantum potential, and it poses things eventually engineerable that are presently deemed impossible. His theory gives all the proper predictions and answers to the current problems and experiments, and it is equally as valid as the present much more limited Bohr interpretation. Indeed, Bohm's theory seems to gain ground with every passing year {49}.

Why Don't Scientists and Engineers Develop Power Systems That Extract Our Electrical Energy Freely from the Vacuum?

Scientists do not research electrical energy from the vacuum because the scientific establishment will not allow such research to be funded. They cannot teach it, for it would not be allowed. Further, if they try to do it on their own, they get no funding, their papers are denied publication and their peers destroy them. Eventually they will be lucky to be employed in a fast food restaurant.

The system has become "self-policing" of its own cherished dogma. The reviewers definitely deny an applicant funding if the project submitted would be an embarrassment to their own self-interest. E.g., Charles McCutchen, a physicist with the NIH, puts it this way: "*[Peers on the panel reviewing a grant applicant] '…profit by his success in drawing money into their collective field, and by his failure to do revolutionary research that would lower their own ranking in the profession. It is in their interest to approve expensive, pedestrian proposals.'*"

Well, surely the scientific journals will readily publish innovative new things, will they not? Again, not so. To quote George {50}:

> *"…I suggest that most revolutions in science have taken place outside the lofty arena of the refereed journals, and with good reason. The philosophy by which these journals govern themselves virtually precludes publication of ideas that challenge an existing consensus."*

In that respect, the publication of two papers {40} by the Alpha Foundation's Institute for Advanced Study (AIAS) in Foundations of Physics Letters, on a COP>1.0 EM system, was nothing short of miraculous. With the publication of several other AIAS papers dealing with energy from the vacuum {51}, a small salient in the solid opposition of the journals appears to have at last been opened. But there is a very, very long way to go

before such papers can be published readily, even when meticulously prepared and scientifically impeccable.

Why does not one paper do it? Why is such a volume of papers needed? As Landauer puts it {52}:

> "*We used to be able to say things once; if the message was reasonable, it had a good chance of becoming a permanent part of the structure of the field. Today, a single publication is lost; if we say it only once, it will be presumed that we have changed our mind, and we therefore must publish repeatedly. This further fuels the large publication volume that requires us to repeat.*"

Actually this is one somewhat unfortunate aspect of science's success and growth. Quoting Price, nearly four decades ago {53}:

> "*Using any reasonable definition of a scientist, we can say that between 80 and 90 per cent of all the scientists that have ever lived are alive now. Now depending on what one measures and how, the crude size of science in manpower or publications tends to double within a period of 10 to 15 years.*"

In short, because of the sheer bulk of the scientific literature and its ever-expanding volume, the subject of a paper can just be lost in the wilderness, unless it is extensively published in many papers, and in multiple journals.

In the field of permissible COP>1.0 power systems, still struggling to be born, the resistance assumes a more sinister, Taliban-like character. The proponent is assaulted with a viciousness and a tirade seldom equaled in the annals of scientific history. Few can survive such an onslaught. Here is a direct example of the type of vicious assault savagely made upon a reputable cold fusion scientist — at the time, cold fusion had achieved more than 600 successful experiments by multiple scientists in multiple labs in several nations:

> "*How stupid do you think we are? My assessment of you and your colleagues is that you are complete frauds or totally mad. There is no known physical principle that would support the kind of results that you claim your technology can accomplish, nor is there any credible argument why there should be such a principle.*"

In science, of course, one is supposed to believe and accept the experimental results, if they are replicable. It does not matter whether a "known physical principle" is available for the experiment, or whether a "credible argument" for it even exists. Either we follow that iron dictum of the scientific method, or we do away with scientific method altogether and practice "truth by authority and decree". Further, calling more than 100 scientists, who have performed successful experiments and replications, frauds or madmen, is totally an ad hominem attack and has no place in science of scientific method.

