

Charged Barrier Technology

THE FOGAL TRANSISTOR

WITH THE COWBOY'S COMMENTS IN THE BEGINNING AND THE WHOLE PAPER BY FOGAL & BEARDEN TO FOLLOW

QUITE SIMPLY – THIS IS A DEVICE THAT READS 2-D INFO AND CONVERTS IT TO 3-D. SIMPLICITY IN OPERATION – THIS TRANSISTOR IS JUST A RESISTOR WITH A PARALLEL CAPACITOR PLATE – CREATING A GAP WITHIN WHICH THE 2-D INFO IS READABLE IN 3-D VIA “SWITCHING” CAUSED BY ELECTRON BLEED THROUGH BETWEEN THE RESISTOR AND THE CAPACITOR PLATE.

Introduction

Remarks

"We are only bound by the limits of our own imagination." We perceive what we cannot see. We feel what we cannot hear. We strive for perfection in our thought models, but we seem to forget that sometimes it is the *imperfections* in nature that can help to make things work.¹

ALL THINGS ARE GOD. THUS THERE ARE NO IMPERFECTIONS.

This paper covers the basics of Bill Fogal's research into Charged Barrier technology, the reason for the name "Charged Barrier," and *how it works as seen directly through Bill's own eyes*. The body of the paper is by the first author [Fogal], and the second author [Bearden] has mostly added some pertinent technical comments. These comments are deliberately placed in the voluminous footnotes so that the reading of Bill's main body is not interrupted. The main body is written in first person by Bill.

Of necessity, the endnotes are extremely wide ranging and complex. It is highly recommended that the reader first read straight through Bill's main text, without reading the endnotes at all. Then at one's leisure, one can study the endnotes in detail as one wishes.

At this time, Bill feels that it is essential to release this information for a better understanding of the importance of his charge-barrier technology. The reader may question the theory concerning this technology, and may also question whether this new semiconductor device can actually work. But, just think about it! This paper covers a

new way of thinking in solid state physics. Now one seeks to utilize and tame pure energy flow rather than just broadly dissipating the collected energy by means of electron current flow. The paper also looks at some of the ideas and theories that make up our world. The Fogal semiconductor — which is an experimentally demonstrated device — may force us to ask some unique questions about conventional EM theories and wonder, "Do things *really* work that way? Could they work differently after all?"

We particularly caution the reader against simply assuming normal EM theory, either classical or quantal, as having the "final answers." The topology of these models has been severely and arbitrarily reduced. If one looks at circuits in a higher topology algebra, many operations are possible, though excluded from present tensor analysis.²

Energy Flows Continuously from Magnetic and Electric Charges

Have you ever taken two magnets and held one magnet in each hand, with the magnets facing each other with the same poles? As you bring the magnets close to each other, you can feel the repulsion and the build-up of the "energy field" as the magnets begin to push your hands away from each other. Each of the magnetic poles is pouring forth hidden energy³ that acts upon the other pole, producing the force that you feel.

AN OBVIOUS 3-D ENERGY BANGING AROUND - 2-D ENERGY ALWAYS LOVINGLY MERGES

That energy is continuously flowing from the magnets^{4,5,6}, and fills the entire space around them, literally to the ends of the universe. The electron⁷ also has such a flowing energy field, and electrons will react just like the magnets under certain conditions. When two like charges approach each other, their streams of energy impact one upon the other, and produce (i) excess pileup of energy⁸ on the electrons, and (ii) mutual repulsion. However, unlike the magnets, usually the electrons are *notoriously* free to move. So free electrons will rapidly move away from the site of repelling charges. As electrons mutually repel each other and move away, they also drain away the collected portion⁹ of their excess energy field in the process.¹⁰

Now if we could only collect and use the energy from the flowing energy field directly, further down the circuit, and not move the repelling electrons themselves! In that case our constrained electrons would continue to be an inexhaustible *source* of that energy flow, and we could collect and use the excess energy from them, without draining away the source by allowing electron current flow from it.

THEY HAVE INFINITE ENERGY ANYWAY – BESIDES THAT STRESS ENERGY IS JUST THAT STRESS – WE WANT LOVE ENERGY TO FUEL THIS PLANET. BUT, THIS IS JUST SURMISE ON HIS PART AS YOU’LL SEE.

And there'd be another great advantage: We would also rid ourselves of most of the *electron collision noise*, that is created in the lattice by the longitudinal movement of the electrons as ordinary current. In other words, we could simply use the direct energy flow changes caused by our signal modulations, without adding lots of little unwanted and spurious field changes due to those electron collisions. This notion is simple: *Use field energy flow to bypass the blocked electron flow, and you bypass much of the noise in the intervening transmission line and associated circuits.*

OR LET IT FLOW AS 2-D INSTEAD OF 3-D AS IN THE MOBIUS RESISTOR
MORE COMPLETELY STATED: FIELD FLOW I.E. AN ELECTROMAGNETIC ENERGY FIELD THAT FLOWS IN THE USEFUL DIRECTION AND PULSED OR MODULATED WITH INFORMATION VS: A FLOW OF NOISY ELECTRONS THAT KEEP BUMPING INTO THINGS AND EACH OTHER CREATING UNWANTED NOISE THE DISRUPTS THE INFORMATION.

THE APPLICATIONS OF THE FOGAL TRANSISTOR:

Some Foreseeable Applications

Charged Barrier Applications

Prototype Charged Barrier devices have been tested in video equipment to process composite video images for a higher resolution. The device has the ability to process and separate the wave pairs and define the "polarization" of light from background objects. This ability can produce a high definition image on a CRT, and a near-holographic image on liquid crystal display panels. The clarity of liquid crystal display panels can be greatly improved by the switching speed of the Charged Barrier technology, with the visual improvement sometimes being startling.

Novel Encryption and Transmission Capability

A preliminary test was constructed in Huntsville, Alabama in May of 1996 to determine if video information could be *infolded within* a DC voltage potential and transmitted across a wired medium.¹¹ Live video information at 30 frames per second was processed and converted by full wave rectification into a DC potential at a voltage of 1.6 V DC and connected to a twisted pair wire medium of 2,000 feet in length. As a voltage, the 5 MHz video information rectified to DC potential had no modulation or AC signal present that could be detected by sensitive signal processing equipment. The analog oscilloscopes that were used to monitor the transmission could only see the DC voltage flat line, although the best digital storage scope could see very weak signal residues because of slightly less than 100% filtering. I later performed additional tests with increased filtering, so that the residues could not be seen. These tests were constructed to see if video information could be "infolded" into an audio carrier and transmitted across an ELF frequency transmission source for communication with submarines, or down a 2,000 ft twisted wire pair. The Charged Barrier device was able to process the hidden video, due to the ability of the device to sense the infolded AC electromagnetic wave information

hidden inside the rectified DC voltage, sensed as a disruption to the internal DC electromagnetic field of the Charged Barrier device. Using the Fogal semiconductor, a good video image was shown on the monitor at the end of the wired medium. The Huntsville test was considered encouraging. As stated, I have since repeated the test with a better buildup, to eliminate the very weak signal residues, and the effects are real and replicable. Use of the "infolded" EM waves in an ELF carrier for video frequency signaling is real.

A novel effect uncovered in the Huntsville tests was that, by adjusting the gain control of the receiving box containing the charged barrier device, the focused field of view of the fixed image could be varied, even though no adjustment at all was made in the video camera's stationary focusing. This showed that the "internal information" in an image actually contains everything needed to scan a fixed volume of space, forward and backward in radial distance, in a *focused* manner. The internal information seems to contain information on the entire volume of view of the camera.¹² And it is possible to scan that volume, from a seemingly "fixed" image where much of the image is "out of the camera-focused field of view). The implications for photo analysis are obvious and profound.

The Charged Barrier device, once precision prototypes are available, can be utilized to encode signals within signals, similar to wavelet technology, or within voltage. Transmissions of such infolded signals could not be detected by conventional signal processing equipment without first being processed by a Charged Barrier device. Without the need for fiber optic cable, conventional wired telephone or cable networks and high voltage AC transmission lines could be used as a transmission source without the need for line amplifiers or noise cancellation equipment. There would be essentially no bandwidth limitations, once the technology is developed.

Future Charged Barrier Applications

Existing radar technology can be refined and improved with the Charged Barrier device. One of the most complex problems in the industry is the "noise content" in signal processing. The Charged Barrier device can be used as a front end low noise amplifier and increase the sensitivity of the target signature scan capability. Radar imaging could be greatly improved simply by processing the return image with the Charged Barrier device for high resolution CRTs and liquid crystal display panels. Systems could also be improved for faster targeting and return echo due to the optical speed of the Charged Barrier device switching. By utilizing the "internal" information, it should be possible to develop improved imaging for sonar applications, so there will be no gaps in the frequency spectrum. The ability to "get at" and detect the hidden internal EM information of an object from its surface reflection, is an innate capability of the Charged Barrier device that needs to be explored. It is already well-known that the entire interior of a dielectric participates in the reflection of light from it; the information on the interior of the reflecting object is in the reflected image, but in the form of hidden EM variables.

New Type of Radar and Sonar Imaging Application

A new type of "volume viewing" radar system can be constructed with the Charged Barrier Technology that can scan the "inner EM signal image" produced over a given area or volume, sensing disruptions within the earth's magnetic field. The movement through that volume of an object — such as a low-flying aircraft made of metal or epoxy resin skin design — can be detected and tracked, regardless of electronic countermeasures and atmospheric disruptions such as tornadoes, hurricanes, or windshear due to microbursts, without the need for *target echo* return capability. The Charged Barrier device can sense and amplify very small disruptions to the "internal" electromagnetic fields and create an image for identification. The volume can be scanned "in focus" back and forth in distance.

For sound direction and distance sensing, the pinna (small folds) of the outer ear use phase reflection information more than 40 dB below the primary sound signal that strikes the eardrum.¹³ Any target's nonlinearities and defects, regardless of overall reflective angle and reflective sonar signals, also produce such minute, hidden "pinna" phase reflections and disturbances in (i) sonar reflections, (ii) the Earth's magnetic field (and in fact in the electric field between the surface of the Earth and the electrosphere), and (iii) in the ocean, in the overall subsurface static potential formed by the conglomerate potentials of the hydrogen bonding, ionizations, etc. These "pinna" signals are broadcast through the surrounding normal fields/potentials of the Earth, including underneath the ocean, although they are many dB below the normal field fluctuations whose gradients are detected by normal sensors. By detecting this "internal" information, Charged Barrier detectors would be able to detect these hidden "pinna" signals and dramatically increase the information available to the sensor system. Terrain-following cruise missiles, for example, could be detected, tracked, and identified by this means, as could submarines, floating subsurface mines, etc. Field camouflage and decoying would be essentially useless against such sensors.

Adaptation of Such "Radars" to Specialized Sensing

If sufficient of the "pinna" signals can be detected and utilized, a totally new method of *internal* target identification and discrimination — as well as typing and identification of the internal warhead(s) and other components on board the target — could be developed using the Charged Barrier technology. From the pinna signals, decoys and ECM-generated "false returns" could readily be discriminated from the real targets.

Specialized detection devices for airports could be developed that would utilize the pinna information to easily and cheaply detect and identify the contents of packages, luggage, etc. This would provide enhanced security against terrorist bombs, weapons, drug smuggling, etc.

Of particular usefulness would be the development of "pinna scanning" sensors which could peer beneath the ground's surface, detecting mines, tunnels, etc. Identification and

classification of the detected subterranean objects and their interior contents is also foreseeable.

ALSO, ONE SHOULD BE ABLE TO LITERALLY TAKE PICTURES OF THE PAST!!!

Induction of Forces and Patterns of Forces In Atomic Nuclei

A force-free (gradient-free) scalar potential readily penetrates the electron shells of the atom, penetrating directly to the nucleus and interacting with it. By infolding desired **E**-fields and **B**-fields inside the scalar potential (inside pure DC voltage), one can *insert* desired electromagnetic forces – and control their magnitude, direction, frequency, and duration – directly inside an atomic nucleus. At least in theory, by sustaining and manipulating these forces in the nucleus, the atomic nucleus itself is subject to direct manipulation and engineering, as contrasted to the present practice of "firing in a bullet" such as a neutron to get through the electron shell barriers and produce limited nuclear effects. It may be that eventually such an electromagnetic *nucleus-engineering* approach, made possible by Charged Barrier technology, can be utilized to render harmless the steadily accumulating radioactive wastes around the world.

Reduction of Drag on Vehicle Skins

Another application also looms for the use of the charged barrier technology. This application is for the reduction of the drag of the medium on vehicle skins. My preliminary tests on model boats in water have demonstrated the effect to exist and operate, though more definitive tests are called for.

Basically the molecules or atoms of the medium, in contact with the skin of a moving vehicle, create a boundary layer of dense matter which exerts frictional drag forces on the skin to retard the forward movement. Because of the use of phase conjugation and Poynting flow, rather than pure current dq/dt flow, the charged barrier technology can be used to charge the skin of the vehicle in a peculiar fashion. The tiny nonlinearities of the skin become pumped phase conjugate mirrors (considering the internal electromagnetics of the static charge, where the hidden biwaves comprise the pumping). Let us consider such a charged skin as now containing a series of *pumped phase conjugate mirrors* (PPCMs). The incoming atoms or molecules of the medium comprising the boundary layer do possess asymmetrical charge volumes, and so they produce "signal wave" inputs to the PPCMs as they come in. With a good charge on the PPCMs, their hidden biwave pumping is substantial. Consequently the PPCMs emit *highly amplified* antisignals – phase conjugate replica waves (PCRs). By the distortion correction theorem, these highly amplified antiwaves backtrack precisely to the incoming asymmetric charges, where they interact to produce force fields that repel them.¹⁴ The point is, there is no recoil on a pumped phase conjugate mirror (PPCM), when it emits such a highly amplified PCR. This is already a theoretical and experimental fact in nonlinear optics. So there is no

consequent Newtonian third law recoil force back on the PPCMs comprising the skin of the vehicle.

In short, one has produced a deliberate "pinpoint, repelling force field" upon each of the incoming atoms and molecules of the medium, without any matching recoil force upon the moving vehicle. Better, all the energy in the force field is concentrated only upon the targets, rather than distributed uniformly in space along wavefronts. The end result is to dramatically reduce or lower the boundary layer, without any drag force reaction being exerted upon the vehicle by that operation. This significantly reduces the skin drag and increases the speed of the vehicle through the medium, for a given on-board propulsion force.

Application of this new kind of "smart skin" technology is straightforward. It should allow ships that increase (even double) their velocity through water for the same expenditure of propeller energy. It should enable super-fast torpedoes, perhaps in the 200 to 300 nautical miles per hour range.

Extended Application of Induced Forces at a Distance

In theory, the "pinpoint" application of force upon a distant target, by self-targeting processes, is not limited to the small distance required to prevent formation of much of the skin boundary layer. Instead, the self-targeting effect can be extended. Our space-borne laser research and development, for example, called for using iterative phase conjugate shooting and self-targeting to hold a laser beam locked on the same spot on a rising hostile booster, up to 10,000 miles distance, providing dwell time for the laser to burn through the casing and destroy the booster during its launch phase.

Follow-on generations of development should add the capability of pinpoint repulsion by an attacked ship of incoming hostile torpedoes, shells, missiles, etc. It should enable faster aircraft, with reduced fuel consumption. In large buildings it could conceivably be applied to lower the resistance of the ducting to the passage of heated or cooled air. In heat pumps it should also increase the COP past the present theoretical 8.22 limit, by dramatically reducing the drag exerted by the gases being compressed and pumped.

With use of the pinna information, scanning the ocean's surface can detect and track submarines lurking in the ocean's depths. Literally the oceans can be made "transparent" in a specialized sense.

There are many other applications for the charged barrier technology; the above examples simply serve as "for instances" to tickle the imagination.

In Summary

As can be seen, the advent of Charged Barrier technology and its further development offers a breathtaking extension of present electronic technologies.

Dramatic new capabilities emerge in military defense, to provide for the security of our nation, our armed forces, and our civilian population.

In astrophysics, the detection and use of the "pinna" information could provide unparalleled details on the internal mechanisms, structures, and constituency of planets and stars.

In geophysics, the "pinna" information could provide unparalleled details on the layers, structures, constituents, faults, etc. of the earth underneath the surface. Again, in a specialized sense the earth is made "transparent."

In medicine, the "pinna" information contained within the weak EM emanations from the body would provide details on structures, cellular disorders, infections, and other irregularities within the body, including organs. Eventually a comprehensive diagnosis of the entire body and its cellular functions could be provided by externally scanning the pinna hidden-variable *"information content of the field."*

In biology the pinna information could provide unparalleled insight into the details and functioning of the brain, its different layers and structures, and of the nervous system. Further, pinna information could reveal the structuring and functioning of the body's recuperative system, as contrasted to the immune system. Very little is presently known about the recuperative system, which is usually just "assumed" by medical scientists.

SAD BUT SO VERY TRUE THIS NEXT SECTION:
SCIENCE IS NOT VERY OPEN MINDED AT ALL

Conclusion

Just as the microscope opened up a previously hidden microworld and its dynamics, the Charged Barrier technology will open up a previously hidden "internal" hidden variable electrodynamic world that will enlarge every present electronic field of endeavor.

Long ago a great scientist, Max Planck,¹⁵ said:

"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. Clarke¹⁶ characterized the four successive stages of response to any new and revolutionary innovation as follows:

- "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."*

The Aharonov-Bohm effect, predicted in 1959, required nearly 30 years after its 1960 demonstration by Chambers until it was begrudgingly accepted. Mayer, who discovered the modern thermodynamic notion of conservation of energy related to work, was hounded and chastised so severely that he suffered a breakdown. Years later, he was lionized for the same effort! Wegener, a German meteorologist, was made a laughing stock and his name became a pseudonym for "utter fool," because he advanced the concept of continental drift in 1912. In the 1960s the evidence for continental drift became overwhelming, and today it is widely taught and part of the standard science curriculum. Gauss, the great mathematician, worked out nonlinear geometry but kept it firmly hidden for 30 years, because he knew that if he published it, his peers would destroy him. In the 1930s Goddard was ridiculed and called "moon-mad Goddard" because he predicted his rocketry would carry men to the moon. Years later when the Nazi fired V-1 and V-2 rockets against London, those rockets used the gyroscopic stabilization and many other features discovered and pioneered by Goddard. And as everyone knows, rocketry did indeed carry men to the moon. Science has a long and unsavory history of severely punishing innovation and new thinking. In the modern world such scientific suppression of innovation is uncalled-for, but it is still very much the rule rather than the exception.

The Charged Barrier technology is an innovation which calls for using the energy flow in circuits that is already (i) extracted from the vacuum flux and (ii) freely provided to the external circuit by the source dipoles. It utilizes an extended electromagnetics that includes a higher topology and a new, inner "hidden variable" EM. This "inner EM" has been in the literature for nearly a hundred years, but ignored. The use of the charged barrier technology will expose many of the present shortcomings in EM theory and models, but it should also lead to a corrected, highly extended electromagnetics.

Let us hope that the charged barrier technology can receive the full scientific attention, testing, and theoretical modeling that it deserves. With that attention and examination I believe my technology will usher in a new revolution in electronics.

Some Simply Addressed But Advanced Content

To fully comprehend some of the content of this paper, a fairly extensive knowledge of quantum solid state physics is helpful. Even then, using the tantalum electrolytic capacitive material to form and sustain spin density waves at room temperature, and forming an EM field by moving and overlapping the energy states of compressed electrons, appear to be new areas in solid state physics. HIS SURMISE This paper will also explain why the AC Josephson tunnel junction effect can be developed at room

temperature in the charged barrier device, and how and why the AC supercurrent can also be developed at room temperature.¹⁷

THE TANTALUM METAL IS INTERESTING DUE TO ITS CUBIC CRYSTALLINE STRUCTURE, THE SQUARE OTHER THAN A CIRCLE IS PROBABLY THE FIRST SCARED GEOMETRIC SHAPE AND USEFUL IN THIS APPLICATION DUE TO THE SPIN IT GENERATES. THE SCARED GEOMETRICAL SHAPE IS DUE TO THE MIRRORING EFFECT OF THE FIRST FOUR ANUS WITHIN THE AETHER – FAIRLY OBVIOUSLY THEY FORM A SQUARE WITH A HOLE OR GAP IN THE MIDDLE, WHICH IS WHERE SPIN AUTOMATICALLY PROPAGATES – SO, IT IS NOT SURPRISING THAT TANTALUM WORKS VERY WELL IN THIS APPLICATION.

