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Dear Colleagues,

In this issues, we have a number of very interesting articles by well known researchers. As you will see below, we have changed the order of the Table of Contents, whereby we are putting the research articles first, followed by the News and Events section and then the Book Reviews. Because of the importance of the research being conducted, we thought that such articles should appear in the first section rather than last. Just scroll down to the Table of Contents to see the article titles, and then scroll down further to read all of the exciting news.

WISE provides a research institute and a worldwide internet platform for the dissemination of information and research on scientific anomalies, alternative, complementary, and traditional medicine, consciousness, parapsychology, alternative energy, paranormal topics, historical legends, and unexplained phenomena of all kinds. This is accomplished through our many programs, especially the **WISE Worldwide Resource Center (WISEwiki)** and the **WISE Digital Library**. We seek to maximize research collaboration and cooperation on these subjects, and WISE wants to make sure that we include all individuals, worldwide, who would like to participate in the our programs and activities, and not have membership dues or the lack of money to be an inhibiting factor.

Remember that WISE has eliminated all membership fees and dues, but yet provides more programs and benefits than any other organization in this field. (Click here to go to the page showing the seventeen (17) benefits you will enjoy as a member and research associate of this institute.) Instead of dues, we encourage you to become active in our programs and projects, and contribute your passion and knowledge, as many of you are already doing.

As usual, people are joining WISE from all over the world, and more members are volunteering to help with and start research projects, to become division, department, or national advisers, and to offer other support for our great quest to do research on the above subjects. **We now have over 10,000 members and research associates from more than 60 countries worldwide.**

We Thank you all for being part of WISE, and wish you success in all of your research and other projects in 2016, and wish you all Happy Holidays!!!

John H. Reed, M.D., Dominique Surel, Ph.D., Richard Blasband, M.D.

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SPECULATIONS ON THE "GOD MATRIX", ON THE THIRD FORM OF REALITY (GIMMEL),
ON THE REFUTATION OF MATERIALISM, AND ON GLUONS

Edward R. Close PhD and Vernon M. Neppe MD, PhD, FRSSAf [a]

KEY IDEAS: THE THIRD SUBSTANCE, GIMMEL AND THE GOD MATRIX. PART 1.

Our current "Standard Model of Particle Physics" (SMP) can explain a great deal. However, there are rare contradictions and unsolved problems that can be resolved only by applying concepts beyond our usual three physical dimensions of space in a moment in time (3S-1t). The most obvious part of our reality involves only our *over*t *experiential* 3S-1t finite reality. Yet, we argue that most of our *existing* reality is *covert* —hidden from us—and requires applying *multidimensional* models. [3; 4]

However, most of these extra-dimensional models, such as the various String Theories [5-8], involve only complex *theoretical* concepts, yet empirically and mathematically, they're unproven. The exception is the *"Close-Neppe 9-dimensional finite spin model (9-D)"*, which has been mathematically derived and additionally replicated in several different ways. It is quite different as it does not involve the folding, or curling in Strings, but spinning. And that spinning involves vortical rotation through only 9 dimensions, not 10 or 11 or 26 or 5 or 8 or 4. [9] Moreover, the 9 dimensions contain 3S-1t. [1] This means that the 9-D does not contradict the current 3S-1t SMP, but data obtained are additive. [10] Moreover, this 9-D finding confirmed a predicted hypothesis: 9-D spin was the postulated consequence of the finite components of the prior carefully developed Dimensional Biopsychophysical model of the *"Neppe-Close Triadic Dimensional Distinction Vortical Paradigm"* (TDVP) [11; 12], which, even prior to the concept of 9-D spin being developed [13], still reflected an extensive, functioning coherent model of reality. [14]

We have applied the empirical findings of chemistry and physics using mathematical equations. These include new derivations to extend quantum-to-molecular level analyses in this 9-D model. Our calculations have been derived from the quantized level of atoms and elements. Specifically, we apply Diophantine mathematics dealing with integers, because our finite reality is quantized. This means it is integral dealing with whole numbers, not fractions, and, additionally, our reality is volumetric not just points.

A key application of this Diophantine quantization involves the "Close Conveyance Equation" applied specifically to a 9-D reality, using related mathematical techniques, including Close's Calculus of Dimensional Distinctions and Dimensional Extrapolation. These derivations are easily replicable mathematically, and derived from already well-known calculations about the Periodic Table of the Elements and their subatomic components, particularly their electrons, protons, neutrons, quarks and valence.

Based on these Diophantine calculations and derivations, we can demonstrate the empirical necessity for what we're calling "gimmel". Gimmel refers to a third mass-less, energy-less substance or process or matrix. Gimmel is not measurable using the usual physical techniques of solely applying mass and energy. Instead, gimmel must be measured using special quantum techniques that apply integers. In effect, gimmel plus mass-energy summed together calculate into "Triadic Rotational Units of Equivalence" (TRUE units).

Mathematically and geometrically, reality is quantized at every level: electrons, and quarks, plus atoms, compounds and molecules. We demonstrate that the concept of the atom consisting solely of protons, neutrons and electrons with the requisite quarks, but without any third substance (a mass-less, energy-less one, called "gimmel") is mathematically impossible. This refutes materialism at the atomic level. We show that no *subatomic* particles can exist as stable permanent entities without gimmel: Gimmel is necessarily tethered to all particles containing mass and /or energy.

Additionally, we postulate that this third content (gimmel) exists at every level from the subatomic, through to water, DNA and RNA. Gimmel is necessarily ubiquitous throughout nature, even cosmologically, including in dark matter and dark energy. *Gimmel is the key to maintaining all of our existence. Without it, substances could not maintain stability and symmetry* in our physical existence and would, instead be ephemeral and transitory as reflected by collider data. [b]

We speculate:
- that gluons could represent the particle equivalent of gimmel and demonstrate several similarities;
- that gimmel, at least, partly, reflects meaningful consciousness;
- that gimmel might have always existed, and might have origins from the infinite, and
- that gimmel might be a content matrix conceptualized as the "God Matrix". This *metaphor* would be far more than the Higgs Boson, an ephemeral particle, previously regarded as the "God particle". [15 c d e]

INTRODUCTORY PERSPECTIVE TO THE GOD MATRIX (PART 2) [f]

The concepts of "gimmel" and "TRUE units" presented in this paper appear to be of great importance because of their groundbreaking implications. [16] In this section, we begin with what we're metaphorically referring to as the "God Matrix". This accentuates the broader idea of how a mass-less, energy-less third substance, gimmel, might impact as an extended consciousness, and influence all our very existence and everything in the cosmos, from the tiniest subatomic particle to the largest cosmological gradation. But these broader creative ideas originate from carefully analyzed mathematical physics.

The information and derivations below are summarized in this introductory perspective. Importantly, the demonstration of gimmel is an extension of the "Triadic Dimensional-Distinction Vortical Paradigm" (TDVP) [11; 12; 17-19] model, as well as part of the nine dimensional triadic concept. [20] However, the results appear to be startling, and, with respect, like TDVP itself, reflect their own paradigm shift. [1] Moreover, this work is an exploration of the fundamental Nature of Reality allowing our searches for scientific and spiritual knowledge to be merged into one serious, combined effort. This work is an illustration of the missing link. It is based on a hundred page single-spaced article and two shorter ones. [21] [16] [20] Effectively, these publications can be perceived as detailed empirical discussions of several different pertinent areas.

This paper is a summary of the principles and highlights of our findings. It is written for non-specialized scientists and mathematicians. There are conceptual jumps in the ways the actual data figures appear, and this is why we reference these other papers, because readers can justifiably wonder where the data comes from. This section, Part 2, can be regarded as a further, abstracted summary of the whole paper. This will give readers a prioritization of the highlights of our findings.

We emphasize particularly that there are three levels of discussion:
- Empirical mathematical derivations that can easily be replicated using the appropriate methodology: Given that the data is based on sound particle physics and credible cosmological studies, we can argue with strong certainty that even if the data appears new and, for some scientists, ground-breaking, it is correct.
- Speculative concepts and creative ideas: Some of these involve potentially testable hypotheses such as the role of silicon as a life element; and the links of gluons and gimmel. We try to discuss these as feasible assumptions based on the best available data. But, they are not, at this point, easily testable hypotheses.
- At another level of feasibility, we look at what could best be regarded as metaphysical ideas, as they involve theoretical presumptions, or conjectures. An example is the concept of infinite vortical flow as part of gimmel.

We carefully try to differentiate these three gradations so the reader can differentiate proof from speculation.

BACKGROUND:
Quantization and TRUE
In TDVP, we apply quantized phenomena existing in a multi-dimensional domain. [22] This consists of space and time, embedded in one or more additional dimensional domains. But, in conventional mathematics, there is a fiction: the fiction of dimensionless objects. [16] This had been simply a convenient expedient, applied as a mathematical label, prior to discovering that all physical phenomena are necessarily quantized. But this label is no longer appropriate.

If the substance of reality is quantized, the quantum necessarily occupies a finite 3-dimensional volume, not a point. This quantum volume defines the lower limit in size, and by setting it equal to 1, we establish a standard

of measurement so that all substances are measureable in integer multiples of this unit. This allows us to proceed with our new form of mathematical analysis, the 'calculus of dimensional distinctions' (CoDD) [23], and treat all phenomena as finite, non-zero distinctions. Replacing the dimensionless points of the Newtonian calculus of conventional mathematical physics with distinctions of finite unitary volume, the *elementary particles of the physical universe must be integer multiples of these unitary volumes*. We can then relate the integers of quantum reality to the integers of number theory, and explore the deep relationship between mathematics and reality.

Equivalence unit derivations
This model requires the definition of a new, truly basic unit for describing elementary particles. This is because in a quantized reality, all particles must be integral multiples of the smallest possible, most basic quantum unit. We call these units TRUE units ("Triadic Rotational Units of Equivalence"). TRUE units cannot be derived from our usual 3S-1t perspective (3 dimensions of space in one moment [the present] in time), because theoretical nomenclature like the conventional "half-spin" in fermions does not lead to integral solutions. One cannot have, e.g. half a quantum unit, or half an atom. Mathematically, measurements of all fundamental particles (electrons, quarks, atoms) and the third substance of reality (which we call "gimmel") have to involve integers.

Analyses of these data in the framework of the mathematics and geometry of TDVP in 3S-1t provide us with a way to find the true *quantum unit* of measurement. The empirically measured and statistically determined inertial masses of the three most basic elementary entities believed to make up what we perceive in 3S-1t as matter, i.e. electrons, up-quarks and down-quarks, are approximately 0.51, 2.0 and 4.8 MeV/c^2, respectively. The values for up and down quarks are derived statistically from millions of terabytes of data obtained from high-energy particle collisions engineered in specially built colliders.

When we analyzed the elements, importantly, we have found the equations of mass and energy of the *stable fermion particles* (electrons and quarks) (e.g. neutrinos are not stable) to be incomplete without a third component. We have called that component "gimmel', the third letter of the Hebrew alphabet written ג: It is a necessary new term. [16] We hypothesize that mass-energy, and what we assume this gimmel to be, namely, some aspect of 'consciousness' or 'meaning' are unitary major components for the stability of atoms, elements, molecules, and, indeed, all of our stable world and our cosmos. Gimmel is necessarily linked together to form a whole. In fact, it is part of that whole: We argue that we cannot have mass without energy because they are interconvertible, so much so that in our TRUE scoring they are together scored as a single measure. But we cannot have mass-energy without gimmel. Using this concept, nothing can exist without this third component: Like a hand without a shoulder, they are more than linked; they're entirely tethered together. Without gimmel, mathematically, the elements of the Periodic Table, including those that are crucial to life, are unstable. [g] The requirement of a third form (gimmel) allows for stability.

To portray this, we apply the concept of "minimal equivalence units". These are defined by applying basic relativity and quantum principles to multi-dimensional spinning elementary particles. We call these *"Triadic Rotational Units of Equivalence",* or TRUE units.
To represent the elementary particles as multiples of the minimum mass/energy/volume units, we convert the collider data into integers, a process called "normalization". We can then apply the "Conveyance Equation", a specific mathematics of integers, in this instance directed towards nine dimensions. The Conveyance Equation can be applied not only for atoms, but also for the whole Periodic Table of the Elements. We can extend such

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[g] We're limited in English terminology: We could refer to the life sustaining elements as "stable" but that is *relative* only to the. ephemeral unstable elements or isotopes of Hadron Collider particles. Clearly, these elements can be demonstrated by applying 3S-1t (our usual experience of 3 spatial dimensions at the present moment in time) measures, but we postulate it's only because of gimmel, as well. Perhaps we should call all including TRUE units "super-stable".

research to molecules, to the fundamental elements and molecules of life, [16] and potentially to DNA and RNA.

The mathematical and particle physics context

The normalization of up-quarks and down-quarks to multiples of this minimum equivalence unit, based on the electron, is consistent with Planck's discovery that mass and energy only occur in multiples of a basic quantum unit [24; 25], and Einstein's discovery that mass and energy are two forms of the same thing, interchangeable by the mathematical relationship $E = mc^2$. This means that all physical objects are made up of combinations of these minimum units and can therefore be represented mathematically and geometrically by combinations of integer multiples of them [26; 27].

Mathematical features:

In order to properly describe a quantized reality, we must apply the mathematics of Diophantine equations. Diophantine equations simply refer to the mathematics that requires whole number solutions —integers, not fractions. In current theoretical physics, Planck's quantum of action is the smallest integral measure and is substantial in terms of both mass/energy and angular momentum. But that approach results in fractional results not found in nature.

In our model, we incorporate unitary volume in TRUE units and consequently, all TRUE analysis equivalence calculations result in cubed integers. We apply three specific Diophantine calculation procedures to define *gimmel*, the third form of the substance of reality.

1. The first applies the mechanism of Close's dimensional extrapolation [28] (DE) to define the rotation and orthogonal projection from one dimensional domain into another, in the plane of the projection. This means that DE involves integers squared as in extending the *Pythagorean Theorem* [29] allowing extrapolations through *9 dimensions*. [1]

2. The second technique involves the addition of integers cubed, representing the combination of elementary quanta. Based on *Fermat's Last Theorem* for m=3, $X^3 + Y^3 \neq Z^3$, there cannot be any cubic volumetric combination with two components that are stable. [30-32] Mathematically, this means that a nucleus comprised of protons and neutrons with orbiting electrons simply cannot produce stable atoms. The quantum entities must combine in quantum equivalence units (TRUE) to be integral and symmetric. [16]

3. We have shown that, while based on Fermat's Last Theorem, involving $X^3 + Y^3 = Z^3$, there can be no integer solutions for the Diophantine equations in TRUE units, describing the combination of two quantum particles, there *are* integer solutions for the equation describing the combination of three quantum particles [16]. In addition, we show that enduring stability cannot be achieved without three components, namely mass, energy and something else—the third substance (which we call) "gimmel" [16]. This fact is discovered when applying the appropriate equation derived from the generalized Diophantine equation for combining quantum particles: $\Sigma^n_{i=1} (X_n)^m = Z^m$ called *"Close's Conveyance equation"*, $(X_1)^3 + (X_2)^3 + (X_3)^3 = Z^3$ for triplets. [16] Moreover, these Diophantine calculations only work mathematically and geometrically when applied to the 3S-1t observable portion of a 9-dimensional reality model and are therefore easily replicable. [1; 11; 19]

The 9-dimensional requirement is not surprising because elsewhere the authors have demonstrated mathematically that our finite reality has to consist specifically of 9 dimensions—not 8 or 5 or 4 or 10 or 11 or 26. [9] Moreover, these dimensions must be spinning. The 'strings' in the various String Theories generally involve the 'curling' or 'folding' into extra dimensions, and therefore do not work mathematically. [5-8; 33]. We have shown the relevance of the nine-dimensional spin model by applying several pertinent mathematical derivations, including: the derivation of a Cabibbo spinning mixing angle [34-36], the derivation of intrinsic electron spin and angular momentum, and of the shape of the electron which in 3S-1t is symmetrical but non-spherical, of the disappearing electron cloud, and deriving a 9-D mathematical thought experiment, plus with weak universality [11; 22; 36-39].

