Commentary on the Work of Don Hotson

Bill Zebuhr

In 2002, *Infinite Energy* published a two-part article by Don Hotson, "Dirac's Equation and the Sea of Negative Energy" (Issues 43 and 44). These are available online at:

www.zeitlin.net/OpenSETI/Docs/HotsonPart1.pdf
www.zeitlin.net/OpenSETI/Docs/HotsonPart2.pdf

As a casual reader of *IE* at the time the articles first appeared, I did not pay close attention to the depth of the material; however, I was motivated to read them more carefully when Billie Westergard, an astronomer who published an article *IE* #68, stated that he thought Hotson's work might be the best published in physics. By then, I was a technical editor for *IE* and I reread the Hotson articles. First I read them through, realizing I was missing a lot. Then I studied them, trying to see the justification for each assertion and came to the conclusion that Billie Westergard was probably right and these articles might be the best material written in physics; I went on to state this in an editorial (*IE* #69). Don saw my editorial and said that I "smoked him out of his cave." That started a two-year effort that resulted in the third article that is in this issue.

Those two years encompassed a long and difficult journey for Don Hotson and during that time I learned some of how the first two articles were written and realized the tremendous effort and concentration that was put into their creation. In the fall of 2007 I visited Don for a few days in the San Francisco Bay area and I think in that time we spent about 20 or so hours in the most interesting conversation that I have had with one person in that kind of timeframe. Most of this time I was driving as we were seeing the sights of the Bay area. There have been an amazing variety of experiences and thoughts that have contributed to his work over the years. The three articles are a result of more than a twenty year effort to resolve the inconsistencies and unknowns in physics.

Don has studied a lot of physics but does not have a formal degree in it. In an undergraduate course he was told to forget a career in physics because he insisted on asking questions that exposed embarrassing inconsistencies that the professor could not answer—and, for that matter, that no one could answer at the time. He pursued other things, including French literature and a career in land surveying, but the questions lingered and decades after they were asked he started to work on the answers. The pursuit became serious, like a job, then almost an obsession. That is what it takes when the questions are fundamental and no one in the world knows the answers. Some give answers but you know they are wrong. That makes it even harder because there are few "experts" to consult and most of the best have their own theory because they, too, know the given answers are wrong. The existing paradigm becomes under siege from multiple fronts but each attacker has a weakness that denies final victory. Furthermore, the attacks do not lend themselves to a coordinated effort because the weapons are not compatible. Scientists working outside the paradigm tend to work alone on the deeper and more radical aspects of their theories.

Don stood on the shoulders of giants as all good thinkers do, but his contribution to the theory had to deal with a formidable array of unanswered questions and also had to comply with facts derived from massive amounts of empirical evidence gathered over many years by thousands of researchers. The Dirac equation has four roots, two of them negative, and at the time it was derived in 1931 no one knew what to do with the negative ones. The equation's implication was that the universe could be made up of electron-positron pairs (epos), two of them with positive energy and two with negative energy. The negative roots were taken out of discussion by making some assumptions and declarations that seem to have stalled physics for over 70 years. Don has studied the implications of taking the equation at face value and extending the theory and seems to have derived a very impressive set of answers to the most intractable problems with the standard model. Among them are the following:

1. It solves the problem that got Don in trouble in physics class—the apparent violation of conservation of energy that occurs during "pair production" when a photon of at least 1.022 MeV "creates" an electron-positron pair and does not account for the large spin energy in the "created" particles. Don shows that the spin comes directly from the negative-energy "sea," restoring conservation.

2. The concept of "zero point" or "vacuum energy" grew out of the equations of the vacuum electromagnetic field. These equations showed that, if one removes all positive energy from any mode of this field, there still remains an energy of $h\nu/2$, and this vast energy, calculated to be greater than the energy density of a neutron star, was supposed to exist at the "zero point." This however is impossible, as the zero point has no volume. How can a point of no volume contain almost unlimited energy? But if one removes all positive energy, what remains, Don showed, is negative energy. This energy belongs to the negative-energy Bose-Einstein Condensate (BEC) which is all-pervasive, but undetectable except by its effects on our dimensions, such as non-locality. Don also showed that this vast BEC is the power supply for all matter. The spin energy possessed by all particles, which conservation cannot explain, comes directly from the BEC.

3. The concept of negative energy is broadly encompassing and has been kept under the rug for over 70 years. Both the Dirac equation and the energy equation, including the momentum term, have positive and negative roots. This theory describes the result and its implications for the structure of the universe. The view of the whole universe changes dra-

matically when it is included and understood.

4. The nature of the electromagnetic field is revealed and explains for the first time how it can act at a distance and also instantaneously. Neither can be explained by conventional theory.

5. It explains the roughly equal numbers of electrons, protons and neutrons in the universe. Electrons appear to be simple particles, not made up of parts, whereas protons and neutrons appear to be made up of many parts, so one would expect that there would be far more electrons than protons and neutrons. The theory makes a strong case for the universe to have started from neutrons with the other particles resulting, in their observed numbers, from beta decay.

6. This synthesis also produces electrons and protons of exactly equal charge even though they differ radically in mass and structure.

7. Experiments show matter and antimatter to be created in exactly equal amounts, but we observe a very small portion of antimatter in the universe. This theory shows that the quantity of antimatter is equal to the quantity of matter and explains why it is not observed.

8. The size and mass of the nucleons is derived and explained. Conventional theory gives no rationale for either

9. The strong force is explained and unified with the Coulomb force. The strong force is observed and measured but so unlike any other force that the standard model has no explanation for it. It is nearly 2,000 times stronger than the Coulomb force and operates in a completely anomalous matter: up to a distance of a little more than a Fermi it is very strongly repulsive to keep the nucleons from merging. At that distance it turns strongly attractive to hold the nucleus together and after that it decays rapidly until, at a distance of about three Fermis, it is no longer measurable. Instead of a fundamental rationale, the conventional theory is patched with the invention out of thin air of the gluon, made unobservable, and assigned it the role of holding the nucleons together. The Dirac/Hotson theory accurately models both the strength and the very peculiar shape of this force. This is a very strong indication of the merit of the theory because the odds of obtaining this kind of precise fit with observation of such anomalous values is vanishingly small as an accidental byproduct of an erroneous theory. The unification of the strong force and the Coulomb is a major achievement.

10. The theory explains the nature of gravity and unifies it with the electromagnetic force. This description is consistent with the observation that gravity seems to act instantaneously. Gravity is shown to be limited in distance so that it is weakened near the edges of galaxies. This eliminates the need for so-called dark matter that has been invented in an attempt to save the current theory of gravity.

11. The structure of atoms is addressed (in the current article) to give a solution that can justify the observed strength of materials in spite of the huge proportion of empty space compared to the size of the nucleus and electrons. A proposed structure of a hydrogen atom is given that offers a rationale for the rigid positioning of the electron at a given radius around the proton and how this builds a structure that prevents the intrusion of other electrons and atoms.

12. One of the great strengths of the theory is that it is not limited in scope. All forces are unified and applied to the macrocosm as well as the traditional quantum world. The spacing of the planets and moons in the solar system that follow Bode's Law is shown to be a result of gravity in combination with a wave of polarization that originates with them. This explains a number of anomalies about the behavior of planets and moons that have not had satisfactory explanations to date.

13. The implications on the theories of cosmology are profound. In 1921 the German physicist Walther von Nernst predicted that light from distant galaxies would be found to have lost energy in transit as every other example of transmission over a distance had demonstrated. This "tired light" theory did not gain acceptance because it was argued that space was empty so that the energy lost in transmission would have nowhere to go. Thus the red shift was attributed to the Doppler effect and has profoundly shaped cosmology ever since. This theory overcomes the objection to the loss of energy and resulting red shift and is a much better explanation. Thus the "big bang" is not needed and probably never happened.

These highlights are profound, but much more is offered by this theory and all science is affected by extension. Among them are the transmutation of elements that seems to occur in experiments that on the surface seem to be only chemical in nature and that seem to occur in plants and animals. These transmutations have been noted many times for over 100 years but seem never to attract the attention of mainstream science. The probable reason is that there is no current explanation for them and they are only an embarrassment if discussed. A better understanding of these phenomena may facilitate the science of cold fusion as well as biology and the medical profession.

Another very controversial subject is the existence and properties of so-called psi phenomena, which encompasses a variety of currently unexplainable events such as telepathy, remote viewing, telekinesis, ability to see future events, and even extends to some UFO phenomena. A lot of serious work (as well a lot of nonsense) has been devoted to this subject without it being seriously considered by science in general. Again, this is mostly because there is no room for it in mainstream thinking and also because it is notoriously irreproducible. However, as the cold fusion community knows, and the Wright Brothers knew, early experiments are not based on a sound understanding of the science and there is a lot of fumbling in the dark. The Dirac/Hotson theory opens a door for the study of these things. Even if it is all nonsense except for a single event that cannot be explained by the existing paradigm, then the paradigm has to change to accommodate it. I think there is plenty of evidence that psi is real and that science has a lot of explaining to do. *IE* has cited the work of William Tiller and other well respected scientists who have offered proof and some explanations for psi and Don extends this thinking in the paper presented in this issue.