HE REFERS TO SUPERCURRENT – MEANING THAT THE AC ENERGY FLOWS VIA THE FOGAL TRANSISTOR WITHOUT RESISTANCE AS ENERGY DOES IN A SUPER CONDUCTOR – THAT TOO IS A SURMISE I THINK – IT WOULD BE VERY HARD TO PROVE – UNLESS THE FOGAL TRANSISTOR LEVITATES, WHICH I WOULD IMAGE IT WOULD DO IF ALLOWED.

ANYWAY THE SUPER CONDUCTANCE THING IS WELL ADDRESSED IN FOOT NOTE NUMBER 11 COPIED JUST BELOW, BECAUSE IT SUMMARIZES THIS WHOLE THING – I COULD GO THROUGH AND STRAIGHTEN OUT EACH AND EVERY SCIENTIFIC MIS-CONCEPT IN THIS PAPER – BUT, IT IS TIME CONSUMING AND BORING. HERE IS THE CRUX OF IT:

11. In conventional superconductivity research, the objective is on moving electrons or Cooper pairs, rather than moving the energy.

COOPER PAIRING – WHAT A BUNCH OF CRAP – ANOTHER SURMISE THAT THE WORLD HAS LATCHED ONTO AND IS TRYING TO MAKE IT REAL. HERE'S THAT DEAL: THE BCS THEORY OF SUPER CONDUCTIVITY LAYS OUT ALL THE FACTS ABOUT SUPER CONDUCTANCE – GREAT STUFF – BUT, THEN COOPER – THE C IN BCS – SURMISES THAT BECAUSE IT IS LIGHT THAT FLOWS ONTO THE SUPER CONDUCTOR AND NOT ELECTRICITY, THAT AS THE ELECTRON PAIRS HEAD INTO THE SUPER CONDUCTOR THAT ONE OF THE ELECTRONS IN EACH PAIR SPIN FLIPS AND BECOMES A POSITRON, THEN COMBINES WITH ITS ELECTRON PARTNER WHICH CREATES A PHOTON – A PIECE OF LIGHT, WHICH THEN FLOWS ONTO THE SUPER CONDUCTOR.

THE FACT THAT IT IS LIGHT THAT FLOWS ONTO THE SUPER CONDUCTOR CREATES THE OTHER GREAT PHENOMENA ABOUT THEM I.E. THAT SUPER CONDUCTORS LEVITATE IS THE PRIMARY WONDERMENT TO SCIENCE AND THEY NEVER REALLY ADDRESS THE FACT THAT SUPER CONDUCTORS ELIMINATE ALL THE LAWS OF PHYSICS. BASICALLY, SUPER CONDUCTORS COME INTO HARMONY WITH THE AETHER WHICH ALLOWS TO BE SUSPENDED

IN SPACE - LEVITATE – THIS IS NOT DIFFICULT TO UNDERSTAND IN THE 2-D UNIFORM FIELD CONCEPT.

BACK TO THE COCKED UP COOPER PAIRING IDEA: WHAT REALLY HAPPENS IS THAT THE ELECTRON'S POSITRON (that supposedly decayed and “disappeared”) ACTUALLY ALWAYS SHADOWS ITS ELECTRON SIBLING IN THE GAP OF THE AETHER, THEN THEY SIMPLY RECOMBINE – THUS, CREATING THE ORIGINAL IDEA – THE PHOTON.

AND I QUOTE FROM THIS VERY DOCUMENT: Though not in conventional theory, signal waves actually travel in *wave pairs*,^{1,1} each pair containing the familiar wave and an associated "hidden" antiwave. WHICH IS EXACTLY THE SAME AS THE ELECTRON & ITS POSITRON PAIR; SO, THEY ALREADY HAVE THE RIGHT IDEA I.E. FOGAL AND BEARDEN – I HAVE NO IDEA WHY THEY WOULD EVEN MENTION COOPER PAIRING. GRRRRR!!!

It would seem to be much better (and far easier!) to move the Poynting energy flow, rather than the charges! It is far beyond the scope of this paper to expound the higher topology actually involved in circuits and nodal systems, and the fact that present electrodynamics has eliminated one of the major types. We simply refer to a most important reference for what we are speaking of: See Gabriel Kron, "Four abstract reference frames of an electric network," IEEE Transactions on Power Apparatus and Systems, PAS-87(3), Mar. 1968, p. 815-823. See particularly Gabriel Kron, "Invisible dual (n-1)-networks induced by electric 1-networks," IEEE Transactions on Circuit Theory, CT-12(4), Dec. 1965, p. 464-470.

Circa 1962 Kron wrote in a paper, "The frustrating search for a geometrical model of electrodynamic networks," journal unknown, p. 111-128, the following words:

"Unfortunately most developments in theoretical physics include local (field) concepts only; while practical engineering is dominated by global (network) concepts. Even in geometry the global point of view has been pressed only during the past few decades, so that the discovery of any point of contact between engineering problems and geometry in-the-large is difficult, and often impossible at the present stage of development. These pages relate a succession of failures and successes encountered by the author in his long search for a geometry in-the-large, (a topological model) that enables the formulation of a "Unified Theory of Engineering and Physics" for a large class of problems in applied electrodynamics. Engineering is considered to differ from physics mainly in the nature of the reference frames and transformation tensors... used. Of course, a temporary success of an analogue may follow only after a string of countless trial-and-error failures — as all 'unifiers' are so well aware...."

And on p. 114 Kron gave the result of his decades of search as follows:

"...the missing concept of "open-paths" (the dual of "closed-paths") was discovered, in which currents could be made to flow in branches that lie between any set of two nodes. (Previously — following Maxwell — engineers tied all of their open-paths to a single datum-point, the 'ground'). That discovery of open-paths established a second rectangular transformation matrix... which created 'lamellar' currents... A network with the simultaneous presence of both closed and open paths was the answer to the author's years-long search." [Underlining emphasis added].

It is the thesis of one of the present authors (Bearden) that *the Fogal charge-barrier semiconductor will ultimately be found to partially function in Kron's final mode involving simultaneous open and closed paths.*

AND THAT IS WHY THE WHOLE OF THESE EM CONCEPTS ARE LOST I.E. TRYING TO MAKE A CONNECTION BETWEEN 2-D AND 3-D ENERGIES. IN THIS CASE REFERRED TO OPEN PATH (2-D) AND CLOSED PATH (3-D) ENERGIES; OR BETWEEN SUPER CONDUCTANCE (2-D) AND WHAT WE CONSIDER NORMAL ENERGY FLOW (3-D).

THE REASON THEY GET LOST IS BECAUSE THINGS DISAPPEAR – THEN ALL OF A SUDDEN RE-APPEAR. BY THINGS I MEAN PARTICLES, WAVES, SPIN AND EM FIELDS EVEN TIME – THEY ALL DISAPPEAR IN THE CAPACITANCE FIELD – THEN RE-APPEAR DUE TO WHAT SEEMS TO BE A VERY RAPID SWITCHING EFFECT IN THE FOGAL DEVICE.

HERE'S THE PROBLEM: THE NORMAL THINGS (ALL OF THE ABOVE) CAN BE SEEN AND ARE MEASURABLE USING CURRENT DEVICES. BUT, WHEN THEY DISAPPEAR – THEY CAN'T BE MEASURED (ALL THE SCIENTIFIC GOBBLE DY GOOK OF THIS PAPER IS TALKING ABOUT JUST THAT – WHERE'D THEY GO? AND HOW DO WE FIND THEM?). BASICALLY SCIENCE IS VERY MUCH IN REDUCTIONISM AND MATERIALISM.

NOW – IMPORTANT – IN 3-D ALL OF THE THINGS (particles, waves, spin and EM fields even time) HAVE POLARITY, TIME AND A 90 DEGREE PHASE ANGLE BETWEEN THE ELECTRIC AND MAGNETIC COMPONENTS. HOWEVER, WHEN THESE THINGS DISAPPEAR – THEY CAN'T BE MEASURED – SO THEY NO LONGER HAVE POLARITY, TIME NOR A 90 DEGREE PHASE ANGLE – IF THEY HAD EVEN A LITTLE OF ANY 3-D ELEMENT, THEN WE COULD SEE AND MEASURE THEM.

HERE IS THE BEST EXAMPLE OF THAT: YOU CAN TAKE ANY MATERIAL THAT RESISTS BUT ALLOWS THE FLOW OF ELECTRICITY – A RESISTOR. ALL SUCH RESISTORS GET HOT AND MAKE ELECTROMAGNETIC NOISE. HOWEVER, IF YOU TAKE THAT VERY SAME RESISTOR AND FASHION IT IN THE SHAPE OF A MOBIUS STRIP, WHICH IS ONE DIMENSIONAL – THEN IT WILL STILL PROVIDE THE SAME RESISTANCE – BUT, IT WILL MAKE NO NOISE, WHICH IS MIND BOGGLING TO MOST FOLKS. SO, IN THE MOBIUS YOU HAVE THE FLOW OF ELECTRON PARTICLES BUT NO EM FIELD, NO SPIN AND NO WAVES COMING OFF – WOW – WHERE DID THEY GO? THAT IS IF THE LEADS ARE ATTACHED DEAD OPPOSITE TO ONE ANOTHER – AS YOU MOVE ONE LEAD ALONG ONE STRAND OF THE MOBIUS THE NOISE WILL STEADILY INCREASE UNTIL YOU REACH 90 DEGREES AT WHICH POINT THE NOISE IS THE GREATEST.

SO THE 3-D MATERIAL – THE RESISTOR – IS STILL THERE AND ALLOWS NORMAL ELECTRICITY FLOW. HOWEVER, DUE TO ITS 1-D SHAPE – IT IS IN HARMONY WITH THE AETHER, WHICH IS 2-D AND WHEREIN TIME & FREQUENCY DO NOT EXIST – WELL THE TIME AND FREQUENCY ARE IN THE GAP REALLY – THE DREAM OR CONCEPT OF THEM IS ALL THAT IS THERE. THIS IS A HUGE IMPORTANT CLUE TO THESE GUYS AS THE FACT THAT THEIR THINGS ARE SHIFTING BETWEEN 2-D AND 3-D; MIND BOGGLING TO ME THAT IT DOESN'T SINK IN – ESPECIALLY ON BEARDEN – HE STARTED ME DOWN THE ROAD.

SO, THE BOTTOM LINE IS THIS – THE 3-D THINGS SHIFT BACK TO THEIR ABORIGINAL STATE – AN IDEA THAT EXISTS ONLY IN 2-D.

AMAZINGLY, THE FOGAL TRANSISTOR IS ABLE TO “SEE” THESE IDEAS AND BRING THEM INTO FOCUS HERE IN 3-D.

NOW THE WAY THAT IT SEES IS THIS: TWO WAYS 1) THE CAPACITANCE FIELD IS GAP OR GOD ENERGY AND ALL THINGS WANT TO RESONATE WITH GOD, WHOSE IDEA ALL OF THIS IS ANYWAY. 2) THE SPIN – THE 2-D SPIN CREATES A RADIONIC WITNESS WELL – THAT ENERGY FIELD IS EXACTLY THE SAME AS WHAT EVER IT IS POINTED AT I.E. “I AM THAT I AM”. THE TRANSISTOR IS POINTED AT AN OBJECT – THEN THE IDEA OF THAT OBJECT IS MIRRORED INTO THE GAP OF THE TRANSISTOR – SIMPLE – THE UNIVERSE IS CONSTRUCTED THIS EXACT WAY (UNDER THE UNIFORM FIELD CONCEPT). THEN AS THE BLEED THROUGH OF ELECTRONS OCCURS BETWEEN THE CAPACITANCE PLATE AND THE RESISTOR, THE WHOLE THING – ALL THE INFO INSIDE THOSE GAPS GET READ – POPS INTO 3-D (THE CONVERSION BETWEEN 3-D AND 2-D OCCURS IN NO TIME, WHICH IS WHY THE TRANSISTOR APPEARS TO SWITCH SO FAST). THAT IS HOW THE FOGAL TRANSISTOR WORKS, PLEASE. DITTO DR. EMOTTO’S WATER CRYSTALS – IT IS THE SAME PROCESS FOR BOTH.

ONE IS INVITED TO READ THE REAL SCIENCE BOOK REPORT/ESSAY TO FIND EVEN MORE AMAZING EFFECTS CAUSED BY CAPACITANCE – DITTO THE GRAVITY ESSAY.

NOW MR. FOGAL’S WHOLE PAPER WITH COL. BEARDEN’S END NOTES:

The Truth Behind Charged Barrier Technology

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With special endnote comments by Tom Bearden

Introduction

Remarks

"We are only bound by the limits of our own imagination." We perceive what we cannot see. We feel what we cannot hear. We strive for perfection in our thought models, but we seem to forget that sometimes it is the *imperfections* in nature that can help to make things work.¹⁸

This paper covers the basics of Bill Fogal's research into Charged Barrier technology, the reason for the name "Charged Barrier," and *how it works as seen directly through Bill's own eyes*. The body of the paper is by the first author [Fogal], and the second author [Bearden] has mostly added some pertinent technical comments. These comments are deliberately placed in the voluminous footnotes so that the reading of Bill's main body is not interrupted. The main body is written in first person by Bill.

Of necessity, the endnotes are extremely wide ranging and complex. It is highly recommended that the reader first read straight through Bill's main text, without reading

the endnotes at all. Then at one's leisure, one can study the endnotes in detail as one wishes.

At this time, Bill feels that it is essential to release this information for a better understanding of the importance of his charge-barrier technology. The reader may question the theory concerning this technology, and may also question whether this new semiconductor device can actually work. But, just think about it! This paper covers a new way of thinking in solid state physics. Now one seeks to utilize and tame pure energy flow rather than just broadly dissipating the collected energy by means of electron current flow. The paper also looks at some of the ideas and theories that make up our world. The Fogal semiconductor – which is an experimentally demonstrated device – may force us to ask some unique questions about conventional EM theories and wonder, "Do things *really* work that way? Could they work differently after all?"

We particularly caution the reader against simply assuming normal EM theory, either classical or quantal, as having the "final answers." The topology of these models has been severely and arbitrarily reduced. If one looks at circuits in a higher topology algebra, many operations are possible, though excluded from present tensor analysis.¹⁹

Energy Flows Continuously from Magnetic and Electric Charges

Have you ever taken two magnets and held one magnet in each hand, with the magnets facing each other with the same poles? As you bring the magnets close to each other, you can feel the repulsion and the build-up of the "energy field" as the magnets begin to push your hands away from each other. Each of the magnetic poles is pouring forth hidden energy²⁰ that acts upon the other pole, producing the force that you feel.

That energy is continuously flowing from the magnets^{21,22,23}, and fills the entire space around them, literally to the ends of the universe. The electron²⁴ also has such a flowing energy field, and electrons will react just like the magnets under certain conditions. When two like charges approach each other, their streams of energy impact one upon the other, and produce (i) excess pileup of energy²⁵ on the electrons, and (ii) mutual repulsion. However, unlike the magnets, usually the electrons are *notoriously* free to move. So free electrons will rapidly move away from the site of repelling charges. As electrons mutually repel each other and move away, they also drain away the collected portion²⁶ of their excess energy field in the process.²⁷

Now if we could only collect and use the energy from the flowing energy field directly, further down the circuit, and not move the repelling electrons themselves! In that case our constrained electrons would continue to be an inexhaustible *source* of that energy flow, and we could collect and use the excess energy from them, without draining away the source by allowing electron current flow from it.

And there'd be another great advantage: We would also rid ourselves of most of the *electron collision noise*, that is created in the lattice by the longitudinal movement of the electrons as ordinary current. In other words, we could simply use the direct energy flow changes caused by our signal modulations, without adding lots of little unwanted and spurious field changes due to those electron collisions. This notion is simple: *Use field energy flow to bypass the blocked electron flow, and you bypass much of the noise in the intervening transmission line and associated circuits.*

Some Simply Addressed But Advanced Content

To fully comprehend some of the content of this paper, a fairly extensive knowledge of quantum solid state physics is helpful. Even then, using the tantalum electrolytic capacitive material to form and sustain spin density waves at room temperature, and forming an EM field by moving and overlapping the energy states of compressed electrons, appear to be new areas in solid state physics. This paper will also explain why the AC Josephson tunnel junction effect can be developed at room temperature in the charged barrier device, and how and why the AC supercurrent can also be developed at room temperature.²⁸

Design, Components, and Functions

Let's Take a Look at the Basic Design

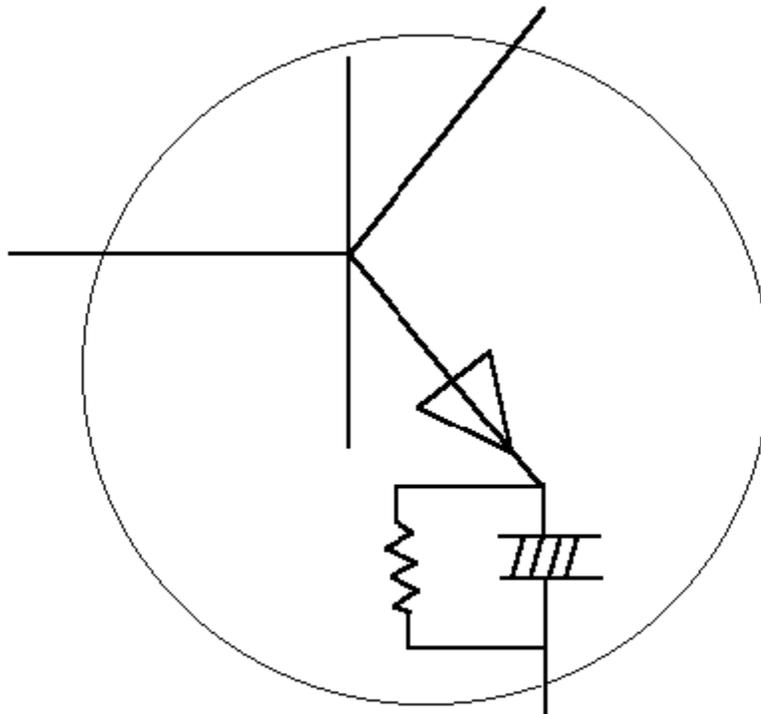


Figure 1. Schematic For Fogal Charged Barrier Device

The simplified schematic of the hybrid charged barrier semiconductor is shown in Figure 1. The device has an electrolytic capacitor and a parallel resistor attached to the emitter junction of a bipolar transistor. Such a circuit configuration has been known in textbook theory as a *bypass* element and the capacitor in the circuit configuration will react to frequency to lower the emitter resistance and create gain. However, there is one interesting point to consider. I have been granted two U.S. Patents on the same circuit configuration, using an *electrolytic* capacitor to form a unitary structure. Under certain conditions, *electrolytic capacitors react differently* in this type of circuit configuration than a standard non-electrolytic bypass capacitor.

I use the electrolytic capacitor to create a unique electromagnetic field. The parallel resistor is used to "bleed-off" excess charge potential from the plate of the capacitor to generate the electromagnetic field. It also performs another function we will detail later. The exact values of the capacitive element and resistive element are not listed at this time.

Let's Look at Capacitors

In theory, a simple capacitor will pass an AC signal and voltage and block a DC voltage from crossing the plate area. However, a physical capacitor is not necessarily simple; instead, it is a *complicated system* having many internal functions. An *electrolytic* capacitor will pass an AC signal and voltage, and also hold a DC charge — with its accompanying DC potential — on the plate area of the capacitor.²⁹ If an electrolytic capacitor can hold a DC charge potential on the plate area, then one can move small portions of that charge potential and that charge, with the use of a parallel bleed-off resistor. This small bleed-off current and change of **E**-field will create a very small, associated magnetic field on the plate area of the capacitor. Through experimentation it has been found that this very small electromagnetic field will oscillate at a very high frequency that is not detected under normal test conditions.³⁰

Conventional theory has shown that one needs to have a movement of the charge state to generate current to create a magnetic field.³¹ However, theory does not tell the exact amount of current needed to create the field. Could the bleed-off effect from a parallel resistor element change enough of the charge state to sustain a very small EM field? The resistor element would have to have just the right specific value in order to bleed-off just enough excess charge potential, so that the charge state between the plate of the capacitive element and the resistor bleed-off would not reach a point of equilibrium (equalization) between the charge states.