These derivations are particularly important because they are mathematically replicable and we have published the data derivations in some detail for those who want to perform such studies. [11; 22; 36-39; 13; 39; 40]

This validation of the 9-dimensional finite spin model was specifically proposed as a key aspect of our metaparadigmatic model called the Neppe-Close Triadic Dimensional Distinction Vortical Paradigm (TDVP). [11; 13; 40; 41]. This means that the result was expected as a detailed several hundred page non-mathematical model preceded it and that paradigm appeared to have profound support even without the mathematical justifications.

Specific Equivalence units derivations:
In order to investigate the *something* that we appear to be immersed in, we measure the substances that something is made of —mass measured in energy-equivalent Mega electron volts divided by the speed of light squared (MeV/c^2). We then look for consistent structures and patterns in this substance that can be described mathematically. [16]

Using this approach, we demonstrate the actual gimmel allocations to specific particles based on empirical conveyance equation solutions for electrons, and the different quarks making up protons and neutrons. This approach has been time-consuming but needed in order to demonstrate every available option was examined in order to achieve the lowest valid level figures. For example, the key "lowest figure" is 108 cubed or 1,259,712.

HYPOTHESES
Hypotheses to be tested:
The following hypotheses are tested in this paper:
1. Gimmel and TRUE units, applied subatomically, should reveal mathematical patterns reflecting the fundamental nature of reality, with specific predictable mathematical patterns.
2. The usual life-sustaining elements known to be vital for organic life are hydrogen, oxygen, carbon and nitrogen particularly, as well as sulfur, calcium and magnesium. These should necessarily exhibit higher proportions of gimmel, the quantum-organizing factor.
3. Stability, symmetry and reactivity of elements and compounds are based not only on gimmel proportions, and on the equality or not of protons, electrons and neutrons, but also on their quantum shells, and numbers of electrons in the outer shells making up a model for valence that is predictable.
4. The noble, inert, cosmologically very abundant gases, Helium and Neon, should also exhibit high amounts of gimmel to TRUE, yet their complete outside electron shells should differentiate them and explain their abundance.
5. Based on its uniqueness, water should contain higher amounts of gimmel to TRUE than any other stable, symmetrical molecule. Specifically, it should, contain higher gimmel proportions than hydrogen sulfide.

Hypothetical areas and speculations not specifically covered in this paper.
The following are hypotheses that are mentioned but not tested in this paper:
6. The patterns of gimmel should be from the quantum level all the way through to the cosmological [42]. It should include DNA and RNA [16]. These hypotheses are important, but discussed elsewhere.
7. Gimmel might turn out in the particle form to be gluons or equivalent to gluons. [16]
8. Gimmel might be conceptualized best as a "matrix" of content. If so, because of the *meaningful* consciousness proposed, and its hypothesized origin from the infinite, it might be better portrayed in layperson terms as the "God Matrix". This is far more justified than the demonstration of an ephemeral Higgs Boson particle, which a journalist labeled as the *"God Particle"*.

RESULTS:

Perspective: In summary, we briefly show in this paper, the outlines of the results of hypotheses 1 to 5 above. These were examined, and the postulated data supported. These analyses are *overviewed* below with the results shown in detail in other publications [21; 22]. These derivations were based on careful and repeated empirical mathematical physics calculations to establish which results could be feasibly applied, and the source data is available. [21]

Key Units: The usual measures are mass-energy in units of MeV/c^2. This has been converted to units of "Mass/Volume (Normalized Average)", where electrons become =1, up-quarks = 4 and down-quarks = 9. Protons have 2 up-quarks u1, u2 and 1 down-quark d1 (Table 2A). Neutrons have 1 up-quark u3, and 2 down-quarks d2 and d3. Ultimately, these are combined with their differing gimmel amounts applying Mass/energy equivalents to obtain the total in TRUE units (triadic rotational equivalence units) and volumetrically, we've called the consequent cube MREV ("minimal rotational equivalent volumes"). (Tables 2A and 2B).

Some specific derivations: In Tables 2A and 2B, we show some empirically derived scores first for elementary particles in the atom, namely the different kinds of quarks and the electron (Table 2A); and for the broader components of atoms (Table 2B). The derivation figures of the gimmel and TRUE unit scores were carefully empirically derived figures and are published elsewhere. [21]

Table 2A: Tabulation of elementary particles including their gimmel and TRUE scores

Elementary Particle	Particle	Mass/Energy	ג Gimmel	Total TRUE Units	Combined Particle
e	electron	1	105	106	Electron =106
u1	proton	4	2	6	
u2	proton	4	4	8	
d1	proton	9	1	10	Proton= 24
u3	neutron	4	5	9	
d2	neutron	9	3	12	
d3	neutron	9	6	15	Neutron =38

In Table 2B, we translate these results into protons, neutrons and electrons and show the end point MREV derivation at 108 cubed. This reflects a volumetric result of TRUE units.

Table 2B Tabulation of neptron[h] subatomic particles including charge, gimmel, TRUE and MREV scores

Particle	Charge	Mass/ Energy	ג Gimmel	Total TRUE Units	MREV
Electrons (e)	- 3	1	105	106	1,191,016
Protons (P$^+$)	+ 3	17	7	24	13,824
Neutrons (N^0)	0	22	16	38	54,872
Totals	0	40	128	168	(108)^3

108 cubed

While filling the gaps in the sequence of $(n \cdot 108)^3$ symmetric structures in the Periodic Table, we find that there may be two or more compounds with the exact TRUE volume to fill the gaps, increasing in number as n increases. We also discover that, after n = 9, there are symmetric compounds equal in TRUE volume to some elements. H_2O, for example, has a TRUE volume of $(10 \cdot 108)^3$, the same TRUE volume as the inert gas Neon.

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[h] Neptrons: Composite term for Neutrons, Electrons and Protons, as components of the atom. [16]

TABLE 2C: SUMMARY OF THE TRUE UNIT ANALYSES OF THE ELEMENTS
ADDING IN THE GAPS [16]

Compound	ג Units	Total TRUE	Valence	ג %[i] Units	TRUE Volume	Comments and Abundance rank #[j]
Hydrogen [k]	150	168	-2+1=-1	89.3%	$(1 \times 108)^3$	*Critical Element* [l] *#1*
Deuterium	128	168	-1	76%	108^3	Isotope; rare
Tritium	144	206	-1	70%	$(118.02)^3$	Isotope; very rare
Helium	256	336	-2+2=0	76.2%	$(2 \times 108)^3$	*Inert Element* [m] *#2*
Gap					$(3 \times 108)^3$	Gap [n]
Helium Hydride He_2H	384	504	+1	76.2%	$(3 \times 108)^3$	*Super acid* Not Natural
Gap					$(4 \times 108)^3$	Gap
Lithium Hydride Li and H2 (Deuterium)	512	672	+2	76.2%	$(4 \times 108)^3$	Lithium in Very Reactive Asymmetric #45
Gap					$(5 \times 108)^3$	Gap
$(He)_2H$	640	826	+3	76.2%	$(5 \times 108)^3$	In Nuclear Fusion
Carbon	768	1008	-2+6=4	76.2%	$(6 \times 108)^3$	Organic element #4
Nitrogen	896	1176	-2+7=5	76.2%	$(7 \times 108)^3$	Life element #7
Oxygen	1024	1344	-2+8=6	76.2%	$(8 \times 108)^3$	Life element #3
Gap					$(9 \times 108)^3$	Gap
HO or OH; H_2N; or CH_3	1,174	1,512	-1_o	77.6%	$(9 \times 108)^3$	Building Block of Amino Acids.
Neon	1280	1680	2 –8+10 = 0	76.2%	$(10 \times 108)^3$	Inert element #5
H_2O	1,324	1,680	0	78.8%	$(10 \times 108)^3$	Water
H_4N	1,496	1,848	+1	80.9%	$(11 \times 108)^3$	Ammonium Ion. Gap
Magnesium	1536	2016	– 10 +12 = 2	76.2%	$(12 \times 108)^3$	Life element #9
					$(13 \times 108)^3$	Gap
C_2H	1,686	2,184	+3	77.2%	$(13 \times 108)^3$	Component of Cysteine Amino Acid.
Silicon	1792	2352	-10 +14 = +4	76.2%	$(14 \times 108)^3$	Postulated Life? #8
Gap					$(15 \times 108)^3$	Gap
Phosphorus	1,936	2,558	+5	75.7%	$(1625.008.)^3$	*Asymmetric*
Sulfur	2,048	2,688	+6	76.2%	$(16 \times 108)3$	*Life element #10*
Gap					$(17 \times 108)^3$	Gap
Chlorine	2,192	2,894	+7	75.6%	$(1840.97)^3$	*Asymmetric #23*

And because it contains 2 Hydrogens in its structure, and a low atomic number life element, the gimmel score of water is the highest of any molecule at 79%. This is not surprising, as water is fundamental to life. [p] Ammonium ion is higher at 80% but is only a stable molecule in combination and then the gimmel figure is

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[i] This is the ratio of the gimmel to the TRUE units.

[j] Abundance rank statistics vary markedly depending on whether the cosmos or earth are measured. Therefore two figures existed. However, there is now a third applying the Wolfram statistics and we've used that one. [43]

[k] This analysis is on Hydrogen 1, not isotopes like heavy deuterium H2 or H3 tritium, though these have also been analyzed.

[l] Hydrogen is unique without a neutron and therefore with 'daled' vertically ד has much more gimmel : 38 for daled (0 MEUs). 150/168 = 89.2%. Volumetrically 108^3 = 1,259,712. Hydrogen is the highest gimmel proportion then the life elements.

[m] Gimmel : 105 for 1 electron (1 mass/energy unit MEU), 7 for 1 proton (17 MEUs), and neutrons are 16 for gimmel; 22 MEUs).

[n] Gap implies that there are no elements with their characteristics. We have listed some compounds that do.

[o] Hydroxyl / hydroxide is OH is major component of water and building block of amino acids. H_2N is common in amino acids; CH_3 is a common organic compound radical.

[p] Gimmel is likely an important aspect, but not the only property that gives rise to the uniqueness of any compound.

lower. Still the ammonium finding is surprising and remarkable.

In order to calculate molecular equivalents of the TRUE totals, we have applied a mathematical cubic number, and we find that the total TRUE unit scores for these elements and for the molecules of life and even DNA and RNA are all multiples of the integer 108^3 (Table 2C). [16] This is an example of the extraordinary detail required here in applying effectively the empirical mathematical physics of our elements and other compounds. Additionally, it turns out that all the life sustaining elements have the same number of protons, neutrons and electrons.

This derived figure of $(108)^3$ turns out to be very important because all the fundamental life providing elements, are multiples of $(108)^3$. Additionally, it reflects the most abundant elements in Helium and Neon. Hydrogen 1 (Protium), our most abundant element by far, of course, is fundamental to life and cosmology.

The finding of 108^3 is very likely not a random finding. These remarkable 108^3 figures in Table 2C may reflect the most fundamental minimum math equivalence once calculations of cube roots are done: There are very few Diophantine triplet equation solutions like $(X_1)^3 + (X_2)^3 + (X_3)^3 = Z^3$ involving 3 cubic additions that produce a summation where the resulting cube root still remains an integer. The most basic example is $3^3 + 4^3 + 5^3 = 6^3$, but a far higher level of Diophantine triplet was required empirically to work out (hence 108 cubed). [16]

The key properties of life?
The elements of life
Based on our empirical knowledge of the stable elements known to support life, namely carbon, oxygen, nitrogen, sulfur, calcium and magnesium, we find these elements all uniquely and very strongly exhibit two properties: First, the *same* high ratio proportion of gimmel to the total TRUE unit analysis, namely 0.762.[q] This gimmel ratio is higher than any of the other less essential elements for life. [16] And second, these life stable elements can easily react with other elements forming compounds: They are not inert as their valence is not zero. (Table 2C).

Inert abundant gases
We also show in Table 2C that the inert noble gases helium and neon show the same stable properties as the life supporting elements, however, their valence makes them non-reactive and thus they are not involved in biological processes supporting organic life.
Additionally, we found that silicon has the properties of these elements of life because it, too, shows as a multiple of 108 cubed with equal Protons, Neutrons and Electrons. This is later discussed as a further testable hypothesis. Moreover, certain atomic radicals and molecules are demonstrated to fill the gaps in missing multiples of $(108)^3$.

Stability based on TRUE units:
The simple terms 'stable or unstable' are insufficient to portray differences in the molecules, atoms and subatomic particles that make up our cosmos. We name and describe several decreasing hierarchies of stability: The stable elements based on the empirically derived examples are:
- *Hydrostable* (for Hydrogen): Hydrogen-1 is unique because of its absence of a neutron, though having a proton and electron. Hydrogen-1 shows an MREV score of 108 cubed. It requires a replacement for the absence of a neutron, namely "daled" ד. Daled may turn out to be synonymous with "gimmel" but we cannot prove it, though for convenience here, will include daled in the gimmel calculations.
- *Superstable* elements involve the basic life elements, like carbon, oxygen, nitrogen, calcium, sulfur and magnesium. These elements exhibit stable and symmetrical qualities. Ultimately their MREV scores are multiples of 108 cubed with equal protons, neutrons and electron numbers elements. It is surprising that

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[q] Interestingly, two inert elements that have completed outer electron shells, helium and neon, also yield this figure of 0.762. However, we analyze valence as well in our calculations so that these would not be "elements of life."

silicon is also superstable, allowing for the testable hypothesis of locating silicon related life-forms.

- *Hyperstable* refers specifically to the inert gases Helium and Neon. This is a particularly interesting group involving completely filled electron shells, MREVs that are one or two times 108 cubed, and equal numbers of protons, neutrons and electrons.
- *Dynamically Stable or Life Permostable* elements refer to chemicals such as sodium, chlorine and phosphorus. These are all stable elements but they are not symmetrical. Ultimately, their MREV scores are not multiples of 108 cubed, and they have unequal numbers of protons and neutrons. We hypothesize that these life permostable elements and compounds might exhibit properties that are *linked with their energetic functions:* They allow for the energy packets as these molecules must be asymmetric to function as the sources of biochemical energy packets and exothermic reactions. Some would have expected phosphorus to have been superstable because of its necessity for life, but we propose that it is permostable because phosphate is physiologically possibly the single greatest source of energy.
- *Protostable*. These include elements that exist naturally, such as trace elements like copper and zinc, and medically relevant ones, like lithium. Protostable elements also include relatively rare elements, like beryllium. Protostable compounds generally include metallic elements, and more commonly metallic compounds that have some levels of stability. Protostable elements, like the permostable elements are not symmetrical, though still stable enough to exist permanently. Their MREV scores are not multiples of 108 cubed. Provisionally, as they have not been exhaustively analyzed, the gimmel scores of protostable elements might *as a group* be lower than the permostable elements. Yet, we have found that this hypothesis cannot be applied individually, as the permostable sodium has a gimmel/TRUE ratio of 75.5%, but the protostable aluminum is at 75.6%.

  Iron fits into this protostable group: Some would have predicted that given its fundamental life related contributions, iron might have been superstable, but it is not, though containing the most gimmel of any of the most abundant elements. The iron in hemoglobin acts particularly as a carrier of the superstable Oxygen. Other protostable elements, such as zinc and copper, act as co-enzymes and catalysts. *We propose that the protostable elements and compounds allow for carriage and functioning of the superstable molecules.*

Those that are unstable can be:
- *Naturally unstable* (such as certain isotopes like deuterium) and/or
- *Artificially unstable* (such as those elements and particles produced in atomic colliders, but which cannot naturally occur).

We know that the unstable elements and compounds are neither symmetric nor stable. But we don't yet understand what makes them unstable based on their gimmel scores. The elements high in the Periodic Table with atomic numbers (for example, in the nineties and higher) fit this group. This suggests that the instability might, in part, have something to do with their electron shells. We know, too, that isotopes almost always fit this artificially unstable group. Similarly, the particles produced in colliders also are unstable: Perhaps they do not have the requisite gimmel, but that is pure speculation.

In summary, gimmel is a complex concept that is very relevant to stability and symmetry.
Superstable elements and compounds, and the hydrostable hydrogen contain a great deal of the third substance, gimmel. We speculate that gimmel may be linked with life, order and infinite.
When elements or compounds are permostable, such as phosphorus, they may be important as reflecting energy packets.
When elements or compounds are protostable, such as iron and zinc, they may be important as reflecting carriage and functioning of superstable compounds.