The theory presented in the Hotson papers is radical in nature and huge in scope. It is the result of over 20 years of hard creative work but is just the beginning of a potentially

very important and comprehensive addition to our understanding of the universe. Others must now comment and extend the thinking. Some ideas may not be valid upon further study, but the theory addresses so many open questions so well that a very strong case is made for it being worthy of further study. *IE* readers include a significant portion of the thinkers that may be able to make constructive comments and we welcome them. There is a good chance that a lot of new science can come from this effort. The value of that would be hard to over-estimate. The whole view of quantum mechanics, relativity and cosmology would change radically and as the engineering community gained an understanding, exciting new technologies would be developed. The current paradigm would be in chaos and heads would roll, but new and better ones would replace them and a new era in understanding of the universe could begin.

Dirac's Equation and the Sea of Negative Energy, Part 3: Structure and Unification

Donald L. Hotson*

Introduction

The preceding two-part article published in *Infinite Energy* 44 and 45 (see web links to both documents in Bill Zebuhr's Introduction) was entirely predicated on the proposition that a true physics must be based on simplicity and causality. If Dirac's equation means what it says—that it describes everything that waves or every possible particle—it arguably provides the first basis, simplicity: the universe must be built of the four kinds of electron which are the roots of the equation. We have shown at least plausible ways this might happen, ways that solve the glaring problems with conventional physics. Moreover, we have shown direct contact, causal solutions to the problems of the "electromagnetic field" and gravitation, in which we have shown that both represent physical, non-local structures, responses the Big BEC (Bose-Einstein condensate) must make to balance imbalances and maintain its own integrity.

There are a number of developments, unmentioned in Parts 1 and 2, which greatly strengthen the case presented there. First, the Nobelist Dr. Norman Ramsey convinced his colleagues that negative absolute temperatures made thermodynamic sense.[1] Since it is the quantity of positive energy in a substance that gives it its positive energy temperature scale, it should be a perfectly obvious corollary that negative energy must be a prerequisite for negative absolute temperatures. This compliments our symmetry arguments, and the fact that both the energy equation and Dirac's equation have negative as well as positive roots.

Dr. Benni Reznik of Tel Aviv University has demonstrated that the "vacuum" as a whole violates Bell's inequalities, and so acts like a BEC.[2] (Bell's inequalities, and the now voluminous proofs thereof, show that two particles or photons, created in the same event, remain "entangled" with each other, sharing the same wave function, no matter how far apart they may move. Thus an action on one instantaneously causes a complimentary change in the other.)

Dr. Reznik demonstrates that two unentangled probes, inserted into the "vacuum" at random distances, rapidly become phase-entangled. This is behavior one would expect from a BEC, not a "vacuum," and can hardly be understood except in terms of a universal BEC. Since the Dirac papers insist that the "vacuum" is a universal BEC, this represents an immense verification of its thesis.

This is only one of a number of demonstrations, recent and ancient, that entanglement and superluminal effects are real and fundamental factors. For instance, it has been known since Laplace that gravitation must act much faster than light, or the earth/sun system would form a "couple" and the earth would spiral off into space.[3] That gravitation acts almost instantaneously has been shown by studies of contact binary stars, which show that it must act many orders of magnitude faster than light. Astronomer Dr. Tom Van Flandern has shown that General Relativity, though it gives lip service to the "light speed limit," simply goes on to assume instantaneous "changes in the curvature of space" in its equations, and so is non-local.[4]

Further, it has been known for decades that electromagnetism acts faster than light, according to a whole series of experimental results starting with the Sherwin-Rawcliffe experiment[5] and continuing with those of the Graneaus[6-10] and Pappas.[11-13] These experiments all show that changes in the electromagnetic field must propagate much faster than light, apparently instantaneously, so that a moving charge has no "left-behind potential hill." Thus changes in electromagnetic potential must propagate apparently instantaneously over any distance.

A BEC has been shown by laboratory experiments to be all one thing, so that an action on one end of a BEC causes an instantaneous reaction at the other end. Therefore a universal BEC is the only plausible explanation for these burgeoning superluminal effects.

But we require a further, in-depth look at causality.

Causality

Physics, as practiced by Newton, Faraday, Maxwell, Lorentz and company, had causality as its very basis: the study of physical effects on physical objects. The *American Heritage Dictionary* defines physics as "the science of matter and energy and the interactions between the two." Until the twentieth century, Newton's pronouncement on "action at a distance" was considered an axiom:

> . . .that one body may act upon another at a distance through a vacuum without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity that I believe no man who has in philosophical matters a competent facility of thinking can ever fall into it.[14]

Maxwell introduced the "field" concept, but only as a computational device, never doubting that there was a physical mechanism operating to perform the functions involved. But starting with Einstein, and his abandonment of a substantial "aether," the "field" became a supernatural

device that magically wafted energies across the void wherever needed, and allowed us to forget we had abandoned physics when we abandoned causality.

Ask a physicist exactly what a "field" is made of, and how it acts to magically convey energy across the void, and you won't get answers, only hand-waving and formulae. But with this "field" devoid of any physical mechanism, a hocus-pocus wave of the wand was introduced at the heart of the discipline, and we all became magicians.

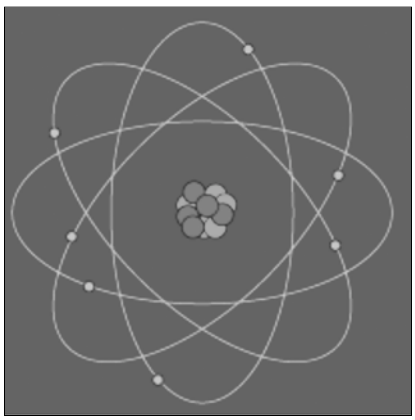

Figure 1. Bohr's atom.

Thereafter, whenever experimental evidence contradicted current theory, we had a ready-made answer. An invented "field" and its invented particles, designed to be unobservable, hence not subject to falsification, could always produce at least apparent conformity with theory. This validation of the fudge factor was then duly ratified by the Nobel Committee, in its awards for the infamous "renormalization" fudge. This meant that regardless of the experimental evidence, the theory didn't have to be modified, and no one had to change their ideas or (horrors!) learn anything new. As in the Mikado, "And you are right, and we are right, and everything is quite correct!" This has fossilized physics, preventing any real debate or change, and led to the currently fashionable "string theory"—an exercise in pure mathematics, devoid of any suspicion of physical content. As Carver Mead famously remarks, "It is my firm belief that the last seven decades of the twentieth century will be characterized in history as the dark ages of theoretical physics."[15]

In Mead's book, we have seen that extensions of Dirac's equation restore causality to electromagnetism and gravitation. This must be counted among the triumphs of this approach. But there is one further, glaring instance where modern theory substitutes magic for physics. According to QM, QED, and the Standard Model, "solid matter" is a vacuum much more vacuous than outer space. So this problem could be stated as "What the Bleep are we standing on?" How can a vacuum much more vacuous than outer space support anything, much less pressures of thousands of atmospheres, as in dense stars?

The Twilight of "Magic"

We are assured that we are standing on the Pauli Exclusion Principle, and that it is based on absolute mathematical laws—that spin-1 bosons are symmetric, whereas spin ½ Fermions are anti-symmetric, and that this absolute law means that no two fermions can occupy the same space with the same quantum numbers. Ask, however, for a definition of "the same space" and things begin to get a little weird. An electron's "space" somehow includes large areas far from it, for instance on the other side of its atom, and simultaneously at both north and south "poles" of its current trajectory.

Moreover, if you increase the pressure sufficiently, the absolute laws aren't so absolute after all—the absolute laws change and atoms become "degenerate." And at even higher pressures, the degeneracy goes to a maximum and the electrons are all pushed back into protons to become neutrons.

But if this anti-symmetric law were based on absolute mathematical principles, there should be no exceptions, regardless of the pressure: at any pressure, no two fermions should be able to occupy the same space with the same quantum numbers. Instead of an absolute law, this begins more to resemble a very strong structure, capable of withstanding great pressures, but like any real structure, as opposed to magic ones based on "absolute mathematical laws," sufficient pressure will cause it to "change laws" and begin to crumble.

Further, this absolute mathematical law must act much faster than light to keep another "nasty" electron (one with the same quantum numbers) from penetrating. What if the nasty electron enters at high speed, from the direction opposite to the instantaneous position of the "home" electron? What knows that the incoming electron is nasty, and acts instantaneously to keep it out? What samples the incoming electron's quantum numbers, and decides if they are different, and allows it in, or the same, and instantaneously excludes it?

Obviously magic, not physics.

Bohr Magic

Since Niels Bohr developed his atomic model nearly a century ago, the cozy representation of the atom has pictured a nucleus at the center, like the sun, with electrons orbiting nearby, like planets. (See Figure 1.)

But the solar system is a vast, empty space. We are 93 million miles or one Astronomic Unit (AU) from the sun, and Pluto orbits at 39 AU, 39 times further from the sun than we are, or more than 3½ billion miles away. To illustrate this, let's set up a scale model of the solar system (Figure 2).

We are quite close to the sun, with respect to the rest of the solar system. (Remember that Mercury and Venus are even closer to the sun.) Let's suppose we could blow up the hydrogen atom, resizing it to the dimensions of the solar system, with the proton now the size of the sun, and the electron's innermost Bohr orbit at the same scale. Our cozy picture is of the electron orbiting like a planet. (In the Bohr atom model, it would be much closer than Mercury.) So where would be the electron's innermost orbit, in this scaled-up model? Among the inner planets like earth? Among the gas giants? Sorry, it wouldn't orbit anywhere in the solar system.