Any historian of science can cite many dozens of incidents where ruthless suppression of new and important scientific discoveries has been done by the scientific community itself. Science has had *and continues to have* a dark history in that respect.

How Will "Electrical Energy from the Vacuum" Science Eventually Get Started?

It will get started when one or more of the inventors and researchers somehow succeeds in getting sufficient funding and scientific support (he will have to pay the scientists himself) to develop a simple, rugged, easily replicable COP>1.0 electrical power system and place it on the world market. Even then, he will have to do it outside the United States, in all probability. Otherwise, the U.S. scientific establishment will destroy him, by fair means or foul. And we do mean *foul*. Jim Watson demonstrated an 8 kilowatt practical self-powering generator system at a national conference and then apparently received an "offer he could not refuse". He and his family simply dropped out of sight and severed all further contact with his friends, including this author. He and his family are still alive, fortunately, but remaining very, very quiet. There are no Watson systems on the open market and there are not going to be.

Steve Marinov was killed in a foreign country with a longitudinal EM wave "shooter", and his body was thrown from the top of a building to suggest a suicide. The body was left there for an extended period by the authorities, who knew it was emitting longitudinal EM radiation for awhile. Where the body lay on the concrete, the cement glowed. There is only one weapon on earth that will kill a body in such fashion: a longitudinal EM wave shooter. At least 10 nations of the world have developed longitudinal EM wave weapons. These are almost certainly the weapons to which Secretary of Defense Cohen referred in 1997 as follows {54}:

> *"Others [terrorists] are engaging even in an eco-type of terrorism whereby they can alter the climate, set off earthquakes, volcanoes remotely through the use of electromagnetic waves... So there are plenty of ingenious minds out there that are at work finding ways in which they can wreak terror upon other nations...It's real, and that's the reason why we have to intensify our [counterterrorism] efforts."*

Sweet was fired at from about 300 yards by a would-be assassin, using a silenced rifle. Being old, he stumbled and fell on the steps just as the assassin pulled the trigger. The bullet snapped right by his ear, where his head had just been. Thereafter, Sweet was always deeply paranoid about taking the unit outside his own apartment or continuing to develop it. Again, I personally worked with Sweet for some years.

The present author has had his own share of such shenanigans, close calls and suppressions, more than a dozen times but does not wish to publicize the incidents. As a single personal example, Kawai's patented motor {55} will produce COP>1.0 if his process is applied to a high-efficiency magnetic motor to start with (such as one from Hitachi with 70% to 80% efficiency). We explained the Kawai engine's operation, placed it on the Internet, and Kawai and party came to Huntsville to see us. At Kawai's urging, we negotiated an agreement that we would manufacture and market Kawai's systems

worldwide; he already had built a closed-loop, self-powering system in Japan. He would fund the entire project. Our agreement was verbally reached on a Thursday afternoon, late. That night a jet arrived posthaste from Los Angeles, with a Yakuza on board. The next morning Kawai and his party were in fear and trembling, and the Yakuza was in total control. Kawai no longer controlled his own company, his invention or his own fate. Needless to say, the Yakuza coldly cancelled the agreement, point blank. This happened in front of my associates and I, so there are multiple witnesses. The Yakuza and party quickly packed up the two Kawai engines in our possession and departed. No Kawai engine will ever be permitted on the world market. Several other Japanese COP>1.0 electrical power systems have also been suppressed by the Yakuza {56}. Many such incidents — including murder — have occurred over the last decades, right here in the United States. Others will happen.

The single thing that is likely to finally force COP>1.0 systems out there is the Internet. For the first time, researchers can exchange information worldwide and on a vast scale. My own website, www.cheniere.org, is an example of a tired old dog, trying to get out important information he has discovered — or believes he has discovered — and make it available freely to students, professors, scientists, and researchers that are interested. Jean-Louis Naudin's website, http://members.aol.com/jnaudin509/, is another example. There are many others.