ATOMIC MATERIALISM, THE PERIODIC TABLE AND GENERALIZING COSOMOLOGICALLY (PART 3) [r]

Atomic Materialism

The following summarizes the key consequences of examining atomic reality within the fabric of gimmel and TRUE units (Triadic Rotational Units of Equivalence).

Materialism as conceptualized atomically involved the atom consisting *only* of protons, electrons and neutrons while also containing elementary particles, like quarks. The concept of mass and energy alone is refuted because protons plus neutrons plus electrons alone, or quarks plus electrons alone cannot form the stable integral combinations that we call atoms and molecules.

There has to be a third substance. [16] Without the extra TRUE units of "gimmel", atoms, volumetrically, cannot exist as stable combinations of integer multiples of TRUE units. Effectively, this means that our current perception of any atom or element without gimmel, the mass-less, energy-less third substance, most likely linked with consciousness, will not provide an atom that can exist for any length of time, which is why the pure Standard Model of reductionist materialist Physics has to be incorrect. [16] Moreover, even before we apply calculations pertaining to gimmel, the mathematical derivation cannot result in stable atoms even when simply applied either volumetrically or based on mass calculations. [16] Effectively, the quantal concept of the atom existing in a universe of pure materialism is simply incorrect, because without a third substance it cannot be an integer.

Effectively, in chemistry, we apply atomic numbers, based on the numbers of protons and electrons in elements; but we also recognize mass so we should apply equivalents of mass.

> *The life sustaining and most stable elements:*

We already know that gimmel can allow the extra integers in the TRUE calculations to consistently provide the unique Diophantine solutions relating to multiples of 108^3 for the life elements (Table 2C). [s] *But why do we even need gimmel?* Surely, the remarkable fact that we have found here that the key life elements, plus He, Ne and Si all have equal numbers of electrons, protons and neutrons, is quite sufficient?

The answer is extraordinarily important: No, it is not sufficient! We can demonstrate this by three easy mathematical proofs: The first relates simply to the number of particles' the second relates to measuring integer mass equivalents of electrons, protons and neutrons, after equating the electron as equivalent to 1 because quanta are necessarily integer multiples of the smallest unit; and the third relates to calculations of mass-energy applying TRUE units, and therefore, includes the stable fermions (quarks in protons and neutrons, plus the electrons). [16]

All three "proofs" adopt the classical perspective of chemistry of the atom only being made up of certain stable particles namely electrons, protons and neutrons: Essentially, the sums of the quantized TRUE volumes of electrons, protons and neutrons form Diophantine equations, which, because mass and energy are quantized, must have integer solutions. In Table 2C, we examined the cubes representing the total volumes, not just the number of particles [t]. The lack of integer solutions in these calculations demonstrates a basic asymmetry of the resulting atomic structures that leads to insufficient stability to sustain organic structure and life. [16]

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[r] Edward R Close PhD and Vernon M Neppe MD, PhD, FRSSAf (Part 3)
[s] Helium and Neon are inert elements with complete (full) outer energy shells but they also have equal protons, neutrons and electrons. These are common elements in the cosmos, but because of their non-reactivity are not regarded as elements of life.
[t] For example, their atomic numbers for protons and electrons as they're equivalent in the Periodic Table; and the mass numbers [and atomic weights, which also include isotopes of those elements] approximating to neutrons less these protons).

The first demonstration: the numbers of particles together don't make an atom.

In the first "proof" just working on atomic numbers, the "life" elements (non-isotopic, non-ionic) empirically, have chemically equal numbers of electrons, protons and neutrons. The first approach would be calculating the cubes of these combined particles based on the numbers alone of protons, electrons and neutrons: For the life elements, where these are equal, the solution would equal $a^3 + a^3 + a^3 = 3a^3$ if one was just approaching these particles based on their numbers in each element, effectively in atomic number equivalents. Based on volumetric calculations, the cube root of $3a^3$ is $1.442n$. That, therefore, is not an integer. But if this atomic materialism were true, an integer would be required for our quantized reality. Therefore, when applying atomic numbers, such a result would refute the hypothesis that our reality is purely materialistic and there is no third substance.

The second demonstration: mass and mass energy of particles also don't work

But some might argue that it is not clear that the sum of the cubes of the number of the electrons, protons and neutrons making up the atom of an element, should necessarily add up to an integer cubed. Instead, the alternative approach is that we should be adding *atomic mass equivalents*. For this alternative, applying the mass of these particles, we calculate volumetric equivalence units, applying 1 for the electron and comparing the mass data equivalence of protons and neutrons, deriving our figures by converting to electron =1 from the Jefferson Lab [44]. Under those circumstances, then a single neutron represents 1839, and a single proton represents 1836. Dividing out the 'a' (atomic number) we have $1 + p^3 + n^3 = (X/a)^3$, where X/a represents the mass of the atom. The resultant cube root is 2315.13843… so it is not an integer and cannot be a solution of the Diophantine equation representing elements with equal numbers of electrons, protons and neutrons, not being an integer (the only Diophantine equation with a solution where 1 is involved is the original conveyance equation $1^3 + 6^3 + 8^3 = 9^3$). [u] These comments actually involve two different calculations reflecting the mass alone in kilograms (kg) and the mega electron volt (MeV) as a measure of mass energy. [44] However, the figures turn out almost identical.

We can further justify this approach because it involves the missing link, the third substance, 'gimmel'. But this time, based on our data, we must include TRUE here, because we can show how essential gimmel and the consequent calculations are for the existing atomic stability, even of just hydrogen alone. Our calculations therefore incorporate TRUE units because we now know from our theoretical model and the resulting research results that they are necessary.

The third demonstration: Particles need to be multiples of TRUE units.

In this third demonstration, we note that electrons, protons and neutrons are rapidly spinning elementary particles, which, because of quantum and relativistic limitations, have to be multiples of TRUE units. When elementary particles combine to form a new particle, the TRUE 'volumetric equivalence' [v] of the new particle will be equal to the sum of the TRUE volumes of the elementary particles (quarks and electrons). But for the new particle to be symmetrically stable, it must have a diameter equal to a whole-number multiple of the

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[u] Neutron = $1.6749286 \times 10^{-27}$ kg; Proton = $1.6726231 \times 10^{-27}$ kg; Electron = $9.1093897 \times 10^{-31}$ kg. Neutrons are 1838.9113 or 1839 and cubed 6219352719; and Proton = 0.99862349 so 1836.3799 or 1836 cubed sis 6188965056 with electrons being 1: The total for the atom is 12408831776 so cube root is 2315.138438418182. The figures are similar for EV measures: Electron = 0.51099906 MeV so when quantized to electrons = 1, then neutron = 939.56563 MeV so when Electron =1, then neutron= 1838.6838 or 1839 again so cubed 6219352719; similarly, Proton = 938.27231 MeV or 1836.1529 or 1836 again so cubed 6188965056 and = then the total for the atom of Helium for example is 12408831776 so cube root is 2315.138438418182. If these have the same numbers of protons and electrons, we can add 2315.138438418182n. If not we can use the same Diophantine formula applications, and because it is $e^3 = 1$; so the answer is the cube root of $[1 + (p1836)^3 + (n1839)^3]$ is $\neq$ integer: Theoretically, because of the 1, the Diophantine triplet is ostensibly very imbalanced and not an integer.

[v] Volumetric equivalence (Close and Neppe) describes the minimal volume occupied by the most elementary of particles. This reflects the finite quantum distinction replacing the infinitesimal of Newton/Leibniz calculus. Volumetric equivalence provides the logical volumetric equivalence unit upon which to base all measurements of the substance of reality. [76; 116] Applying concepts from the calculus of distinctions, the minimal *volume* is the 'unitary volume of extent', and its *content* is the 'unitary quantity of mass and energy'.

diameter of a TRUE unit. This relationship allows us to form a Diophantine equation, which is only valid for integer solutions.

Normalizing the mass/energy of up-quarks and down-quarks to the mass of the electron, and calculating mass/energy volumetric equivalence [vv] for the proton and neutron shows that the proton is 17 times the electron and the neutron is 22 times the electron (without applying gimmel).[w] For an atom to be symmetric and stable, the *volumetric equivalents* of the particles must add up to a cube. Without gimmel, the Diophantine equation would then be of the form $(n*1)^3 + (n*17)^3 + (n*22)^3 = Z^3$. But Z is a non-integer because $Z^3 = 15,562n^3$ and 15,562 is not a cube[x]. This demonstrates that no atom with equal numbers of electrons, protons and neutrons can be stable: Without gimmel, all of the elements necessary for organic life would be very unstable.

 Since Hydrogen is the most abundant element in the universe, and organic compounds are, in fact, very stable, proof of the existence and effectiveness of gimmel is all around us.

> *The three scenarios that demonstrate the pure materialistic atomic model must be incorrect.* [16]

We have shown the three scenarios, based on atomic number cubed, atomic mass energy cubed (and ultimately the same figures for mass-energy cubed) and on volumetric equivalents using TRUE units. Essentially, applying the Diophantine solutions *we know that without gimmel there are no solutions for the totality of protons, neutrons and electrons being in the Periodic Table producing an integral atom.*

These three results are consistent and have applied all three hypothesized scenarios to make the atom "whole". This consistency amplifies the point that however one attempts to apply the mathematical derivations, *an atom still cannot be derived simply of protons, neutrons and electrons together.*

These major stable subatomic particles in combination simply cannot allow the necessary requirement for the atom to exist as an integral whole. But clearly the atom needs to be a whole.[y] *Therefore, these obvious empirically based mathematical solutions ostensibly refute the hypothesis of pure materialism: There simply <u>must</u> be something else besides the stable mass-energy particles of protons and neutrons and electrons, as there must be an integral volumetric solution as quanta are by definition integral and volumetric.* This can only be achieved by adding a third substance. [16]

Generalizing across the Periodic Table

What about the rest of the Periodic Table of the Elements that do not have equal protons and neutrons? Applying the known empirical data for all of the approximately 80 stable elements, even when combining unequal but numerically different numbers of protons (*with balanced electrons*) and neutrons in any atom, no other elements *can* produce the requisite cubic Diophantine solution because the cube root of the consequent atom cannot equal an integer. Effectively, where *a* and *b* are integers, with *a* representing both protons and electrons and *b* representing neutrons then in $a^3+a^3 +b^3=2a^3+b^3=c^3$, *c* as the cube root of $c^3 \neq$ an integer. However, for stability it must be an integer so this algebraically demonstrates that without gimmel, stability is not possible.

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[w] The derivation of these figures is explained in greater detail in two of our forthcoming books [45; 46]. 17 and 22 reflect normalizing statistical data because of quantization of the triad of up and down quarks respectively in protons and neutrons with electrons equaling one in volumetric equivalence. This is an entirely different calculation from the total mass or mass-energy derivations of being 1836 and 1839 times more than the electron in the second calculation as it relates to the 9-dimensional model and the third form, gimmel. The derivation specifically includes the demonstrable fermion half-spin variants—the up-quarks and the down-quarks—but does not include the entire particle 'soup' in the neutrons and protons.

[x] The cube root of 15,562 is 24.966…. The closest integral cube root solution would be 25 from 15625.

[y] The major components of the atom are neutrons, electrons and protons. There is no consistent term for the three though sometimes they're included in 'composite elementary particles' or 'composite fermions'. While composite these terms are not exclusive and may be incorrect. For example, there is more than just 'fermions'; and 'composite elementary particles' do not fully reflect this, because components of elementary particles exist such as quarks and a whole "particle zoo' though often ephemeral and unstable within the proton and neutron. Based on the names of the three particles, it's logical for the new name to end in 'trons'. The first letters could then contain each of the three—neutrons, electrons and protons. Neppe and Close have suggested 'neptrons' [16].

A special case for this is Hydrogen, the element that contains the most gimmel or daled because of the absence of a neutron. With Hydrogen, c=0, so $a^3 + a^3 = 2a^3$ and the cube root is not an integer, in this case 1.26a. Similarly the relative mass kg figures and the relative mass energy EV figures make atoms not equivalent to integrals. [16] In like vein, applying the mass TRUE equivalence calculations as above, the calculation is the same as above, $(n)^3 + (n*17)^3 + (n*22)^3 = Z^3$ implies Z is a non-integer. Effectively, there are very few Diophantine triplet equations, and none can work in the Periodic Table to create an integral cube root solution, unless gimmel is accounted for. [z]

The calculus of distinctions

Close's Calculus of Distinctions (CoD) is critical, not the traditional Newtonian-Leibnizian infinitesimal calculus, for our calculations. This is because empirically, we should be applying CoD as everything is quantal is integral. We do not just tend towards zero. In the finite reality, we stop at the quantized minimum, not at zero. This infinitesimal calculus is simply a traditional convenience in mathematics but the approximation of infinitesimals is incorrect in quantized reality. Given the Planckian quantum units, which are integral, it is integers that are critical in measuring finite reality as everything is quantized: This is why we converted *mass-energy* to unitary equivalents. And this is why we apply Diophantine equations, with three terms on the left side because three symmetric cubes can combine symmetrically and may be very stable if the cube root of the result on the right is an integer. This specifically involves using Close's Conveyance Equation in a 9-dimensional Diophantine model.

Nine dimensions are specifically indicated by dimensional extrapolation, pure number theory and, importantly, a part of CoD, the Calculus of Dimensional Distinctions (CoDD). [23] The CoDD defines all mathematical operations in terms of distinctions that are integral, to accommodate the finite components of quantized reality.

The concept of integral equivalents is unique and linked with expanding our experiential 3S-1t to an existing finite 9D spin reality.

Valence:

Pertinently, valence incorporates *both* the number of open spaces *and* electrons in the outer shell of an atom, and the figure applied depends on which is the smaller.

- Both the number of spaces available and electrons in the outer shell together give indications of reactivity and will affect the abundance or lack thereof of elements and their reactivity properties. Geometrically, we propose that the shells in atoms reflect volume and correspond to energy levels. With this approach to re-analysis of shells and electrons, and particularly the outer shells, new concepts of Valence are applied.

- When these Valence concepts are added to Gimmel and TRUE calculations, the Periodic Classification of the Elements can be understood possibly better than before.

- It appears that one can apply mathematical Diophantine Conveyance equation calculations to establish the properties of a chemical and the less the ratio of gimmel to TRUE, the less the reactivity, symmetry and stability.

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[z] The greater the neutron to proton difference, the less gimmel, because neutrons have less gimmel than protons.