To show the electron's orbit in its relative position, we need to enlarge the scale again. Once more, the sun, with the proton the same size, is at the left. But now the entire huge solar system, enclosed by Pluto at 39 AU, is just one

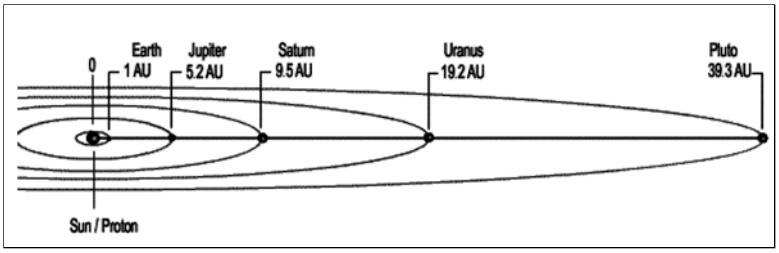

Figure 2. Scale model of the solar system.

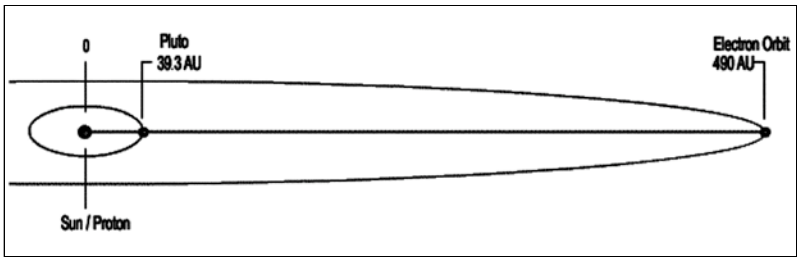

Figure 3. Enlarged scale model of the solar system.

inch in diameter. So where would be the electron's innermost orbit in this model? The electron would orbit six inches from the sun/proton, twelve times as far from the sun/proton as is Pluto, over 45 billion miles away. This is 490 AU, or 490 times further from the sun/proton than we are (Figure 3).

Not a cozy little solar system model any more, is it?

It is now evident that the "Bohr atom" picture amounts to a Little Lie. It has been known to be nonsense for nearly a century, but it is still widely pictured and publicized and almost never contradicted. It is clearly designed to hide from the public (and perhaps from physicists themselves) the vast unlikelihood of the nonsensical concept, preached by conventional physics, of "empty solid matter" (an oxymoron if ever there was one).

For this supposed point-electron must police this immense spherical volume, on this scale over 13,000 times the volume of the entire solar system out to Pluto. How can it possibly keep everything else out, up to pressures of thousands of atmospheres, especially from something approaching from a direction opposite to the electron's supposed instantaneous position? To look at it in terms of the antisymmetric Pauli Exclusion Principle, how can something this vast distance away, 980 AU on our scale, possibly be said to "occupy the same space" as our electron? How can this be anything but the most non-physical "action at a distance"? Einstein called it a "ghost field" (Gespensterfeld), since this miraculous field carries no energy, yet can resist enormous pressures. This is a direct indication that we are dealing with magic, not science.

This immense problem has never been given any but vague hand-waving by conventional physics. Calling it the Pauli Exclusion Principle names it, but doesn't even attempt to give any kind of explanation. You can perhaps "stand on your principles," but only in broadest metaphor. Schrödinger thought that his equation's Ψ wave meant that the electron was perhaps "smeared out" over this immense volume, but the Born interpretation of Ψ^2 as "probability" removed even this "ghost field" of an explanation.

This totally non-physical "action at a distance" which causes the oxymoronic "empty solid matter" to be somehow capable of resisting immense pressures, is only one of the severe problems posed by this solar system model. We might call it Miracle 1.

Consider next the case of a lone electron, approaching a lone (ionic) proton. They are impelled together by the strong Coulomb force between them, which increases at $1/r^2$ as they approach, accelerating towards each other all the way. Yet when the electron reaches the appropriate Bohr radius, where its velocity and the Coulomb attraction are relatively huge, it instantly turns at right angles without any force being applied to it, and begins to orbit the proton as a hydrogen atom. We might call this repeal of the law of inertia Miracle 2.

Next: whenever an electron is accelerated, as is well known, it emits electromagnetic radiation. In the hydrogen atom, our electron is orbiting in continual acceleration around the proton; it should lose energy and spiral into the proton. But somehow, against everything we know about accelerated electrons, it does not radiate. We might call this Miracle 3.

Furthermore, the hydrogen atom is electrically neutral. Yet in the Born "probability" interpretation, the electron is somewhere within the confines of the Ψ wave: it simply has a certain "probability" to be in a certain place. But wherever this electron actually is, any measurement of the atom's charge, except where electron and proton are exactly the same distance away, should show the atom not to be neutral. Yet the hydrogen atom is electrically neutral, from any angle. Moreover, the electron and the proton should be impelled together by their Coulomb force, so that even if the electron's orbital motion balanced the electrical force impelling it toward the proton, the proton still must feel this force and oscillate rather than remaining stationary, which is not observed. Thus the electron charge must be somehow "shared" by the entire sphere surrounding the proton, or the atom would not be either neutral or stationary. We might call this Miracle 4.

Born's "probability" explanation does not address this problem. If there is a certain tiny "probability" for the electron to be at a certain place in this huge volume, there is a much higher probability that it is not going to be elsewhere, and the atom would not be neutral or stationary, absent other forces.

There is a further problem with gravitation. Since the electron is such an immense distance from the proton, if it orbited around the proton, the common center of gravity of the electron-proton system would be quite a distance outside the proton, and the proton would orbit around this common center, causing a "jitter motion" which is not observed. We might call this Miracle 5.

So we see that this tidy solar system model of the hydrogen atom requires at least five major miracles to sustain it. However, in other instances where such supposed "action at a distance" seems to occur, we have found the action to be mediated by a physical direct-contact structure of epos, formed into a BEC-like configuration: the electromagnetic field, the Ψ wave of the photon, even the nucleon itself.

Here we might note that every "law of nature" in our positive-energy realm turns out to be merely something that the Big BEC must do to maintain its own integrity: balancing unbalanced charges, expelling positive energy and maintaining it "out of the way" in our "energy dump" of a reality.

To accomplish this, the Big BEC has an infinite number of epos to throw at any problem—since infinity minus infinity is still infinity, there is no chance that the BEC is going to "run short" of epos.

Any ion is a huge irritant to the BEC—it must connect it, even across galaxies, with its corresponding positive charge, and maintain a large "electromagnetic field" to service it. So the BEC would seek a permanent, neutral "box" for the irritating ions, one that would be the least-energy solution.

(The BEC can't just put a proton and electron back together as a neutron, as that requires more than the available energy, and anyhow the neutron is unstable, and would just decay to produce more ions.)

At this point, we need to take a new look at the "epo," because comments made concerning the first Dirac article have shown that the epo wasn't clearly explained.

Both the energy equation and Dirac's equation call for both positive and negative energy. Negative energy has been ignored and all reference to it deleted. But the Standard Model, currently in use, is a theory for massless particles. Incorporating mass throws the Standard Model into chaos, producing infinities which have to be fudged away, and an unobserved entity, the unlikely Higgs Boson, has been invented to "endow" particles with mass in some unspecified manner.

But the only logical definition of mass/energy, which is the same thing according to the energy equation, is a kinetic one, in line with the Lorentz equations, in which motion increases mass/energy. By this definition, energy is the motion of charges and "mass" is a standing reciprocation of charges. And by this definition, positive energy would be charges vibrating in "real" directions and negative energy would be charges vibrating in "imaginary" directions, those indicated by *i*, the square root of minus one, which indicates a direction at right angles to our ordinary three. The square root of minus one appears in most of the equations of quantum mechanics, and is a "wild card"—no one knows what to make of it. But the answer is simple—any time an equation calls for this, it indicates a function that has amplitude in one of these "imaginary" dimensions. (This also is its function in electronics.)

Dirac's equation has four roots, two positive and two negative. I called them "four kinds of electrons." This is imprecise, for Dirac's equation has no mass term: the mass has to be put in "by hand." This is what Dirac did, when he first attempted to use the equation: thinking that the two positive roots must refer to electron and proton, the only two particles known at that time, he entered the average mass of the two. As this didn't work, he realized that the positive energy particle had to have the same mass as the electron, and so predicted the positron, which was soon discovered in the laboratory.

What the equation actually describes is two kinds of bosons, one with negative energy and one with positive: a spin-1 boson with no rest mass, a string if you will, Tau *c* in length, with a positive charge at one end and a negative charge at the other. These charges reciprocate, exchanging the negative and positive charge every Tau. I call this an epo. The negative energy epo vibrates in some imaginary direction, and so has negative energy of $h\nu$. This is proven by the equations of the vacuum electromagnetic field, which show that if all positive energy is removed from any mode of the field, there remains an energy of $h\nu/2$. But if all positive energy is removed, what remains but negative energy? Thus any mode of the field, with positive energy removed, still contains one end of our negative energy boson, thus a negative energy of $h\nu/2$. This proves not only that our negative energy boson field is ubiquitous, but also that, since it is composed of bosons below zero, it is necessarily a Bose-Einstein Condensate (BEC).

According to quantum field theory[16] the simplest quantum field must necessarily be populated with unlimited quantities of identical, neutral, spin-1 bosons. Since the negative energy quantum field is below zero, this field of bosons would necessarily be all one thing: a Bose-Einstein Condensate. This again exactly describes our negative energy sea.

How a particle acquires "rest mass" is illustrated by "pair production." A photon of at least 1.022 MeV interacts with one of these ubiquitous negative-energy epos, and each end of it acquires mc^2 of positive energy, with a half unit of spin from the half-epo. The energy it acquires is a vibration at *c* in two "real" directions. Thus it is a spherical standing vibration in two "real" dimensions and one "imaginary" one.