Of course, there is a great deal of *dis*information on the web as well as information. The reader still has to sift it for himself. In my own case, I extensively cite the references I use, and the interested party can check them himself to see if they say what I said they did. In short, the idea is to educate, not dogmatize. It is also intended to give the interested young researcher what I have uncovered in 30 years of very hard work, so he does not have to rediscover all the wheels again, so to speak. He can simply start from where I am and go much further. It is very heartening that many other researchers are doing the same thing and sharing what they have uncovered. In my own case, I have also labored very hard to lay a sound basis for a legitimate theory of permissible COP>1.0 EM systems. That effort will culminate with the publication of my book late this year {57}.

As more researchers succeed, eventually this thing will finally acquire enough momentum to "get born". When the scientific community finally turns the sharp young graduate students and post-docs loose on it and funds them, it will simply explode into science and technology like a skyrocket. Then, of course, it will be just as Planck and Freud stated. Suddenly everyone will have not only *known* it all along, but *they did it first*.

But it *will* get born. If it doesn't, the "dirt economics" in poor nations with fanatical leaders — and the increasing struggle for control of cheap oil and its use as a weapon — will generate wars and world terrorism. The terrorists will see to it that humanity destroys or nearly destroys itself during the first half of this century, and perhaps even by the end of this first decade. It is not accidental that President George W. Bush has declared war on terrorism.

Every nation must soon get cheap clean electrical energy from the vacuum and develop self-powering electrical power systems quickly or no nation will ever be safe again. Radicals and terrorists will see to it, if we lose the energy war.

So COP>1.0 electrical power systems have become both a moral imperative and a national imperative, in my opinion. Either we develop them and establish them worldwide or we perish, as simple as that. If enough of us determine to do it, and if we hang together and get a little funding — and if we have a little luck— hopefully it will be accomplished.

Notes and References

1.   Lee and Yang strongly predicted broken symmetry in 1956; see T. D. Lee, "Question of Parity Conservation in Weak Interactions," Physical Review, 104(1), Oct. 1, 1956, p. 254-259; — and C. N. Yang, "Remarks on Possible Noninvariance under Time Reversal and Charge Conjugation," Physical Review, 106(2), 1957, p. 340-345.

2.   Wu *et al*. experimentally proved broken symmetry in 1957; see C. S. Wu, E. Ambler, R. W. Hayward, D. D. Hoppes and R. P. Hudson, "Experimental Test of Parity Conservation in Beta Decay," Physical Review, Vol. 105, 1957, p. 1413.

3.   So revolutionary to physics was this discovery of broken symmetry that the Nobel Prize was awarded to Lee and Yang in the very same year that Wu experimentally proved it. For Lee's Nobel acceptance speech, see T. D. Lee, "Weak Interactions and Nonconservation of Parity," Nobel Lecture, Dec. 11, 1957. In T. D. Lee, Selected Papers, Gerald Feinberg, Ed., Birkhauser, Boston, 1986, Vol. 1, p. 32-44.

4.   James Clerk Maxwell, "A Dynamical Theory of the Electromagnetic Field," Royal Society Transactions, Vol. CLV, 1865, p 459.

5.   See Terence W. Barrett, "Tesla's Nonlinear Oscillator-Shuttle-Circuit (OSC) Theory," Annales de la Fondation Louis de Broglie, 16(1), 1991, p. 23-41. Tesla was able to shuttle the potential (and the energy) around in his circuits at will. Barrett, one of the pioneers of ultrawideband radar, extended Tesla's method and obtained two U.S. patents for use in signaling science: See T. W. Barrett, "Active Signalling Systems," U.S. Patent No. 5,486,833, issued Jan. 23, 1996; — "Oscillator-Shuttle-Circuit (OSC) Networks for Conditioning Energy in Higher-Order Symmetry Algebraic Topological Forms and RF Phase Conjugation," U.S. Patent No. 5,493,691, issued Feb. 20, 1996.