PRELIMINARY IDEAS ON GIMMEL THAT NEED CONFIRMATION (PART 4) [aa]

Cosmological justifications of gimmel [42]
A separate but extraordinarily important issue arises. This is also directly linked with TRUE units and gimmel, but this time cosmologically. The data we discuss here is very much necessarily preliminary, but exciting given that it confirmed a hypothesis, and extends the ideas of gimmel, from the quantum level through to the cosmological. [20]

In summary, when one calculates 3 dimensionally, we are applying a triad applying volumetric components. We need to apply that to dark matter. There is an almost exact correlation of the proportion of Dark Matter plus Dark Energy in the Cosmos (based on the latest Planck probe data) [47-50] as the proportion of Gimmel to TRUE units. Correlations are not linked causally but could it be that Gimmel is a mass-less, energy-less component of dark matter/ dark energy, just as it and TRUE plays a role in elements? [42]

Effectively, we hypothesized that the ratios of gimmel to TRUE units and dark matter and energy taken together as a proportion of the cosmos should strongly correlate. [42]

Supporting a remarkable hypothesis
This mathematical result is still preliminary based on our best available figures, but the equivalence, which likely has an error we guesstimate of 1-2%, is very striking. We hypothesized this correlation would work out and it does. Our hypothesis was based on the postulation that if indeed TRUE units are appropriate at the atomic level, they should be at the element level, at the molecular level and indeed all the way through to the cosmological levels. This, indeed, might provide the beginnings of a solution to the challenge of what dark matter and dark energy are. It is one that has been regarded as unsolvable. [42]

The cosmic proportions
Very briefly and preliminarily, the calculation is complex and involves some assumptions of ratios in the cosmos. Effectively, 'dark matter' and 'dark energy' account for most of the matter and energy in the entire universe. The 'dark' components cannot be seen directly with telescopes as apparently it does not emit or absorb light or other electromagnetic radiation. Its existence and properties can only be inferred, and the Planck Probe mission team, applying the standard model of cosmology, calculated the total mass–energy of the known universe as containing 4.9% ordinary matter, 26.8% dark matter and 68.3% dark energy. Applying mass-energy equivalence together, the 'dark' components constitute 95.1% of the total content of the universe. [47-50]. Importantly, the Planck probe data reflecting 95.1% is a linear proportion and should be calculated *volumetrically* as TRUE unit analysis already has cubes as the values. The cube of the 95.1% is *86.1%*, which we would use to compare with the gimmel/ TRUE proportion. As an aside, it is irrelevant that Dark Matter and Dark Energy may be differently located and distributed. The hypothesized correlation still can be tested. [42]

The cosmos is thought to be made up of about 75.6% hydrogen and 24.5% other substances mainly helium (but all these other substances have a similar gimmel to TRUE ratio of 0.762). [42]

For hydrogen, we needed to introduce another form in the 'horizontal axis' besides gimmel, called 'daled' (which may or may not be the same as gimmel). The necessity for a horizontal axis calculation with hydrogen is because the hydrogen atom lacks a neutron. Without something to compensate, the atom based on the TRUE unit calculations would be symmetrically unstable. There needed to be a further flow of a gimmel type substance to compensate. While we assume it would be the same 'gimmel', we're applying it uniquely and in a

different context, hence Daled.[bb] Daled may or may not be the same as gimmel, and we're referring to both as 'gimmel' here. [42]

Gimmel and TRUE cosmologically
The figures on Mass-energy and Gimmel in the TRUE unit calculations are already based on volumetric (cubic) units. By applying volumetric equivalents of 75.6% hydrogen abundance in the cosmos with a 0.892 ratio of Gimmel to TRUE, we calculate the hydrogen contribution to be 67.5%. [42]

Similarly, applying the 24.5% of helium (0.762 ratio) and any other life element (also = 0.762) that may be very small in the cosmos, the same figure TRUE unit ratio exists producing 18.6% as the ratio of Gimmel to TRUE. The total volumetric proportion then is 67.5% + 18.6% = *86.1%*.

The similarity of figures (86.1% of volumetric dark matter plus dark energy compared with the proportion of gimmel to TRUE in the cosmos at 86.1% here) is striking and exactly equivalent. However, these figures despite being based on best available current statistics, are, as indicated, still speculative. The range 'guesstimation' for gimmel/ TRUE ratio might have an error of say 2% or even more, based on the proportions of estimated hydrogen and helium / other life sustaining elements in the cosmos. [42]

Nevertheless, particularly, given that it was hypothesized to be so, the correspondences are remarkable based on current ratio figures (gimmel/ TRUE :: volumetric dark matter and energy together/ proportion of the cosmos). So very preliminarily, it appears that we could postulate that gimmel/ daled exists as a third substance besides mass and energy at every level, ranging from the quantal to the cosmological. [42] The ratio of Gimmel to TRUE units being the same as the volumetric measures of dark matter with dark energy to the proportion of the cosmos is a truly remarkable finding given it was postulated. [42] Or is this purely a coincidence?

TDVP provides a "mechanism" explaining why there is something rather than nothing. In TDVP, the form and structure of reality is determined by the intrinsic logic of nine-dimensional reality, without requiring any transfer of mass or energy. [11; 12; 17-19] And TRUE units and gimmel is a critical extension of this research, allowing us to validate hypotheses and explain some unexplained and poorly understood observations and data.

These results strongly suggest that, in a nine-dimensional spin reality, stable structures are apparently purposefully formed for use as vehicles through which the extent of a structured substrate, likely associated with consciousness, may require continuously tethered linkage with space-time reality. [42] Moreover, gimmel, as the third substance can be described as a "content" just like mass and energy are contents. We postulate that this third substance, gimmel, is cosmologically linked [42] as well as being contained in fundamental structures like the elements [16].

Finally, TRUE analysis reveals the mathematical patterns underlying reality. This has apparently never been performed before because we've normalized the basis of descriptive measurement to integer multiples of the smallest possible unitary equivalence unit. Logical patterns in the primary structure of reality are exposed, rather than remaining hidden behind multiple arbitrary, non-commensurate mathematical procedures as they have been in the current paradigm. The fundamental unitary equivalence unit, i.e. the triadic rotational unit of

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[bb] We don't know exactly what Gimmel is. We *postulate* that gimmel is linked with a unitary 'broader consciousness'. We *speculate that* gimmel might exist as a *continuous infinite* vortical flow of more than just a 'consciousness' content: Embedded within this consciousness 'container' would be other *infinite continuity* properties equivalent to mass and energy content. We postulate that when presenting in the quantized finite reality, gimmel *manifests differently* for every chemical—atoms, molecules, or even components of the cosmos: Everything has its unique 'cosmic fingerprint'. Gimmel therefore applies to *meaningful specific* information (a *targeted* consciousness) as opposed to the general components. Communications occur across all the nine dimensions, as well as in the still quantized transfinite. Those interfaces are across, between and within dimensions, involving indivension translated through intersections of vortices, scalar, vector and tensor components. [1; 51; 52] This implies different levels: Some regard these as 'vibrational', referring to the different frequencies of movements, but then those 'vibrational resonances' would be multidimensional and manifesting relative to a particular framework, like 3S-1t. [3] We speculate that gimmel and daled reflect the same property, but they might turn out to be different (hence, their different names). Further lengthy papers will discuss these complex concepts.

equivalence (TRUE) that we have derived, consistently describes the combination of gimmel with the mass-energy quarks to form protons and neutrons, and the combination of electrons, protons and neutrons plus gimmel to form atoms and all stable compound objects in the universe, from molecules to galaxies. [42]

. Importantly, this research extends to the new discipline of Dimensional Biopsychophysics, and emphasizes:

- The 9-dimensional finite spinning model;

- A re-evaluation of the atomic structure: the application of triads of 2 quarks (up and down) plus electrons as the most fundamental active parts of atomic structure. This applies the proton with 2 up-quarks and a down-quark, and the neutron with 2 down and one up, and utilizes the third stable fermion component, the electron. Together, these with the necessary gimmel, make up the atom. [16]

- molecules are likely not just the sum of atoms. The combined equivalence of atoms in molecules can be calculated based on gimmel, mass-energy equivalences and TRUE. For example, using just the presence of the atoms and taking into account the covalent bonding of water and hydrogen sulfide, they could superficially have the same activity and similar applications. But empirically we know this not to be so. This is demonstrated by the more appropriate calculation of Hydrogen-hydroxide (H-OH) (=water) compared with H-H=S (H2S) (=hydrogen sulfide): H2S calculates out at a lower gimmel /TRUE ratio and is not a cube root, indicating that it is asymmetric.

- These concepts are not limited to just elements and apply at every level to compound entities.

SPECULATIONS ABOUT GIMMEL: OF MEANING AND GLUONS (PART 5) [cc]

The idea of Gimmel is new. [21; 42; 53; 54 16] There are still many questions to be answered: Consequently, we now provide our perspective of the current status of gimmel. This section (Part 5) is headed "speculations about gimmel" because there are supporting, possibly creative ideas: Some of these ideas are feasible, yet cannot be falsified. [55-57]. At times, these concepts can still fit the Neppe-Close concept of interpreting science in a broader way, where we can interpret science through feasibility and replicability: This way we can extend the scientific method by applying "Lower Dimensional Feasibility, Absent Falsification" (LFAF) [58; 59].

On the nature of gimmel.

Our fundamental particles contain mass and energy. The third substance (which we've defined as 'gimmel') *must* be mass-less and energy-less, because otherwise it should be an overt, measurable fundamental particle that is stable and logically, like all the other particles always existed. We could then locate gimmel by its mass and energy. Yet, we cannot.

We have empirically shown how this gimmel addition allows for stability because the elements now demonstrate integral solutions, even at the atomic level. These elements exist and are not ephemeral. Particles in our real world must reflect stability, not exist only for this transient fraction of a millisecond. The difference is that those particles that exist in a stable and symmetrical way contain the correct amount of gimmel. Indeed, some of these particles make up life-sustaining elements such as oxygen, nitrogen, carbon, sulfur, calcium and magnesium plus the hydrogen: these all have a higher proportion of gimmel than any other elements. In summary, *all* the elements in the Periodic Table that naturally occur *necessarily* need a third substance (gimmel) with a specific measure, besides their mass and energy, to provide the needed stability and symmetry for these elements to exist over extended time. Those elements that do not occur naturally, such as the elements with high atomic numbers above 90, for example, are unstable, and do not permanently exist.

Yet, this gimmel third substance must be mass-less and energy-less, as otherwise it would revert to the mass or energy of our fundamental particles. If that were the case, gimmel could easily be demonstrated because the result would make the mass and energy of the atom greater than it is; yet the mass and energy of these atoms do not change with gimmel calculations. [16]

Moreover, could gimmel *always have been present* in some way, even in the very most basic quantum structure of finite reality? We can likely answer this question because it appears that, unless there had been an extraordinarily unlikely fundamental change in the nature of reality sometime in the past, gimmel had to be exist from the beginning of the event horizon or big bang or some such initial finite happening.

Gluons and gimmel

We know that some "stable" particles always exist: Electrons and the up and down quarks in protons and neutrons, are examples. Also, photons are stable, and of course, contain gimmel at a similar level to electrons, based on our calculations. But these particles require the "third substance" that we have called "gimmel". Gimmel occupies volumetric equivalents to make these particles stable because it allows for symmetry and stability of atoms, elements and compounds that would not otherwise exist.

Could this gimmel already have been discovered?

Let's explore the many other particles that appear to be unstable and are located as part of the ephemeral "particle soup" that we can locate only through Hadron Colliders or their equivalents. [60] Is there maybe a particle in that particle soup that could actually be gimmel or reflect some kind of mirror image of gimmel?

To narrow down the question, could it be that "gimmel" has already been discovered as part of another subatomic structure in this particle soup?

We postulate that there is a possible candidate: We suggest the particle called "gluons". This is currently a tenuous idea, but may provide for an area worth exploring, particularly as there are some dramatic parallels between gluons and gimmel. In this scenario, some gluons would manifest in our stable elements and compounds, and yet be in the particle soup because they would have been difficult to explain because of their lack of mass and energy.

Gluons were originally described by Murray Gell-Mann in 1962. [61] They technically fit into the particle classification of "bosons", with strong interactions electromagnetically within the nucleus. They are supposedly the "glue" between the quarks, [62] the way quarks are held together. This property is despite gluons having no energy themselves [16]. This way the atomic nucleus of protons and neutrons stays together and does not fall apart. Gluons have been hypothesized to act via these strong electromagnetic forces, despite being regarded as mass-less and energy-less particles. [60]

Let's speculate further and amplify the idea a little that gluons might actually be the same as the gimmel that is reflected in quarks because both gimmel and gluons, by definition, are similar in that they both are mass-less and energy-less. Even this basic commonality could be putative because gluons are known to occupy no mass, and mass and energy being interconvertible implies they exhibit no energy, as well.

But the gluons *could* be regarded as responsible for explaining a significant part of the volume in the protons and neutrons, just as the gimmel contributes to rotational units of equivalence by their tethering or linkage to quarks. In effect, like gimmel, gluons could occupy volume, just as gimmel does in the TRUE unit tables. Consequently, gluons could potentially replace the "gimmel" in the protons and the neutrons headers in the Tables 2A, 2B and 2C above, because they could be linked with quarks there.

The usual current interpretation of gluons is that they act as the "glue" in the nucleus. This glue is the proposed classical explanation for the mechanism of how gluons are responsible for the strong electromagnetic forces in the nucleus (protons, and neutrons). But, if gluons are like gimmel, gluons need not be functioning as like glue in the nucleus. Instead, if gluons were "gimmel-like", they would be working differently, just as gimmel does. The parallel is particularly striking because gimmel also links with quarks. Applying gimmel and TRUE, would provide a different explanation for these "strong electromagnetic" gluon linked forces inside the nucleus that keep the quarks together.

Gluons have been proposed to exhibit two properties in their strong interaction with quarks, namely *participating with*, in addition to *mediating* the quarks. [61; 63; 64] These proposed dual properties have made the interpretations of the exact properties of gluons more difficult to understand. This is so, as the "functions" of gluons are regarded as involving interactions that reflect more active mediation roles [61; 63; 64], and hence, particle physicists recognize there has been some mystery to what exactly gluons are. This is one reason why the different kinds of gluons have been conceptualized into a special classification system in particle physics, so-called "quantum chromodynamics". This allows trying to differentiate the different kind of gluons.

There is another parallel: Applying our analyses, gimmel also mediates with the quarks by being tethered to the quarks. This makes the atom stable. This creates a more logical explanation than "just a glue" of gluons that interacts and mediates, and yet may have difficulty separating.

Carrying this parallel further, gluons would be synonymous with the important rotational mass-less, energy-less volumes of the third substance, gimmel. We speculate this rotational property could provide a quantal level consciousness and stability because of their rotations through to the ninth dimension. [65] Interestingly, we know there are nine finite dimensions in the TDVP model [22; 37] and there is spinning through from dimension number 1 to dimension number 9: This makes 8 components of vortical spinning. [1; 18] Is it likely purely coincidence that there are 8 main gluons currently described? Interestingly, gluons have already also been represented as helical structures, [64] and so could be conceptualized as rotating moving vortices. Vortices are fundamental to the TDVP [1; 11; 66] model, so much so that "Vortical Paradigm" is part of the TDVP name, and therefore the 9-D finite spin model fits. [1; 51; 52]

Could it be that gimmel and gluons are one and the same? Could it be that gluons and the family of gluons are not always particles, but part of an infinite spinning flow that is not detectable, except when applying calculations of stability? Could it be that when gluons express themselves as participating, mediating particles, these are their dynamic manifestations in the finite subatomic reality? Could it be that this is where particle physics and that third substance, gimmel, more easily meet, because gimmel is functioning more effectively in the same context?

Effectively, we're arguing that gluons may not need to be portrayed just as the sticky 3S-1t strong glued electromagnetic force. Instead, gluons might be the same as gimmel, or function like gimmel, and act in 9 dimensions, spinning dynamically, being tethered to the quarks, and play an active role in influencing, impacting and mediating the quarks. We're further arguing that if, indeed, gimmel and gluons are the same, these gimmel-like gluons would also be tethered to electrons and other particles like photons, and that their rotations suggest 9 dimensional functioning. That, in turn, may reflect links with a continuous infinite reality vortical matrix flow.

Flowing through 9-dimensions or being glued together?

The concept of gluons providing the subatomic glue could conceptually provide for a limited stability in elements. This is because they might not easily separate. However, the alternative to gluons—the gimmel properties—might much more easily reflect a stable, symmetrical 9-dimensional third substance rotating through eight 360-degree cycles from dimension number 1 to number 9. As an aside, this also explains the concept of half-spin in fermions like quarks and electrons: 8 cycles produce integer rotations. We need not have "half-spin" in a quantized reality of integers.

We propose that this flow of gimmel would create an active way for us to make the atoms in elements and compounds containing quarks and electrons stable. But gimmel works with electrons, as well, however, gluons do not apparently—or they not been discovered to do so.

We know that for gluons to do the same job in the nucleus as gimmel, they too must link with quarks. They do, but there is no direct correspondence with the numbers of quarks: Conventional wisdom conceptualizes two *stable* kinds of quark, namely up-quarks and down-quarks. But based on our data, this requires not just two quarks (one up and one down), but two *triads* of three quarks each making six different kinds of stable quark. This is exemplified in Table 2A, where we observe that there are two up-quarks, and one down-quark for protons, and one down-quark and two up-quarks for neutrons. These must be fundamentally dissimilar because each of the six quarks necessarily have empirically derived different gimmel scores.

Matching gluons with links with quarks

It would be simplistic to draw a parallel that there are six kinds of stable gluons in the nucleus, and that these correspond with the gimmel linked with these six different stable quarks. A major reason is that current thinking argues that there are possibly eight different types of gluons [65]. Gluons are difficult to locate and are regarded as part of the subatomic soup. But could some of these eight, such as six of them, be explaining some of the

volume in the nucleus?   Could those six gluons in the nucleus be linked with the six quarks that we have described? It is complicated certainly because there might be a mix be ephemeral and stable gluons, just as there is with quarks: We know that there are at least four other kinds of ostensibly ephemeral unstable quarks in the particle soup, namely strange-quarks, charm-quarks, top-quarks and bottom-quarks. [67-72] So, applying a similar hypothesis, there might potentially be ephemeral and stable gluons and these may make up gimmel-like substances in the nucleus. An unlikely speculation would be that under some circumstances these six gluons might match the numbers of stable quarks that may be relevant.