However, the equations of QM have famously shown that any bare charge, say an electron, is instantly surrounded by an unlimited number of epos, their positive charged ends toward the electron. This ring of epos is further surrounded by a further ring of epos, and so forth. This has led to the most exact match of calculated with experimental values in all of science, the electron's magnetic 'g' factor. Since the opposite happens at a positive charge, this would in itself create the electromagnetic field. (See Figure 4.)

However, QM postulates that these epos are real electrons and positrons, "created" by the charge, which makes the mass and charge of the electron infinite, something to be fudged away. But Dirac's equation shows that these are massless epos merely raised in state from the BEC, from pointing in imaginary directions to pointing in "real" ones. Thus they have "real" energy, capable of "carrying" the electromagnetic force. And since there are epos everywhere, this takes no energy.

To visualize what happens, imagine that the two opposite charges in Figure 4 are an ionic electron and proton. They are strongly attracted to each other by the Coulomb force, and must, one would think, collide. However, despite the Coulomb force increasing at $1/r^2$ as they approach, they do not do so. Why not? Well, imagine that the epos between them, instead of merely dropping back into the BEC, begin to form a spherical structure at the "permitted (Bohr) radii" around the proton, in the shape of the Ψ wave, particularly populating the radius whose energy agrees with the electron's kinetic and potential energy as it approaches. They form a crystal-like structure, with every positive charge surrounded by six negative charges, and vice versa, like an ionic salt.

Then, when the electron arrives, its energy sets up a "standing wave" around the proton, and the electron supplies the "order parameter" which allows the structure to

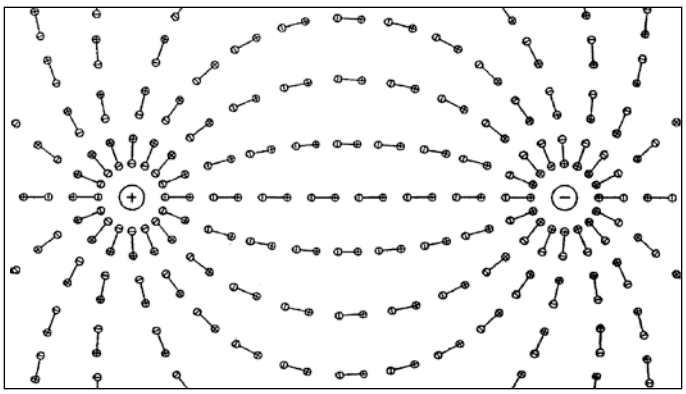

Figure 4. Vacuum polarization around unlike charges.

condense as a BEC or BEC-like object, "all one thing" under the electron's wave function. If this is an "excited" state, it lasts only a fraction of a second, collapsing to the first Bohr radius, emitting a "photon" (transferring angular momentum to nearby epos) and setting up a BEC there. (See Figure 5.)

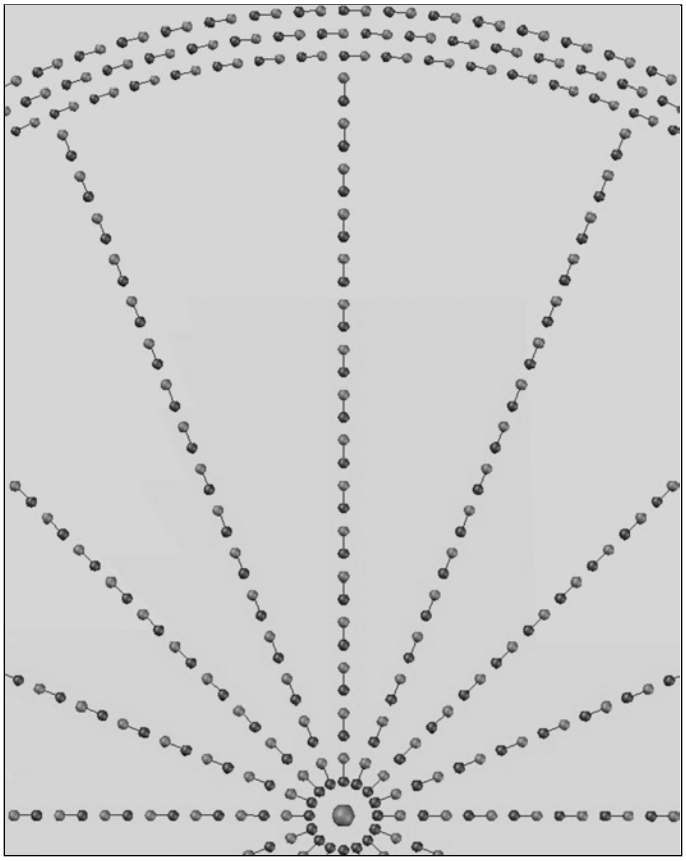

Figure 5. Hydrogen atom. This structure, an "Atomic BEC," is understood to be spherical, many epos thick, and formed into a crystal lattice, similar to the schematic in Figure 6.

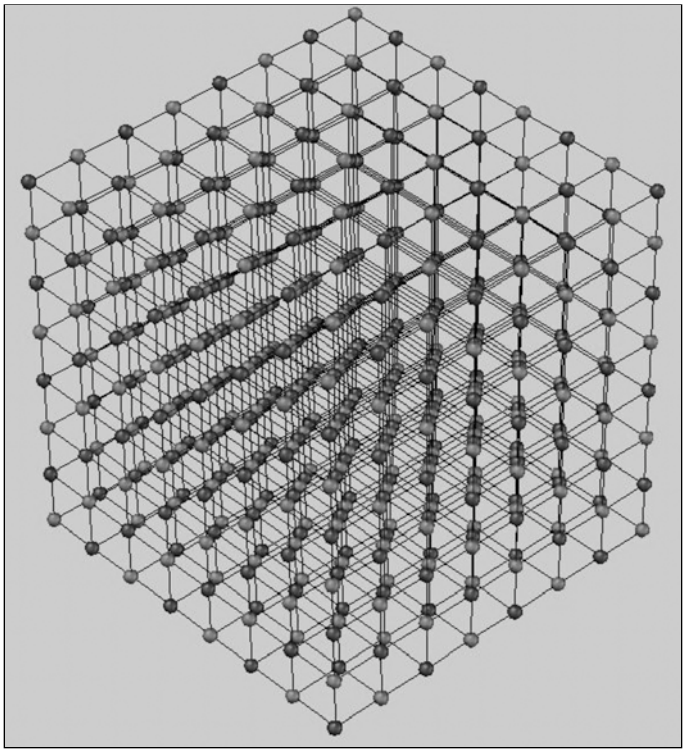

Figure 6. The epo crystal matrix.

Note that the resulting Figure 6 would be a tremendously strong structure, supported by "spokes" emanating from the proton, and having the symmetrical strength of a Buckminster Fuller dome. It has an epo structure wherever the Ψ wave has amplitude, explaining the minor mystery of why the Ψ wave has a tiny amplitude all the way down to the proton. Its strength could probably be computed by structural mechanics, and could resist enormous pressures.

Such an immensely strong BEC-like structure would solve the problem of "What the Bleep are we standing on?" or Miracle 1, above. What about the other miracles?

Since the electron's kinetic energy is totally absorbed by the epo structure as it arrives, and spread throughout the structure possibly as an "excited" state which emits a photon to revert to the "ground" state, Miracle 2 is not needed.

Further, this "Atomic BEC" is a uniform structure with the electron's charge and other properties collectively shared by the entire BEC, which eliminates Miracles 3, 4, and 5.

And since the electron's properties are spread throughout the BEC structure, it would explain Born's statistical explanation, and justify Schrödinger's feeling of a "smeared-out electron" as well. (A measurement of the electron's position, say by an incoming alpha particle, would of course place the electron at the random location where the alpha particle interacted with the BEC.)

Also, since a BEC is non-local, this fact would explain the instantaneous "God-damned quantum jumping" to which Schrödinger so objected. This occurs when an electron in an "excited" state emits a "photon" and reverts to the lowest Bohr energy level, and can be understood when it is realized that the electron's properties, spread among the entire excited structure, also include a certain Ψ wave amplitude at the lowest Bohr level. When the "photon" is emitted, the upper "excited" structure is simply vacated, all the epos reverting to the BEC, and the electron's properties instantaneously inhabit the lower energy level. In the obverse case, where an incoming photon "excites" an electron to a higher state, the photon's energy populates the higher orbital state, which the electron then simply occupies for a few microseconds.

"Self-Organization"

We see the phrase "self-organizing" often with respect to plasmas. It has a long history. David Bohm's early work at Berkeley Radiation Laboratory included a landmark study of plasmas.[17,18] To his surprise, Bohm found that ions in a plasma stopped behaving like individuals and started acting as if they were part of a larger, interconnected whole. In large numbers, these collections of ions produced well-organized effects. Like some amoeboid creature, the plasma constantly regenerated itself and enclosed all impurities in a wall in a way similar to the way a biological organism might encase a foreign substance in a cyst. Similar behavior has been observed by Rausher,[19] Melrose,[20] and others, and is now a commonplace of plasma physics.

However, no one has ever explained how a collection of ions can "self-organize" to act in concert. What is this "self"? How can a collection of ions act in concert, as an individual organism? From a physical standpoint, the phrase self-organizing is nonsensical. To attribute a self to a few ions is the worst kind of anthropomorphism. What it really means is, "This behavior happens, we don't have any idea why, so

we give it a name, forget the dilemma, and go on about our business."