Formation of Electromagnetic Field

At the point of charge, with no signal applied, and with a bias of the junction, the capacitive element will charge to the voltage potential of 250 mv DC at the emitter junction. The parallel resistor element will work to "bleed-off" excess charge from the capacitor plate area, and try to reach a point of equalization of the charge state. However,

the associated field will oscillate at a frequency around 500 MHz and *will not* reach a point of total equalization due to this high frequency oscillation. In other words, equilibrium does not occur.³²



The formation of the electromagnetic field is shown in Figure 2, which is a photograph from a Tektronix transistor curve tracer operating in the microamp region. A reading of the DC operating voltage of the emitter junction of the transistor *will not show a change* in the voltage potential due to the high frequency oscillation of the electromagnetic field. *At this point, the emitter electrons become trapped and pinned within the electromagnetic field of the capacitor. This pinning blocks current and dampens the amount of electron collision noise and heat due to electron interaction.*³³

Charge-Blocking and Formation of the AC Supercurrent



The photograph in Figure 3 is taken from the Tektronix transistor curve tracer operating in the microamp region. At the point of a small signal injection to the base region of the

transistor, the effect of the AC carrier disruption to the internal DC emitter junction electromagnetic field can clearly be seen. This effect is caused by the *Overpotential of Charge State* and the *compression* of the pinned electron clusters within the DC charged electromagnetic field developed by the capacitor. At this point in device conduction, the parallel resistor element will try to equalize the field charge, and align the pinned electron clusters in the charged field on the capacitor plate. The **E**-field will start to develop along with its associated Poynting energy density flow (**S**-flow).³⁴

Formation of the AC Supercurrent



The photograph in Figure 4, taken from the Tektronix transistor curve tracer, shows the effect to "disruption and compression of the pinned electron clusters." At this point in time, in the semiconductor the parallel resistor element can no longer handle the bleed-off of excess charge potential from the charged plate of the capacitor, due to the compression of electrons and the consequent rapid formation of an **E**-field. So there is a buildup of the Poynting energy density flow due to the change in electron energy state and compression of charge clusters. A spin density wave will develop and increase within the tantalum capacitor.³⁵

Discharge of the AC Supercurrent



The photograph in Figure 5, again taken from the Tektronix transistor curve tracer, shows almost the full development of the AC supercurrent, due to the Poynting energy density flow and the increased spin density wave action of the tantalum capacitor. The development of the **E**-field is almost complete. The emitter junction DC electromagnetic field is about to collapse and release the AC supercurrent as well as the flow of Poynting energy density. The AC supercurrent is too massive and the increased nature of the spin density wave of the tantalum element is too fast, due to the buildup of the **E**-field, for the bleed-off resistor to effectively regulate and shut down the action.³⁶



Taken from the Tektronix transistor curve tracer, the photograph in Figure 6 shows the point of discharge and the Poynting energy density flow, the AC supercurrent, and the collapse of the DC charged electromagnetic field, due to the change of energy state on the plate of the tantalum capacitor. Most of the device conduction is a Poynting energy density flow across the doped regions of the device's crystal lattice. With a dramatic decrease in electron collisions, the **S**-flow now is not subject to distortions due to the

material defects within the lattice structure. Device switching times are far faster (at optical speed) and there are few if any limitations on frequency response.

The phenomenal frequency response — up to essentially the optical region — follows, since the shortest frequency wavelengths can be passed directly as Poynting energy density flow.³⁷ Without divergence or scattering of this energy flow, there is no "work" being done in the conventional sense on the non-translating electrons in that region, even though they are potentialized. That is, *electron transport* has been halted temporarily or dramatically reduced, while the Poynting flow continues apace. With most electrons not being translated longitudinally, there is no heat build-up in the device as there is with lattice vibration interactions with a normal electron current.³⁸ This device can work as a *charge coupled device*³⁹ with the ability to pass both voltage and Poynting current flow S rather than conduction electron current flow dq/dt .⁴⁰

Researching Charge and Poynting Flow in Circuits

Tom Bearden is a very good friend of mine in Huntsville, Alabama. Tom has been deeply involved in research for a number of years to explain and define the charge state in physics. He has taken a serious look at the flow of Poynting energy in circuits,⁴¹ and how most circuit analysis focuses on the power (rate of dissipation of the energy flow) in circuits rather than on the actual rate of energy transport flow (which is not power at all, if it is not dissipated). Tom can explain the basic theory for formation of the charge state⁴² and he can explain the Poynting energy flow used in my charged barrier technology.⁴³ The reader is referred to the extensive endnote comments added by him. Over the last few years it has been a real pleasure to exchange ideas with him.

Remember the Magnets

Tantalum is one of the elements that is used in the construction of the charged barrier device, as well as the "parallel resistor element." Under certain conditions, when stimulated with a very small electric current to align the charge state, the excess bleed-off effect due to the parallel resistor can move the charge state on the capacitor and develop a very small electromagnetic field. Electrons are "held" and "pinned" within this field to reduce electron lattice interaction within the emitter junction.

With the influence of the AC conduction electrons reacting with the pinned electrons within the charged field, a unique effect will start to happen: The clusters of bound electrons within the charged field are compressed to a point where there is a "change of energy state" within the compressed, bound electrons in the tantalum lattice. This will start the formation of the E -field due to the interaction of the compressed electron clusters with the influence of the AC conduction electrons. Remember the magnets when their like poles were brought within close proximity to each other? An analogous action will start the formation of the AC supercurrent and the Poynting energy flow within the device.⁴⁴

Charged Barrier Fogal Engine

Putting together all the actions we have discussed, we may compare the electromagnetic actions as the actions of a special kind of engine cycling, as shown in Figure 7.

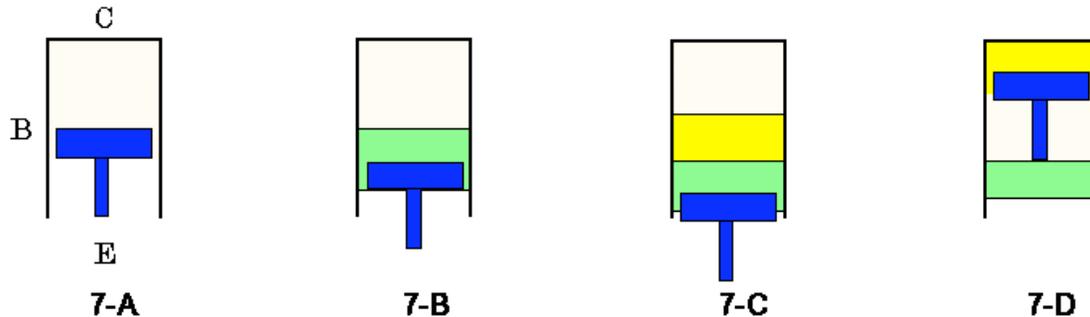


Figure 7. Charged Barrier "Fogal Engine"

In Figure 7, we show four analogous actions involved in the "Fogal engine". Figure 7A shows the start of the "down stroke" of the Fogal *emitter piston*, so to speak, and the formation of the DC electromagnetic field. Figure 7B shows the *signal injection* into the cylinder from the *injector base region*, as the *emitter piston* pulls the signal into the chamber. Figure 7C shows the *compression of electron density* and the formation of the amplified **E**-field due to the *charge compression*, with a resulting expansion of the *Poynting energy density flow*. Figure 7D shows the point of discharge of the *Poynting energy density flow*, the resulting *AC supercurrent*, and the collapse of the DC electromagnetic field of the *emitter piston*.

Testing the Fogal Charged Barrier Semiconductor

Device Testing Parameters for Tektronix

Now that you have seen the pictures of the formation of the internal DC electromagnetic field and the development of the AC supercurrent, I will explain how to test this device. The Charged Barrier device has certain testing parameters that have to be followed to test it accurately. The device must be operated within certain parameters to maintain the internal electromagnetic field action. Tests have to be constructed on the Tektronix transistor curve tracer in the microamp range of operation, in order to keep from saturating the internal electromagnetic field. Important: The Charged Barrier prototype device will test and look like a normal transistor when tested or operated outside of its specified operating parameters!

In the tests, the testing parameters on the Tektronix were set up as follows: The collector current was set at 20 μamp per division. The base current was set at 0.1 μamp with signal injection to the base region. The supply voltage was set at 10 V DC per division. The signal injection was 100,000 kHz (100 MHz) at a level of less than 100 μV AC.

Important: This device cannot be tested on the Tektronix curve tracer equipment in the milliamp range of operation for a normal transistor. Testing it in the milliamp range will overload and shut down the internal electromagnetic field developed by the electrolytic capacitor. The prototype device will then test and look like any normal transistor, with similar noise figure, gain, and frequency range. The "new effects" only occur at the proper microamp range as specified, and only then does one obtain in the Fogal transistor the dramatic noise reduction, increase in sensitivity, increased gain, and increased frequency response as well as "optical" type functioning due to the blocking of dq/dt current flow and the increase in Poynting energy density flow.

Circuit Testing the Device

The Fogal Charge Barrier transistor can be tested under normal circuit conditions with a 3 V DC supply voltage and a bias to the base-emitter junction of 0.7V DC with the emitter grounded. A normal transistor under these conditions will turn on and conduct with an input to the base region of 4.5 mV AC at 0.1 μ amp AC, and produce a gain at the collector junction of 20 mV AC with 0.1 μ amps of current. Under the same circuit conditions, the Charged Barrier device with a signal injection of 200 μ V AC at 0.1 μ amp to the base region, will produce 450 mV AC and an AC current of 133 μ amp AC at the collector junction. A large signal injection to the base region of the Charged Barrier device will overload and shut down the internal electromagnetic field and the device will test just like a normal transistor, until a point of device saturation is reached where the device will pass large amounts of current without a noticeable change in device temperature.⁴⁵ The device can easily be used in existing equipment for signal processing applications to process and reduce the noise content of signals.

Device Wave Function

Though not in conventional theory, signal waves actually travel in *wave pairs*,^{46,47} each pair containing the familiar wave and an associated "hidden" antiwave. The two waves of the pair have the same frequency. Current semiconductor technology cannot separate these wave pairs, due to limitations in switching time.⁴⁸ The Charged Barrier device can switch at a sufficiently fast rate to (i) separate the wave pairs at the higher frequencies and (ii) define the "polarization of light waves" to show background imaging and enhanced video resolution. A pre-recorded audio or video tape can be processed to reveal hidden sounds or background imaging that standard electronic equipment will not process.⁴⁹ The device has been shown to process frequencies in the range from 20 Hz to 5 GHz and higher with no loss in frequency response, due to the ability of the device to separate and process wave pairs, and due to faster device switching.

Some Foreseeable Applications

Charged Barrier Applications

Prototype Charged Barrier devices have been tested in video equipment to process composite video images for a higher resolution. The device has the ability to process and

separate the wave pairs and define the "polarization" of light from background objects. This ability can produce a high definition image on a CRT, and a near-holographic image on liquid crystal display panels. The clarity of liquid crystal display panels can be greatly improved by the switching speed of the Charged Barrier technology, with the visual improvement sometimes being startling.

Novel Encryption and Transmission Capability

A preliminary test was constructed in Huntsville, Alabama in May of 1996 to determine if video information could be *infolded within* a DC voltage potential and transmitted across a wired medium.⁵⁰ Live video information at 30 frames per second was processed and converted by full wave rectification into a DC potential at a voltage of 1.6 V DC and connected to a twisted pair wire medium of 2,000 feet in length. As a voltage, the 5 MHz video information rectified to DC potential had no modulation or AC signal present that could be detected by sensitive signal processing equipment. The analog oscilloscopes that were used to monitor the transmission could only see the DC voltage flat line, although the best digital storage scope could see very weak signal residues because of slightly less than 100% filtering. I later performed additional tests with increased filtering, so that the residues could not be seen. These tests were constructed to see if video information could be "infolded" into an audio carrier and transmitted across an ELF frequency transmission source for communication with submarines, or down a 2,000 ft twisted wire pair. The Charged Barrier device was able to process the hidden video, due to the ability of the device to sense the infolded AC electromagnetic wave information hidden inside the rectified DC voltage, sensed as a disruption to the internal DC electromagnetic field of the Charged Barrier device. Using the Fogal semiconductor, a good video image was shown on the monitor at the end of the wired medium. The Huntsville test was considered encouraging. As stated, I have since repeated the test with a better buildup, to eliminate the very weak signal residues, and the effects are real and replicable. Use of the "infolded" EM waves in an ELF carrier for video frequency signaling is real.

A novel effect uncovered in the Huntsville tests was that, by adjusting the gain control of the receiving box containing the charged barrier device, the focused field of view of the fixed image could be varied, even though no adjustment at all was made in the video camera's stationary focusing. This showed that the "internal information" in an image actually contains everything needed to scan a fixed volume of space, forward and backward in radial distance, in a *focused* manner. The internal information seems to contain information on the entire volume of view of the camera.⁵¹ And it is possible to scan that volume, from a seemingly "fixed" image where much of the image is "out of the camera-focused field of view). The implications for photo analysis are obvious and profound.

The Charged Barrier device, once precision prototypes are available, can be utilized to encode signals within signals, similar to wavelet technology, or within voltage.

Transmissions of such infolded signals could not be detected by conventional signal processing equipment without first being processed by a Charged Barrier device. Without the need for fiber optic cable, conventional wired telephone or cable networks and high voltage AC transmission lines could be used as a transmission source without the need for line amplifiers or noise cancellation equipment. There would be essentially no bandwidth limitations, once the technology is developed.

Future Charged Barrier Applications

Existing radar technology can be refined and improved with the Charged Barrier device. One of the most complex problems in the industry is the "noise content" in signal processing. The Charged Barrier device can be used as a front end low noise amplifier and increase the sensitivity of the target signature scan capability. Radar imaging could be greatly improved simply by processing the return image with the Charged Barrier device for high resolution CRTs and liquid crystal display panels. Systems could also be improved for faster targeting and return echo due to the optical speed of the Charged Barrier device switching. By utilizing the "internal" information, it should be possible to develop improved imaging for sonar applications, so there will be no gaps in the frequency spectrum. The ability to "get at" and detect the hidden internal EM information of an object from its surface reflection, is an innate capability of the Charged Barrier device that needs to be explored. It is already well-known that the entire interior of a dielectric participates in the reflection of light from it; the information on the interior of the reflecting object is in the reflected image, but in the form of hidden EM variables.

New Type of Radar and Sonar Imaging Application

A new type of "volume viewing" radar system can be constructed with the Charged Barrier Technology that can scan the "inner EM signal image" produced over a given area or volume, sensing disruptions within the earth's magnetic field. The movement through that volume of an object — such as a low-flying aircraft made of metal or epoxy resin skin design — can be detected and tracked, regardless of electronic countermeasures and atmospheric disruptions such as tornadoes, hurricanes, or windshear due to microbursts, without the need for *target echo* return capability. The Charged Barrier device can sense and amplify very small disruptions to the "internal" electromagnetic fields and create an image for identification. The volume can be scanned "in focus" back and forth in distance.

For sound direction and distance sensing, the pinna (small folds) of the outer ear use phase reflection information more than 40 dB below the primary sound signal that strikes the eardrum.⁵² Any target's nonlinearities and defects, regardless of overall reflective angle and reflective sonar signals, also produce such minute, hidden "pinna" phase reflections and disturbances in (i) sonar reflections, (ii) the Earth's magnetic field (and in fact in the electric field between the surface of the Earth and the electrosphere), and (iii) in the ocean, in the overall subsurface static potential formed by the conglomerate potentials of the hydrogen bonding, ionizations, etc. These "pinna" signals are broadcast through the surrounding normal fields/potentials of the Earth, including underneath the ocean,

although they are many dB below the normal field fluctuations whose gradients are detected by normal sensors. By detecting this "internal" information, Charged Barrier detectors would be able to detect these hidden "pinna" signals and dramatically increase the information available to the sensor system. Terrain-following cruise missiles, for example, could be detected, tracked, and identified by this means, as could submarines, floating subsurface mines, etc. Field camouflage and decoying would be essentially useless against such sensors.

Adaptation of Such "Radars" to Specialized Sensing

If sufficient of the "pinna" signals can be detected and utilized, a totally new method of *internal* target identification and discrimination — as well as typing and identification of the internal warhead(s) and other components on board the target — could be developed using the Charged Barrier technology. From the pinna signals, decoys and ECM-generated "false returns" could readily be discriminated from the real targets.

Specialized detection devices for airports could be developed that would utilize the pinna information to easily and cheaply detect and identify the contents of packages, luggage, etc. This would provide enhanced security against terrorist bombs, weapons, drug smuggling, etc.

Of particular usefulness would be the development of "pinna scanning" sensors which could peer beneath the ground's surface, detecting mines, tunnels, etc. Identification and classification of the detected subterranean objects and their interior contents is also foreseeable.

Induction of Forces and Patterns of Forces In Atomic Nuclei

A force-free (gradient-free) scalar potential readily penetrates the electron shells of the atom, penetrating directly to the nucleus and interacting with it. By infolding desired **E**-fields and **B**-fields inside the scalar potential (inside pure DC voltage), one can *insert* desired electromagnetic forces — and control their magnitude, direction, frequency, and duration — directly inside an atomic nucleus. At least in theory, by sustaining and manipulating these forces in the nucleus, the atomic nucleus itself is subject to direct manipulation and engineering, as contrasted to the present practice of "firing in a bullet" such as a neutron to get through the electron shell barriers and produce limited nuclear effects. It may be that eventually such an electromagnetic *nucleus-engineering* approach, made possible by Charged Barrier technology, can be utilized to render harmless the steadily accumulating radioactive wastes around the world.

Reduction of Drag on Vehicle Skins

Another application also looms for the use of the charged barrier technology. This application is for the reduction of the drag of the medium on vehicle skins. My preliminary tests on model boats in water have demonstrated the effect to exist and operate, though more definitive tests are called for.

Basically the molecules or atoms of the medium, in contact with the skin of a moving vehicle, create a boundary layer of dense matter which exerts frictional drag forces on the skin to retard the forward movement. Because of the use of phase conjugation and Poynting flow, rather than pure current dq/dt flow, the charged barrier technology can be used to charge the skin of the vehicle in a peculiar fashion. The tiny nonlinearities of the skin become pumped phase conjugate mirrors (considering the internal electromagnetics of the static charge, where the hidden biwaves comprise the pumping). Let us consider such a charged skin as now containing a series of *pumped phase conjugate mirrors* (PPCMs). The incoming atoms or molecules of the medium comprising the boundary layer do possess asymmetrical charge volumes, and so they produce "signal wave" inputs to the PPCMs as they come in. With a good charge on the PPCMs, their hidden biwave pumping is substantial. Consequently the PPCMs emit *highly amplified* antisignals – phase conjugate replica waves (PCRs). By the distortion correction theorem, these highly amplified antiwaves backtrack precisely to the incoming asymmetric charges, where they interact to produce force fields that repel them.⁵³ The point is, there is no recoil on a pumped phase conjugate mirror (PPCM), when it emits such a highly amplified PCR. This is already a theoretical and experimental fact in nonlinear optics. So there is no consequent Newtonian third law recoil force back on the PPCMs comprising the skin of the vehicle.

In short, one has produced a deliberate "pinpoint, repelling force field" upon each of the incoming atoms and molecules of the medium, without any matching recoil force upon the moving vehicle. Better, all the energy in the force field is concentrated only upon the targets, rather than distributed uniformly in space along wavefronts. The end result is to dramatically reduce or lower the boundary layer, without any drag force reaction being exerted upon the vehicle by that operation. This significantly reduces the skin drag and increases the speed of the vehicle through the medium, for a given on-board propulsion force.

Application of this new kind of "smart skin" technology is straightforward. It should allow ships that increase (even double) their velocity through water for the same expenditure of propeller energy. It should enable super-fast torpedoes, perhaps in the 200 to 300 nautical miles per hour range.

Extended Application of Induced Forces at a Distance

In theory, the "pinpoint" application of force upon a distant target, by self-targeting processes, is not limited to the small distance required to prevent formation of much of the skin boundary layer. Instead, the self-targeting effect can be extended. Our space-borne laser research and development, for example, called for using iterative phase conjugate shooting and self-targeting to hold a laser beam locked on the same spot on a rising hostile booster, up to 10,000 miles distance, providing dwell time for the laser to burn through the casing and destroy the booster during its launch phase.