If needed, that gluon alternative mechanism is reflected in gimmel. But, conceptually, there may be more: Those gluons could even flow like a *matrix*. This gimmel would then manifest not only sub atomically as a particle in 3S-1t, but also, speculatively, as a "matrix" at the higher dimensional or infinite levels. This would then make gluons much more versatile, and easier to comprehend than the gluon "glue" concept. This is so as given a 9-dimensional finite spin model: the gluons must then still rotate through eight dimensions in that 9-D finite spin. Yet, the "glued" gluons, with the strong electromagnetic forces, might be entrapped in the nucleus, and therefore not have the facility of being able to separate from the quarks. By contrast, a rotating gimmel would always be present, and more easily interact with quarks.

So the jury is certainly open. Gimmel and gluons are likely different. But maybe, just maybe, at some time in the future, the eight gluons versus the six active stable gimmel units in the nucleus will be demonstrated to be the same, or the further two gluons will have some relationship with another elementary particle like electrons or possibly photons. An advantage of gimmel over gluons is that we can calculate the exact number of TRUE units of gimmel that has to be associated with specific particles and also explain them within the framework of TDVP theory. In contracts, gluons as "glue" are more like ad hoc fill-ins to explain the strong force.

Gimmel, Consciousness and meaning.

We postulate that gimmel is strongly linked with meaning: This is logical because the third "substance", by definition, is mass-less and energy-less, and there are simply no other obvious alternatives beside reflecting, at least in part, a broader informational meaning or "meaningful consciousness" that is tethered with the mass/ energy in the 9-dimensional domain. Consciousness is a strong gimmel candidate because there appears none other. If this is so, this means that we can demonstrate how consciousness is describable in the equations of quantum physics and relativity. The consciousness, in this context, manifests as a content, and with mass and energy, forms a tethered triad.

Gimmel might provides an order to an existence that may otherwise be disordered. If this is so, one likely origin for gimmel is the infinite consciousness. If Gimmel involves meaning, we could argue that everything is unique from the tiniest structure through to the cosmos. Everything is unified. [16]

The "God Matrix" or the "God Particle"?

We now move to a further level of LFAF. We examine speculations that are unproven, and that reflect a level of feasibility that may allow for conjecture but not scientific proof, per se. This is because even though these ideas may be feasible. they may never be falsifiable. [58; 59] This may be because we may be approaching the infinite or higher quality dimensional domain (?) concepts such as love and beauty. We may have to relegate such ideas to the artistic canvas of metaphysics and not science even to the broadest LFAF science level. Still let's proceed.

Should we just conceptualize "gimmel" simply as a particle in the subatomic context that has no special relevance? Is it just as irrelevant or meaningless as the accidental order that reflects our reality, our existence and our finite experiences? Are these electrons, quarks, neutrons and atoms all simply coincidental evolutionary quirks? Essentially, is gimmel something meaningless or is it something meaningful? Was Einstein just incorrect when arguing that "God does not play dice" [73]?

Ordropy, life and meaning

Instead, is there something else, something relevant to all these remarkable patterns of life, and something meaningful about the abundance of certain elements and of water? Is there a pertinence to the stability and symmetry that allows for life, and, is there, indeed, a relevant beauty that we conceptualize as a psychological gestalt? Does our existence have a multidimensional order, which might even derive from the infinite, a term that is implied by our using "ordropy" [1]. Ordropy is more than just negative entropy, because that order exists everywhere and is multidimensional. Yet ordropy cannot exist from finite reality as it would contradict the second law of thermodynamics. The tendency towards disorder—entropy— implies a finite closed system. In ordropy, we have postulated a potential continuous flow of gimmel from the infinite, a state of order that allows for life and meaning, and does not approach everything purely stochastically.

 Certainly, a mathematical approach might conceptualize gimmel simply as a discrete quantized cluster of particles, where the mathematics just happens to work out. The math would then be there just for calculation purposes. We argue that it should possibly be reflecting a hidden grander component that is reflected in our existence, and this is possibly why we have remarkably accurate constants to many significant figures and these might exist because part of math is a reflection of an internal ordered existence, allowing our world and our reality to function not by accident, but by design [74; 75]. A tiny deviation would destroy our cosmos but our cosmos continues to be sustained. [76 77 78 14; 51; 52; 79]

This creates a dilemma for us: We are aware that conventionally scientists should be "neutral" in all information. But the reality, we argue, is that we scientists should be allowed to apply common-sense and be prepared to look at what is feasible and not falsified, even if we cannot prove something ever. [58; 59]. Science is not neutral and scientific methodology requires amplification. [58; 80]

Gimmel certainly represents a distinction of content, just as mass and energy are containers of content. This is contrasted with the concept of Space, Time and Consciousness extent. These are represented in TDVP and in the calculus of distinctions as "dimensional substrates" [1 23].

But this content may be more than just a particle context, which is why we referred to "gimmel" as the third substance. We propose that gimmel is also the "matrix" for that something that is necessarily linked or part of everything that exists, including subatomic particles.   Now here comes the metaphor. Gimmel then could imply a flow for that matrix. That would mean arrays of always dynamically in motion spinning (vortices) quantities or expressions reflecting a single entity obeying laws of order (ordropy). We call this the "God Matrix". The God Matrix would reflect a logical, coherent organizational structure flowing from the infinite at the subatomic level through to our living physical existence through to the cosmological level.

The God Matrix and the Gluon Matrix

We could then conceptualize gimmel metaphorically as more than just a particle, but as a matrix, with possible origins as an infinite vortical flow to the finite—hence, the lay term "God Matrix". As an aside, the matrix idea could make the Gluon-Gimmel hypothesis even more interesting [61; 63; 64]. This is so because Nobel Physicist Murray Gell-Mann also described a matrix that he called the "gluon matrix" [61; 69].

We regard that third substance, gimmel, as reflecting, at least, in part, a meaningful consciousness. This is because, by default, there is little else that would be mass-less and energy-less. What else besides an "extended kind of consciousness" or "meaning" could gimmel be? Surely, this could not be amazingly coincidental at every elemental level? That would defy any Bayesian priors[81 3]. Furthermore, would it be logical to postulate that gimmel might always have existed, might have had origins from the infinite, and might be a matrix made up of a gimmel content that can manifest as mass-less, energy-less particles with a volume? And could that

gimmel be logically tethered to energized subatomic particles? Could it be fair to argue there is a non-stochastic relevance to this, and therefore that gimmel should be conceptualized, in layperson terms, as the "God Matrix". This metaphor may be far more apposite than the layperson naming of the so-called Higgs Boson, an ephemeral particle, as the "God particle". [15]

As we are speculating here, we are not literally implying that "gimmel" is a "God Matrix". However, such a matrix metaphorically connotes a potential mystical base for an extended and ubiquitous consciousness. Moreover, gimmel appears to convey a meaningful structure for supporting life. That base might impact and influence meaning at every level. It may involve reciprocal dynamic feedback. It has implications for motivation, for action, for choice and for guidance. In reality, we don't know if this meaning or mystical flow is even appropriate because explorations into the infinite continuity are unknown, but the metaphors of meaning, and in an optimistic reality, possibly positivity, love, creativity and goodness, allow for creative active though metaphysical messages. This superimposition of a meaningful consciousness, possibly in every subatomic particle is entirely speculation, but the metaphor should in no way discredit the carefully built mathematical base or our data, because that reflects excellent open-minded science and any metaphysical speculation is the cherry on the top. [53; 82; 83]

The infinite and spinning interpretations

We provide another speculation: Could it be that we don't need to worry about whether or not there is or is not collapse of the quantum receptor *vis-à-vis* the various related quantum Copenhagen related [14; 16-18; 26] interpretations? [22; 84 85] Perhaps, if gimmel from the infinite is all-pervasive, and has always been present, the so-called observer does not need a source of interaction. He is already part of that reality experiment! [66]. This might provide a solution to a fundamental quantal question and this has been discussed in some detail by applying a complex mechanism of flow that we call "vortical indivension" across multiple dimensions. [86; 87]

Revisiting relativity in 9-D

We provide a further speculation. Einstein's speed of light, c, [88] might involve a different constant in each dimensional domain beyond our conventional experiential 3S-1t (the three dimensions of space in the present moment in time. This could be so because light speed squared is proportional to the ratio of energy to mass. But we have mathematically proven that there are 9 finite spinning dimensions [20; 37; 89] so we have to take this into account. We do not yet know the exact nature of these dimensions, but have postulated there may be multidimensional time [90] and consciousness. [20; 37; 89]. This necessitates further possibilities.

- If there were more than one dimension of time, the speed of light would be variable relative to dimensional domains involving those time dimensions.

- Moreover, ultimately given there is a third substance, gimmel, a new theory of everything needs to include gimmel as well. This is where we propose consciousness is put into the equations of physics.

- Importantly, space-time related constants, like the speed of light, as well as the extent and content of consciousness, might involve different relative concepts depending on the frameworks of the specific dimensions ("dimensional domains") involved.

Other comments

1. The whole is more than sum of the parts because gimmel contributes to stability, yet cannot be directly observed or measured.

2. This new way of analyzing particles suggests that all compound structures, however complex, and whatever their size, are quantum systems. Historically, John Von Neumann demonstrated in his seminal 1932 work "Mathematical Foundations of Quantum Mechanics" [91], including with his Dirac–von Neumann axioms, that there is a rigid mathematical framework for quantum mechanics and that this can extend to the macro-world [91].

Concluding Perspective

This paper is meant to provide a very basic perspective on the new concept of "gimmel". We carefully differentiate the easily replicable empirical mathematical physics derivations from the speculative. We recognize that gimmel, TRUE units and the layperson perception of such phenomena as the God Matrix provides an entirely new way of understanding reality.

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Influencia del Campo Magnético de Baja Frecuencia en la Obtención del SAR en la Cabeza Humana

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Resumen: Esta investigación tiene por objetivo cuantificar el campo magnético cercano alrededor de una línea de transmisión eléctrica. Para este efecto, el desarrollo del problema se consideró en dos dimensiones, considerando que los conductores de la línea de transmisión son infinitamente largos y rectos, asimismo, para resolución de las ecuaciones diferenciales de segundo grado que describen el comportamiento físico de los campos electromagnéticos en los alrededores de la línea eléctrica, se utilizó el método de elementos finitos (MEF). Como aplicación se presentan resultados de simulación de la configuración de líneas en condiciones de operación normal, de los cuales se puede concluir que para un dimensionamiento estándar para el diseño de las líneas, el efecto electromagnético asociado no parece relevante, sin embargo, hay situaciones en que la extrema cercanía de líneas aéreas a recintos domiciliarios motiva la necesidad de cuantificar estos efectos, en virtud del cumplimiento de normas de emisión de campos electromagnéticos de baja frecuencia. El campo magnético casi constante generado muy cerca de una línea de transmisión interactúa fuertemente con la alta frecuencia de un teléfono celular incidiendo decisivamente en la absorción específica (SAR) en la cabeza de un usuario que vive permanentemente en lugares como el que se describe en el texto. Este coeficiente aumenta drásticamente en el caso de que el usuario sea un niño.

Palabras clave: Campo magnético, Método de Elementos Finitos (MEF), Líneas de transmisión, Método de diferencias finitas, Absorción

1. Introducción

La comunidad, en general, se encuentra cada vez más expuesta a campos eléctricos y magnéticos debido al uso generalizado y extendido de la electricidad donde sus intensidades pueden poner en peligro la salud y la seguridad de las personas o de la población debido a las exposiciones frecuentes o permanentes. En este sentido, el efecto perjudicial de los campos eléctricos y magnéticos provenientes de las líneas de transmisión, y en particular de las líneas de extra alta tensión. En el proyecto de una línea de transmisión, los campos electromagnéticos son una importante limitación y resulta necesario justificar sus diferentes valores. Entre los campos que necesitan más atención está el campo eléctrico en la superficie del conductor, el cual una vez pasado de su límite, puede producir el denominado efecto corona y traer grandes pérdidas de transmisión. Otro problema es la determinación de los valores esperados de los campos magnéticos en el rango seguro a nivel del suelo, e incluso más allá de unos pocos metros, que resulta crítico para definir restricciones y niveles de exposición de la población a los campos electromagnéticos. En este trabajo se utiliza para efecto de cálculos de campo magnético el método de elementos finitos (FEM). El FEM es uno de los métodos numéricos más populares en el estudio de efecto electromagnéticos [1-5], otros métodos, como la técnica tridimensionales de análisis también han sido utilizadas [5,6], sin embargo, la ventaja clave del FEM es la capacidad de manejar problemas de geometría no lineales dependientes del tiempo.

Este trabajo desarrolla el modelo que describe el comportamiento físico de los campos electromagnéticos en los alrededores de la línea eléctrica, para el objetivo planteado de determinar el campo eléctrico en la superficie de los conductores, los campos eléctricos y magnéticos en el suelo y la inducción electromagnética. Para el estudio se utiliza el método de elementos finitos (FEM) sobre las ecuaciones diferenciales de segundo grado resultantes del modelo desarrollado, presentando simulaciones del caso propuesto. Esta investigación cuantifica el campo magnético en líneas de transmisión que para este caso corresponde a una línea de sub-transmisión en 66 kV circuito simple, figura 1. Este caso, presenta una magnitud de campo eléctrico, no muy exagerada pero cobra relevancia (importancia) por la extrema cercanía a un grupo de viviendas sociales y porque es el campo magnético el que puede influir con mayor incidencia en seres vivos. Es común que en zonas suburbanas de ciudades latinoamericanas (en este caso Arica, Chile), los blocks de departamentos son construidos después de las líneas de alta tensión y por economía de mercado quedan extremadamente cerca de líneas de alta tensión, como se muestra en la figura 1. El campo magnético permanente de esas líneas lógicamente influye más fuertemente en las personas que habitan en los pisos cercanos a las mismas [5,6]. Una vez determinado el perfil del campo magnético el cual es perjudicial al ser humano si sobrepasa los niveles establecidos [7-10], se calcula el SAR en un modelo de cabeza humana excitada por la microonda del celular en el ambiente magnetizado producido por la línea de transmisión. Aquí se utiliza el método de diferencias finitas para el cálculo del SAR [11-12].

2. Modelo matemático del campo electromagnético de una línea de transmisión

La ecuación de onda que representa el campo magnético (**B**), en los alrededores de una línea de transmisión, producido por el flujo de corrientes en los conductores, se expresa en términos de la intensidad del campo magnético (**H**) [1-5], en el cual **B**= μ**H**

$$\nabla^2 \vec{H} - \sigma\mu \frac{\partial \vec{H}}{\partial t} - \varepsilon\mu \frac{\partial^2 \vec{H}}{\partial t^2} = 0 \qquad . \tag{1}$$

En el espacio circundante a la línea de transmisión, ε es la permeabilidad, μ es la permisividad y σ es la conductividad.

Este estudio se ha considerado como un sistema de tiempo-armónico en el cual la frecuencia angular ω, a la cual oscila el sistema, es constante, por lo tanto:

$$\frac{\partial}{\partial t} = j\omega \qquad y \qquad \frac{\partial^2}{\partial t^2} = -\omega^2 \quad , \tag{2}$$

en consecuencia, la ecuación (1) puede volver a escribirse como:

$$\nabla^2 \vec{H} - j\sigma\mu\omega \vec{H} + \varepsilon\mu\omega^2 \vec{H} = 0 \quad . \tag{3}$$

Al considerar el problema en dos dimensiones para el plano cartesiano (x, y), se tiene que:

$$\frac{\partial}{\partial x}\left(\frac{1}{\mu} \frac{\partial \vec{H}}{\partial x} \right) + \frac{\partial}{\partial y}\left(\frac{1}{\mu} \frac{\partial \vec{H}}{\partial y} \right) - (j\omega\sigma - \omega^2\varepsilon)\vec{H} = 0 \quad , \tag{4}$$

así, la ecuación (4) representa el modelo matemático del campo magnético en los alrededores de una línea de transmisión [1]. De igual forma, se tiene el modelo matemático del campo eléctrico en la vecindad de una línea de transmisión [3]:

$$\frac{\partial}{\partial x}\left(\frac{1}{\mu}\frac{\partial \vec{E}}{\partial x}\right)+\frac{\partial}{\partial y}\left(\frac{1}{\mu}\frac{\partial \vec{E}}{\partial y}\right)-(j\omega\sigma-\omega^2\varepsilon)\vec{E}=0\,. \tag{5}$$

Un mayor detalle de la deducción de los modelos matemáticos se describe en los anexos A y B de este trabajo.