6.   When Maxwell died, he himself was engaged in converting his own quaternion-like theory into the much simpler vector theory, in a desperate attempt to reduce the objections to it. See Maxwell, James Clerk, A Treatise on Electricity and Magnetism, Oxford University Press, Oxford, 1873, Second Edition 1881 (Maxwell was already dead), Third Edition, Volumes 1 and 2, 1891. Foreword to the second edition was by Niven, who finished the work as Maxwell had dramatically rewritten the first nine chapters, much new matter added and the former contents rearranged and simplified. Maxwell died before finishing the rest of the second edition. The rest of the second edition is therefore largely a reprint from the first edition. The third edition edited by J. J. Thomson was published in 1892, by Oxford University Press, and later was published unabridged by Dover Publications, New York, 1954. J. J. Thomson finished the publication of the third edition, and wrote a "Supplementary Volume" with his notes. A summary of Maxwell's modified equations are given in Vol. II, Chapter IX of the third edition. However, Maxwell had

gone (in his second edition) to some pains to reduce the quaternion expressions himself, and therefore to not require the students to know the more difficult calculus of quaternions (so stated on p. 257).

7.   Actually the first "symmetrizing" truncation of Maxwell's equations was by Ludwig van Lorenz, shortly after Maxwell's 1865 definitive paper was published. See Ludvig Valentin Lorenz, "On the identity of the vibrations of light with electrical currents," Philosophical Magazine, Vol. 34, 1867, p. 287-301. In this paper L. V. Lorenz gave essentially what today is called the Lorentz symmetrical regauging. However, when H.A. Lorentz (a different individual with a similar name), then perhaps the greatest electrical scientist, regauged the Maxwell-Heaviside equations in the 1880s, the H.A. Lorentz regauging was adopted because of Lorentz's prestige.

8.   The symmetrized systems can and do receive the excess energy only in the form of a net force-free stress potential (simply examine the regauging equations and the regauging condition). With no net force available to dissipate the stress potential energy, no net work can be done by the excess stress energy received. That is precisely what the Lorentz condition means, in simpler terms. The closed current loop circuit automatically self-applies Lorentz regauging, by making the back-emf precisely equal to the forward emf, so that the collected energy becomes stress energy with no net force fields self-generated by the system itself. In that case, the operator must continue to input some form of net work and net force field, to which the system will respond by "using it" to produce the back emf. In that use, the system is able to power a load to that extent only. The known absence of Newton's third law from electrodynamic fields already assures us that back-emf equal to forward emf is not a law of nature in electrodynamics. Yet mainstream electrical engineering persists in assuming that it is.

9.   Disequilibrium systems produce net force fields along with receipt of the excess energy — something we have called "asymmetrical regauging". This violates the Lorentz condition, and the system can then utilize this net force to dissipate the net energy received, thus performing some "free work". This is no more mysterious than a windmill receiving energy and net force from the environment, and using that force to dissipate the energy and do free work. To imply that it is somehow a violation of natural law or a violation of energy conservation is .

10.   To see how this is done, see J. D. Jackson, Classical Electrodynamics, Second Edition, Wiley, New York, 1975, p. 219-221; 811-812.

11.   Again, a system in equilibrium can and does receive excess energy from the environment, but it also immediately returns the energy. The "force in" and "force out" balance to a net zero, so input of additional energy just results in the production of excess system stress, but no free work in an external load.

12.   Any dipole (such as a permanent magnet) or charge (such as an electron) pours out EM energy in all directions at the speed of light — and hence produces a continuous "free electromagnetic wind". If we leave it intact, the dipole or the charge will pour out such energy indefinitely. The dipoles and charges in the original matter of the universe have been doing it for some 15 billion years, and they are still doing it. So the process does not "run down". Every charge and dipole in the universe exhibits *giant negentropy*, producing all that EM energy and the EM fields and potentials in nature. Yet for more than a century we have designed and built only entropic systems. We have steadily despoiled the biosphere in the process.