This "self-organization" has become a buzz-word which hides from us the fact that we have no idea how this can happen. Consider the following abstracts:

NONLINEAR PHENOMENA IN PLASMA AS A CONSEQUENCE OF SELF-ORGANIZATION

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Abstract
Recent experiments performed on physical plasma revealed the possibility to establish a direct relationship between non-linearity and the creation of space charge configurations with behavior usually attributed to living beings. Such a "viable" self-organized complexity acts as the "vital" part of a plasma oscillator working with differential negative resistance and, in certain conditions, as the genuine cause of the so-called Turing instability.

FUNCTIONAL DOUBLE LAYERS EMERGED IN PLASMA BY SELF-ORGANIZATION

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Instead of considering the double layer (DL) as generated by two plasma maintained at different potentials, we show that it actually acts as a functional structure that, performing the operations "learned" during its emergence by self-organization, it is itself able to sustain a proper potential drop that separates the two plasmas. We prove this by two facts. First, the self-assemblage process of a DL is a nonlinear process during of which thermal energy from the plasma is directly converted into energy of the electric field of the DL.[1] Locally, and for a very short time, the second law of thermodynamics is not active during this process. Second, for its surviving the DL emits entropy in the form of incoherent light, *i.e.* it formally acts as a system that produces negative entropy.[1] Possessing memory, the DL acts as an "intelligent" circuit element that attributes to the plasma diode the ability to work as a bistable/multistable circuit element.[1-3]

[1]. E. Lozneanu, M. Sanduloviciu, Chaos, *Solitons & Fractals*, in print, available at www.sciencedirect.com
[2]. E. Lozneanu *et al.*, *Chaos, Solitons & Fractals* 17 (2003) 243
[3]. E. Lozneanu *et al.*, *J. Appl. Phys*. 92 (2002)195

These reports are typical of experimental work with plasma double layers. Note the profusion of assumptions that a plasma, a group of ions, can exhibit "learned," "intelligent" behavior. Such language seems inevitable when contemplating the heretofore unexplained behavior of the plasma double layer.

However, the concept of a universal BEC gives the first plausible solution to this dilemma. Instead of being self-organized, it is now clear that a collection of similar ions, a huge irritation to the BEC, is organized by the BEC into the least-irritating, least-energy configuration. We submit that it is surrounded by a structure similar to that in Figures 5 and 6, except for the central proton.

Such a structure, organized by the BEC, would account for all of its apparent "learned," "intelligent" behavior without attributing a self or a purpose to a bunch of ions.

Note that the electron sheath around a proton exhibits most of the behavior attributed to the double layer. Acting as a BEC-like structure, it sustains a potential drop between the atom and the surrounding environment, making the atom electrically neutral. In the plasma, this sheath can support huge potential differences between plasma and plasma, or between plasma and vacuum or "ordinary" gas or matter.

As such, it is governed by the same wave function, and so acts in concert. The BEC acts to isolate this irritation in a pocket, tending toward the spherical, isolating it by means of a membrane called a double layer (also unexplained by current theory) which separates the irritation from the neutralized condition of normal matter.

But this is exactly the behavior of one of our BECs, formed in the laboratory at temperatures near 0°K and consisting of an aggregation of bosons.

Any BEC must have an exact balance of positive and negative charges. An ion can't be tolerated and must be expelled by the BEC. It is suggested that the above behavior of a plasma is not because it is self-organizing, but because the universal BEC can't tolerate a collection of unbalanced ions, and so organizes this irritation into a plasma "pocket" of least irritation, tending toward a spherical form. This plasma pocket acts, in some ways, as if it were itself a BEC. The organization exhibited is because some of its attributes, ordered and controlled by the BEC, are governed by a single wave function.

Our hypothesis is that any aggregation of plasma will behave to a certain extent as a single unit, acting as if self-organizing, because, since it is intolerable to the Big BEC, it is isolated as a body, organized by the BEC, and thus partially governed by a single wave function. Since the wave function is determined by the BEC, whose components vibrate only at *c*, the period of the wave function would necessarily be, for a spherical plasma pocket, its light-diameter. This is according to Hamilton's Law of least action, as in quantum theory the longest-wavelength vibration will have the least energy. Thus the light-diameter vibration will be the stable, least energy one.

The "Atomic BEC"

From the standpoint of the Big BEC, the resulting "Atomic BEC" (hydrogen atom, or any neutral atom) is the least-energy configuration. Ions are a huge irritation, which the BEC must "service" continually. A lot more energy (and an anti-neutrino) would be required to combine the electron and proton back into a neutron, and the result would still be unstable. But this Atomic BEC is a tidy, electrically neutral, non-irritating, non-radiating "package" that the BEC can just ignore, unless disturbed (ionized) by an outside influence. This is the BEC's preferred solution to any group of ions. The BEC just wants to wrap up every irritating ion in a cocoon of epos so it can ignore it.

This Atomic BEC structure is, from the BEC's standpoint,

like an "object" in Object-Oriented Programming (OOP). The BEC can simply set it aside and ignore it, until it is ionized or otherwise disturbed. And like the programmer's "object," it has a handy "label" (the wave-function of the order parameter electron).

This handy label apparently includes the whole atom, including the nucleus. This suggests how massive transmutations can occur, by removing the label. This can apparently be accomplished by catalysts, by high "B" fields, high surges of electricity, and possibly other means. Then a collection of objects dissolve into a bunch of ions ramming around looking for a home, and transmutations occur as the ions come together in different "object" configurations. This can be illustrated by an actual experiment, that by Leonid Urutskoiev. With the author's permission, I quote from a description of the experiment by Georges Lochak which was presented at a scientific conference in Marseille, France.

LOW-ENERGY NUCLEAR REACTIONS AND THE LEPTONIC MONOPOLE

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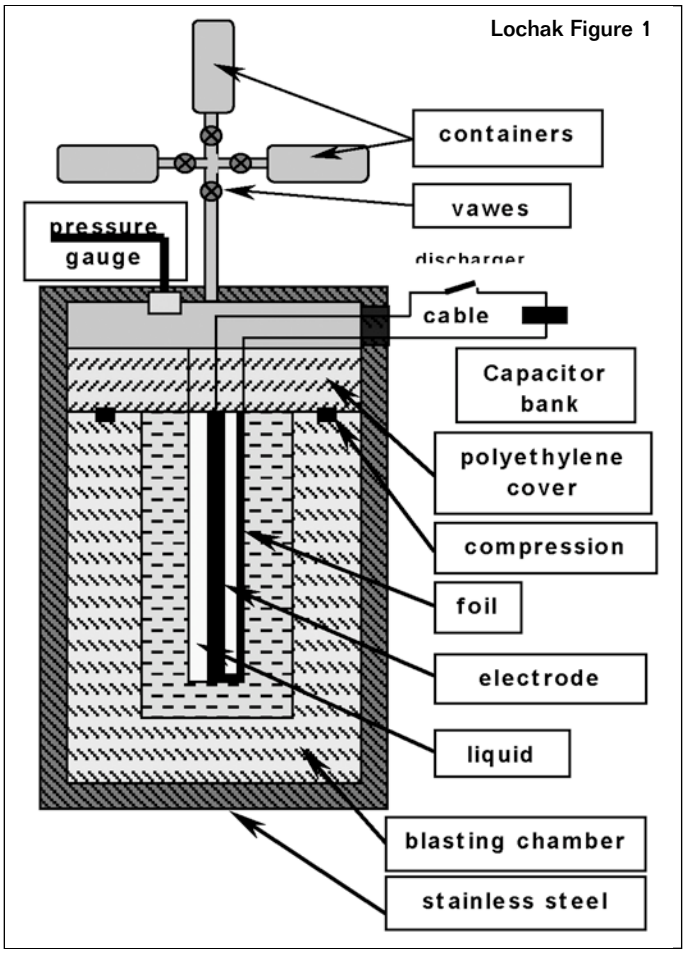
**RECOM, Kurchatov Institute, Moscow, Russia

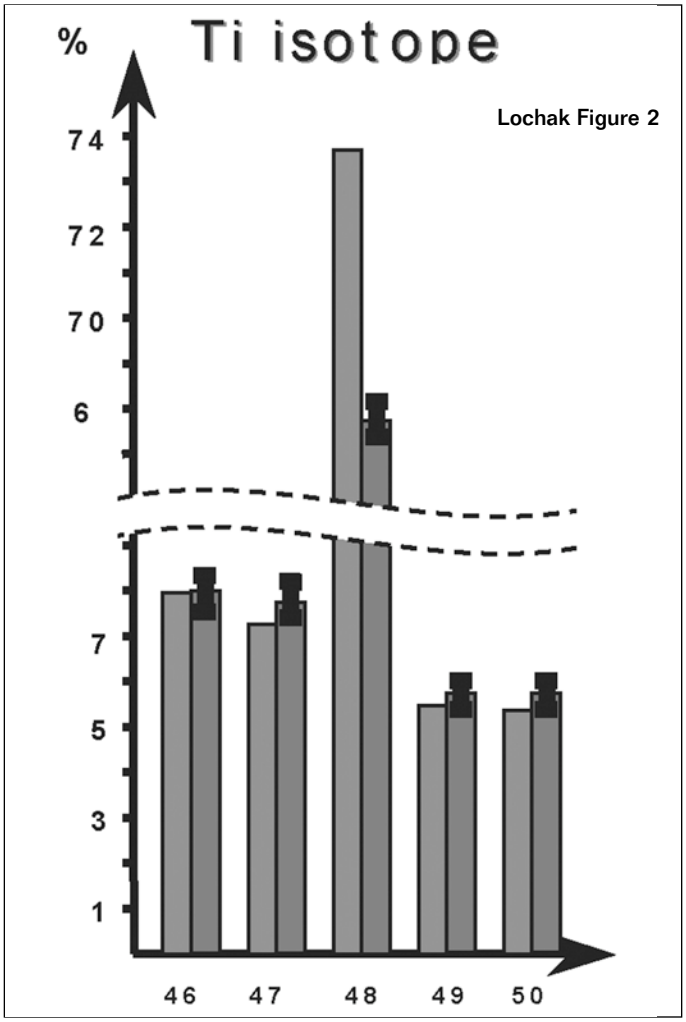
In 1998, to solve some applied problem, our research group studied the electric explosion of titanium foil in water. By pure accident, in mass-spectrometric analysis of the titanium powder formed after the electric explosion, we noted a pronounced distortion of the natural isotope composition of titanium. The principle of the experiment was as follows. Two banks of capacitors with the total energy store W = 50 kJ and the voltage U = 5 kV are discharged synchronously and independent of each other to two foil loads over time t ~ 0,1 ms. Of course, during the long period of our studies, we employed different experimental block diagrams, and I cannot describe all of them. The most general experimental diagram is shown in Figure 1.