MEF aplicado a una línea de transmisión

A. **Discretización**

La región de trabajo que modela el campo eléctrico y magnético utilizando el método de elementos finitos es discretizada con elementos triangulares. Como ejemplo se presenta el área de trabajo (40m x 47m) para una línea de 66 kV, la cual es discretizada con 3943 elementos y 2040 nodos.

Figura 1. Línea de transmisión trifásica (66 kV, 16 metros de altura) en estudio.

B. **Formulación del modelo mediante elementos finitos**

La solución aproximada de las ecuaciones diferenciales, que modelan los campos electromagnéticos (5), se realiza con elementos finitos triangulares, entonces la intensidad del campo magnético en cualquier punto de coordenadas (x,y) en el área de trabajo es:

$$H(x,y)=h_1 n_1(x,y)+h_2 n_2(x,y)+h_3 n_3(x,y)\,,$$

donde h_1,h_2,h_3 son las aproximaciones de la intensidad de este campo en cada nodo del elemento triangular y n_1, n_2, n_3 son las funciones de forma de cada elemento, cuyos valores son:

$$n_1=\frac{a_1+b_1 x+c_1 y}{2\Delta}\,, \qquad n_2=\frac{a_2+b_2 x+c_2 y}{2\Delta}\,, \qquad n_3=\frac{a_3+b_3 x+c_3 y}{2\Delta}\,,$$

siendo Δ el área de cada elemento triangular y el valor de las constantes a_i, b_i y c_i está dado por las coordenadas de cada nodo, tal que:

$$\Delta=\frac{1}{2}\det\begin{bmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{bmatrix}, \qquad \begin{aligned} a_1&=x_2 y_3-x_3 y_2 & b_1&=y_2-y_3 & c_1&=x_3-x_2 \\ a_2&=x_3 y_1-x_1 y_3 & b_2&=y_3-y_1 & c_2&=x_1-x_3 \\ a_3&=x_1 y_2-x_2 y_1 & b_3&=y_1-y_2 & c_3&=x_2-x_1 \end{aligned}\,.$$

Ahora, al aplicar el método de Galerkin [4], anexo B, sobre la ecuación que modela la intensidad del campo magnético de una línea eléctrica, se obtiene:

$$\frac{\partial}{\partial x}\left(\frac{1}{\mu}\frac{\partial \vec{H}}{\partial x}\right)+\frac{\partial}{\partial y}\left(\frac{1}{\mu}\frac{\partial \vec{H}}{\partial y}\right)-(j\omega\sigma-\omega^2\varepsilon)\vec{H}=0 \ ,$$

$$\frac{1}{\mu}\int_{\Omega}\left(\frac{\partial w}{\partial x}\frac{\partial H}{\partial x}+\frac{\partial w}{\partial y}\frac{\partial H}{\partial y}\right)d\Omega-\left(j\omega\sigma-\omega^2\varepsilon\right)\int_{\Omega}\left(wH\right)d\Omega=0 \ ,$$

y definiendo $\left[K^e\right]=\dfrac{1}{\mu}\displaystyle\int_{\Omega}\left(\dfrac{\partial w}{\partial x}\dfrac{\partial H}{\partial x}+\dfrac{\partial w}{\partial y}\dfrac{\partial H}{\partial y}\right)d\Omega$ y $\left[M^e\right]=-\left(j\omega\sigma-\omega^2\varepsilon\right)\displaystyle\int_{\Omega}\left(wH\right)d\Omega$,

finalmente se deduce que $\left[K^e+M^e\right]H=0$, donde:

$$\left[K^e\right]=\frac{1}{4\mu\Delta}\begin{bmatrix} b_1b_1+c_1c_1 & b_1b_2+c_1c_2 & b_1b_3+c_1c_3 \\ b_1b_2+c_1c_2 & b_2b_2+c_2c_2 & b_2b_3+c_2c_3 \\ b_1b_3+c_1c_3 & b_2b_3+c_2c_3 & b_3b_3+c_3c_3 \end{bmatrix}, \quad \left[M^e\right]=\frac{\left(j\omega\sigma-\omega^2\varepsilon\right)\Delta}{12}\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}.$$

C. Condiciones de borde y parámetros de simulación

El estudio de la MEF generado por líneas de transmisión es muy genérico, pudiéndose analizar el comportamiento de EMF para diferentes configuraciones y condiciones de operación. En este trabajo se modela la configuración simple indicada en figura 1. Las hipótesis consideradas en este caso son:

Hipótesis adoptadas

Conductores perfectamente nivelados uno respecto de otro y tierra.
El campo se calcula para una sección transversal de la línea considerando una altura mínima de los conductores.
Las fases se consideran como sección circular, la separación del haz es despreciable en comparación con las distancias en las que se calcularon la MEF (1 m por sobre el suelo)
Para el caso considerado de 66 kV se utilizó un margen de 5% por sobre este voltaje nominal (69.3 kV).
Las corrientes de línea se consideraron de acuerdo al límite térmico de los conductores de fase, línea de 66 kV ACSR 4/0 (I = 340 A).
Las condiciones de borde aplicadas para el problema son campos magnético y eléctrico nulos a nivel del suelo [1,3].
Para los conductores de fase las condiciones de borde en la periferia se calcularon con las leyes de Ampere y de Gauss para los campos magnético y eléctrico, respectivamente [5,6].
Al mismo tiempo, la conductividad, permisividad y permeabilidad en el aíre son $\sigma=5.5\cdot10^{-15}(S/m)$, $\mu=4\pi\cdot10^{-7}(H/m)$ y $\varepsilon=8.85\cdot10^{-12}(F/m)$, respectivamente.

3. Resultados y discusión sobre la alta tensión

Referente a los niveles permisibles de emisión de campos electromagnéticos en espacios públicos, en Chile se adoptan normativas internacionales y corresponden a niveles establecidos por ICNIRP. Para lugares públicos la ICNIRP establece niveles de 5 kV/m para el campo eléctrico y 100 µT para el campo magnético. Se puede observar que los límites establecidos para una exposición pública de campos eléctricos es levemente sobrepasada justo frente a la zona de los conductores de fase de la línea eléctrica, se alcanzan valores máximos de 7 kV/m a 2 m de distancia. El campo magnético en estas condiciones de operación de la línea eléctrica cumple apenas con la normativa vigente

establecida por la ICNIRP. Sin embargo, para zonas muy cercanas a la línea de alta tensión el campo magnético sobrepasa en un 100% la norma establecida.

Si bien, las obras constructivas se rigen por estrictas normas, por aspectos económicos, se especifican generalmente para cumplir los mínimos exigidos, y en algunos casos, se puede llegar a no cumplir estos límites. Precisamente, esta es la situación que se pretende estudiar a continuación. Así, para este caso la línea considerada es de 66 kV con una potencia de carga estimada de 30 MVA. Lo particular del asunto no es la gran intensidad del campo electromagnético creado alrededor de ella, si no, la permanente exposición sobre las personas al estar instalada en una zona residencial. Esta situación se muestra en la figura 1, donde se puede observar que la distancia, entre los conductores de fase de la línea de transmisión y las viviendas sociales, se encuentra a menos de 4 m de distancia; la altura de la línea es de 16 m.
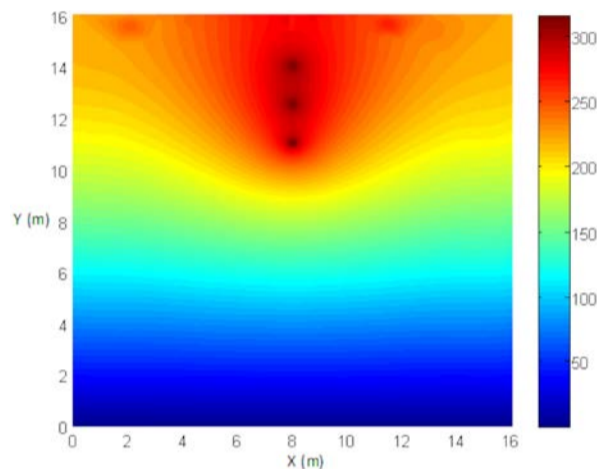
Figura 2. Distribución de la magnitud del campo magnético en µT para la línea de transmisión de 66 kV simple circuito.
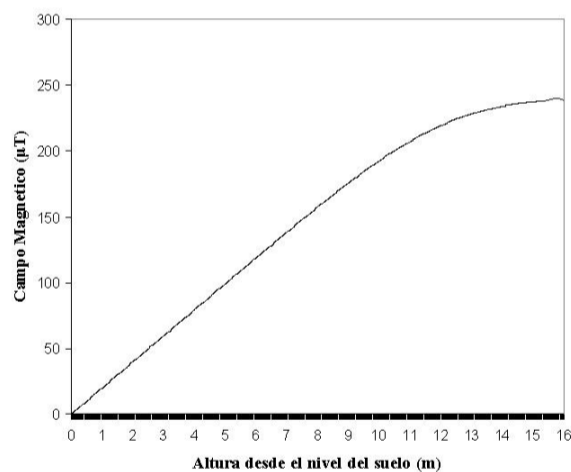
Figura 3. Intensidad del campo magnético en µT medida en el eje vertical a 4 m de los conductores de fase.

Las figuras 2 y 3 muestran la intensidad del campo magnético con el método de elementos finitos. Los niveles de emisión máxima del campo magnético se producen a los 13 m de altura, justo frente a la posición de los conductores de fase. El método de análisis empleado arroja resultados que sobrepasan los 100 µT recomendados por la ICNIRP para una exposición pública, esto es en alturas superiores habitables de la construcción. El posible efecto negativo se hace más intenso en niños cuya cabeza tiene un cráneo más delgado y de mayor conductividad.

4. Coeficiente específico de absorción en un medio magnetizado

Conductividad específica del tejido

La conductividad de los tejidos varía de forma significativa con la frecuencia para valores sobre 1 GHz, para la sangre. Este gráfico en general, representa la conducta de tejidos con alto volumen de agua. En tejidos altos en grasa existe una dependencia lineal entre el volumen de agua y la conductividad, es decir, un tejido con menor porcentaje de agua posee una conductividad menor, y uno con mayor porcentaje de agua su conductividad es mayor [13-17].

La potencia absorbida por unidad de volumen P_a, para un onda incidente con el campo eléctrico E de la microonda y de un tejido de conductividad σ, tiene la expresión $P_a = \dfrac{\sigma |E|^2}{2}$, en la cual $E = E(B_0)$ con B_0 el campo magnético de la línea de transmisión.

Tasa de absorción específica (SAR)

Se define la absorción específica (Specific Absorption, SA) la relación existente entre una cantidad de energía infinitesimal, dU, absorbida por un elemento infinitesimal de masa $SA = \dfrac{dU}{dm} = \dfrac{dU}{\rho \cdot dV}$ $\left[J/Kg \right]$. De este modo, se define la tasa de absorción específica (Specific Absorption Rate, SAR) como la variación respecto del tiempo de la absorción específica, es decir, el incremento de energía absorbida por un elemento diferencial de masa contenido en un volumen elemental con una densidad determinada:

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm} \right) = \frac{d}{dt}\left(\frac{dU}{\rho \cdot dV} \right) \ \left[W/Kg \right].$$

El SAR se relaciona con el campo eléctrico en un punto mediante la expresión analítica $SAR = \dfrac{1}{2} \cdot \dfrac{\sigma}{\rho} \cdot |E|^2 \ \left[W/Kg \right]$, donde:

σ = Conductividad del tejido, medida en $\left[S/m \right]$.

ρ = Densidad volumétrica de masa del tejido, medida en $\left[Kg/m^3 \right]$.

E = Valor de pico del campo électrico, medido en $\left[V/m \right]$.

Asimismo, SAR se conecta con un aumento localizado de la temperatura en un punto del volumen de cálculo, mediante la relación $SAR = c \cdot \dfrac{\Delta T}{\Delta t} \left[W/Kg \right]$ tal que:

c = Calor *e*specífico del tejido, medido en $\left[J/\left(Kg \cdot ^oC \right) \right]$.

ΔT = Variación de la temperatura, medido en $\left[^oC \right]$.

Δt = Duración de la exposición, medida en $\left[seg \right]$.

Desafortunadamente, esta última expresión está restringida a asumir el hecho de que las medidas se realizan bajo condiciones ideales no termodinámicas, situación en la que se pueden despreciar los efectos de pérdidas de calor por difusión térmica, radiación de calor, o termorregulación (este último factor de importancia dado que la sangre actúa como un termorregulador natural en el cuerpo humano). Resumiendo, el coeficiente ó tasa de absorción específica (SAR), mide la forma en que una radiación es absorbida por un cuerpo. Se define como el valor de energía absorbida por unidad de masa de tejido corporal, y se expresa en watt por kilogramo (W/kg o J·kg⁻¹S⁻¹). Su valor depende tanto de la energía que lleva la radiación electromagnética como de la cantidad y tipo de tejido expuesto.

Campo magnético a bajas frecuencias

De las ecuaciones de Maxwell anteriormente descritas, se incluye el campo magnético a baja frecuencia por medio de una descomposición del B_t (densidad de flujo magnético total) $B_t = B + B_0$, donde B_0 es la densidad de flujo magnético en baja frecuencia, entonces por la ley de Faraday:

$$\nabla \times \vec{E} = -\frac{\partial \left(\vec{B} + B_0 \right)}{\partial t} = -\frac{\partial \vec{B}}{\partial t} - \frac{\partial B_0}{\partial t}, B_0 = B_0 \sin \omega_0 t, \omega_0 \Box 1 \quad \therefore \quad \cos \omega_0 t \approx 1 \quad (6)$$

$$= -\frac{\partial \vec{B}}{\partial t} - B_0 \omega_0.$$

Ahora, utilizando el sistema de unidades MKS, se obtiene el sistema a resolver en coordenadas rectangulares (x,y):

$$\frac{\partial H_x}{\partial t} = -\frac{1}{\mu}\frac{\partial E_z}{\partial y} - \frac{2B_{0x}\omega_{0x}}{\mu}, \quad \frac{\partial H_y}{\partial t} = \frac{1}{\mu}\frac{\partial E_z}{\partial x} - \frac{2B_{0y}\omega_{0y}}{\mu}, \quad \frac{\partial H_z}{\partial t} = \frac{1}{\mu}\left(\frac{\partial E_x}{\partial y} - \frac{\partial E_y}{\partial x}\right) - \frac{2B_{0z}\omega_{0z}}{\mu}$$

$$(7)$$

$$\frac{\partial E_x}{\partial t} = \frac{1}{\varepsilon}\frac{\partial H_z}{\partial y} - \frac{\sigma}{\varepsilon}E_x, \quad \frac{\partial E_y}{\partial t} = -\frac{1}{\varepsilon}\frac{\partial H_z}{\partial x} - \frac{\sigma}{\varepsilon}E_y, \quad \frac{\partial E_z}{\partial t} = \frac{1}{\varepsilon}\left(\frac{\partial H_y}{\partial x} - \frac{\partial H_x}{\partial y}\right) - \frac{\sigma}{\varepsilon}E_z,$$

donde se hicieron las siguientes aproximaciones:

$$\frac{\partial}{\partial t} \rightarrow j\omega \qquad \frac{\partial}{\partial x} \rightarrow jk_x \qquad \frac{\partial}{\partial y} \rightarrow jk_y$$

$$\omega = 2\pi f \qquad k_x = \frac{2\pi}{\lambda_x} \qquad k_y = \frac{2\pi}{\lambda_y}$$

Como se observa, las derivadas parciales con respecto a *z* son iguales a cero, esto es debido a que se asume que la estructura a modelar se extiende infinitamente en la dirección *z*. Por lo tanto, si no consideráramos el campo magnético de baja frecuencia, en las ecuaciones (7) tendríamos los modos transversal magnético en la dirección *z* o TM$_z$, y el transversal eléctrico en la dirección *z* (TE$_z$). Los fenómenos físicos asociados con estos dos modos pueden ser muy distintos. Note que el modo TE$_z$ contiene líneas de campo *E* en un plano perpendicular al eje infinitamente largo (eje *z*) de la estructura.