Follow-on generations of development should add the capability of pinpoint repulsion by an attacked ship of incoming hostile torpedoes, shells, missiles, etc. It should enable faster aircraft, with reduced fuel consumption. In large buildings it could conceivably be applied to lower the resistance of the ducting to the passage of heated or cooled air. In heat pumps it should also increase the COP past the present theoretical 8.22 limit, by dramatically reducing the drag exerted by the gases being compressed and pumped.

With use of the pinna information, scanning the ocean's surface can detect and track submarines lurking in the ocean's depths. Literally the oceans can be made "transparent" in a specialized sense.

There are many other applications for the charged barrier technology; the above examples simply serve as "for instances" to tickle the imagination.

In Summary

As can be seen, the advent of Charged Barrier technology and its further development offers a breathtaking extension of present electronic technologies.

Dramatic new capabilities emerge in military defense, to provide for the security of our nation, our armed forces, and our civilian population.

In astrophysics, the detection and use of the "pinna" information could provide unparalleled details on the internal mechanisms, structures, and constituency of planets and stars.

In geophysics, the "pinna" information could provide unparalleled details on the layers, structures, constituents, faults, etc. of the earth underneath the surface. Again, in a specialized sense the earth is made "transparent."

In medicine, the "pinna" information contained within the weak EM emanations from the body would provide details on structures, cellular disorders, infections, and other irregularities within the body, including organs. Eventually a comprehensive diagnosis of the entire body and its cellular functions could be provided by externally scanning the pinna hidden-variable *"information content of the field."*

In biology the pinna information could provide unparalleled insight into the details and functioning of the brain, its different layers and structures, and of the nervous system. Further, pinna information could reveal the structuring and functioning of the body's recuperative system, as contrasted to the immune system. Very little is presently known about the recuperative system, which is usually just "assumed" by medical scientists.

Conclusion

Just as the microscope opened up a previously hidden microworld and its dynamics, the Charged Barrier technology will open up a previously hidden "internal" hidden variable electrodynamic world that will enlarge every present electronic field of endeavor.

Long ago a great scientist, Max Planck,⁵⁴ said:

"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. Clarke⁵⁵ characterized the four successive stages of response to any new and revolutionary innovation as follows:

- "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."*

The Aharonov-Bohm effect, predicted in 1959, required nearly 30 years after its 1960 demonstration by Chambers until it was begrudgingly accepted. Mayer, who discovered the modern thermodynamic notion of conservation of energy related to work, was hounded and chastised so severely that he suffered a breakdown. Years later, he was lionized for the same effort! Wegener, a German meteorologist, was made a laughing stock and his name became a pseudonym for "utter fool," because he advanced the concept of continental drift in 1912. In the 1960s the evidence for continental drift became overwhelming, and today it is widely taught and part of the standard science curriculum. Gauss, the great mathematician, worked out nonlinear geometry but kept it firmly hidden for 30 years, because he knew that if he published it, his peers would destroy him. In the 1930s Goddard was ridiculed and called "moon-mad Goddard" because he predicted his rocketry would carry men to the moon. Years later when the Nazi fired V-1 and V-2 rockets against London, those rockets used the gyroscopic stabilization and many other features discovered and pioneered by Goddard. And as everyone knows, rocketry did indeed carry men to the moon. Science has a long and unsavory history of severely punishing innovation and new thinking. In the modern world such scientific suppression of innovation is uncalled-for, but it is still very much the rule rather than the exception.

The Charged Barrier technology is an innovation which calls for using the energy flow in circuits that is already (i) extracted from the vacuum flux and (ii) freely provided to the external circuit by the source dipoles. It utilizes an extended electromagnetics that

includes a higher topology and a new, inner "hidden variable" EM. This "inner EM" has been in the literature for nearly a hundred years, but ignored. The use of the charged barrier technology will expose many of the present shortcomings in EM theory and models, but it should also lead to a corrected, highly extended electromagnetics.

Let us hope that the charged barrier technology can receive the full scientific attention, testing, and theoretical modeling that it deserves. With that attention and examination I believe my technology will usher in a new revolution in electronics.

Notes and References

1. One must consider the "imperfections" in our present "smoothed" theoretical models. In attempting to explain the unorthodox functioning of the Fogal semiconductor, we are invoking phenomenology from what would be a higher topological model, or a model which is a *superset* of the accepted models. It follows that, in the higher topology, many things will become possible that were not possible in the basic "smoothed" model of lower topology.

This is particularly true in electromagnetics, where Maxwell's 20 quaternion equations in 20 unknowns were arbitrarily reduced — primarily by Heaviside and Hertz — to a vector set of some four equations (variables separated) or two equations (potential form, variables not separated). In reducing the topology so severely, the present EM model is only a small subset of nature's EM. Further, suppose one performs an EM analysis of a circuit in a higher topology algebra — e.g., quaternion algebra, which has a higher topology than tensors. We will then find many functions that circuits actually perform, which will not show in even the most sophisticated tensor analysis. For the proof that inventors — such as Tesla — sometimes capture and utilize such hyperfunctioning which present electrodynamicists have not comprehended, see T.W. Barrett, "Tesla's Nonlinear Oscillator-Shuttle-Circuit (OSC) Theory," Annales de la Fondation Louis de Broglie, 16(1), 1991, p. 23-41. For another refreshing look at the far frontiers of still-developing EM theory, see T.W. Barrett and D.M. Grimes, [Eds.], Advanced Electromagnetism: Foundations, Theory, & Applications, World Scientific, (Singapore, New Jersey, London, and Hong Kong), Suite 1B, 1060 Main Street, River Edge, New Jersey, 07661, 1995.

This line of thinking leads to a very useful tool in qualitatively analyzing novel results obtained in experiments with multiple nonlinear components. Barrett, 1991, *ibid.* shows us that we can expect nonlinear optical functioning of "ordinary-appearing" circuits as one of the primary higher-topology effects that will usually be observed. Hence when one encounters unusual phenomena in novel circuits, one of the first rules is to look for the nonlinear optical functioning of the pieces of the components, at other than optical frequencies. *This will often prove to be highly useful, and the primary way to search for the hidden mechanisms involved in higher topology EM functioning beyond the realm of vectors and tensors.* Of course then the results of the qualitative evaluation must itself be evaluated against the hard experimental data for consistency or inconsistency.

2. See Barrett, 1991, *ibid.* for the proof. As an example, when charge blocking is applied or partially applied, circuits can often perform optical functions even without the presence of optical materials. From our own work it appears that the hidden variable EM inside the scalar potential — as shown by Stoney and Whittaker [to be covered later in these notes] — easily acts in a fashion prescribed by nonlinear phase conjugate optics theory, even when the frequencies are well below the optical region and even in the ELF region.

We accent that it is well-known that there exists radiationless transport of energy between excited and nonexcited atoms, particularly in semiconductors, where in some cases it has been referred to as the interference of reactive EM field components. E.g., see A.A.

Kolokolov and G.V. Skrotskii, "Interference of reactive components of an electromagnetic field," *Sov. Phys. Usp.*, 35(12), Dec. 1992, p. 1089-1093. Speaking of this type of interference, Kolokolov and Skrotskii state, "As a result an interference flux of energy in a new direction is formed, where energy transport for the original waves can be completely absent."

Further, it is now known that extremely large second-order susceptibilities can be obtained in charge-blocking asymmetric quantum wells in semiconductors. This has been predicted to lead to the emergence of new properties in such semiconductors, such as double resonance enhancement, and even fully solid-state parametric oscillators. E.g., see E. Rosencher *et al.*, "Quantum engineering of optical nonlinearities," *Science*, Vol. 271, Jan. 12, 1996, p. 168-172. It would appear that the forefront of semiconductor work on quantum wells and charge trapping is groping toward the type of capability already possessed by the patented Fogal semiconductor.

3. We emphasize that the notion of energy flow through space did not even exist in physics, at the time Maxwell formulated his theory in the 1860s. The concept of energy flowing through space was formulated by Heaviside and independently by Poynting, after Maxwell had already been dead for a decade. Heaviside published first, but not prestigiously. Poynting published not long after, in a prestigious journal. Hence the theory bears Poynting's name, as does the energy flow vector. But Poynting himself credited Heaviside as being first.

The point is, electrodynamicists were already completely focused upon the energy dissipation in a circuit, well before Maxwell developed his theory. Succeeding generations of electrodynamicists have maintained essentially the same focus in circuits. We produce *power* (rate of energy dissipation) electrical engineers rather than *energy transport* engineers.

4. As is well-known, a magnetic dipole or an electric dipole produces a continuous flow of Poynting energy. What is *not* included in EM theory is that — from particle physics, not classical EM theory! — the dipole is a *broken symmetry* in the violent virtual particle flux exchange between the vacuum and the charges comprising the ends of the dipole. Since the magnetic or electric charge is a broken symmetry, it is a "gate" that extracts energy from the vacuum, and it also produces something observable (the Poynting energy density flow \mathbf{S} , *since there is no other candidate!*) If an external circuit is attached to the dipole, that extracted energy density flows along the outside of the conductors of the circuit as the Poynting energy density flow $\mathbf{S} = \mathbf{E} \times \mathbf{H}$. This Poynting energy density flow continues, whether or not the circuit has current dq/dt flowing in it. It flows, e.g., from the source to the ends of an open circuit, *and on out into space from there*. In a given circuit, the \mathbf{S} -flow along the outside of the conductors enters the conductor radially, interacting with the electrons [\mathbf{S} is composed of altered virtual photon flux (VPF) of the immediate vacuum, and all electrically or magnetically charged particles bathed in it, interact with that altered VPF].

The interaction of \mathbf{S} with the conduction electrons in the conductor increases their potential (their flux exchange rate with the local vacuum). In turn, this locally increased ϕ is greater than the ϕ further down the conductor, and this produces (amongst other things) a longitudinal gradient $\nabla\phi$ and therefore a longitudinal \mathbf{E} -field via $\mathbf{E} = -\nabla\phi$. This potential gradient (longitudinal \mathbf{E} -field) produces the begrudging, very sluggish drift current and Slepian flow $\mathbf{j}\phi$, where the ϕ is continually established and maintained by the transverse entry of the violent \mathbf{S} -flow. That is, in the \mathbf{S} -flow there exists an \mathbf{E} -field, where $\mathbf{E} = -\nabla\phi$. Thus the \mathbf{S} -flow *contains and produces* the ϕ that "bathes" the conduction electrons in the circuit, and produces their collected (Slepian) energy density flow $\mathbf{j}\phi$ that is being dissipated from the collecting current loop. It can be shown that nominally only about 10^{-13} or so of the *actual* Poynting \mathbf{S} -flow is "collected" in this manner and dissipated in the circuit by the Slepian energy density flow $\mathbf{j}\phi$. [E.g., see T.E. Bearden, "Maxwell's equations, regauging, and

overunity systems," Explore, 7(3), 1996, Fig. 4, p. 60. See Bearden, *ibid.*, Fig. 3, p. 59 for the graphic depiction of what "collection" of energy by electrons actually consists of: It is a *dynamic, ongoing* process requiring the Poynting flow; it is *never* a static collection in "chunks" as it is treated in normal physics and electrodynamics. As Bohm stated, "There are no things, only processes."]

Exact methods of increasing the energy collection rate in circuits, materials, and media and using it to provide overunity coefficient of performance are given in T.E. Bearden, "Energetics Update and Summary," Explore!, 1997 (in publication). Experimental verification of these mechanisms, and verified processes (such as Anti-Stokes radiation, the Letokhov-Lawandy effect, the Patterson effect, etc.) are included to demonstrate the experimentally proven use of the principles to produce permissible systems with overunity coefficient of performance, without violating the laws of physics or of nonequilibrium thermodynamics.

5. In modern field theory, even a "static" field is known to have angular momentum, a dynamic quantity. E.g., see W. Shockley and R.P. James, Phys. Rev. Lett., Vol. 18, 1967, p. 876. For a simple example, see H.S.T. Driver, "Angular momentum in static electric and magnetic fields: A simple case," Am. J. Phys. 55(8), Aug. 1987, p. 755-757. In fact, a force can be regarded as a flow of momentum, and torque can be regarded as an angular momentum current. See F. Herrmann and G. Bruno Schimid, "Momentum flow in the electromagnetic field," American Journal of Physics, 53(5), May 1985, p. 415-420. So when we speak of "electric field" and "magnetic field" – whether static or dynamic – we should be aware that such static concepts actually represent an ongoing dynamic process.

In quantum field theory, one may regard the magnetic field of the magnet, e.g., as the flow of virtual photons from – by convention – the north pole to the south pole. We stress that the north pole (positive magnetic charge) represents a broken symmetry in the virtual photon flux of vacuum, and this asymmetry is the source which extracts and gates the energy in the magnetic field. Actually, the "negative magnetic charge" south pole (which is just a time-reversed north pole) is *also* an asymmetry in the VPF of vacuum, and consequently it is a source of virtual *antiphotons*, and so a *flow of antiphotons* also flows from the south pole to the north pole. Another way of saying that, is that the two poles of the magnet form a dipole, and the south end of the dipole is known to be time-reversed with respect to the north end, and vice versa. Thus there are two energy flows from the magnet, not one, and these flows in the so-called "lines of force" are interlocked. In 1996-97 Stoney showed that any scalar potential (which would include the magnetostatic scalar potential existing between the two poles of the magnet) can be decomposed into a series of bidirectional wavepairs. See G. Johnstone Stoney, Phil. Mag. Vol. 42, Oct. 1896, p. 332; Phil. Mag. Vol. 43, 1897, p. 139, p. 273, p. 368.

In 1903 Whittaker beautifully completed and extended Stoney's approach, to show that a scalar potential decomposes into a harmonic series of hidden bidirectional EM wavepairs, where each wavepair is composed of a wave and its true phase conjugate replica wave (its antiwave). See E.T. Whittaker, "On the Partial Differential Equations of Mathematical Physics," Mathematische Annalen, Vol. 57, 1903, p. 333-355. If we now invoke a "strong" interpretation of the Stoney-Whittaker work, then the bidirectional hidden photon/antiphoton flows of the magnet actually are mutual phase conjugate replicas of each other. So they must continually form and unform coupled photon/antiphoton pairs, as the photons and antiphotons pass through each other. However, a photon/antiphoton couplet has spin 2 and so the continually forming and unforming couplets are thus *gravitons*. Relative spatial movement of the hidden wavepairs of this "magnetic field" with respect to a conductor introduces a *phase splitting* of the graviton, and the photon half interacts with the electrons in the conductor to produce the well-known magnetic induction, while the antiphoton half interacts in the nucleus of an atom in the conductor, producing the well-known Newtonian recoil.

This Newtonian 3rd law recoil was inadvertently omitted from basic EM theory by Faraday's assumption of the EM field in space as *composed of* physical taut strings (his "lines of force") without any accompanying *string holders*. In other words, Faraday had already *conceptually* discarded Newton's third law from his notion. That notion is false because *no taut string exists in nature without external tensile forces pulling on the string*. In other words, a taut string must have a "string holder" to provide the tensile forces. When the string is plucked to yield transverse string-waves, waves of equal and opposite energy – though highly damped in magnitude because of the great mass of the "holder" medium – are inevitably produced in the body of the holder. Both the string wave and the holder wave "slap" the surrounding medium simultaneously, with equal injection of virtual photons. The dually perturbed medium then vibrates according to its own degrees of freedom, not that of the string. Maxwell merely *assumed* the transverse string wave that resulted from Faraday's view of physical lines of force as actual "taut strings," with no consideration of the "holder" producing the tautness or of the antiwave that occurs in the body of the inevitable string holder. So Maxwell also unwittingly discarded the string holder and the equal-energy antiwave.

Thus Maxwell's EM theory failed to capture Newton's third law, which almost universally occurs in our EM field experiments, but which must presently be *mystically* invoked by electrodynamicists as "Oh, yes, that's Newton's third law reaction!", without any notion of an EM *cause* for the reaction. In quantum field theory, all mechanical forces are caused by the absorption and emission of virtual photons. So if Newton's third law appears, being a mechanical force it must have resulted from the same (virtual photon interaction) type of mechanism, but from antiphotons. A single photon interaction can be shown to also initiate Newtonian reaction; hence it must have been accompanied by an erroneously omitted antiphoton. This logical reasoning also establishes the presence of the antiphotons and the antiwave, accompanying the "conventional" EM wave in the vacuum. The so-called "photon" interaction in most cases is a graviton interaction anyway! Else its interaction could not induce Newtonian recoil.

In short, *Faraday and Maxwell erroneously threw out exactly half of the electromagnetics, the electromagnetic waves, the force fields, and the EM energy!* Neither Heaviside, Hertz, nor Gibbs did anything to restore the missing electromagnetics, which if anything was just swept under the rug in the ubiquitous "Oh, yes, that's Newtonian third law recoil!" The end result was to discard the unification of EM and gravitation, which appears immediately whenever the missing half of classical EM theory is restored. Succeeding generations of electrodynamicists have not corrected this colossal error.

6. Contrasted to a normal standing wave whose amplitudes add, we stress here a fundamental difference in the bidirectional wavepair element of the Stoney-Whittaker decomposition of the scalar potential. Each wavepair is composed of a wave and its antiwave (phase conjugate replica or PCR). Now electrically (in terms of electrical force) the wave and its PCR *superpose* spatially, they do *not* "add magnitudes" spatially! This is now just the well-known (but poorly named!) *distortion correction theorem* in phase conjugate optics. The wave and its antiwave twin are antiphased in time, so that *along the time dimension only*, the absolute values of their *time* components would add.

But their magnitudes do not add spatially! Quite simply, such a spatial *superposition-without force magnitude addition* of an EM wave and its true phase conjugate replica constitutes a *standing gravitational wave*. The main effect has been shifted to the time dimension, rather than the spatial dimensions.

Now suppose we insist that the distortion correction theory applies not only to waves, but also to the photons comprising them. In that case the antiphotons comprising the antiwave and the photons comprising the wave are performing a most interesting dance: The passage of the two waves *precisely through each other spatially*, as they travel in opposite directions (as perceived by the external observer), must result (from a spatial

observation) in the continual coupling and decoupling of photon/antiphoton couplets. But such a couplet is a massless spin-2 entity and therefore a *graviton*. So coupled *gravitons* comprise this gravitational wave, each graviton of which is continually forming and unforming. In short, gravitation and electromagnetics are continually turning one into the other, in this "standing wave". Here is where electromagnetics and gravitation unify – and it is precisely this area that was discarded unwittingly by Faraday and Maxwell when they discarded the string holder and its antiwave.

7. We point out that, as is well-known in particle physics, the electron is not a simple unitary q_e . *Charge should not be used as a fundamental unit in physics!* In fact, in a standard elementary model the electron consists of a bare negative charge (note that electric charge is *undefined* in physics!) which attracts near to it a screen of virtual positrons from the vacuum's virtual particle flux. In fact, the positive screen immediately around the electron partially shields the negative charge from being felt away from the system. In many experiments particle physicists must correct the *measured* charge of an electron (i.e., through its positive screen) to agree with the "bare" charge actually existing as the electron-behind-the-screen. Further, we may take one of those average virtual screening positive charges, consider it coupled to a small portion of the inner bare electron charge, and Voila! *The electron system – defined as its "bare" constituency and its associated vacuum exchange constituency – is also a set of dipoles.* Since any dipole is a broken symmetry in the virtual flux of the vacuum, these broken symmetries "extract and gate" part of the virtual photon flux (VPF) exchange of the electron with the surrounding vacuum, sending the extracted energy back out from the electron asymmetry as a continuous Poynting energy density flow, *from the electron system-as-a-source.* This outwardly transmitted energy flow comprises the *self-potential* ϕ_e of the electron, and the gradients of ϕ_e constitute what is called the "E-field" of the *electron charge as a generating source of energy flow.* An electron (and any other electrical or magnetic charge) is already a *free-energy generator*, driven by its asymmetry in the vacuum VPF. This is why collections of charges are "sources" of a scalar potential, and of the gradients of that potential which we refer to as E-fields. In addition, the electron is spinning (quantum mechanically it must spin through 720° to make one full loop!) and so its "swirl" creates what we call its *magnetic spin.*

Note that we have been using VPF in the particle view. We can just as easily decompose the self-potential ϕ_e of the electron into Stoney/Whittaker biwaves. We can place the electron in an "artificial" potential, where we have deliberately assembled the biwaves in a given deterministic pattern or *template*. Placed in that artificial potential, the internal SW structures of the artificial potential and of the electron self-potential will diffuse, since the structured (dimensioned) artificial potential furnishes part of the VPF interactions generating the ϕ_e . In that manner one violates the present physics notion (assumption) that all electrons are identical. That assumption is not necessarily true. This *dimensioning* (deterministic SW structuring) of the self potential of charges, is the fundamental driving mechanism behind homeopathy, e.g., which has never been given sufficient theoretical attention by the scientific community except in the "normal" theoretical approach. The normal theoretical model does not contain – and in fact excludes by assumption – the *templating* effect for the EM hidden variables utilized by homeopathy. The point is, one can indeed affect the chemistry, hydrogen bonding, and other aspects by just such deliberate templating of massless electrical charge (of the potential).