The figure shows a half of the setup. The load is located in the explosion chamber, which is a leak-tight strong metallic container, whose internal structure is made of high-density polyethylene. The design of the explosion chamber includes facilities for the gas exhaust and bleeding-in and for taking gas samples into cylinders. The

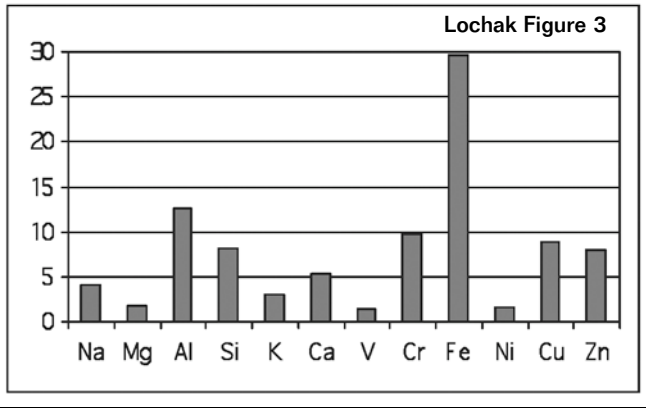
Lochak Figure 1



Lochak Figure 2



Lochak Figure 3



electrodes were made of high-purity titanium. As the operating fluid, we used either bidistilled water with an impurity level of 10^{-6} g/l or solutions of various metal salts in bidistilled water.

The key result is as follows. The remainder of the titanium foil shows a distorted titanium isotope ratio (Figure 2). It can be seen from the Figure that the situation looks as if ^{48}Ti "disappeared" at the instance of the pulse. Please, pay attention that the ^{48}Ti isotope was not transformed into another isotope but disappeared, while other isotopes remained approximately in the same proportion, of course, to within the error of measurements. The deficiency of ^{48}Ti in some experiments is ~5% while the error of measurements is ±0.4%. Simultaneously with disappearance of ^{48}Ti, a sharp (ten-fold) increase in the impurity content in the samples was detected by mass-spectrometry, X-ray fluorescence analysis and so on. The percentage of the new impurities corresponded to the percentage of the lost ^{48}Ti. The chemical composition of the resulting foreign components is shown in Figure 3. All the components that could be present from the beginning have been subtracted.

I am not going to analyze the experimental results, as this analysis has been published in [1]. Nevertheless, the results were so unexpected that they called for an independent verification. This was done by our colleagues from Dubna (Kuznetsov's group). The verification was thorough, and the results were published in [2]. An important result is that, unlike Fleischmann and Pons, we claim that no neutrons are observed in our experiments with the limitation on the neutron flux of I $<10^3$ per pulse. This is a weighty reason supporting the assumption that our "magical" nuclear transformations do not involve strong interactions. [References not shown here.]

The paper goes on to show that the amount of ^{48}Ti missing is almost exactly equal to the total amount of "foreign components" shown in Lochak's Figure 3. They also show that the energy roughly balances as well—the energy released in the disintegration of ^{48}Ti is almost completely balanced in the endothermic and exothermic reactions necessary to produce the "foreign components" in Lochak's Figure 3.

Readers of this magazine will be well aware that such transmutations can and do occur. This suggests a hitherto unexplored "pathway" which could start to explain most, or all, of these transmutations. This makes use of the "label" concept, and notes the vast differences in the results of LENR experiments, depending, I believe, on the mind-set of the experimenter. For the wave function is a *thought*, and in conditions far from equilibrium, as Prigogine stresses (*The End of Certainty*), the path back to equilibrium can take byways that are governed by thought.

This is shown most clearly in biological transmutations, particularly the famous ones studied by Dr. Kervran, in which both animals and plants are seen to have transmuted a wide variety of elements.

A special consensus seems necessary for a miracle to happen. But plants and animals must each contain a special consensus within them, or chickens in the farms of skeptical farmers would cease to produce calcium eggs.

The special consensus is most easily seen in the experiments of Dr. William Tiller[21] in which he uses a team of Chi Gong masters to "condition" the sites of his experiments, after which the experiments work without exception. The same kind of special consensus is found surrounding certain faith-healers.

Recently, a whole series of books has been published, citing the "wholeness" principle that seems mandated by Quantum Connectedness: among many others, *The Conscious Universe* (Radin, 1997), *The Self-Aware Universe* (Goswami, 1993), *The Non-Local Universe* (Nadeau and Kafatos, 2001), and *Entangled Minds* (Radin, 2006).

Radin's books, in particular, establish beyond any reasonable doubt the proofs for a range of psi phenomena; as he says, "The evidence is based on analysis of more than a thousand experiments investigating various forms of telepathy, clairvoyance, precognition, psychic healing, and psychokinesis." All, he shows, are established to combined odds against chance of 10^{104} to one. (Radin, 2006, p. 275). "The evidence for these basic phenomena is so well established that most psi researchers no longer conduct 'proof-oriented' experiments. Instead, they focus largely on 'process-oriented' questions like, What influences psi performance? And how does it work?" (Radin, 1997, p. 6).

These experiments, and others, show that mind and mind, and mind and matter, are connected non-locally. All these books are looking for the non-local medium that connects everything, as they show it is connected, but an explanation of these connections is lacking.

The dilemma for physics is pointed out by Radin. He asks: "What is the nature of this hypothetical medium in which mind and matter are intimately intertwined?" (*Entangled Minds*, p. 236) Further (p. 261), "For physics, we must reside in a medium that supports connections transcending the ordinary boundaries of space and time."

The answer, from Dirac's equation, seems to leap out: the Big BEC, called for by those equations, provides exactly the required ubiquitous, non-local medium connecting everything to everything else in the universe. We have seen that it gives the first explanations for quantum entanglement and the non-local effects of gravitation and electromagnetism. The question is how does it make these connections?

The work of Radin and many other researchers shows that the BEC acts like a non-local, infinitely reactive jelly surrounding and pervading everything. It is thought-sensitive, so that a mind thinking of someone or something here causes a reaction in the object of the thought there.

Radin and others suggest that thinker and the object of the thought are quantum entangled, like the photons in Aspect's experiments, and like the unentangled probes inserted into the vacuum by Reznik *et al.*, which rapidly become entangled.

But Reznik ignores the connection between thinker and object of thought demonstrated by these multiple experiments. It seems evident from this that it is the thought of the experimenter which causes the quantum entanglement, not the properties of the "vacuum" per se.

The "Double Layer"

We have seen above that a plasma, immediately surrounded

by a double layer, seems to act like a living thing, because it is isolated by the BEC. These completely isolated plasmas seem to offer handholds on such phenomena as ball lightning (see "The Missing Science of Ball Lightning" in Vol. 17, #3 of the *Journal of Scientific Exploration*).

Some of these extreme cases of plasmas completely isolated and maintained at voltages differing by billions of volts, called "EVOs," are noted by Kenneth Shoulders in his *Infinite Energy* article (Issue 75, p. 41) and his articles posted on the Web at http://www.svn.net/krscfs/.

It seems evident that Shoulders' EVOs are extreme examples of plasma pockets of many electrons at extremely high voltages isolated by the BEC by a sheath of insulating epos that maintains the plasma pocket in its radical voltage difference from the outside environment.

But there are plasmas with much smaller potential drops between plasma and the atmosphere which are not all-excluding. An example might be the bioplasma which Russian scientists have detected surrounding the human body, and have identified with the aura of metaphysics. This has a mere few volts of potential difference, but can have several layers, and studies have shown that it is maintained by the body and reflects the thought of the mind and the health of the body, with illness showing up first in it.

This bioplasma, intimately connected to the BEC, seems to act like an antenna, sensitive to the health and thought of the subject. Further, it would appear to react to, for instance, the thought of another person, or being stared at by another person, both effects which have been demonstrated by experiment to astronomic odds against chance. In both cases, the body's autonomic system reacts, but whether the subject is consciously aware of the intrusive thought or sight depends on a number of factors, which seem to include whether the subject easily receives signals from her bioplasma.