13.   We stress this point most strongly. Such a system may freely receive excess energy from its environment, but it self-enforces equilibrium by applying some form of Newton's third law, to negate any net force fields resulting from the excess energy. Consequently, this system can

change its stress energy, but not its usable net field energy to do external work. It can only change the equilibrium condition, with a change of stress potential as it changes the conditions of equilibrium.

14. Superconductive *sections* in a system are often touted as COP = 1.0 systems, by implication. However, when the cryogenics overhead one must pay is counted, they are grossly underunity.

15. David Halliday and Robert Resnick, <u>Fundamentals of Physics</u>, Third Edition Extended, Wiley, New York, 1988, Vol. 1, p. 518.

16. E.g., see M.W. Evans, P.K. Anastasovski, T. E. Bearden et al., "Explanation of the Motionless Electromagnetic Generator with O(3) Electrodynamics," <u>Foundations of Physics Letters</u>, 14(1), Feb. 2001, p. 87-94; — "Explanation of the Motionless Electromagnetic Generator by Sachs's Theory of Electrodynamics," <u>Foundations of Physics Letters</u>, 14(4), 2001, p. 387-393.. The tired old "perpetual motion nonsense" charge was strongly raised in the vigorous refereeing of these two AIAS papers. To refute the charge raised against the latter paper, I prepared a vigorous rebuttal, "On Permissible COP>1.0 Maxwellian Systems: A Reply to the Board Member," and submitted it to the referees and editors. Based on the paper, the referees and editors overruled the objections and published the second paper because every charge and every dipole in the universe already clearly demonstrates a COP>1.0 Maxwellian system. We challenged the classical scientists to provide a solution to the source charge problem in their Lorentz-regauged theory, then showed the solution which can only appear in a higher symmetry electrodynamics — such as the O(3) EM or the Sachs EM used in the two papers. The old EM assumes an inert local vacuum and a locally flat spacetime, both assumptions being long since refuted in modern physics. And every charge and dipole demonstrates the falsity of those two assumptions, as is easily demonstrated on the lab bench.

17. Except the classical electrodynamicists who have not resolved their own source charge problem, no one advocates that an EM system can do more work in a load than the *total amount* of usable energy that is input to it! Instead, one advocates that it can do more work than the *operator* inputs; the remaining energy is freely input from the active external environment due to the disequilibrium (the broken symmetry) condition. The broken symmetry also specifically implies violation of the Lorentz symmetry condition, a priori.

18. The reason is extraordinarily simple, once one makes clear definitions of terms. *Work* rigorously is *a change the form of energy*. A priori, an inert system cannot "convert the form of energy" it has not received and collected. But it can receive additional energy from the environment and convert more than the *operator himself* inputs, in which case the environment freely inputs the remainder of the input energy being converted in form!

19. Craig F. Bohren, "How can a particle absorb more than the light incident on it?" <u>American Journal of Physics</u>, 51(4), Apr. 1983, p. 323-327. Under nonlinear conditions, a particle can absorb more energy than is in the light incident on it. Metallic particles at ultraviolet frequencies are one class of such particles and insulating particles at infrared frequencies are another. See also H. Paul and R. Fischer, {Comment on "How can a particle absorb more than the light incident on it?"}," <u>Am. J. Phys.</u>, 51(4), Apr. 1983, p. 327. The Bohren experiment is repeatable and produces COP = 18.