Such a templating forms a vacuum engine, where one has structured (and interested) curvatures of the local spacetime. For a discussion of vacuum engines and their rigorously demonstrated use to cure terminal tumors and infectious diseases in rats, see T.E. Bearden, "Vacuum Engines and Priore's Methodology: The True Science of Energy-Medicine. Parts I and II." *Explore!*, 6(1), 1995, p. 66-76; *ibid.* 6(2), 1995, p. 50-62.

When we place an electron in a different potential (which after all is just a change to the local vacuum potential), we alter the rate of VPF exchange between the electron and the vacuum because *now the electron is embedded in an altered VPF*. In other words, we alter the dipoles comprising the *electron system*, and we alter the "massless electrical charge" of the *electron system*. In turn, that alters the rate of Poynting flow \mathbf{S} that these dipoles produce from the vacuum, by their asymmetry. The massless (i.e., the VPF exchange) of an electron is not quantized, contrary to the conventional assumption of its quantization! The self-potential ϕ_e (i.e., the massless charge of the electron) is discretized as a function of its VPF with the vacuum, which can be altered at will simply by altering the local vacuum potential (i.e., placing the electron in a different potential). In the ambient (standard) vacuum, the discretized VPF value is standard, and so the electron *appears* to be charge-quantized because then the discretized value of its ϕ_e does not vary.

The point is, a flowing current dq/dt in a conductor is not at all just the simple thing it is treated as, in classical electromagnetics (CEM). It is instead a highly dynamic system of free energy generators comprised of many different kinds of movements, levels, asymmetries, energy exchanges, and interaction changes simultaneously. Classical EM (and even quantum electrodynamics) are gross simplifications and extremely high level averaging of the much deeper, complex physics and dynamic structuring of the vacuum that are actually occurring, along with a myriad of Poynting energy flows!

8. The bare electrical charge constantly interacts with, and is an asymmetry in, the vacuum's violent virtual photon flux. Any scalar potential is an alteration of this vacuum flux. Hence an electron placed in a potential sees either a higher or lower VPF interaction rate, depending upon whether the extra potential is positive or negative. The asymmetry of the *electron system* thus gates additional or less Poynting flow energy, with a resulting stronger or weaker \mathbf{E} -field accordingly.

9. "Drain away" just means that, as the collected charges that are the generating source of a given potential move away, then the potential being generated decreases because the electron system is now in an area of decreased potential and therefore decreased VPF. This is why and how an electron in a current dq/dt through a load (voltage drop) "gives up" its "collected energy." An electron only possesses "excess collected energy" when it is in an excess potential and its associated VPF, which increases the asymmetry of the *electron-vacuum-interaction system* and causes it to emit excess ϕ , \mathbf{E} , and \mathbf{S} .

In a circuit, charge generators in a current moving away from a collection of charges (a source) constitute component sources subtracted from the overall source dipole, with the inflow of charges on the return line replenishing those charges. The internal nonlinearities of the source, however, and the resulting excess electron collisions result in some losses, creating the "internal resistance" of the source. The so-called "power" furnished by the battery of generator (source) is what is required to return those scattering charges back to their dipolar separations. In other words, all the source has to furnish energy for, is to continually replenish the scattered dipole charges. By charge blocking, one can eliminate or dramatically reduce the scattering of the dipole charges, by reducing the current flow. In that case the dipole alone will furnish (freely) the Poynting energy flow \mathbf{S} that it continuously extracts from the vacuum, using the mechanism we specified for the *electron system*.

10. In a circuit, those moving electrons together with their interacting excess potential ϕ constitute the Slepian current $\mathbf{j}\phi$. In turn, $\mathbf{j}\phi$ represents the rate at which "collected" (i.e., excess) energy density is being dissipated in the current loop; specifically, it does not represent anywhere near the rate of the actual energy flow $\mathbf{S} = \mathbf{E} \times \mathbf{H}$.

11. Refer again to Whittaker, 1903, *ibid*. The scalar potential ("voltage") is actually comprised of hidden wavepairs of bidirectional waves. The test was an attempt to insert signal intelligence (i.e., signal modulations) upon one or more of these "hidden wavepairs"

comprising the DC potential. In the mid-to-latter 1980s, Ziolkowski independently rediscovered the Stoney/Whittaker infolded biwave pairs comprising the scalar potential, and also added the *product* set of internal waves in addition to Whittaker's *sum* set. E.g., see Richard W. Ziolkowski, "Exact Solutions of the Wave Equation With Complex Source Locations," Journal of Mathematical Physics, 26(4), April 1985, p. 861-863. See also Ioannis M. Besieris, Amr M. Shaarawi, and Richard W. Ziolkowski, "A bidirectional traveling plane wave representation of exact solutions of the scalar wave equation," Journal of Mathematical Physics, 30(6), June 1989, p. 1254-1269. Ziolkowski in my opinion laid the groundwork for superluminal communication -- for communication with the stars. Further, if there *are* advanced civilizations "out there" in other star systems, then they are almost certainly communicating superluminally, not by the puerile electromagnetics we presently use.

The infolding experiment at Huntsville was the beginning of our experimentation intended to eventually achieve superluminal transmission capability, along the following lines: (i) "Tunneling" of a signal can in a sense be conceived of as the passage of a signal without the passage of a normal potential gradient (force field). In other words, ordinary force-field communications signals involve gradients of the electrostatic and magnetostatic scalar potentials. Tunneling may be the passage without those gradients, and therefore appear to be "force free" propagation. (ii) In turn, one way to conceive the signal "passing" without a gradient (i.e., to conceive a "force-free" signal) is to consider it having "burrowed inside" the scalar potential, so that it no longer requires a "bulk gradient" change in the entire potential. (iii) Since a (normal transverse wave) gradient involves a transverse change, we might consider that this "burrowing" or "infolding" means that the field has simply "lost its transverse component," while *retaining* its longitudinal component. In other words, infolding differs from total absence of the field, in that it is only the absence of the field's transverse component, while the longitudinal component remains. (iv) Interestingly, if one decomposes the electric field into both longitudinal and transverse field components, the longitudinal component is propagated instantaneously. However, if the *transverse* component is also present, it can be shown that it contains a term which *exactly cancels* the instantaneous longitudinal electric field; e.g., see Rod Donnelly and Richard Ziolkowski, "Electromagnetic field generated by a moving point charge: A fields-only approach," American Journal of Physics, 62(10), Oct. 1994, p. 916-922. Thus the (in standard theory) transverse waves we normally produce, simply "blank out" an associated instantaneous communication by their longitudinal components. On the other hand, if we *infold* the signal, so that a "surface gradient" is not present, then we remove the offending transverse component. At least conceptually, then, we have removed the term which canceled the instantaneous longitudinal component. In that case, the "infolded" signal is free to travel instantaneously -- or certainly much faster than the speed of light. Certain anomalies in previous communications testing of a Fogal device, made by one of the leading communications companies, did reveal what appear to be "absences of appropriate system delay" through satellite links, link amplifiers, etc.

So in our search for superluminal communications, our testing had started at the beginning: Simply see if the Fogal device can *infold* signals, inside a DC potential, so we can rid ourselves of that offending "transverse field component" and free the longitudinal component. If one believes the exact mathematics of Stoney, Whittaker, and Ziolkowski, and if one also believes quantum mechanics (which has always included instantaneous action at a distance), then *superluminal communication is possible*. And we think the place to start on it, is to begin tests on infolding signals in DC potentials.

Finally, we point out that "infolding" may be modeled in n dimensions, where $n > 4$, as moving the signal out of 3-space into hyperspace. In that case it is free to move superluminally, since a single orthogonal rotation in hyperspace, away from the velocity vector, is what the speed c is. Two consecutive "departing" orthorotations would give (to the

normal 3-space observer) a communications speed c^2 . Three would give c^3 , etc. If one insists on 4-d Minkowski space modeling, then infolding is moving the signal into "subspace," where it can move superluminally anyhow.

12. This is explainable by the fact that the reflected field from a dielectric material is not generated just at its surface, but comes from everywhere in the interior of it. For a discussion, see G.C. Reali, "Reflection from dielectric materials," American Journal of Physics, 50(12), Dec. 1982, p. 1133-1136. Rigorously this means that the reflections from the entire volume of surveilled space in the camera image, contain not only surface information from all the reflecting objects, but also voluminous internal information from each and every one of them. This "hidden variable" information in the primary image — i.e., the internal (infolded) pinna information content of the "gross potential gradient fields" — can be detected and processed by the Fogal semiconductor. Therefore one should not be surprised that the *infolded content* of a fixed "field of view" image from a video camera can also be scanned "in focus" in both its seemingly blurred foreground and its seemingly blurred background. *The internal information is not blurred!*

Another way of looking at it is to consider a zero vector resultant that is comprised of nonzero finite vectors. The "gross" examination of that system — by a detector that only uses gross translation of electrons — will see nothing at all because its electrons are not translated. On the other hand, an examination of that system by a detector that "sees beneath the zero-vector-summation surface" to the "infolded" real vectors beneath it, will see a pattern of real hidden vectors and real, hidden dynamics. By using only bulk gradients in scalar potentials and ignoring the Stoney/Whittaker decomposition of the potential into its infolded hidden dynamics, orthodox EM models have unwittingly discarded consideration of the infolded real vector components of zero-vector-summation systems. Such zero-vector systems are still very much real entities, containing real energy, hidden dynamics, and hidden information! In the simplest example, these "trapped" energies constitute nested structuring of curvatures of local spacetime. Thus they are little vacuum engines which can act upon subcomponents of physical systems, and upon the hidden EM dynamics of those components, in other than a "gross particle translation" manner.

13. E.g., see Michael Stocker, "Trying to 'pinna' down the localization of sound sources," Electronic Engineering Times, Feb. 3, 1997, p. 44. For information on the pinna transform, see Gardner and Gardner, Journal of the American Acoustics Society (JASA), 53(2), 1973; Wright, Hebrank, and Wilson, JASA, 56(3), 1974; C. Puddie Rodgers, JASA, 29(4), 1981.

14. It is stressed that the backtracking of the emitted wave from the PCMs is convergent and like a "laser beam" rather than a broad wave front. So this is not a "broad wavefront" type of repelling force effect, but instead is a set of pinpoint repulsion-force-generating beams. The energy is far more concentrated at its "targeted pinpoints" than is the same energy in a broad-front force field. Further, the pinpoint effect is iterated for all approaching atoms and molecules; these are "self-tracked" in pinpoint fashion. In nonlinear optics, such an effect is known as *self-targeting*. In this fashion the "repulsion beam" can actually be "locked-on" to the repelled object, delivering all its energy to that object to repel it. At least in theory, eventually it should be possible to use this effect on an aircraft skin — for example — to repel incoming bullets or projectiles.

It also appears possible to adapt this PPCM effect to produce *attraction* forces upon the targeted objects rather than repulsion, but that is beyond the scope of these comments.

In theory it is also possible to develop an electromagnetic antigravity propulsion system, and a concept along that line was developed some years ago and — at least once — successfully tested, smoothly and controllably reducing the weight of an object on the bench by 90%. For the results of the test, see 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. Further discussion of this effect is proprietary and beyond the present scope.

15. G. Holton, Thematic Origins of Scientific Thought, Harvard University Press, Cambridge, MA, 1973.

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

18. One must consider the "imperfections" in our present "smoothed" theoretical models. In attempting to explain the unorthodox functioning of the Fogal semiconductor, we are invoking phenomenology from what would be a higher topological model, or a model which is a *superset* of the accepted models. It follows that, in the higher topology, many things will become possible that were not possible in the basic "smoothed" model of lower topology.

This is particularly true in electromagnetics, where Maxwell's 20 quaternion equations in 20 unknowns were arbitrarily reduced — primarily by Heaviside and Hertz — to a vector set of some four equations (variables separated) or two equations (potential form, variables not separated). In reducing the topology so severely, the present EM model is only a small subset of nature's EM. Further, suppose one performs an EM analysis of a circuit in a higher topology algebra — e.g., quaternion algebra, which has a higher topology than tensors. We will then find many functions that circuits actually perform, which will not show in even the most sophisticated tensor analysis. For the proof that inventors — such as Tesla — sometimes capture and utilize such hyperfunctioning which present electrodynamicists have not comprehended, see T.W. Barrett, "Tesla's Nonlinear Oscillator-Shuttle-Circuit (OSC) Theory," Annales de la Fondation Louis de Broglie, 16(1), 1991, p. 23-41. For another refreshing look at the far frontiers of still-developing EM theory, see T.W. Barrett and D.M. Grimes, [Eds.], Advanced Electromagnetism: Foundations, Theory, & Applications, World Scientific, (Singapore, New Jersey, London, and Hong Kong), Suite 1B, 1060 Main Street, River Edge, New Jersey, 07661, 1995.

This line of thinking leads to a very useful tool in qualitatively analyzing novel results obtained in experiments with multiple nonlinear components. Barrett, 1991, *ibid.* shows us that we can expect nonlinear optical functioning of "ordinary-appearing" circuits as one of the primary higher-topology effects that will usually be observed. Hence when one encounters unusual phenomena in novel circuits, one of the first rules is to look for the nonlinear optical functioning of the pieces of the components, at other than optical frequencies. *This will often prove to be highly useful, and the primary way to search for the hidden mechanisms involved in higher topology EM functioning beyond the realm of vectors and tensors.* Of course then the results of the qualitative evaluation must itself be evaluated against the hard experimental data for consistency or inconsistency.

19. See Barrett, 1991, *ibid.* for the proof. As an example, when charge blocking is applied or partially applied, circuits can often perform optical functions even without the presence of optical materials. From our own work it appears that the hidden variable EM inside the scalar potential — as shown by Stoney and Whittaker [to be covered later in these notes] — easily acts in a fashion prescribed by nonlinear phase conjugate optics theory, even when the frequencies are well below the optical region and even in the ELF region.

We accent that it is well-known that there exists radiationless transport of energy between excited and nonexcited atoms, particularly in semiconductors, where in some cases it has been referred to as the interference of reactive EM field components. E.g., see A.A. Kolokolov and G.V. Skrotskii, "Interference of reactive components of an electromagnetic field," Sov. Phys. Usp., 35(12), Dec. 1992, p. 1089-1093. Speaking of this type of interference, Kolokolov and Skrotskii state, "As a result an interference flux of energy in a

new direction is formed, where energy transport for the original waves can be completely absent."

Further, it is now known that extremely large second-order susceptibilities can be obtained in charge-blocking asymmetric quantum wells in semiconductors. This has been predicted to lead to the emergence of new properties in such semiconductors, such as double resonance enhancement, and even fully solid-state parametric oscillators. E.g., see E. Rosencher *et al.*, "Quantum engineering of optical nonlinearities, Science, Vol. 271, Jan. 12, 1996, p. 168-172. It would appear that the forefront of semiconductor work on quantum wells and charge trapping is groping toward the type of capability already possessed by the patented Fogal semiconductor.

20. We emphasize that the notion of energy flow through space did not even exist in physics, at the time Maxwell formulated his theory in the 1860s. The concept of energy flowing through space was formulated by Heaviside and independently by Poynting, after Maxwell had already been dead for a decade. Heaviside published first, but not prestigiously. Poynting published not long after, in a prestigious journal. Hence the theory bears Poynting's name, as does the energy flow vector. But Poynting himself credited Heaviside as being first.

The point is, electrodynamicists were already completely focused upon the energy dissipation in a circuit, well before Maxwell developed his theory. Succeeding generations of electrodynamicists have maintained essentially the same focus in circuits. We produce *power* (rate of energy dissipation) electrical engineers rather than *energy transport* engineers.

21. As is well-known, a magnetic dipole or an electric dipole produces a continuous flow of Poynting energy. What is *not* included in EM theory is that — from particle physics, not classical EM theory! — the dipole is a *broken symmetry* in the violent virtual particle flux exchange between the vacuum and the charges comprising the ends of the dipole. Since the magnetic or electric charge is a broken symmetry, it is a "gate" that extracts energy from the vacuum, and it also produces something observable (the Poynting energy density flow \mathbf{S} , *since there is no other candidate!*) If an external circuit is attached to the dipole, that extracted energy density flows along the outside of the conductors of the circuit as the Poynting energy density flow $\mathbf{S} = \mathbf{E} \times \mathbf{H}$. This Poynting energy density flow continues, whether or not the circuit has current dq/dt flowing in it. It flows, e.g., from the source to the ends of an open circuit, *and on out into space from there*. In a given circuit, the \mathbf{S} -flow along the outside of the conductors enters the conductor radially, interacting with the electrons [\mathbf{S} is composed of altered virtual photon flux (VPF) of the immediate vacuum, and all electrically or magnetically charged particles bathed in it, interact with that altered VPF].

The interaction of \mathbf{S} with the conduction electrons in the conductor increases their potential (their flux exchange rate with the local vacuum). In turn, this locally increased ϕ is greater than the ϕ further down the conductor, and this produces (amongst other things) a longitudinal gradient $\nabla\phi$ and therefore a longitudinal \mathbf{E} -field via $\mathbf{E} = -\nabla\phi$. This potential gradient (longitudinal \mathbf{E} -field) produces the begrudging, very sluggish drift current and Slepian flow $\mathbf{j}\phi$, where the ϕ is continually established and maintained by the transverse entry of the violent \mathbf{S} -flow. That is, in the \mathbf{S} -flow there exists an \mathbf{E} -field, where $\mathbf{E} = -\nabla\phi$. Thus the \mathbf{S} -flow *contains and produces* the ϕ that "bathes" the conduction electrons in the circuit, and produces their collected (Slepian) energy density flow $\mathbf{j}\phi$ that is being dissipated from the collecting current loop. It can be shown that nominally only about 10^{-13} or so of the *actual* Poynting \mathbf{S} -flow is "collected" in this manner and dissipated in the circuit by the Slepian energy density flow $\mathbf{j}\phi$. [E.g., see T.E. Bearden, "Maxwell's equations, regauging, and overunity systems," Explore, 7(3), 1996, Fig. 4, p. 60. See Bearden, *ibid.*, Fig. 3, p. 59 for the graphic depiction of what "collection" of energy by electrons actually consists of: It is a *dynamic, ongoing* process requiring the Poynting flow; it is *never* a static collection in

"chunks" as it is treated in normal physics and electrodynamics. As Bohm stated, "There are no things, only processes."]

Exact methods of increasing the energy collection rate in circuits, materials, and media and using it to provide overunity coefficient of performance are given in T.E. Bearden, "Energetics Update and Summary," Explore!, 1997 (in publication). Experimental verification of these mechanisms, and verified processes (such as Anti-Stokes radiation, the Letokhov-Lawandy effect, the Patterson effect, etc.) are included to demonstrate the experimentally proven use of the principles to produce permissible systems with overunity coefficient of performance, without violating the laws of physics or of nonequilibrium thermodynamics.

22. In modern field theory, even a "static" field is known to have angular momentum, a dynamic quantity. E.g., see W. Shockley and R.P. James, Phys. Rev. Lett., Vol. 18, 1967, p. 876. For a simple example, see H.S.T. Driver, "Angular momentum in static electric and magnetic fields: A simple case," Am. J. Phys. 55(8), Aug. 1987, p. 755-757. In fact, a force can be regarded as a flow of momentum, and torque can be regarded as an angular momentum current. See F. Herrmann and G. Bruno Schimid, "Momentum flow in the electromagnetic field," American Journal of Physics, 53(5), May 1985, p. 415-420. So when we speak of "electric field" and "magnetic field" – whether static or dynamic – we should be aware that such static concepts actually represent an ongoing dynamic process.