This would seem to provide a model for at least some of the psi results proven by experiment. The thinker's bioplasma is connected through the BEC with the object of the thought, and causes corresponding changes in the object's bioplasma. They are connected non-locally, quantum-entangled. The amount of information that can pass through this channel seems to depend on the degree of their entanglement. Merely thinking about a total stranger, under laboratory conditions, has been shown to affect the stranger's autonomic nervous system: the thought causes them to be quantum-entangled to a certain extent. But a mother and child, for instance, will be deeply quantum-entangled and will retain this connection throughout life. Thus the occasional complete "visions" which seem to occur in life-threatening situations and seem to occur most frequently with these persons who are deeply quantum-entangled.

Quantum entanglement alone, however, doesn't seem to explain the more robust cases of psi, such as "remote viewing" and psychic healing, both of which have been established by multiple experiments. Nor does it explain the related "Out of Body" (OOB) experiences. These are not readily accessible to repeatable experiments, so these have not yet met with total acceptance by parapsychologists. However, a large and growing body of the closely-related "Near Death Experiences" (NDEs) have been studied under clinical conditions. See, for instance, the two books *Recollections of Death* and *Light and Death*, by Michael Sabom, a cardiologist who reports a systematic study of OOBs in near-death experiences. His subjects, from a "second body" hovering above their near-dead body, (in one case, a body clinically brain-dead), were able to describe in detail operations on their bodies which they could not possibly have physically observed. A burgeoning number of similar studies, while they may fall short of absolute proof, lend considerable credibility to anecdotal reports.

One such is *Mindsight* by Kenneth Ring and Sharon Cooper (1999). This careful study shows that persons born blind nonetheless can see when out of body, and can describe persons, instruments, and surgical procedures they have never seen when in their blind physical bodies. They study 31 cases, some utterly inexplicable except by the OOB hypothesis.

"Reality"

At this point I would like to exercise the prerogative, which is everyone's right, to offer my answer to the question "What is really going on?"

I am going to suggest something that should have been evident from the time of Planck's discovery that our reality was not continuous, but grainy, or "quantum," as it came to be called. This caused a great shock to the materialists. A greater shock came with the discovery that when an electron around an atom jumps from one energy level to another, emitting a photon, it disappears from one level and reappears at the other without occupying any intermediate position. This is the "God-damned quantum jumping" that Schrödinger so deplored.

Further, according to Quantum Mechanics, a quantum object, or "quon," making a visible path through a cloud chamber cannot be said to have a continuous trajectory, but in essence is said to be "re-created" each time it interacts with the substance of the cloud.

Almost worse, it was found that when an electron interacts, it does so at a point of immeasurably small dimensions. Quantum electrodynamics, one of the most successful parts of quantum mechanics, in fact treats electrons as mathematical points, having no dimensions. How can a "real" particle literally have zero dimensions? Where does one find mathematical points but in mathematics, or in a mind doing mathematics?

Moreover, quons of the same type in the same state are indistinguishable from and interchangeable with each other: you might call them "radically identical." "Real" objects are always slightly different in detail. Even if stamped from the same mold, there will be flaws or imperfections which distinguish them, at least microscopically; they are not radically identical. It is only in the realm of ideas that you achieve radical identity. The difference between 3 and 4 is radically identical to the difference between 1001 and 1002, because an integer is an idea, not a real object.

In his famous Lectures, Richard Feynman famously said that everything in quantum physics ultimately comes down to the two-slit experiment, which demonstrates the wave-particle duality of quons. And in this experiment, as physicists have found to their utter consternation, the electron or photon must somehow "know" not only whether one slit or two is open, but whether we are watching or not. It must "know" the entire experimental setup, in principle including the entire physical universe, in order to "know" where to hit the screen. Similarly, a photon, approaching a partially

reflective surface, must "know" not only what kind of surface it is approaching, but also how many surfaces there are, in order to "know" how to interact with it. As Feynman asks, but doesn't answer, "Can we have a theory in which light knows what kind of surface it is hitting, and whether it is the only surface?"

Thus quons such as electrons and photons are ideas, not "real" objects. They consist totally and exclusively of their information, which appears to be what is conserved. We have suggested that the uncertainty principle is best explained as an analog-to-digital conversion. In this, the analog wave formed by the quon's possibilities (the Ψ wave) collapses to a single result at a measurement, and is referred to a mathematical point every Tau, with the uncertainty being the light-distance between measurements. If no interaction or measurement is made, as for example when a photon leaves a distant star, the possibility wave (where it is possible for that photon to interact) simply keeps spreading, and may be larger than the earth itself, until an interaction occurs, collapsing the possibility wave. Thus the information of that distant quantum jump, which created the photon, is conserved.

Since our reality, as we have shown, is built entirely of such integer-like, radically identical quons, each distinguished only by its information, we can make a very large generalization: it is clear that our reality is a virtual, not a "real" reality. It is a mental construct, like a video game, built of information and nothing but information. Information is conserved, and it is all that is conserved, since matter and energy are merely information. (That we live in a virtual reality is, of course, what Eastern philosophies have been saying for thousands of years—that we live in Maia, the Grand Illusion.)

Our virtual reality appears to work very much like a hologram, with the "least count" frequency acting as the hologram's reference frequency: every Tau, or 6.26×10^{24} times a second, a "recording" is made, with every interaction referred to a mathematical point. During the next interval, the analog wave created by each quon's possibilities spreads, until the next "recording" or interaction collapses it again. This reference frequency is the refresh rate of the universe, everything being re-created each Tau, like the refresh rate of a hologram, or of a television screen, refreshed 60 times a second. Thus the complete information of the entire universe is conserved.

When we are enthralled in physical reality, or are playing the space-time-illusion game, we experience this information serially, one frame at a time, like spectators at a film. However, the analog wave from which the film is generated contains information about the past and future, as the director of a film knows what happens next. This perhaps explains the precognitive experiments cited in the above books.

Further, it appears that the universe is "fine tuned," as Sir Fred Hoyle pointed out, specifically to permit and promote life, which is "information rich." Information, in scientific information theory, is something you haven't run into before: something new under the sun. It is unpredictable; and life, particularly human life, is most unpredictable, hence produces the most information.

To recapitulate: our virtual reality consists solely of information, and seems to exist to create and record information. "I" am not my body, but my information, and this can exist separate from my body, and survive bodily death.

Acknowledgement

Thank you to my son, Clayton Hotson, for preparing most of the figures for this paper.

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The Music of the Spheres 2

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In the second part of the Dirac papers (Issue 44, "Dirac's Equation and the Sea of Negative Energy, Part 2), I attempted to show that the solar system is harmonic, arrayed in octaves of *T* (Tau), $2e^2/3mc^3$, the Least Count of the universe, and octaves of 10 *T*. The sun is organized on an octave of 10 *T*, with Jupiter organized on an octave of *T*. The largest influences on the Solar System were demonstrated to be the sun, with most of the mass, and Jupiter, with most of the angular momentum.

The positions of the planets, I demonstrated, are the resultants of a harmonic "war" between these titans, the planets between Jupiter and the sun occupying positions at the intermodulation nodes of this war. Mercury, like a good Quantum Object, oscillates between a harmonic of Jupiter and a harmonic of the sun. The other planets, and the asteroids, occupy intermodulation positions, explaining the rough symmetry of Bode's Law. Jupiter itself occupies an intermodulation position, 11/10 of an octave of Tau. The outer planets, Saturn, Uranus, and Pluto, again occupy positions which are near-octaves of the sun's diameter, with Neptune on a one-half octave position.

The argument is that a spinning body of plasma sets up a standing magnetic wave. The prime wavelength is the diameter of the body, with a node at the surface. Since a wave cannot be confined to a single wavelength, this wave spreads in octave wavelengths and has amplitude (pulls up epos from the BEC) everywhere but at the octave nodes, which, like sand on a tapped drumhead, become the locations of the planets. (This rule is modified, with the inner planets, by the out of phase Tau harmonics of Jupiter, so that they occupy intermodulation positions.)

Further, it was argued that while we couldn't perhaps prove that the sun was the source of a standing harmonic spin wave capable of moving huge planets into position, it was observed that there are anomalies at least consistent with that assumption. Since none of the inner planets are at nodal positions, each should exhibit anomalies which conventional astronomy cannot explain. The review of these started at the sun, with the huge anomaly that the solar "exhaust" is 50 times hotter than the "furnace": the solar corona achieves temperatures of over a million degrees Kelvin, while the sun's surface, at the node, is a mere 5,800 degrees K. Since the corona is expanding away from the sun's surface, it should, by the gas law, cool as it expands. Instead, it is violently heated. Moreover large numbers of protons are accelerated in the same region to relativistic velocities, forming the "solar wind," another unexplained phenomenon.

There are further anomalies with all of the inner planets, anomalies celestial mechanics cannot explain, and which seem to diminish in magnitude at roughly $1/r^2$ from the sun, as would be expected. The advance of the perihelion of Mercury is well known, and is supposedly explained by General Relativity. But the GR answer is outside the probable error. And GR gives no correction for the Venus anomaly, and for Mars, the GR correction is only about 17% of the measured discrepancy.

So GR doesn't seem to provide the answer. Moreover, Van Flandern[1] observes that there is a small but persistent discrepancy concerning the Earth's period between the optical and the radar data. However, a harmonic influence, diminishing at $1/r^2$ such as we suggest, might well explain all of these unexplained anomalies.

Further evidence for this is provided by the gas giant planets. In the Dirac paper it was shown that the satellites of three of these planets occupy harmonic positions, with the first harmonic being the diameter of the gas giant. The paper showed that the satellites of three of the gas giants, by regression analysis, occupied harmonic positions with R^2 values approaching unity. The satellites of Neptune have since been shown by Glen Perry (personal correspondence) to obey the same rule, making it four out of four.