20. As an example, quoting Jed Z. Buchwald, <u>From Maxwell to Microphysics</u>, University of Chicago Press, Chicago and London, 1985, p. 44: *"[Poynting's result] implies that a charged capacitor in a constant magnetic field which is not parallel to the electric field is the seat of energy flows even though all macroscopic phenomena are static."*

21.   The key is in that word "detectable" — or as the physicist would say, "observable". The experiment rigorously demonstrates that, if the law of energy conservation is valid, then the charge and the dipole must be continuously receiving energy (from its external environment) in nonobservable (virtual) form and integrating it into observable form. And so it is, as has been known in particle physics for 45 years. In the case of the dipole, it is due to the known broken symmetry of the opposite charges comprising the dipole. In the case of the charge, when one accounts for the clustering virtual charges (from quantum electrodynamics), then the charge is actually a set of composite dipoles, each exhibiting the required broken symmetry. Hence charges and dipoles freely absorb (receive) virtual photon energy from the seething vacuum (particle physics proves this), integrating the absorbed "disintegrated" energy into observable form, and re-emitting real, observable EM energy in all directions, continuously. That this has not yet appeared in the electrical engineering model is strictly the fault of the leaders of the scientific community who have not enforced its inclusion. Consequently, the electrical engineers do not even understand what powers an EM circuit or system. It is energy from the vacuum, extracted and integrated by the source charge and the source dipole.

22.   E.g., see D. K. Sen, Fields and/or Particles, Academic Press, London and New York, 1968, p. viii.

23.   T. E. Bearden, "Giant Negentropy from the Common Dipole," Proceedings of Congress 2000, St. Petersburg, Russia, Vol. 1, July 2000 , p. 86-98. Also published in Journal of New Energy, 5(1), Summer 2000, p. 11-23. Also carried on www.cheniere.org and the DoE restricted website http://www.ott.doe.gov/electromagnetic/.

24.   F. Mandl and G. Shaw, Quantum Field Theory, Wiley, 1984, Chapter 5.

25.   With the broken symmetry of unlike charges and with the Nobel Prize awarded to Lee and Yang in 1957.

26.   With the fact that virtual charges of opposite charges cluster around an "isolated" observable charge. One differential piece of the observable charge and one clustering virtual charge of opposite sign comprise a composite dipole. The "isolated source charge" may thus be treated as a set of composite dipoles. The broken symmetry of opposite charges solves the problem for any dipole, and thus for the "isolated" charge as a set of composite dipoles.

27.   E. T. Whittaker, "On the Partial Differential Equations of Mathematical Physics," Mathematische Annalen, Vol. 57, 1903, p. 333-355.

28.   By use of the conventional closed current loop circuit, where all the current in the external circuit (through the losses and the loads) is returned by a "ground return line" back through the source dipole that is freely extracting the EM energy from the vacuum and radiating it. This "spent" current must be forcibly rammed back up through the source dipole itself, scattering the charges and destroying the dipole. We must then input additional energy to the shaft of the generator to rotate it and restore that dipole.

29.   For a good description of the modern vacuum, see I. J. R. Aitchison, "Nothing's plenty: The vacuum in modern quantum field theory," Contemporary Physics, 26(4), 1985, p. 333-391.

30.   E.g., see R. Podolny, Something Called Nothing: Physical Vacuum: What Is It?, Mir Publishers, Moscow, 1986, p. 181. In mass units, the energy density of the virtual particle flux of vacuum is on the order of 10^{80} grams per cubic centimeter.

31.   Willis E. Lamb Jr. and Robert C. Retherford, "Fine structure of the hydrogen atom by a microwave method," Physical Review, 72(3), Aug. 1, 1947, p. 241-243. Lamb received the 1955

Nobel Prize in physics jointly with Polykarp Kush for experiments measuring the small displacement later called the "Lamb shift" of 0+ne of the energy levels in atomic hydrogen.

32.   E.g., see W. T. Grandy Jr., "The Explicit Nonlinearity of Quantum Electrodynamics." in The Electron: New Theory and Experiment, David Hestenes and Antonio Weingartshofer, Eds., Kluwer Academic Publishers, Boston, 1991, p. 149-164. Quoting, p. 150: *"...the energy density associated with the Lamb shift would produce a Poynting vector about three times the total power output of the sun, and a gravitational field disrupting the entire solar system!"* We comment that the reaction is ongoing in a maelstrom of additional such violent interactions, and so — even though *each* of these fierce interactions might be energetic enough to disrupt the entire solar system — the *net summation* is a very tame little thing confined to shifting that single little electron, while still participating in the fluctuations of the vacuum energy elsewhere. The summation of infinite things to leave a manageable finite thing, is well-known and used in particle physics, where it is often referred to as *renormalization*. Simply put, the vacuum energy also has a process for "renormalization".