In quantum field theory, one may regard the magnetic field of the magnet, e.g., as the flow of virtual photons from – by convention – the north pole to the south pole. We stress that the north pole (positive magnetic charge) represents a broken symmetry in the virtual photon flux of vacuum, and this asymmetry is the source which extracts and gates the energy in the magnetic field. Actually, the "negative magnetic charge" south pole (which is just a time-reversed north pole) is *also* an asymmetry in the VPF of vacuum, and consequently it is a source of virtual *antiphotons*, and so a *flow of antiphotons* also flows from the south pole to the north pole. Another way of saying that, is that the two poles of the magnet form a dipole, and the south end of the dipole is known to be time-reversed with respect to the north end, and vice versa. Thus there are two energy flows from the magnet, not one, and these flows in the so-called "lines of force" are interlocked. In 1996-97 Stoney showed that any scalar potential (which would include the magnetostatic scalar potential existing between the two poles of the magnet) can be decomposed into a series of bidirectional wavepairs. See G. Johnstone Stoney, Phil. Mag. Vol. 42, Oct. 1896, p. 332; Phil. Mag. Vol. 43, 1897, p. 139, p. 273, p. 368.

In 1903 Whittaker beautifully completed and extended Stoney's approach, to show that a scalar potential decomposes into a harmonic series of hidden bidirectional EM wavepairs, where each wavepair is composed of a wave and its true phase conjugate replica wave (its antiwave). See E.T. Whittaker, "On the Partial Differential Equations of Mathematical Physics," Mathematische Annalen, Vol. 57, 1903, p. 333-355. If we now invoke a "strong" interpretation of the Stoney-Whittaker work, then the bidirectional hidden photon/antiphoton flows of the magnet actually are mutual phase conjugate replicas of each other. So they must continually form and unform coupled photon/antiphoton pairs, as the photons and antiphotons pass through each other. However, a photon/antiphoton couplet has spin 2 and so the continually forming and unforming couplets are thus *gravitons*. Relative spatial movement of the hidden wavepairs of this "magnetic field" with respect to a conductor introduces a *phase splitting* of the graviton, and the photon half interacts with the electrons in the conductor to produce the well-known magnetic induction, while the antiphoton half interacts in the nucleus of an atom in the conductor, producing the well-known Newtonian recoil.

This Newtonian 3rd law recoil was inadvertently omitted from basic EM theory by Faraday's assumption of the EM field in space as *composed of* physical taut strings (his "lines of force") without any accompanying *string holders*. In other words, Faraday had already

conceptually discarded Newton's third law from his notion. That notion is false because *no taut string exists in nature without external tensile forces pulling on the string*. In other words, a taut string must have a "string holder" to provide the tensile forces. When the string is plucked to yield transverse string-waves, waves of equal and opposite energy — though highly damped in magnitude because of the great mass of the "holder" medium — are inevitably produced in the body of the holder. Both the string wave and the holder wave "slap" the surrounding medium simultaneously, with equal injection of virtual photons. The dually perturbed medium then vibrates according to its own degrees of freedom, not that of the string. Maxwell merely *assumed* the transverse string wave that resulted from Faraday's view of physical lines of force as actual "taut strings," with no consideration of the "holder" producing the tautness or of the antiwave that occurs in the body of the inevitable string holder. So Maxwell also unwittingly discarded the string holder and the equal-energy antiwave.

Thus Maxwell's EM theory failed to capture Newton's third law, which almost universally occurs in our EM field experiments, but which must presently be *mystically* invoked by electrodynamicists as "Oh, yes, that's Newton's third law reaction!", without any notion of an EM *cause* for the reaction. In quantum field theory, all mechanical forces are caused by the absorption and emission of virtual photons. So if Newton's third law appears, being a mechanical force it must have resulted from the same (virtual photon interaction) type of mechanism, but from antiphotons. A single photon interaction can be shown to also initiate Newtonian reaction; hence it must have been accompanied by an erroneously omitted antiphoton. This logical reasoning also establishes the presence of the antiphotons and the antiwave, accompanying the "conventional" EM wave in the vacuum. The so-called "photon" interaction in most cases is a graviton interaction anyway! Else its interaction could not induce Newtonian recoil.

In short, *Faraday and Maxwell erroneously threw out exactly half of the electromagnetics, the electromagnetic waves, the force fields, and the EM energy!* Neither Heaviside, Hertz, nor Gibbs did anything to restore the missing electromagnetics, which if anything was just swept under the rug in the ubiquitous "Oh, yes, that's Newtonian third law recoil!" The end result was to discard the unification of EM and gravitation, which appears immediately whenever the missing half of classical EM theory is restored. Succeeding generations of electrodynamicists have not corrected this colossal error.

23. Contrasted to a normal standing wave whose amplitudes add, we stress here a fundamental difference in the bidirectional wavepair element of the Stoney-Whittaker decomposition of the scalar potential. Each wavepair is composed of a wave and its antiwave (phase conjugate replica or PCR). Now electrically (in terms of electrical force) the wave and its PCR *superpose* spatially, they do *not* "add magnitudes" spatially! This is now just the well-known (but poorly named!) *distortion correction theorem* in phase conjugate optics. The wave and its antiwave twin are antiphased in time, so that *along the time dimension only*, the absolute values of their *time* components would add.

But their magnitudes do not add spatially! Quite simply, such a spatial *superposition-without force magnitude addition* of an EM wave and its true phase conjugate replica constitutes a *standing gravitational wave*. The main effect has been shifted to the time dimension, rather than the spatial dimensions.

Now suppose we insist that the distortion correction theory applies not only to waves, but also to the photons comprising them. In that case the antiphotons comprising the antiwave and the photons comprising the wave are performing a most interesting dance: The passage of the two waves *precisely through each other spatially*, as they travel in opposite directions (as perceived by the external observer), must result (from a spatial observation) in the continual coupling and decoupling of photon/antiphoton couplets. But such a couplet is a massless spin-2 entity and therefore a *graviton*. So coupled *gravitons* comprise this gravitational wave, each graviton of which is continually forming and

unforming. In short, gravitation and electromagnetics are continually turning one into the other, in this "standing wave". Here is where electromagnetics and gravitation unify – and it is precisely this area that was discarded unwittingly by Faraday and Maxwell when they discarded the string holder and its antiwave.

24. We point out that, as is well-known in particle physics, the electron is not a simple unitary q_e . *Charge should not be used as a fundamental unit in physics!* In fact, in a standard elementary model the electron consists of a bare negative charge (note that electric charge is *undefined* in physics!) which attracts near to it a screen of virtual positrons from the vacuum's virtual particle flux. In fact, the positive screen immediately around the electron partially shields the negative charge from being felt away from the system. In many experiments particle physicists must correct the *measured* charge of an electron (i.e., through its positive screen) to agree with the "bare" charge actually existing as the electron-behind-the-screen. Further, we may take one of those average virtual screening positive charges, consider it coupled to a small portion of the inner bare electron charge, and Voila! *The electron system – defined as its "bare" constituency and its associated vacuum exchange constituency – is also a set of dipoles.* Since any dipole is a broken symmetry in the virtual flux of the vacuum, these broken symmetries "extract and gate" part of the virtual photon flux (VPF) exchange of the electron with the surrounding vacuum, sending the extracted energy back out from the electron asymmetry as a continuous Poynting energy density flow, *from the electron system-as-a-source.* This outwardly transmitted energy flow comprises the *self-potential* ϕ_e of the electron, and the gradients of ϕ_e constitute what is called the "E-field" of the *electron charge as a generating source of energy flow.* An electron (and any other electrical or magnetic charge) is already a *free-energy generator*, driven by its asymmetry in the vacuum VPF. This is why collections of charges are "sources" of a scalar potential, and of the gradients of that potential which we refer to as E-fields. In addition, the electron is spinning (quantum mechanically it must spin through 720° to make one full loop!) and so its "swirl" creates what we call its *magnetic spin.*

Note that we have been using VPF in the particle view. We can just as easily decompose the self-potential ϕ_e of the electron into Stoney/Whittaker biwaves. We can place the electron in an "artificial" potential, where we have deliberately assembled the biwaves in a given deterministic pattern or *template.* Placed in that artificial potential, the internal SW structures of the artificial potential and of the electron self-potential will diffuse, since the structured (dimensioned) artificial potential furnishes part of the VPF interactions generating the ϕ_e . In that manner one violates the present physics notion (assumption) that all electrons are identical. That assumption is not necessarily true. This *dimensioning* (deterministic SW structuring) of the self potential of charges, is the fundamental driving mechanism behind homeopathy, e.g., which has never been given sufficient theoretical attention by the scientific community except in the "normal" theoretical approach. The normal theoretical model does not contain – and in fact excludes by assumption – the *templating* effect for the EM hidden variables utilized by homeopathy. The point is, one can indeed affect the chemistry, hydrogen bonding, and other aspects by just such deliberate templating of massless electrical charge (of the potential).

Such a templating forms a vacuum engine, where one has structured (and interested) curvatures of the local spacetime. For a discussion of vacuum engines and their rigorously demonstrated use to cure terminal tumors and infectious diseases in rats, see T.E. Bearden, "Vacuum Engines and Priore's Methodology: The True Science of Energy-Medicine. Parts I and II." *Explore!*, 6(1), 1995, p. 66-76; *ibid.* 6(2), 1995, p. 50-62.

When we place an electron in a different potential (which after all is just a change to the local vacuum potential), we alter the rate of VPF exchange between the electron and the vacuum because *now the electron is embedded in an altered VPF.* In other words, we alter the dipoles comprising the *electron system*, and we alter the "massless electrical charge" of

the *electron system*. In turn, that alters the rate of Poynting flow \mathbf{S} that these dipoles produce from the vacuum, by their asymmetry. The massless (i.e., the VPF exchange) of an electron is not quantized, contrary to the conventional assumption of its quantization! The self-potential ϕ_e (i.e., the massless charge of the electron) is discretized as a function of its VPF with the vacuum, which can be altered at will simply by altering the local vacuum potential (i.e., placing the electron in a different potential). In the ambient (standard) vacuum, the discretized VPF value is standard, and so the electron *appears* to be charge-quantized because then the discretized value of its ϕ_e does not vary.

The point is, a flowing current dq/dt in a conductor is not at all just the simple thing it is treated as, in classical electromagnetics (CEM). It is instead a highly dynamic system of free energy generators comprised of many different kinds of movements, levels, asymmetries, energy exchanges, and interaction changes simultaneously. Classical EM (and even quantum electrodynamics) are gross simplifications and extremely high level averaging of the much deeper, complex physics and dynamic structuring of the vacuum that are actually occurring, along with a myriad of Poynting energy flows!

25. The bare electrical charge constantly interacts with, and is an asymmetry in, the vacuum's violent virtual photon flux. Any scalar potential is an alteration of this vacuum flux. Hence an electron placed in a potential sees either a higher or lower VPF interaction rate, depending upon whether the extra potential is positive or negative. The asymmetry of the *electron system* thus gates additional or less Poynting flow energy, with a resulting stronger or weaker \mathbf{E} -field accordingly.

26. "Drain away" just means that, as the collected charges that are the generating source of a given potential move away, then the potential being generated decreases because the electron system is now in an area of decreased potential and therefore decreased VPF. This is why and how an electron in a current dq/dt through a load (voltage drop) "gives up" its "collected energy." An electron only possesses "excess collected energy" when it is in an excess potential and its associated VPF, which increases the asymmetry of the *electron-vacuum-interaction system* and causes it to emit excess ϕ , \mathbf{E} , and \mathbf{S} .

In a circuit, charge generators in a current moving away from a collection of charges (a source) constitute component sources subtracted from the overall source dipole, with the inflow of charges on the return line replenishing those charges. The internal nonlinearities of the source, however, and the resulting excess electron collisions result in some losses, creating the "internal resistance" of the source. The so-called "power" furnished by the battery of generator (source) is what is required to return those scattering charges back to their dipolar separations. In other words, all the source has to furnish energy for, is to continually replenish the scattered dipole charges. By charge blocking, one can eliminate or dramatically reduce the scattering of the dipole charges, by reducing the current flow. In that case the dipole alone will furnish (freely) the Poynting energy flow \mathbf{S} that it continuously extracts from the vacuum, using the mechanism we specified for the *electron system*.

27. In a circuit, those moving electrons together with their interacting excess potential ϕ constitute the Slepian current $\mathbf{j}\phi$. In turn, $\mathbf{j}\phi$ represents the rate at which "collected" (i.e., excess) energy density is being dissipated in the current loop; specifically, it does not represent anywhere near the rate of the actual energy flow $\mathbf{S} = \mathbf{E} \times \mathbf{H}$.

28. In conventional superconductivity research, the objective is on moving electrons or Cooper pairs, rather than moving the energy. It would seem to be much better (and far easier!) to move the Poynting energy flow, rather than the charges! It is far beyond the scope of this paper to expound the higher topology actually involved in circuits and nodal systems, and the fact that present electrodynamics has eliminated one of the major types. We simply refer to a most important reference for what we are speaking of: See Gabriel Kron, "Four abstract reference frames of an electric network," IEEE Transactions on Power

Apparatus and Systems, PAS-87(3), Mar. 1968, p. 815-823. See particularly Gabriel Kron, "Invisible dual (n-1)-networks induced by electric 1-networks," IEEE Transactions on Circuit Theory, CT-12(4), Dec. 1965, p. 464-470.

Circa 1962 Kron wrote in a paper, "The frustrating search for a geometrical model of electrodynamic networks," journal unknown, p. 111-128, the following words:

"Unfortunately most developments in theoretical physics include local (field) concepts only; while practical engineering is dominated by global (network) concepts. Even in geometry the global point of view has been pressed only during the past few decades, so that the discovery of any point of contact between engineering problems and geometry in-the-large is difficult, and often impossible at the present stage of development. These pages relate a succession of failures and successes encountered by the author in his long search for a geometry in-the-large, (a topological model) that enables the formulation of a "Unified Theory of Engineering and Physics" for a large class of problems in applied electrodynamics. Engineering is considered to differ from physics mainly in the nature of the reference frames and transformation tensors... used. Of course, a temporary success of an analogue may follow only after a string of countless trial-and-error failures — as all 'unifiers' are so well aware...."

And on p. 114 Kron gave the result of his decades of search as follows:

"...the missing concept of "open-paths" (the dual of "closed-paths") was discovered, in which currents could be made to flow in branches that lie between any set of two nodes. (Previously — following Maxwell — engineers tied all of their open-paths to a single datum-point, the 'ground'). That discovery of open-paths established a second rectangular transformation matrix... which created 'lamellar' currents... A network with the simultaneous presence of both closed and open paths was the answer to the author's years-long search." [Underlining emphasis added].

It is the thesis of one of the present authors (Bearden) that *the Fogal charge-barrier semiconductor will ultimately be found to partially function in Kron's final mode involving simultaneous open and closed paths.*

29. This DC potential is held on the input plate because of the nonlinear phase conjugate action of the optically-active material comprising the dielectric of the electrolytic capacitor. What is not commonly known is that, in the hidden internal Stoney-Whittaker channel, all nonlinear materials can be optically active at all frequencies. The potential on the entry plate is comprised of such hidden bidirectional waves, per Stoney-Whittaker, and therefore hidden "optical effects" can occur far below optical frequencies, including even at ELF frequencies. The end result is that one must apply some version of overpotential theory, from the well-known theory of double surfaces, because of the hidden optical activity of the tantalum dielectric. One must also "very finely tune" the spacings, geometry, etc. of the components inside the simplified circuit, in order to evoke the overpotential theory. As is well-known, once the overpotential theory is evoked and utilized, exceedingly tiny current changes — such as on the highly controlled bleed-off resistor — can in turn gate and control far larger currents and very high fields across the double surface interface. E.g., see J. O'M. Bockris and A.K.N. Reddy, Modern Electrochemistry, Vol. 1 & 2, Plenum Press, 1970 for a comprehensive introduction to the double surface theory and to overpotential theory in particular. For a succinct synopsis of the overpotential and its importance, see J. O'M. Bockris, "Overpotential: a lacuna in scientific knowledge," Journal of Chemical Education, 48(6), June 1971, p. 352-358. Most electrical engineers are unaware of this overpotential

theory and its importance, although the modern solid state physicist is aware of it, as well as the importance and peculiarities of double surface effects.

30. It seems that one function of Bill's careful tuning of the geometry, parameters, etc. of the bleed-off in the transistor, is actually to create and sustain this AC oscillation. For some of our later comments, we can replace this 500 MHz oscillation wave with two special Whittaker scalar potentials, per Whittaker 1904. Then each of those decomposes into the hidden Stoney-Whittaker biwave pairs, by Whittaker 1903. The end result is that a condition of slight disequilibrium is maintained on the plate, and hidden pump waves are created and sustained.

31. Actually this standard view is not quite complete. Any change of **E**-field automatically produces a **B**-field, and vice versa. Further, the flow of either of the several kinds of massless displacement currents (such as $d\mathbf{E}/dt$, $d\phi/dt$, and $d\mathbf{P}/dt$) can also create a magnetic field. It is well-known that the electrons themselves do not actually cross the gap between the plates of a capacitor; instead, one or more — usually several — of the displacement currents move across the capacitor gap via material distortion of the dielectric molecules. The movement of the bound charges in the distorting dielectric is a "bound current," but it impels electrons from the receiving plate on out into the external circuit conductor attached to it. It is also well-known (and it has even been measured) that these displacement currents in capacitors do make magnetic fields. In my opinion Fogal has adapted the bypass resistor and the included electrolytic capacitor as a very highly tuned system that (i) controls and uses additional "bleed-off" currents that are mostly massless displacement currents rather than current dq/dt , (ii) creates and utilizes weak magnetic fields by these massless currents, (iii) blurs the "separate states" between the charges into overlapping states, which seemingly produces what formerly has been labeled "tunneling" but without physical passage of electrons, (iv) applies and utilizes the overpotential theory to control (and block) up to 10^5 to 10^6 or more times as much current (and potential) as the device must "draw" in the double surface area, (v) increases the usable Poynting flow from the double surface area by increasing the field strength via the overpotential mechanism, and thus (vi) dramatically increases and passes the Poynting flow

$\mathbf{S} = \mathbf{E} \times \mathbf{H}$ of the charge-barrier area on through the transistor, processing it in the circuitry beyond. We specifically point out that altering the potential ϕ across a double surface area, while blocking dq/dt , rigorously constitutes *asymmetrical regauging* of the circuit area involved, rather than the *symmetrical* regauging commonly used — by assumption — in classical electrodynamics to separate the variables of the two Heaviside-Maxwell equations that Heaviside produced as his vector reduction of Maxwell's theory (potential form). The ordinary symmetrical regauging [which is actually two simultaneous asymmetrical regaugings, such that one produces an equal and opposite excess force as produced by the other] used to separate variables thus discards the extra **E**-field and overpotential effect that Bill produces and utilizes. Note that he is violating a standard "symmetrical regauging" assumption arbitrarily imposed upon Maxwell's CEM theory, not the fundamental theory itself. Nonetheless, electrical engineers with the symmetrically and arbitrarily regauged Maxwellian equations firmly in their minds cannot usually comprehend the mechanism used in Bill's charge-barrier technology.

32. A very complicated function happens simultaneously in the paralleled tantalum capacitor. The DC potential across the tantalum can be decomposed via Stoney/Whittaker into hidden bidirectional EM waves. These cover the full spectrum up into the optical region, and serve as "pump waves" in the nonlinear optical sense. These "hidden inner waves" pump the tantalum, which is well-known to be optically active.

Consequently the tantalum becomes a pumped phase conjugate mirror (PPCM) *in the inner, hidden channel inside the DC potential*. The various signals entering the plate

constitute "signal wave" inputs to the PPCM, which scavenges most of the energy from its pump waves to produce amplified phase conjugate replicas (PCRs). Suddenly the ordinary "bleed-off" of the charging plate becomes very complicated indeed! An *amplified* countereffect now exists, and acts upon the resistor. This "underdamped" corrective response results in an amplified "blocking" effect upon resistor bleed-off and an AC oscillation.

With such an effect imposed upon it, the resistor-tantalum system has become not just a load and a capacitor, but a negative resistance and an oscillating source! The response is exactly like a guidance and control system that uses underdamped correction of errors. *Such a feedback system is already well-known to oscillate.*

A very complicated set of pinning, blocking, and phase-conjugating actions ensue. The overall result is that the tantalum capacitor-resistor combination now is functioning not only as a capacitor with a bypass resistor, but as a completely different kind of negative resistance oscillator system. In effect, the entire region becomes a sort of *oscillating quantum well*, in which the potential builds up and is amplified, so that its gradient also increases and is amplified, all the while oscillating. This complex system also passes the Poynting energy flow, even though much of the normal dq/dt passage is now blocked. The result is that, during this region of operation, the transistor shifts into a predominately self-amplifying (i.e., self-regauging asymmetrically) Poynting generator, while creating an effective oscillating quantum well *and a special kind of Josephson junction*. The capacitor/bypass resistor/transistor element system becomes largely an optically-acting device rather than an ordinary current-acting device.