Método FDTD

El método de las diferencias finitas en el dominio del tiempo (FDTD) es sumamente simple, es además robusto y provee exactitud de modelamiento para la interacción de varias ondas electromagnéticas y sus problemas de campos electromagnéticos. El FDTD es un no tradicional esquema electromagnético, donde los rápidos avances en los computadores hacen que este método sea más atractivo día a día [10,12]. Se introduce una notación para los puntos espaciales y las funciones del espacio y tiempo. A continuación se denotan los puntos espaciales de una grilla rectangular y uniforme:

$$(i, j, k) = (i\Delta x, j\Delta y, k\Delta z), \tag{8}$$

donde Δx, Δy y Δz son los incrementos de la grilla espacial en la dirección *x*, *y* y *z*, respectivamente e *i*, *j*, *k* son números enteros. Además, se denota cualquier función *u* del

espacio y tiempo evaluada en un punto discreto de la grilla y en un punto discreto del tiempo como:

$$u\left(i\Delta x, j\Delta y, k\Delta z, n\Delta t\right) = u_{i,j,k}^{n}.$$ (9)

Aquí se utilizan expresiones de diferencias finitas centrales para las derivadas del espacio y tiempo programadas con precisión de 2do orden en los incrementos espacial y temporal. Considerando una expresión para la primera derivada parcial de u en el espacio y la dirección x, evaluada en el tiempo fijo $t_n = n\Delta t$ se tiene:

$$\frac{\partial u}{\partial x} = \frac{u_{i+1/2,j,k}^{n} - u_{i-1/2,j,k}^{n}}{\Delta x} + \xi\left[\left(\Delta x\right)^2\right],$$ (10)

donde ξ representa el error de la aproximación y es proporcional al cuadrado del incremento espacial. Observe que el incremento de $\pm 1/2$ en el subíndice i de la función u denota una diferencia finita en el espacio sobre Δx. Se elige esta notación porque intercala las componentes de E y H en la grilla espacial a intervalos de $\Delta x/2$. Por ejemplo, la diferencia de dos componentes de campo E adyacentes, separados por Δx y localizados a $\Delta x/2$ a ambos lados de un componente H, es usada para proporcionar una aproximación numérica para $\partial E/\partial x$ permitiendo calcular la componente H en el tiempo. Por analogía, la expresión para la primera derivada parcial de u en el tiempo, evaluada en un punto espacial fijo (i, j, k) es:

$$\frac{\partial u}{\partial t} = \frac{u_{i,j,k}^{n+1/2} - u_{i,j,k}^{n-1/2}}{\Delta t} + \xi\left[\left(\Delta t\right)^2\right],$$ (11)

tal que el superíndice $n\pm 1/2$ representa el intervalo de tiempo posterior a calcular.

Otras de las expresiones que se obtienen en este algoritmo es para el caso de valores de campos eléctricos que a un paso de tiempo n no se almacenan en la memoria del computador, para estimar este término se utiliza una llamada aproximación implícita:

$$E_x\Big|_{i,j+1/2,k+1/2}^{n} = \frac{E_x\Big|_{i,j+1/2,k+1/2}^{n+1/2} + E_x\Big|_{i,j+1/2,k+1/2}^{n'1/2}}{2}.$$ (12)

Aquí los valores de E_x se consideran como un simple promedio aritmético de los valores ya almacenados de E_x, (ver anexo C).

Al resolver ecuaciones de campos electromagnéticos en el dominio del tiempo mediante el método FDTD, se presenta un problema frecuente con las condiciones de contorno absorbentes. En esta aproximación se utilizan éstas de primer orden para simular una región bidimensional infinita. El contorno absorbente fue localizado a una distancia de $4\sim 7\Delta$ en la proximidad del objeto de análisis (el modelo de la cabeza) $\Delta x = \Delta x = \Delta = 0.5$ cm. La fuente de radiación del teléfono celular fue modelada por una fuente puntual que equivale a la sección transversal de una antena de dipolo.

Cálculo del SAR

Después de obtener la solución de los campos dados por las ecuaciones en el anexo C, se calcula el SAR en forma local de la siguiente forma:

$$SAR_{i,j} = \frac{\sigma_{i,j} E_T^2(B_0)\Big|_{i,j}}{2\rho_{i,j}}, \qquad E_T(B_0)\Big|_{i,j} = \sqrt{\frac{1}{n}\sum_{1}^{n} E_y^2\Big|_{i,j}^{n} + E_x^2\Big|_{i,j}^{n} + E_z^2\Big|_{i,j}^{n}}.$$ (13)

El valor de B_0 es obtenido de la figura 3.

Imágenes digitalizadas a utilizar

De las imágenes ya digitalizadas, para el estudio a realizar, se utilizan las consideradas más relevantes. En casos de estudios anteriores, se utilizó un modelo esquemático de la cabeza humana que representaba al corte 35. Para este estudio, se empleará el corte real 35 correspondiente a la capa obtenida de las MRI (Imagen de Resonancia Magnética).
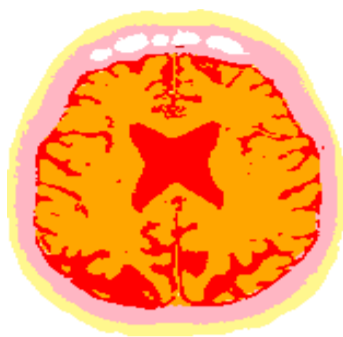
Figura 5. Imagen MRI de Corte 35 real en cabeza de niño

En la siguiente Tabla se muestran los parámetros utilizados, su correspondiente color para el programa FDTD y sus valores de permitividad, permeabilidad y conductividad utilizados para 1 GHz.

TIPO DE TEJIDO	MEDIO	PARAMETROS		
		900 MHz		
		εr (F/m)	σ (S/m)	ρ (g/m³)
Aire	0	1	1	1000
Piel	1	23	0,63	1000
Hueso	2	5,4	0,04	1200
Cerebro	3	51	1,46	1050
Sangre	4	59	1,26	1000

Tabla 1. Los cortes a estudiar, también se analizarán para distintas resoluciones, éstas serán de 40x40 y 80x80.

En las figuras 6 y 7se muestran las imágenes digitalizadas para ambas resoluciones:
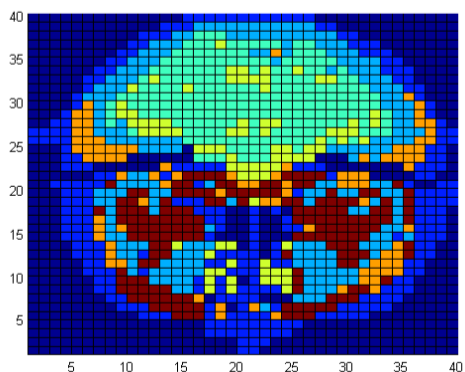
Figura 6. Corte 35 resolución 40x40
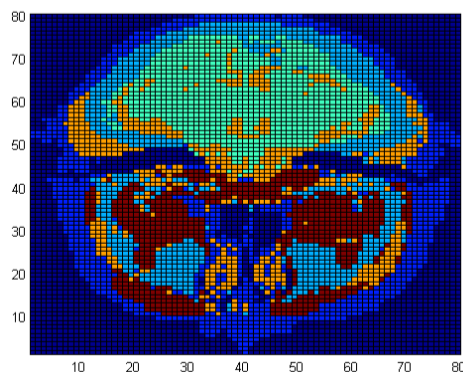
Figura 7. Corte 35 resolución 80x80

Como se observa en las figuras, se aprecia el cambio que existe entre utilizar una matriz digitalizada de 40x40 a la de una de 80x80, entre estas diferencias se encuentra la mayor nitidez que presenta la imagen, esto provoca una mayor exactitud en el cálculo de la matriz SAR, eso sí implica un mayor tiempo de cálculo para una misma cantidad de iteraciones.

Con el método FDTD se obtienen las figuras 8 y 9 que muestran claramente el aumento sustantivo del SAR cuando el campo magnético de la línea de transmisión es considerado en usuarios que habitan cerca de la línea. Este efecto puede ser peligroso en niños que usan celulares en ambientes magnetizados.
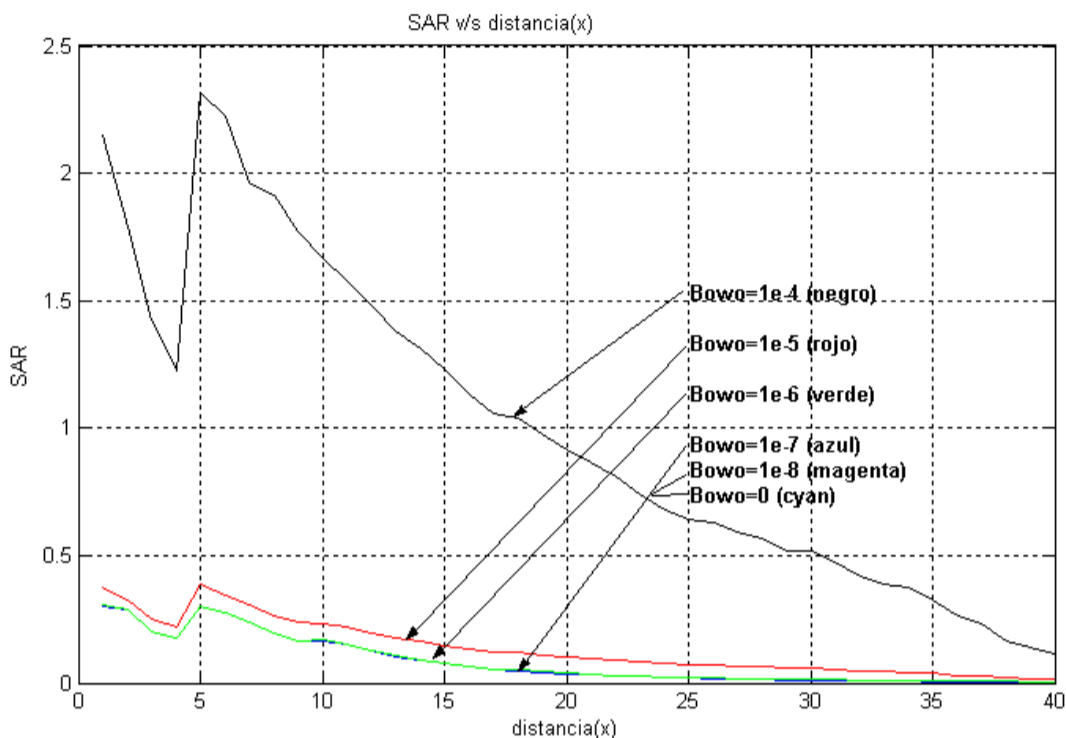
Figura 8. SAR versus distancia teniendo como parámetro el factor B_0 del campo magnético de la línea de alta tensión y la frecuencia w_0

De la figura 5 se observa que para el factor $B_0 w_0 = 10^{-4}$, el valor del SAR se hace sustancialmente alto. Los valores de B_0 son obtenidos de la figura 3.
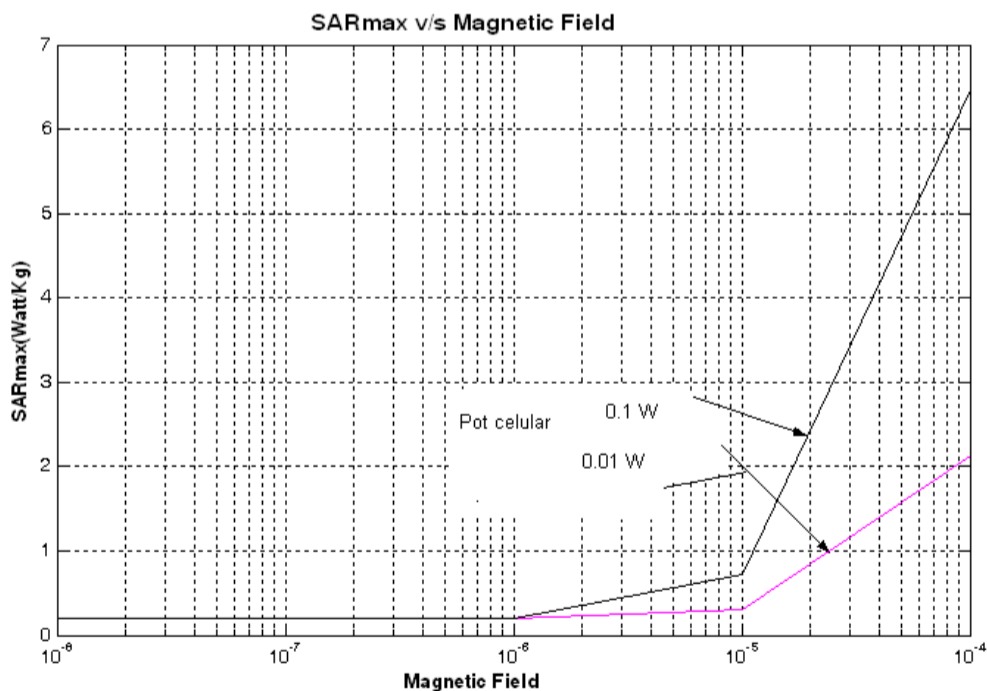
Figura 9. SAR versus campo magnético B_0 teniendo como parámetro la potencia del teléfono celular.

De la figura 9 se observa que para valores de $B_0 = 10^{-5} - 10^{-4} T = 10$ μT-100 μT, el valor de SAR es significativamente alto para dispositivos portátiles de potencia de 0.1 Watts, estando por sobre los niveles permitidos de SAR [11].

Conclusiones

Las normativas vigentes en el país respecto de niveles máximos para exposición a campos electromagnéticos es nula, el criterio recae en el instalador ya que éste podría seleccionar normativas estrictas de otros países o simplemente regirse por las normas dadas por la ICNIRP. Las enfermedades que se pueden ocasionar con una exposición prolongada a campos electromagnéticos no han sido comprobadas científicamente, existen diversos estudios donde se dan argumentos en contra y a favor sobre este tema [6,7]. Sin embargo, en la mayoría de los países desarrollados se han adoptado normas que fijan niveles máximos de exposición para espacios públicos, como un principio de precaución mientras no se demuestre que los campos electromagnéticos no producen daño a la salud. En Chile, como mínimo debieran respetarse las normas dadas por la ICNIRP, sin embargo, en este estudio aplicado a una línea de transmisión de 66 kV cercana a viviendas sociales se comprueba que se exceden los niveles de emisión de campo magnético para una exposición pública. En el ámbito de los teléfonos celulares el uso no restringido y permanente por niños especialmente en ambientes magnetizados el efecto del SAR estudiado por otros autores [13-18] que no han considerado el campo magnético de líneas de alta tensión en zonas suburbanas, se vería acrecentado fuertemente como se ha demostrado en este trabajo.