33.   H. B. G. Casimir, "On the attraction between two perfectly conducting plates," presented at a meeting of the Royal Netherlands Academy of Arts and Sciences on 29 May, 1948. Published in the same year in Proceeding Koninklijke Nederlandse Akademie van Wetenschappen, Amsterdam, Vol. 51(7), 1948, p. 793-796.

34.   An accurate modern measurement of the Casimir effect is given by S. K. Lamoreaux, "Demonstration of the Casimir Force in the 0.6 to 6μm range," Physical Review Letters, 78(1), Jan. 6, 1997, p. 5-8.

35.   Daniel C. Cole and Harold E. Puthoff, "Extracting Energy and Heat from the Vacuum," Physical Review E, 48(2), Aug. 1993, p. 1562-1565.

36.   Myron W. Evans, private correspondence.

37.   Nikola Tesla, "The True Wireless," Electrical Experimenter, May 1919. Heaviside was speaking of Hertzian (transverse) EM waves in the vacuum. Indeed, with Whittaker's bidirectional longitudinal EM wave decomposition of the scalar potential, and by quantum field theory's finding that the time-polarized photon and longitudinal photon, when combined, are observed as the instantaneous scalar potential, one can make a very good case that the EM waves in space are longitudinal EM waves anyway. This is particularly interesting since nearly a dozen nations have already secretly weaponized longitudinal EM wave technology.

38.   Particularly see M. W. Evans, "O(3) Electrodynamics," in Modern Nonlinear Optics, Second Edition, 3 vols., Edited by M.W. Evans, Wylie, New York, 2001, Part 2, p. 79-267. Evans also has more than 600 other papers in the scientific literature.

39.   M. W. Evans, "The Link Between the Sachs and O(3) Theories of Electrodynamics," in M. W. Evans (Ed.), Modern Nonlinear Optics, Second Edition, , 3 vols. Wiley, 2001; vol. 2, p. 469-494; M.W. Evans *et al*., "Derivation of O(3) Electrodynamics from the Irreducible Representations of the Einstein Group," Foundations of Physics Letters, 2002 (in press).

40.   E.g., M. W. Evans *et al*., "Explanation of the Motionless Electromagnetic Generator with O(3) Electrodynamics," Foundations of Physics Letters, 14(1), Feb. 2001, p. 87-94; — "Explanation of the Motionless Electromagnetic Generator by Sachs's Theory of Electrodynamics," Foundations of Physics Letters, 14(4), Aug. 2001, p. 387-393.

41.   M. W. Evans *et al*., "Anti-Gravity Effects in the Sachs Theory of Electrodynamics," Foundations of Physics Letters, 2002 (in press).

42.   Floyd Sweet and T. E. Bearden, "Utilizing Scalar Electromagnetics to Tap Vacuum Energy," Proceedings of the 26th Intersociety Energy Conversion Engineering Conference (IECEC '91), Boston, Massachusetts, 1991, p. 370-375. Sweet's device produced 500 watts for a 33 microwatt input. A highly successful anti-gravity experiment was also performed, and is reported in the paper. Unfortunately Sweet later died and never fully revealed the activation secret by which barium ferrite magnetic materials could be in strong self-oscillation at 60 Hertz. Weak self-oscillation of such permanent magnetic materials at higher frequency is known, of course. E.g., see V. S. L'vov, Wave Turbulence Under Parametric Excitation: Applications to Magnets, Springer Series in Nonlinear Dynamics, Springer-Verlag, New York, 1994.