The second part of the paper also made a case that the Jupiter system might be responsible for the sunspot cycle. Successive conjunctions at elongation of Jupiter's three inner Galilean satellites produce explosive pulses pointed directly at the sun, and are exactly on the harmonics of the sun's resonant frequency. The sunspot cycle rises and falls in lockstep with these elongations, and the sun responds with its cyclic magnetic activity. This produces not only the sunspots, but also the 160-minute pulsation. This major resonance of the sun has been documented for 35 years by a Ukrainian team of scientists led by Dr. Valery Kotov.[2] This pulsation amounts to a rhythmic expansion and contraction of the sun's surface by hundreds of meters, and has been rock-solid for the 35 years of their study. Dr. Kotov reported in personal correspondence to me:

> We measured 160-min solar pulsations from 1974 through 2008. The pulsation Po = 160.0101(2) min. was present only during the first 9 years, from 1974 through 1982. But during the total 35-yr length of the observations, from 1974 to 2008, the other period was dominant: P1 = 159.9656(4) min.
>
> Please note the P1 pulsation was absent in 1985-1986 and 1996-1997, *i.e.* at the very epochs of solar minima.
>
> Notice: the beating period of Po and P1 is equal to 399(4) days, *i.e.* the *synodic* period of Jupiter. The origin of this phenomenon is unknown. . .

Preliminary data indicate that the pulsation is again

absent during the present Solar Minimum. Furthermore, those who have followed the dependence of the sunspot cycle on the Jupiter system will not find the presence of the synodic period of Jupiter too unusual.

The Jupiter system appears to act like a homopolar generator, similar to the little meter that measures electric flow to your house. The Galilean satellites act as "projectors," directing the generated energy towards the sun on its harmonics. The sun responds with storms of magnetism, shown as sunspots on the sun, but which energize space in harmonics of its fundamental resonance. The first effect of this magnetic, harmonic storm is the tremendous heating of the solar corona, hitherto unexplained. (Note also that the corona reaches its maximum temperature at roughly a solar radius, which would be the high point of our proposed fundamental resonance, thinning and declining rapidly thereafter.)

The decisive proof that this magnetic harmonic resonance has power even at the distance of the earth has recently been provided by Glen Perry (private correspondence), as follows.

The orbit of the earth is not on a node of this solar resonance, but on the intermodulation harmonic between Jupiter and the solar resonance. Thus this magnetic harmonic resonance from the Sun should have a measurable effect on the earth. And this has proven to be the exact case.

It has been assumed without proof that the earth is gradually slowing down owing to tidal and other forces. But since precise measurement with cesium clocks has been available, it has not done so. In fact, as shown me by my friend Glen Perry, the actual length of day has changed depending on the sunspot cycle—when the sunspot magnetic polarity is one way, the earth rotates slower; when it is the other way, eleven years later, it rotates faster! (See Table 1, from Glen Perry.)

Imagine the power it takes to speed up and slow down the earth! Why it does both, cycling around 24 hours, would appear to be harmonic: the earth's present rotation is in harmony with the sun's 160-minute vibration, so it merely oscillates around 24 hours. (160 minutes times 9 = 24 hours.) This would seem to be proof that the magnetic sunspots and the 160-minute oscillation "spin up" something on earth, acting at right angles to the earth's spin. (Another indication that magnetism is involved—magnetism acts at right angles to electricity.)

There is a further proof of this solar effect. There have been two long-running measurements of radioactive decay rates at recognized scientific institutions. One, at Brookhaven during the 1980s, measured the decay rate of silicon-32. More recently, a German laboratory repeated the measurement with radium-226. These experiments showed that some (but not all) radioactive elements decay at rates that vary with the earth's distance from the sun.[3] This could only be another effect of our solar magnetic wave, varying with distance.

Table 1. Length of Day (LOD) Correlation to Solar Cycle

First sunspot	Solar Max *	LOD rate change
April 54	1958	1962 – slower (-3 seconds)
Oct 1964	1970	1972 – faster (+2 seconds)
June 1976	1981	1984 – slower (-1 second)
Sept 1986	1990	1992 – faster (+2 seconds)
May 1996	2001	2003 – slower (-1 second so far)
Jan 2008	2012	2014 – faster ??

* Solar Max is a 2-3 year event, dates are approximate only

This effect might further be the influence that affects the periods of pendulums during solar eclipses in the Allais-Saxl effect. Particularly in Nobelist Maurice Allais' measurements during the Paris eclipse of 1954, the sun was almost directly overhead. Thus the impulse that deflected Allais' Foucault pendulum by 13.5 degrees from its normal (for that time) 175 degree position would have come at right angles to the earth-sun direction—another indication that a magnetic force was involved.

Effects on LENR

It has long been evident that Low Energy Nuclear Reactions (LENR) happen primarily at surfaces. The preparation and conditioning of these surfaces is a difficult and lengthy process, which has contributed to the difficulty of replicating these experiments. Recently, advances have been made by increasing the surface area, by the use of nanoparticles, powders having dimensions of from 3 to 15 nm.

Recent experiments by Professor Yoshiaki Arata[4] using palladium nanoparticles of 5 nm have produced reliable excess heat and neutron bursts, but replication has failed, apparently because larger clusters had been used in the replication attempts—the large particles didn't have sufficient surface area.

Microclusters, aggregates of fewer than several hundred or so atoms, clearly have much more surface area. Duncan and Rouvay[5] demonstrate that microclusters constitute a new distinct phase of matter. They note, for example:

> Many cluster properties are determined by the fact that a cluster is mostly surface. A closely packed cluster of 20 atoms has only one atom in its interior; a cluster made up of 100 atoms may have only 20. Other properties stem from cluster's unfilled electronic bonding capability, which leaves them "naked" and hence extremely reactive.

However, it is the magnetic susceptibility of nanoclusters that account for their remarkable properties. This is only true of the seven precious metals, which include palladium. Hernando *et al.* (2006), by approximating the nanoscale by utilizing thin thiol-capped gold films, found that this surface exhibited a huge magnetic anisotropy, an effective field on the order of 1,000 Tesla, directed perpendicular to the surface. To show that this was only true of the precious metals with their large numbers of available conduction electrons, they prepared a thiol-capped silicon surface, which exhibited no magnetic anisotropy.

They report that, "The orbital momentum induced at the surface conduction electrons is crucial to understanding the observed giant anisotropy. The orbital motion is driven by a localized charge and/or spin through spin-orbit interaction, which reaches extremely high values at the surfaces. The induced orbital motion gives rise to an effective field on the order of 10^3 T which is responsible for the giant anisotropy."

I suggest that the reason surfaces are so reactive is that a surface atom can accept spin as spin, while atoms in bulk must accept it as heat. Thus surface atoms "spin up" to high spin and spin-orbit coupling, hence to high magnetic fields, as shown above. I further suggest that most of this anomalous spin is obtained from the sun's harmonic magnetic

field, which as shown above is powerful enough to speed up and slow down the earth's rotation.

However, we have seen a progression here. Most LENR happens at surfaces. Nanoparticles with increased surfaces are seen to enhance LENR, but only if small enough so that they are mostly surface, with anomalous magnetic fields. And microclusters, smaller yet, exhibit "amazing magnetic properties," so much so that thin films are being examined as potential superconductors.[6] This all happens with the platinum group metals, the "transition group," so named because they have half-filled (or half-empty) outer shells.

Continuing this progression, what would we imagine to be the properties of a single atom of the platinum group, one not associated with any other atom? It would be all surface, and so would exhibit the above peculiarities, only magnified. It would have "amazing magnetic properties" and would perhaps exhibit room-temperature superconductivity because its "giant magnetic anisotropy" would perhaps produce a Meissner field. With all of its conduction electrons spin-orbit coupled, they would be unavailable for chemical bonding.

Late last century, a cotton farmer named David Hudson claimed to produce exactly such "monatomic" particles, all members of the platinum group. And surprise surprise, he claimed that they exhibited all of the above "amazing" properties: he found that they were room-temperature superconductors, and in bulk their magnetic fields could loop together to produce Meissner fields, so that they occasionally levitated above the earth's magnetic field. Because their conduction electrons were all Cooper paired, they were unavailable for chemical bonding, and thus these "stealth atoms" had never been identified by conventional chemical analytical means. He discovered them to constitute a considerable portion of the earth's crust, and that they represent a portion, perhaps a decisive portion, of brain tissue.

His findings have, of course, been totally ignored by conventional chemists and physicists because, "Well, a cotton farmer! I mean, really!" However, Hudson spent over eight million dollars of his own money, hiring experts and prestigious laboratories in a successful effort to reveal the properties of what he had discovered, and his findings are not to be dismissed in such cavalier fashion.

These stealth atoms exist. They may be isolated by a simple procedure from ordinary sea water. I have done so myself, and have found them indeed to have remarkable electric/magnetic properties. I believe they hold the key to repeatable LENR, and to upsizing LENR to commercial use. By capturing the power of the sun's harmonic magnetic resonance, they further hold promise of uses like "spin batteries," ones that would self-recharge even while powering a vehicle. And because they exist in abundance in sea water, and in ordinary soil, they may be the hitherto undiscovered 'motor' that powers hurricanes and tornadoes.

The challenge to science is immense. If the properties of these monatoms remain the province of amateurs and alchemists, while major inventions are made utilizing them, science will receive a deserved black eye of historic proportions. A major scientific effort is required to capture, tame and understand the properties of these "stealth atoms," but the benefits are unlimited.

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