We believe that, to completely layout and verify all the pieces of this complex system operation, a highly qualified laboratory team will be required, and work by some of the best theoreticians will also be required. The team will also need to contain members familiar with the electrochemical electrode concepts of the overpotential, as well as quantum physicists thoroughly familiar with quantum well theory and behavior, in addition to optical physicists familiar with nonlinear phase conjugate optics.

33. I suspect that the pinning action is due to the hidden pump waves, the novel oscillating quantum well, and the negative resistance effect previously mentioned. The two sets of hidden pump waves will generate a hidden multiwave interferometry of the Whittaker multiwave pairs. Such "scalar potential" interferometry (i.e., the hidden interferometry of the multiwaves comprising the interfering scalar potentials) was shown by Whittaker in 1904 to create all the normal EM fields anyway.

So two **E**-fields (potential gradients) are created, with two sets of pumps for the defects and nonlinearities. Attempted stress-relieving departure of the pinned electrons results in an EM "signal input" into the pumped defect mirror [four wave mixing theory]. In turn, the pumped phase conjugate mirror emits an amplified phase conjugate replica, which sharply reverses the attempt of the individual electron to leave the pinned area. Consequently the electron is forced back toward the pinning site (PCM), with negative feedback then stopping it. The end result is that the amplified negative feedback from the pumped PCM defect/nonlinearity holds the electron fast. This creates a pinning and compressing effect with an amplifying *dynamic* quantum well, at each defect or nonlinearity in the lattice where the electrons are pinned. In other words, the quantum well continually adjusts itself to counter any move the electron attempts to make. This pins the electron and blocks it in place.

Another way of expressing this *dynamic quantum well effect* is to say that it continually *compresses* the pinned electron clusters at the pinning sites, since it produces a stronger recovering force upon the electron attempting to deviate, than was that electron's deviation force.

34. The Poynting energy density flow is given by $\mathbf{S} = \mathbf{E} \times \mathbf{H}$ in the general case. There are other comparable formulas to compute the \mathbf{S} -flow from electric dipoles and from magnetic dipoles. Rigorously, the \mathbf{S} -flow is expressed as an *energy density* flow, in terms of joules per m^2sec , or joules per collecting coulomb, etc. In whatever fashion it is expressed, this energy density flow must be multiplied by the appropriate numbers for the right side of the "per" statement. But it is quite awkward to continually write or say the mouth-filling phrase *Poynting energy density flow*. Consequently texts refer to it loosely by a variety of terms such as *energy flow*, *energy density flow*, *Poynting energy flow*, *Poynting flow*, \mathbf{S} , \mathbf{S} -flow, *Poynting current*, *energy current*, *energy density current*, etc. In this paper all such terms refer to the Poynting energy density flow.

35. Cluster theory can perhaps be applied to more adequately explain the long range ordering and spin density waves that seem to occur in the transistor, or at least to augment the rough, proposed explanation given here.

36. In other words, optical switching and long range ordering now apply.

37. In the Whittaker decomposition of the scalar potential, a harmonic series of biwave pairs results. The frequency is unlimited, consisting of all the harmonics from any fundamental from which one starts.

38. Heating represents the scattering of photons (energy). Of course it is only the *conglomerate hierarchy* of the photons that has been "disordered"; *each photon itself remains perfectly ordered*. Hence macroscopic "entropy" is composed of, and overlaid upon, an underlying perfect order. Since only the patterning of energy can be created or destroyed, while the underlying order (energy) always remains constant, then energy cannot be created or destroyed (the fundamental conservation of energy theorem). When we perform work, the energy that is scattered or changed in form is *still there*, every bit of it. As does nature, we can utilize the same energy, over and over. By multipass retroreflection in scattering processes (as in the well-known but previously not understood anti-Stokes emission), one can readily "recover" and utilize the hierarchical ordering of the scattered photons — or much of it — and "reuse" (i.e., rescatter) the photons again. This recovery and reuse process can be iterated. From a single joule of energy, we can "collect" and obtain a million joules of work — rigorously in accord with the master conservation of energy law. *There is no "conservation of work" law in nature!*

The present *energy-work theorem* is a highly specialized case for "single pass" energy collection and single dissipation implicitly assumed. Nature itself *multipasses*, *multicollects*, and *iterates* the dissipation of the same energy flow, over and over, ubiquitously. In spite of all the work that has been accomplished in and on the matter of the universe, precisely all the energy that was present in the primordial universe just after the big bang is (i) still present and (ii) still repeatedly doing work! Every joule of it has already done countless "millions of joules" of work! Note that retroreflection (as in phase conjugate reflection) is a *negentropic* and engineerable process. At any rate, the multipass, multi-retroreflection, multicollection process is a fundamental change to the work-energy theorem of physics. As presently stated, that theorem implicitly assumes single-pass, single collection of energy, with consequent loss, scattering, or transport of the collected energy. Further, electrodynamic collection of energy is nominally a process of only about 10^{-13} efficiency. Thus almost all the flowing Poynting energy is still there in the \mathbf{S} -flow after a single-pass collection. Millions or even billions of iterative additional energy collections are possible in the same volumetric area from the same \mathbf{S} -flow, merely by retroreflecting it iteratively. When the energy density in that volume is thus increased by *multipass multicollection*, this also increases the Poynting flow itself, since the local ϕ (energy density) increases by the extra collection of energy in the same volume.

We are preparing a technical paper detailing this major change to the present work-energy theorem, and its major ramifications for overunity processes. Both the Patterson

Power Cell® and the Lawandy patents (lasing without population inversion, via negative absorption in — translation: *excess emission from* — the medium) are already independently validated and patented overunity processes using iterative retroreflection for iterative multicollection in the same volume, from the input Poynting \mathbf{S} -flow.

If there is no scattering of the Poynting flow, there is no divergence and no heating. This of course has always been the *first part* of the solution to room temperature superconductivity; i.e., it is a *necessary* but not *sufficient* condition for room temperature superconductivity. In this respect, the bridging concept is important. By *bridging* we mean the external introduction of Poynting flow \mathbf{S} , of emf, of $d\mathbf{E}/dt$, and of $d\phi/dt$ onto and into a dq/dt -closed loop — *without* externally introducing any dq/dt in the process. We call the component which connects the external \mathbf{S} -source with the dq/dt -closed loop the *bridge*. From the processes just being described in Fogal's semiconductor, one remaining condition for achieving room temperature superconductivity is that the Poynting flow furnished from the process described so far, must again be introduced into the external current loop, without introducing current dq/dt from outside that loop. In that fashion the electrons in the load loop can be energized and powered normally by the introduced emf alone.

However, it can be shown that the external loop electrons in the return line will not power back against the back emf, *if no other function is accomplished*. In other words, in the receiving (load) loop, the "source" component acting as the emf source must provide an additional function that makes the current flow backwards, *against* the back emf in that region. So a second remaining condition for room temperature superconductivity is that, in this "activated" or "energized" load loop, the back emf across the load-loop side of the bridge must exist in a *partially time-reversed region* — which simply means phase conjugate reflection of at least some of the photons comprising the back EMF so that partial "time reversal" is achieved. That means that a fraction of the "back EMF" — as seen by the external observer in his "forward time" — actually is a *forward* emf, as far as the return conduction electrons are concerned, because of the partial time reversal. Expressed another way, the current flows with the inducing emf in a time-forward region, and against the emf in a time-reversed region.

With the addition of the time-reversing function on the load side of the bridge, the dq/dt -isolated load loop will be fully powered-up by the external introduction of the \mathbf{S} -flow across the bridge, and current dq/dt will circulate normally in the load. This provides not only room temperature superconductivity, but also overunity coefficient of performance of the load loop, since it is (i) a closed system with respect to dq/dt flow, but (ii) an open system with respect to input of excess energy from its external environment, and radiation of that excess energy from loads. Energetically being an open system not in equilibrium, *nonequilibrium* thermodynamics applies and overunity COP is permissible, as is well-known for such systems.

Presently the only device I know of, that will reliably perform the bridging function, is the Fogal semiconductor. We have several other candidates, but so far none has yet proven out. My colleagues and I have filed several patent applications on the process for use of the bridging concept for room temperature superconductivity and overunity COP, and for the use of the Fogal semiconductor in the requisite Poynting flow bridging. Fogal retains full patent rights on his semiconductor; our use of it in our own patent pending processes represents a licensed application.

39. Of course here one needs to clarify the use of *charge coupled*. As I understand his use of the term, Bill is referring to a charge coupling of a quantum mechanical nature rather than of the normal "translation of charge carriers" sense. Electrons actually do not "move down the wire" as little balls, as we tend to think of the current classically. A blocked or pinned electron is not totally and physically "located at a point" as in the classical notion. Instead, it is probabilistically located; i.e., there is a certain probability at each point in a distributed spatial cloud, that it will be found there at that point. By the *time-fraction*

interpretation of probability, one can say that the blocked electron already "spends a portion of its time" at each point in the cloud region, where that fraction of time it is "located" at one point is given by its probability of being there. Another way of saying this is that the electron considered as a wave function overlaps an entire region of space, and only appears at a point in space as a particle when physical intervention ("observation" or "measurement" or "detection") occurs by collapse of the wave function. So it's as if the electrons "feel every possible path and point ahead" in the cloud, and are free to simply "appear" at points ahead in the cloud without "physical travel through the intervening space" as in the classical sense.

I believe this is what Bill means by "charge coupled device." Bluntly, the blocked electrons are no longer localized as simple particles, because of the blocking of their particle nature yet passage of their wave aspects. Bill considers this also as their wavefunctions overlapping and blending, and their "states" thus melding into a conglomerate." Given that this "grouping" of wavefunctions and nonlocalization of the electrons actually occur, then the classical picture of charge transport fails completely. Charge transport is now by an entirely different mechanism, seemingly a "tunneling" in one sense, but not really tunneling in the accepted sense. It would appear that, if we call it "tunneling" anyway, the tunneling is also oscillating! At any rate, let us just consider that the charges flow into the blocking region and mechanism classically, then exit at a given but separated point further along in the circuit and flow from that exit point classically.

In the nonclassical region, the notion of "flow through space" does not apply, at least in 3-space. I personally believe that the mechanism herein is essentially equivalent to the "open path" concept uncovered by Gabriel Kron, who applied full general relativity to electrical circuits, networks, and machines. Circa 1962, Kron — perhaps the greatest electrical scientist in U.S. history — wrote these words (accent added):

"...the missing concept of "open-paths" (the dual of "closed-paths") was discovered, in which currents could be made to flow in branches that lie between any set of two nodes. (Previously — following Maxwell — engineers tied all of their open-paths to a single datum-point, the 'ground'). That discovery of open-paths established a second rectangular transformation matrix... which created 'lamellar' currents..." "A network with the simultaneous presence of both closed and open paths was the answer to the author's years-long search."

I believe that Kron's "open paths" may correspond to, or be related to, my own concept of bridging the S-flow between dq/dt-isolated closed loops. To show the complexity of what is actually ongoing in electrical circuits, we further quote from Gabriel Kron, "Invisible dual (n-1)-networks induced by electric 1-networks," IEEE Transactions on Circuit Theory, CT-12(4), Dec. 1965, p. 464-470:

"Since Kirchhoff's current-law prohibits the use of 'nodes,' and Kirchhoff's voltage-law prohibits the use of the 'planes over the meshes,' the topological theory of electric networks must be based upon the utilization of 'branches' only (1-network) and their surroundings. A large number of visible and invisible multidimensional p-networks surrounding the branches can be introduced, that collectively form neither a graph nor a polyhedron, but a non-Riemannian space. All the parameters of Maxwell's field equations ... of each p-network form the building-blocks of an asymmetric 'affine connection' It defines the 'covariant' space-derivatives, that replace in networks the familiar gradient, divergence, and curl concepts of fields."

Quoting again from the same reference, p. 464:

"A conventional electric network differs from transportation, communication, and all other types of nonelectric networks dealt with by electrical engineers,

in that an electric network is surrounded in all directions to infinity by an invisible dynamic electromagnetic field of its own creation. In order to describe such an intricate n-dimensional continuous field in a discrete manner, several sets of visible and invisible abstract reference-frames must be introduced, that can be utilized to form a still larger variety of multidimensional physical p-networks. These interlinked p-networks propagate all the electromagnetic parameters (not merely i and e) whose presence is defined by the field equations of Maxwell. However, the latter have to be expressed in their tensorial (relativistic) form in order to organize properly the topological structure of conventional electrical networks."

The point is, when one blocks dq/dt and "slips" the \mathbf{S} -flow on past, one directly alters the entire multidimensional topology of the involved circuitry. Something very akin to higher dimensional "translation" of charges *can* occur, and something similar to this is what Bill is referring to by *charge coupling* and by *charge compression*.

40. It is the Poynting flow \mathbf{S} from a dipole that creates the potential ϕ and the therefore the $-\nabla\phi$ that constitutes the \mathbf{E} -field in space, surrounding the charges at the ends of the dipole. That is, from particle physics, as is well-known the dipole is a broken symmetry in the virtual photon flux exchange between the vacuum and the charges comprising the ends of the dipole (in fact it is *two* broken symmetries, one for each end). The asymmetry is a "gating" effect, which means that some of the vacuum exchange energy is extracted and gated out of the dipole (that is what asymmetry means!)

Further, as is well-known in particle physics, when symmetry is broken, something virtual has become observable. So all the observables for which the dipole charges are "sources" — i.e., the \mathbf{E} -field, the scalar potential, the \mathbf{S} -flow, etc. — are created directly from the vacuum flux exchange by the asymmetry of the dipole. That's why a "static" charge is a *source* of ϕ and a *source* of \mathbf{E} ! More accurately, its asymmetry in the dynamic vacuum flux is the source of those entities. The vacuum exchange is *anything but* static! Since one end of the dipole is time-reversed with respect to the other end, it follows that a bidirectional gating occurs — in short, it follows that one gets *bidirectional field flows*, as typified by Stoney/Whittaker biwave decomposition of the scalar potential across the dipole.

41. Actually there has been an ongoing, polite debate for many decades about the "energy flow" in circuits; e.g., in American Journal of Physics. Many engineers are thoroughly confused by the universal misuse of the term "power" in electrical engineering. They speak of a "power source" — even in the textbooks and the literature — when the source is an *energy density flow* source. E.g., the source hardly furnishes a single extra conduction electron to the external circuit; instead, the Drude gas conduction electrons in the circuit are contributed by the atoms in the conductors, materials, etc.

Engineers speak of "drawing power" from the source, which is equivalent to saying "drawing the scattering of energy" from the source, which is a non sequitur. It is also equivalent of saying (simple case) "drawing VI " from the source, which again is a non sequitur because the source does not furnish the electrons, and hence cannot furnish the I . It *causes* the I to occur in the conduction electron gas, by activating the conduction electrons in a violent longitudinal bath of Poynting energy flow \mathbf{S} . This Poynting flow carries the \mathbf{E} -field, and therefore the $\mathbf{E} = -\nabla\phi$. In short, the Poynting flow *furnishes* the emf of the circuit. But it does not *furnish* the I .

One draws the Poynting *energy density flow* from the source — *not* the scattering of the energy; the energy scattering occurs in the loads and losses. Many engineers believe that the Slepian vector $\mathbf{j}\phi$ prescribes the energy density flow of the circuit; it does not do so at all. Instead, $\mathbf{j}\phi$ in a current loop is part of the *energy density dissipation rate* in that current loop.

E.g., for proposal of $\mathbf{j}\phi$ as the Poynting vector, see C.J. Carpenter, "Electromagnetic energy and power in terms of charges and potentials instead of fields," IEE Proceedings A (Physical Science, Measurement and Instrumentation, Management and Education), (UK), 136A(2), Mar. 1989, p. 55-65. For a refutation of the Slepian vector approach advocated by Carpenter, including citing of experimental refutation, see J.A. Ferreira, "Application of the Poynting vector for power conditioning and conversion," IEEE Transactions on Education, Vol. 31, No. 4, Nov. 1988, p. 257-264.

The energy flow is $\mathbf{S} = \mathbf{E} \times \mathbf{H}$, and only a tiny, tiny fraction of that energy flow is "intercepted" (collected) by the electrons in the circuit and then dissipated in the loads and losses. It can be shown that, in a nominal single-pass circuit, only about 10^{-13} of the available Poynting flow \mathbf{S} is intercepted and "collected" and dissipated by the conduction electrons in the circuit. Of that minuscule collected fraction, half is expended in the source dipole to scatter the charges comprising the dipole, thereby gradually "killing" the dipole and consequently its broken symmetry "gate" that is extracting and furnishing the Poynting energy flow.

Most university electromagnetics texts give very short shift to Poynting energy flow in circuits, usually showing only one or two very simple circuit examples, then moving on from that "bottomless pit" with a great sigh of relief. E.g., J.D. Jackson's epochal Classical Electrodynamics, 2nd edition, Wiley, 1975, does not even *cover* Poynting flow in circuits. But see J.D. Jackson, "Surface charges on circuit wires and resistors play three roles," American Journal of Physics, 64(7), July 1996, p. 855-870 for an excellent example of Poynting flow and effects in a simple circuit. Jackson strongly accents the fact that the surface charge densities must vary in the conductors. But as with other texts, the concept does not appear of bridging the Poynting flow from a blocked charge area, and introducing it upon a dq/dt -closed current loop containing the load.

42. Here Bill gives me too much credit! I cannot personally handle the Kron-type approach – which involves full general relativity and lots of other things – necessary to adequately do this. What I have done is to advance a rigorous definition for electric charge, which has not previously been done in physics. E.g., quoting M.P. Silverman, And Yet It Moves: Strange Systems and Subtle Questions in Physics, Cambridge University Press, Cambridge, 1993, p.127:

"And yet, curiously enough, we do not know exactly what charge is, only what it does. Or, equally significantly, what it does not do."

To define a charge, the definition must capture (1) the mass of the charge, and (2) the violent flux exchange between the charge and the surrounding QM vacuum, at least to the point of including the broken symmetry in that flux and hence the gated Poynting \mathbf{S} -flow, with its concomitant ϕ and \mathbf{E} . To first order, $q \equiv \phi_q \bullet m_q$, where " \bullet " is a "coupling operator" (in the simplest case, ordinary multiplication), ϕ_q is the self-potential exhibited by the charge q and interpreted as the set of virtual EM interactions between m_q and the entire surrounding vacuum, and m_q is the mass associated with q . The importance of this definition is that charge q is not a *unitary* quantity at all! Instead, it is a *system* comprised of a massless charge (potential) ϕ_q , and a mass m_q . Charge itself is massless and is the ϕ_q portion. [A separate and fundamental definition for mass has also previously been given; see T.E. Bearden, Quiton/Perceptron Physics, National Technical Information System, Report AD-763210, 1973.]

With $q \equiv \phi_q m_q$, one may then apply Stoney/Whittaker decomposition to express ϕ_q as a harmonic set of hidden bidirectional wave pairs, extending from the location of q out to infinity in all directions. This further provides internal hidden EM variables inside ϕ_q . By separately forming such wavepairs in a desired sequence, and assembling them, one can create

a massless charge (scalar potential) with a desired, deterministic set of "hidden wave" structuring. Placing charges q in this potential will result in a gradual exchange of internal patterning (*dimensioning*) via a mutual diffusion process. When the now-*dimensioned* charges are then removed and sent elsewhere, they carry their dimensioned self-potentials ϕ_q with them, holding it for a while as it gradually dissipates by diffusion mixing with other potentials it comes in contact with. Charges q with such deterministic components of structuring inside their ϕ_q components are said to be *dimensioned*. A dimensioned charge q can behave quite differently in — for example — chemical interactions in the body than does a nondimensioned "identical" charge q . An entirely new area of electrodynamics is opened up, one which allows the direct engineering of Bohm's hidden variable theory, including instantaneous action at a distance, and including deliberate structuring and usage of Bohm's quantum potential. The implications for physics, electronics, medicine, and power systems are profound.