43.   Max Planck, in G. Holton, Thematic Origins of Scientific Thought, Harvard University Press, Cambridge, MA, 1973.

44.   Arthur C. Clarke, in "Space Drive: A Fantasy That Could Become Reality" NSS ... AD ASTRA, Nov/Dec 1994, p. 38.

45.   Maciej J. Ogorzalek, Chaos and Complexity in Nonlinear Electronic Circuits, World Scientific, New Jersey, 1997, p. vii.

46.   S. Austen Stigant, "Gabriel Kron on Tensor Analysis, A bibliographical record," BEAMA Journal, Aug. 1948 gives an extensive bibliography of Kron's publications.

47.   J. W. Lynn and R. A. Russell, "Kron's Wave Automaton," Journal Unk, date unk, p. 131. We have the physical paper, with the identifying markings unfortunately obscured. A more complete citation of this reference would be appreciated.

48.   David J. Bohm, "A Suggested Interpretation of the Quantum Theory in Terms of 'Hidden' Variables, I and II." Physical Review, 85(2), Jan. 15, 1952, p. 166-179 (Part I); 180-193 (Part II).

49.   Indeed, several nations of the word have already highly weaponized Bohm's quantum potential, and such weapons are presently the most decisive weapons on earth. Discussion of this area is beyond the scope of this paper. If one wishes to guess at the nations, one should observe where Bohm went when the U.S. effectively booted him out of the U.S. Russia and China also have quantum potential weaponry.

50.   William K. George, in Editing the Refereed Scientific Journal, edited by Robert A. Weeks and Donald L. Kinser, IEEE Press, New York, 1994, p. 227-228.

51.   M. W. Evans, P. K. Anastasovski, T. E. Bearden et al., "Derivation of the B(3) Field and Concomitant Vacuum Energy Density from the Sachs Theory of Electrodynamics," Foundations of Physics Letters, 14(6), Dec. 2001, p. 589-593; — "Anti-Gravity Effects in the Sachs Theory of Electrodynamics," Foundations of Physics Letters, accepted (in press); — "Operator Derivation of the Gauge Invariant Proca and Lehnert Equations: Elimination of the Lorentz Condition," Foundations of Physics, 30(7), 2000, p. 1123-1130; — "Spontaneous Symmetry Breaking as the Source of the Electromagnetic Field," accepted by Foundations of Physics Letters (in press); — "The Effect of Vacuum Energy on the Atomic Spectra," Foundations of Physics Letters, 13(3), June 2000, p. 289-296; — "Runaway Solutions of the Lehnert Equations: The Possibility of Extracting Energy from the Vacuum," Optik, 111(9), 2000, p. 407-409; — "Classical Electrodynamics without the Lorentz Condition: Extracting Energy from the Vacuum," Physica Scripta, 61(5), May 2000, p. 513-517; — "Derivation of the Lehnert Field Equations from Gauge Theory in Vacuum: Space Charge and Current," Foundations of Physics Letters, 13(2), Apr. 2000, p. 179-184.

52.   Rolf Landauer, "Fashions in Science and Technology," Physics Today, 50(12), Dec. 1997, p. 62.

53.	Derek John de Solla Price, <u>Little Science, Big Science</u>, Columbia University Press, New York, 1963.

54.	Secretary of Defense William Cohen at an April 1997 counterterrorism conference sponsored by former Senator Sam Nunn. Quoted from DoD News Briefing, Secretary of Defense William S. Cohen, Q&A at the Conference on Terrorism, Weapons of Mass Destruction, and U.S. Strategy, University of Georgia, Athens, Apr. 28, 1997.

55.	Teruo Kawai, "Motive Power Generating Device," U.S. Patent No. 5,436,518. Jul. 25, 1995.

56.	The Yakuza also have longitudinal EM wave weapons, and have had them for some time.

57.	Tentatively titled <u>Energy from the Vacuum: Concepts and Principles</u>, World Scientific, 2002 (in preparation).