43. The Poynting flow from the source dipole flows primarily along the outside of the conductors in the external circuit, so that the conductors act essentially as "guides." E.g., a very nice statement to this effect is given by Mark A. Heald, "Electric fields and charges in elementary circuits," American Journal of Physics, 52(6), June 1984, p. 522-526. Quoting:

"The charges on the surface of the wire provide two types of electric field. The charges provide the field inside the wire that drives the conduction current according to Ohm's law. Simultaneously the charges provide a field outside the wire that creates a Poynting flux. By means of this latter field, the charges enable the wire to be a guide (in the sense of a railroad track) for electromagnetic energy flowing in the space around the wire. Intuitively one might prefer the notion that electromagnetic energy is transported by the current, inside the wires. It takes some effort to convince oneself (and one's students) that this is not the case and that in fact the energy flows in the space outside the wire."

Our only comment on Heald's statement is that electrodynamicists do not utilize the concept of the *electron as a system in a violent energy exchange with the vacuum*, and do not include the asymmetry of the charges with the vacuum VPF, the formation of the virtual dipoles, and the emission of the charge systems' individual Poynting energy density flows $\mathbf{S} = \mathbf{E} \times \mathbf{H}$ as the collective *cause* that produces the circuit's \mathbf{S} -flow, \mathbf{E} -fields, etc.

44. Here I interpret Bill as stating the mutual crowding of additional like charges on each side of a double layer, as constituting the increase of charge density in the double layer area. This contrasts to "normal" capacitive double layer where the signs of the charges on each side differ. In the Fogal case, what would normally be the "flow-out" of charge from one side of the double layer is reversed due to the unexpected phase conjugation effect of the tantalum, and the blocking of the bleed-off by the parallel resistor.

If we consider the constituent bidirectional waves comprising the potential formed by this charge compression effect, the hidden biwaves form optical pumps for the tantalum material, which is acting as a pumped phase conjugate mirror. In turn, this acts as a sort of amplified negative feedback to reverse the bleed-off usually performed by such a parallel resistor. If this amplified phase conjugation effect is added, then high charge densities of like sign are developed on both sides of the double layer. I interpret this "crowding together" in tightening clusters, of the like charges on both sides of a very sharp boundary (the double layer), as Bill's "compression of charges."

The result is that what would otherwise be a single double layer now has *another* double layer immediately surrounding it, with the inner double layer increasing its charge density much greater than that found in a normal double layer, because of the thwarting of outflow bleed-off and stress relieving. A very steep electrostatic gradient — and consequently

a large blocking **E**-field — results from the triple layer action. This "triplet layer" effect would seem to provide a mechanism for *significantly amplifying the effect of a normal double layer*. If valid, then Bill has incorporated a "new" kind of overpotential effect.

If so, two effects should thus become apparent: (i) even a very small voltage (e.g., microvolts) across the new, amplified "outer" double layer can produce an *unexpectedly large* charge barrier **E**-field, since the separation distance across which it exists is compressed smaller than the original separation distance, and (ii) the Poynting flow **S** from the amplified double layer is also amplified as a function of the square of this increased **E**-field, compared to the **S**-flow from a *normal* double layer without charge compression. At least something very similar to the preceding is happening in the transistor, which can perhaps explain (i) its extreme sensitivity, (ii) its extreme reduction of noise in the processed and passed Poynting flow signal, and (iii) its dramatically increased frequency range and response. Obviously a great deal of very exacting, specialized laboratory testing must be accomplished on the semiconductor in order to fully develop and substantiate the unusual mechanisms occurring, and the full parameters of the device.

45. This unusual and anomalous "lack of heating" functioning is apparently due to the "time reversal" region still being established in the "bridging" function region of the transistor. Heating by passage of current is due to scattering (divergence) of the photons in the energy flow, usually following electron collisions with the lattice vibrations. With time reversal present in what would otherwise be the normal scattering region, the scattering (divergence) has become reversed (i.e., has become *convergence*) for much of the photon scattering and the current flow. This would seem to be a special, new kind of "electrostatic cooling," or a direct "noise reduction" effect, so to speak.

Just exactly how one models it and thinks of it is still very much to be determined after much more extensive and precise laboratory testing. In my above comments I have only presented what I regard as some probable mechanisms that would explain the novel phenomena encountered. In other words, at best we presently have only a rather "ad hoc" model, and much more work obviously needs to be accomplished before one regards the conceptual model as "solid." However, our comments on the functioning of the transistor and the use of the "inner Stoney/Whittaker" hidden variable electrodynamics should serve to highlight some of the hundred-year-old flaws in the conventional EM theory. At least some of these major flaws and omissions in classical and quantal electrodynamics must be corrected, if the performance of the Fogal Charged Barrier semiconductor is to be properly deciphered and modeled.

46. First, by Stoney *ibid.* and Whittaker 1903 *ibid.*, every scalar potential is comprised of hidden pairs of bidirectional EM waves, with the pairs in phase-locked harmonic series. Now see 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. Here Whittaker shows that any EM wave or field pattern can be expressed as two scalar potentials (rather than the conventional scalar potential and vector potential). By Whittaker 1903, each of those two scalar potentials is further comprised of biwaves in harmonic series. So rigorously, even an "ordinary EM wave" is comprised of hidden biwaves.

47. For every wave accounted for by classical EM theory, there is also an antiwave (time-reversed replica wave) accompanying it, as we discussed in preceding notes above. Both Faraday and Maxwell erred in deleting this antiwave, followed by Heaviside, Hertz, and Gibbs also in their dramatic topological reduction of Maxwell's theory to the present "Maxwell's equations" which are due to Oliver Heaviside.

One may visualize the missing wave this way: When a Drude electron gas in a wire antenna is stimulated, the EM coupling of the electrons to the atomic nuclei is also stimulated. The nuclei are stimulated with equal energy; but the positively charged nuclei are

time-reversed, and their amplitude of oscillation is highly damped due to their much greater mass density. However, equal energy vibrations occur in the nuclei. Consequently, the wire antenna actually "slaps" the vacuum flux medium (i.e., the virtual photon flux of the vacuum) with an injection of two simultaneous disturbances: one from the electron gas "slap" and one from the nuclei "slap." By "slap" we refer to the quantum field theoretic injection of virtual photons. Both slaps inject equal photon densities; the electron gas injects photons and the nuclei inject antiphotons (time-reversed photons). In the vacuum both perturbations have the same damping factor, so the perturbed medium excursions due to the equal photon injections are equal and opposite.

Consequently, what actually occurs in the dually disturbed "virtual gas" medium is a wave of "compression and rarefaction" of the virtual gas. What we mean by "compression" is an increase in local virtual photon flux of vacuum, and by "rarefaction" we mean a decrease in the local virtual photon flux of vacuum. We hold to the proven particle physics that no symmetry of our mass systems can exist anyway unless the vacuum interaction is included; classical EM theory is very much in error in neglecting the vacuum medium. Note that the "wave of rarefaction and compression" is properly modeled as a longitudinal wave, not a transverse wave at all.

We point out that a "string wave" stays on the string; it does not go into the medium it perturbs when the string "slaps" that medium, and it is not the "wave that is in the medium" at all — *unless one postulates that the medium itself is composed of taut strings!* Instead, the slapped medium vibrates with its own degrees of freedom, not with the more restricted degrees of freedom of the perturbing constrained string. Again, both quantal and classical EM theory are in serious error in following the Faraday/Maxwell assumption of the transverse string wave.

We also point out that, due to the separation of the ends of the dynamic dipoles that comprise an atom, there is a very tiny phase lag between the disturbance of the Drude gas in the antenna and the accompanying disturbance of the "nuclei". When the biwave vacuum disturbance impinges upon another wire antenna at a distance, the material in the wire has the same phase lag between its nuclei interaction and its electron disturbance. Essentially what happens is that the time-forward wave of the impinging biwave reacts with the electron gas in the receiving antenna, and the time-reversed wave of the impinging biwave reacts with the nuclei. In the nuclei, the disturbance is just the well-known Newtonian third law recoil — which until now has not had any EM cause associated with it. Now we have presented the actual EM generatrix for Newton's third law.

Let us examine the reaction of the receiving antenna, to this longitudinal wave disturbance that impinges upon it. A longitudinal force perturbation is created upon the electrons comprising the Drude gas. However, the electrons are severely restrained longitudinally, though not nearly so restrained laterally. Further, the electrons are spinning (classically viewed). Since they are restrained longitudinally, they constitute little gyroscopes. Consequently, when longitudinally disturbed, they precess laterally. All our instruments are "electron wiggle detectors" and detect the gyroelectrons' precession and lateral movement. In the electron gas, the *detected* wave is indeed a transverse wave — but that is not at all the perturbing EM wave from the vacuum; instead, it is the *gyro precession wave* of the electron gas. The detected transverse wave in the Drude gyro-electrons actually proves that the incoming vacuum disturbance is longitudinal! Else we must discard the spin of the electron, the longitudinal constraint of the electrons, and gyro precession theory.

In the early days when EM theory was formed, the surrounding vacuum ether was considered to be a thin material fluid, as indeed was electric fluid. The concept of energy flow through space was not yet born, since it was only created by Heaviside and Poynting well after Maxwell's death. Consequently, the early electricians regarded the electrical transverse waves detected by their instruments as being simply an interception of the penetrating transverse waves from the ether. In other words, they confused the electron precession

waves with ether waves, since (i) the electron had not yet been discovered, and (ii) both the vacuum and electricity were regarded as thin material fluids. Maxwell included the material ether (and Faraday's physical strings comprising it!) in his electrodynamics, and it was perpetuated in the subsequent topological reduction to a subset theory, by Heaviside, Hertz, and Gibbs.

So the myth of the "transverse EM wave in the vacuum" continued, and is still present in all our textbooks today — and the assumption of the material ether is still erroneously contained in CEM, in the notion that *force* fields exist in the vacuum. There are no force fields in the nonmaterial vacuum. Mass is a *component* of force, by $F \equiv d/dt(mv)$. Electrodynamics actually assumes that at each and every point in the vacuum, there exists a unit north pole, a unit positive electric charge, and a unit mass — an assumption that foundations scientists are well aware of. E.g., see Robert Bruce Lindsay and Henry Margenau, Foundations of Physics, Dover Publications, New York, p. p. 283, which emphasizes that a "field of force" at any point is actually defined only for the case when a unit mass is present at that point.

It follows from the antiwave generation of Newtonian recoil in the nuclei of the receiving antenna, that were we to redirect the antiwave before it struck the nuclei, then the atomic nuclei would not recoil and the antenna would exhibit an "apparent violation" of Newton's third law. This has already been widely done, in phase conjugate mirror reflectors. Here the incoming waves undergo multiwave interaction due to the nonlinearity of the situation. The antiwaves from the incoming signal wave are interacted outside the nucleus, and redirected back along the path of the signal wave (via the distortion correction theorem). But that means that Newton's third law reaction mechanism did not occur, since the antiwaves did not interact with the nuclei to generate the reaction. One would therefore predict that a phase conjugate mirror, no matter how strongly pumped, will not recoil when it emits a powerful phase conjugate replica wave. And that is true, as has long been proven in PPCM theory of nonlinear optics, although there it is "explained" (actually *described*) quantum mechanically.

We can in fact also utilize this process for "absenting a force-creation mechanism" effect to produce antigravity directly in a suitable material on the bench, but that is outside the scope of the present commentary. For an actual experiment that did this successfully, see Floyd Sweet and T. E. Bearden. (1991) "Utilizing Scalar Electromagnetics to Tap Vacuum Energy," Proceedings of the 26th Intersociety Energy Conversion Engineering Conference (IECEC '91), Boston, Massachusetts, 1991, p. 370-375.

48. The wavelength of the switching frequency to separate the hidden wave pairs is on the order of the length of the dynamic dipoles constituting an atom, where the negative end of the dipole is one of the electrons in the electron shells, and the positive end of the dipole is one of the protons in the nucleus. This is largely beyond the ability of "charge pushing" switching; instead, optical switching is required. Since the Fogal semiconductor process in terms of field energy and Poynting energy density flow, it can in fact observe such optical switching times — sharply differentiating it from orthodox transistors. In theory, an extremely well-made Fogal semiconductor should be able to switch and *amplify* at frequencies from the infrasonic range to the optical range, and perhaps eventually even into the x-ray and γ -ray range, in the same device.

49. Indeed, the recording medium *does* record all the more subtle information being referred to, but not in a form prescribed by conventional theory. Instead, it is recorded "in" the hidden variable Stoney/Whittaker biwave structuring of the scalar potentials comprising the various lattice vibrations, atomic vibrations, nucleus vibrations, etc. in the medium material itself (a la Whittaker 1904 and Whittaker 1903). Present semiconductors will not detect this dimensioned signal information at all, while the Fogal semiconductor will react to and detect at least some of it. There are literally thousands of waiting applications of this

new "internal electromagnetics" technology. Just as one example, with the proper pinna information detectors, a radar should be able to track a target right through the heaviest of ECM with impunity, with its return signal completely overwhelmed even by 40 to 100 dB down in the jamming noise. Further, all the internal field information of the tracked target is there in the signal, waiting to be detected and processed, as the technology is further developed. The information about what is inside the detected target, under the surface of the ground, or beneath the surface of the ocean is all there in return reflections of signals from the surface, without signal penetration. It just needs detection of the "internal hidden variable EM" in order to be utilized.

50. Refer again to Whittaker, 1903, *ibid*. The scalar potential ("voltage") is actually comprised of hidden wavepairs of bidirectional waves. The test was an attempt to insert signal intelligence (i.e., signal modulations) upon one or more of these "hidden wavepairs" comprising the DC potential. In the mid-to-latter 1980s, Ziolkowski independently rediscovered the Stoney/Whittaker infolded biwave pairs comprising the scalar potential, and also added the *product* set of internal waves in addition to Whittaker's *sum* set. E.g., see Richard W. Ziolkowski, "Exact Solutions of the Wave Equation With Complex Source Locations," Journal of Mathematical Physics, 26(4), April 1985, p. 861-863. See also Ioannis M. Besieris, Amr M. Shaarawi, and Richard W. Ziolkowski, "A bidirectional traveling plane wave representation of exact solutions of the scalar wave equation," Journal of Mathematical Physics, 30(6), June 1989, p. 1254-1269. Ziolkowski in my opinion laid the groundwork for superluminal communication -- for communication with the stars. Further, if there *are* advanced civilizations "out there" in other star systems, then they are almost certainly communicating superluminally, not by the puerile electromagnetics we presently use.

The infolding experiment at Huntsville was the beginning of our experimentation intended to eventually achieve superluminal transmission capability, along the following lines: (i) "Tunneling" of a signal can in a sense be conceived of as the passage of a signal without the passage of a normal potential gradient (force field). In other words, ordinary force-field communications signals involve gradients of the electrostatic and magnetostatic scalar potentials. Tunneling may be the passage without those gradients, and therefore appear to be "force free" propagation. (ii) In turn, one way to conceive the signal "passing" without a gradient (i.e., to conceive a "force-free" signal) is to consider it having "burrowed inside" the scalar potential, so that it no longer requires a "bulk gradient" change in the entire potential. (iii) Since a (normal transverse wave) gradient involves a transverse change, we might consider that this "burrowing" or "infolding" means that the field has simply "lost its transverse component," while *retaining* its longitudinal component. In other words, infolding differs from total absence of the field, in that it is only the absence of the field's transverse component, while the longitudinal component remains. (iv) Interestingly, if one decomposes the electric field into both longitudinal and transverse field components, the longitudinal component is propagated instantaneously. However, if the *transverse* component is also present, it can be shown that it contains a term which *exactly cancels* the instantaneous longitudinal electric field; e.g., see Rod Donnelly and Richard Ziolkowski, "Electromagnetic field generated by a moving point charge: A fields-only approach," American Journal of Physics, 62(10), Oct. 1994, p. 916-922. Thus the (in standard theory) transverse waves we normally produce, simply "blank out" an associated instantaneous communication by their longitudinal components. On the other hand, if we *infold* the signal, so that a "surface gradient" is not present, then we remove the offending transverse component. At least conceptually, then, we have removed the term which canceled the instantaneous longitudinal component. In that case, the "infolded" signal is free to travel instantaneously -- or certainly much faster than the speed of light. Certain anomalies in previous communications testing of a Fogal device, made by one of the leading

communications companies, did reveal what appear to be "absences of appropriate system delay" through satellite links, link amplifiers, etc.

So in our search for superluminal communications, our testing had started at the beginning: Simply see if the Fogal device can *inifold* signals, inside a DC potential, so we can rid ourselves of that offending "transverse field component" and free the longitudinal component. If one believes the exact mathematics of Stoney, Whittaker, and Ziolkowski, and if one also believes quantum mechanics (which has always included instantaneous action at a distance), then *superluminal communication is possible*. And we think the place to start on it, is to begin tests on infolding signals in DC potentials.

Finally, we point out that "infolding" may be modeled in n dimensions, where $n > 4$, as moving the signal out of 3-space into hyperspace. In that case it is free to move superluminally, since a single orthogonal rotation in hyperspace, away from the velocity vector, is what the speed c is. Two consecutive "departing" orthorotations would give (to the normal 3-space observer) a communications speed c^2 . Three would give c^3 , etc. If one insists on 4-d Minkowski space modeling, then infolding is moving the signal into "subspace," where it can move superluminally anyhow.

51. This is explainable by the fact that the reflected field from a dielectric material is not generated just at its surface, but comes from everywhere in the interior of it. For a discussion, see G.C. Reali, "Reflection from dielectric materials," American Journal of Physics, 50(12), Dec. 1982, p. 1133-1136. Rigorously this means that the reflections from the entire volume of surveilled space in the camera image, contain not only surface information from all the reflecting objects, but also voluminous internal information from each and every one of them. This "hidden variable" information in the primary image — i.e., the internal (inifolded) pinna information content of the "gross potential gradient fields" — can be detected and processed by the Fogal semiconductor. Therefore one should not be surprised that the *inifolded content* of a fixed "field of view" image from a video camera can also be scanned "in focus" in both its seemingly blurred foreground and its seemingly blurred background. *The internal information is not blurred!*

Another way of looking at it is to consider a zero vector resultant that is comprised of nonzero finite vectors. The "gross" examination of that system — by a detector that only uses gross translation of electrons — will see nothing at all because its electrons are not translated. On the other hand, an examination of that system by a detector that "sees beneath the zero-vector-summation surface" to the "inifolded" real vectors beneath it, will see a pattern of real hidden vectors and real, hidden dynamics. By using only bulk gradients in scalar potentials and ignoring the Stoney/Whittaker decomposition of the potential into its inifolded hidden dynamics, orthodox EM models have unwittingly discarded consideration of the inifolded real vector components of zero-vector-summation systems. Such zero-vector systems are still very much real entities, containing real energy, hidden dynamics, and hidden information! In the simplest example, these "trapped" energies constitute nested structuring of curvatures of local spacetime. Thus they are little vacuum engines which can act upon subcomponents of physical systems, and upon the hidden EM dynamics of those components, in other than a "gross particle translation" manner.

52. E.g., see Michael Stocker, "Trying to 'pinna' down the localization of sound sources," Electronic Engineering Times, Feb. 3, 1997, p. 44. For information on the pinna transform, see Gardner and Gardner, Journal of the American Acoustics Society (JASA), 53(2), 1973; Wright, Hebrank, and Wilson, JASA, 56(3), 1974; C. Puddie Rodgers, JASA, 29(4), 1981.

53. It is stressed that the backtracking of the emitted wave from the PCMs is convergent and like a "laser beam" rather than a broad wave front. So this is not a "broad wavefront" type of repelling force effect, but instead is a set of pinpoint repulsion-force-generating beams. The energy is far more concentrated at its "targeted pinpoints" than is the same energy in a broad-front force field. Further, the pinpoint effect is iterated for all

approaching atoms and molecules; these are "self-tracked" in pinpoint fashion. In nonlinear optics, such an effect is known as *self-targeting*. In this fashion the "repulsion beam" can actually be "locked-on" to the repelled object, delivering all its energy to that object to repel it. At least in theory, eventually it should be possible to use this effect on an aircraft skin -- for example -- to repel incoming bullets or projectiles.

It also appears possible to adapt this PPCM effect to produce *attraction* forces upon the targeted objects rather than repulsion, but that is beyond the scope of these comments.

In theory it is also possible to develop an electromagnetic antigravity propulsion system, and a concept along that line was developed some years ago and -- at least once -- successfully tested, smoothly and controllably reducing the weight of an object on the bench by 90%. For the results of the test, see 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. Further discussion of this effect is proprietary and beyond the present scope.

54. G. Holton, Thematic Origins of Scientific Thought, Harvard University Press, Cambridge, MA, 1973.

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