Agradecimientos

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ANEXOS

A. Modelo matemático del campo electromagnético de una línea de transmisión

Podemos obtener la ecuación de onda para el campo magnético a partir de la ley de Maxwell-Ampere:

$$\nabla \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t} \quad , \tag{A.1}$$

y al aplicar el rotacional en ambos lados de la ecuación, obtenemos:

$$\nabla \times \nabla \times \vec{H} = \nabla \times \vec{J} + \frac{\partial}{\partial t} \nabla \times \vec{D} \; . \tag{A.2}$$

Para materiales isotrópicos podemos ocupar las ecuaciones constitutivas, de manera que

$$\nabla \times \nabla \times \vec{H} = -\sigma \frac{\partial \vec{B}}{\partial t} - \varepsilon \frac{\partial^2 \vec{B}}{\partial t^2} \quad , \tag{A.3}$$

donde se utilizó la ley de Faraday para reemplazar $\nabla \times E$ por cantidades magnéticas. Tenemos una ecuación de segundo orden que puede ser escrita para el vector de intensidad de campo magnético, en efecto:

$$\nabla^2 \vec{H} - \sigma\mu \frac{\partial \vec{H}}{\partial t} - \varepsilon\mu \frac{\partial^2 \vec{H}}{\partial t^2} = \nabla\nabla \cdot \vec{H} = 0 \; . \tag{A.4}$$

La forma diferencial de las ecuaciones de Maxwell al ser analizadas como campos harmónicos oscilando a una frecuencia constante [2], permite aproximar las derivadas usando la notación compleja fasorial $\frac{\partial}{\partial t} = j\omega$ y $\frac{\partial^2}{\partial t^2} = -\omega^2$, $\vec{E}(r,t) = \operatorname{Re}(\vec{E}(r,\omega)e^{-j\omega t})$. Por lo tanto, la ecuación (A.4) puede ser reescrita como [1]:

$$\nabla^2 \vec{H} - \sigma\mu j\omega \vec{H} + \varepsilon\mu\omega^2 \vec{H} = 0 \; . \tag{A.5}$$

Debido a la simetría de nuestros ejemplos, se considera el problema en dos dimensiones para el plano cartesiano (x, y), finalmente se tiene que:

$$\frac{\partial}{\partial x}\left(\frac{1}{\mu}\frac{\partial \vec{H}}{\partial x}\right)+\frac{\partial}{\partial y}\left(\frac{1}{\mu}\frac{\partial \vec{H}}{\partial y}\right)-(j\omega\sigma-\omega^2\varepsilon)\vec{H}=0\,,\qquad\text{(A.6)}$$

en consecuencia, la ecuación (A.6) representa el modelo matemático del campo magnético en los alrededores de una línea de transmisión [1].

Podemos obtener una ecuación de onda similar para el campo eléctrico partiendo de la ley de Faraday, aplicando el rotacional a ambos lados de la ecuación y ocupando las relaciones constitutivas [2]. Esto resulta en:

$$\nabla^2\vec{E}-\sigma\mu\frac{\partial \vec{E}}{\partial t}-\varepsilon\mu\frac{\partial^2\vec{E}}{\partial t^2}=\frac{1}{\varepsilon}\nabla\rho\,,\qquad\text{(A.7)}$$

la densidad de carga en la región analizada es $\rho=0$, ya que no hay cargas libres presentes. Además, considerando el campo de tiempo armónico y utilizando la notación compleja fasorial se tiene [3]:

$$\frac{\partial}{\partial x}\left(\frac{1}{\mu}\frac{\partial \vec{E}}{\partial x}\right)+\frac{\partial}{\partial y}\left(\frac{1}{\mu}\frac{\partial \vec{E}}{\partial y}\right)-(j\omega\sigma-\omega^2\varepsilon)\vec{E}=0\quad,\qquad\text{(A.8)}$$

así la ecuación (A.8)) representa el modelo matemático del campo eléctrico en los alrededores de una línea de transmisión [3].

B. Método de Galerkin sobre la ecuación que modela el campo eléctrico alrededor de una línea eléctrica

Al aplicar el método de Galerkin [4] sobre la ecuación que modela el campo eléctrico alrededor de una línea eléctrica se tiene:

$$\frac{\partial}{\partial x}\left(\frac{1}{\mu}\frac{\partial \vec{E}}{\partial x}\right)+\frac{\partial}{\partial y}\left(\frac{1}{\mu}\frac{\partial \vec{E}}{\partial y}\right)-(j\omega\sigma-\omega^2\varepsilon)\vec{E}=0\,,$$

$$\frac{1}{\mu}\int_{\Omega}\left(\frac{\partial w}{\partial x}\frac{\partial E}{\partial x}+\frac{\partial w}{\partial y}\frac{\partial E}{\partial y}\right)d\Omega-\left(j\omega\sigma-\omega^2\varepsilon\right)\int_{\Omega}\left(wE\right)d\Omega=0\,,$$

$$\left[K^e\right]=\frac{1}{\mu}\int_{\Omega}\left(\frac{\partial w}{\partial x}\frac{\partial E}{\partial x}+\frac{\partial w}{\partial y}\frac{\partial E}{\partial y}\right)d\Omega\,,\quad\left[M^e\right]=-\left(j\omega\sigma-\omega^2\varepsilon\right)\int_{\Omega}\left(wE\right)d\Omega\,,$$

y finalmente $\left[K^e+M^e\right]E=0$.

Podemos observar que las ecuaciones diferenciales de segundo orden son matemáticamente equivalentes, al reemplazar la intensidad del campo magnético $\vec{H}$ por la intensidad del campo eléctrico $\vec{E}$ [3]. Por lo tanto, en el análisis de elementos finitos, se utiliza la misma matriz 3x3 de cada elemento finito triangular para ambas variables, con sus correspondientes constantes.

C. Expresiones de diferencias finitas

Se tienen las expresiones para los campos de microondas:

$$H_x \big|_{i-1/2,j+1}^{n+1} = H_x \big|_{i-1/2,j+1}^{n} - C_{ay}\left(E_z \big|_{i-1/2,j+3/2}^{n+1/2} - E_z \big|_{i-1/2,j+1/2}^{n+1/2}\right) - \frac{2B_{0x}\omega_{0x}}{\mu},$$

$$H_y \big|_{i,j+1/2}^{n+1} = H_y \big|_{i,j+1/2}^{n} + C_{ax}\left(E_z \big|_{i+1/2,j+1/2}^{n+1/2} - E_z \big|_{i-1/2,j+1/2}^{n+1/2}\right) - \frac{2B_{0y}\omega_{0y}}{\mu},$$

$$H_z \big|_{i,j+1}^{n+1} = H_z \big|_{i,j+1}^{n} + C_{ay}\left(E_x \big|_{i,j+3/2}^{n+1/2} - E_x \big|_{i,j+1/2}^{n+1/2}\right) - C_{ax}\left(E_y \big|_{i+1/2,j+1}^{n+1/2} - E_y \big|_{i-1/2,j+1}^{n+1/2}\right) - \frac{2B_{0z}\omega_{0z}}{\mu},$$

$$E_x \big|_{i,j+1/2}^{n+1/2} = D_a \big|_{i,j+1/2} E_x \big|_{i,j+1/2}^{n-1/2} - D_{by} \big|_{i,j+1/2}\left(H_z \big|_{i,j+1}^{n} - H_z \big|_{i,j}^{n}\right)$$

$$E_y \big|_{i-1/2,j+1}^{n+1/2} = D_a \big|_{i-1/2,j+1} E_y \big|_{i-1/2,j+1}^{n-1/2} - D_{bx} \big|_{i-1/2,j+1}\left(H_z \big|_{i,j+1}^{n} - H_z \big|_{i-1,j+1}^{n}\right),$$

$$E_z \big|_{i-1/2,j+1/2}^{n+1/2} = D_a \big|_{i-1/2,j+1/2} E_z \big|_{i-1/2,j+1/2}^{n+1/2} + D_{bx} \big|_{i-1/2,j+1/2}\left(H_y \big|_{i,j+1/2}^{n} - H_y \big|_{i-1,j+1/2}^{n}\right)$$
$$- D_{ay} \big|_{i-1/2,j+1/2}\left(H_x \big|_{i+1/2,j+1}^{n} - H_x \big|_{i+1/2,j}^{n}\right),$$

donde:

$$C_{ay} = \frac{\Delta t}{\mu_0 \Delta y}, \quad C_{ax} = \frac{\Delta t}{\mu_0 \Delta x}, \quad D_a \big|_{i,j} = \frac{2\varepsilon_{i,j} - \sigma_{i,j}\Delta t}{2\varepsilon_{i,j} + \sigma_{i,j}\Delta t}, D_{by} \big|_{i,j} = \frac{2\Delta t/\Delta y}{2\varepsilon_{i,j} + \Delta t\sigma_{i,j}}, D_{bx} \big|_{i,j} = \frac{2\Delta t/\Delta x}{2\varepsilon_{i,j} + \sigma_{i,j}}$$

Aquí B_{0x}, B_{0x}, B_{0x} son los valores de campo magnético de la línea de transmisión [11, 12].

THE STRUCTURE OF WATER
and
HOW PSYCHE ENTERS MATTER

Part Two
Jerry Pollack, and the Structure in Water

by
Dr. Richard Alan Miller, c2015
www.richardalanmiller.com
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Part Two
Jerry Pollack, and the Structure in Water

Dr. Jerry Pollack - I first met Dr. Jerry Pollack in 1970, when he hired me to work under him (lead) at the University of Washington, School of Medicine, and Department of Anesthesiology. Boeing had just lost the B-1 Project, and more than 30,000 scientists were left unemployed in a single day, including me.

> There was even a sign on the outskirts of Seattle stating "*Would the last person out of town please turn off the lights?*"

Professor of Bioengineering at the University of Washington, Dr. Gerald Pollack is now an international leader in the field of water research. He received his Ph.D. from the University of Pennsylvania in 1968.

Since then, his research interests have ranged broadly over the scientific spectrum, from cardiac dynamics and electrophysiology, to muscle contraction, cell biology, and more recently to the role of water in nature.
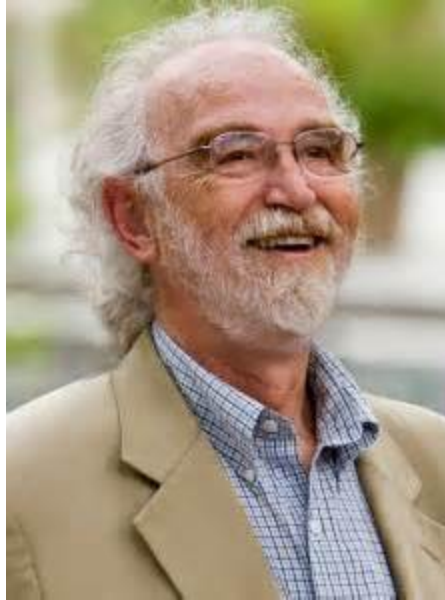
Dr Jerry Pollack, 2014

At age 72, Jerry currently runs the Pollack Laboratory at the University of Washington, which focuses on uncovering some of nature's more deeply held secrets. He is also the Editor-In-Chief of the scientific journal *WATER*, a multidisciplinary research journal that brings together water-oriented research from diverse disciplines.

Professor Pollack has earned many distinctions, medals, and honors. He was awarded the highest faculty honor bestowed by his university, the Annual Award Lectureship at the University of Washington in 2008. Jerry is now in demand internationally as a catalytic lecturer, with a dynamic way of presentation.

In his spare time in Seattle, his joy lies gardening, cooking, and skiing. He also ruminates on subjects as diverse as the origin of weather, the molecular basis of brain function, and attempting to solve the world's crises (water, energy, health). He has also been known to build ponds, harpsichords, and tree houses.

EZ Water - Water is clearly one of the most important factors for our health - especially when we consider that it is in over 99 percent of our body. Water is a really underappreciated part of the equation of optimal health.

Dr. Gerald Pollack is one of the leading premier research scientists in the world when it comes to understanding the physics of water, and what it means to your health. His book, *The Fourth*

Phase of Water: Beyond Solid, Liquid, and Vapor, is a phenomenal read that is easy to understand even for the non-professional.
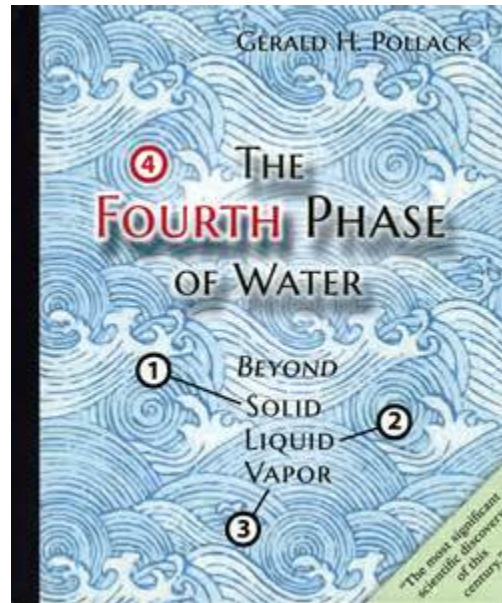
Dr Jerry Pollack, and his newest book:
The Fourth Phase of Water

It clearly explains the theory of the 4th phase of water, which is nothing short of ground-breaking. This 4th phase of water is, in a nutshell, living water. It's referred to as EZ water - EZ standing for "exclusion zone" - which has a negative charge. This water can hold energy, much like a battery, and can deliver energy too.

For years, Dr. Pollack had researched muscles and how they contract, and it struck him as odd that the most common ideas about muscle contraction do not involve water, despite the fact that muscle tissue consists of 99 percent water molecules.

> *I began to think about water in the context of biology: if water inside the cell was*
> *ordered and structured and not bulk water or ordinary water as most biochemists*
> *and cell biologists think, then it is really important*

Dr Jerry Pollack

The Water in Human Cells

Gilbert Ling, who was a pioneer in this field, discovered that water in human cells is not ordinary water (H2O), but something far more structured and organized.

Dr. Pollack's book also touches on some of the most basic features of water, many of which are really not understood. For example, how does evaporation take place? Why does a tea kettle whistle? Also, despite the fact that conventional science tells us freezing is supposed to occur at zero degrees Celsius, experiments show that it can freeze in many different temperatures down to minus 50 degrees Celsius.

Water Information Transfer

There's actually no one single freezing point for water! Other experiments show that the boiling point of 100 degrees Celsius (or 212 degrees Fahrenheit) does not always hold true either. There are actually 18 phases of water, which will be part of next month's article.

This is where several various states can exist (like liquid, gas, or ice) at the same time, under specific boundary conditions. For example: because of the very low pressure on Mars, the water Curiosity rover discovered was in a slushy-ice form due to the lack of pressure in that atmosphere.

> There's a famous website1 put together by a British scientist, Martin Chaplin.
> Martin lists numerous anomalies associated with water. In other words, things
> that shouldn't be according to what we know about water...

Dr Jerry Pollack

The more anomalies we have, the more we begin to think that maybe there's something fundamental about water that we really do not yet know.

> *That's the core of what I'm trying to do. In our laboratory at the University of Washington, we've done many experiments over the last decade. These experiments have clearly shown the existence of this additional phase of water.*
>
> Dr Jerry Pollack

The reason this 4th phase of water is called the exclusion zone or EZ is because the first thing Dr. Pollack's team discovered is that it profoundly excludes things. Even small molecules are excluded from EZ water. Surprisingly, EZ water appears in great abundance, including inside most of your cells. Even your extracellular tissues are filled with this kind of water.
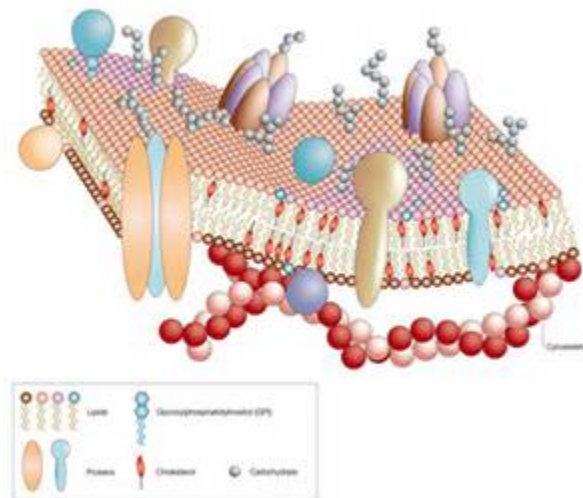
Cell Membrane Structure

EZ Water in the Cell Membrane Structure - Other inherent differences between regular water and EZ water include its structure. Typical tap water is H2O. But, this 4th phase is not H2O; but H3O2. This is a stabilized hydrogen peroxide, with an extra hydrogen molecule.

It's also more viscous, more ordered, and more alkaline than regular water, and its optical properties are quite different. The refractive index of EZ water is about 10 percent higher than ordinary water. Its density is also about 10 percent higher, and it has a negative charge (negative electrical potential). This may provide the answer as to why human cells are negatively charged.

Everybody knows that the cell is negatively charged. If you insert an electrode into any of your cells, you'll measure a negative electrical potential. The textbook says that the reason for this negative electrical potential has something to do with the membrane and the ion channels in the membrane.

Dr Jerry Pollack

Oddly, if you look at a gel that has no membrane, you record much the same potential - 100 to 150 millivolts negative. The interior of the cell is much like a gel. It's kind of surprising that something without a membrane yields the same electrical potential as the cell with a membrane.
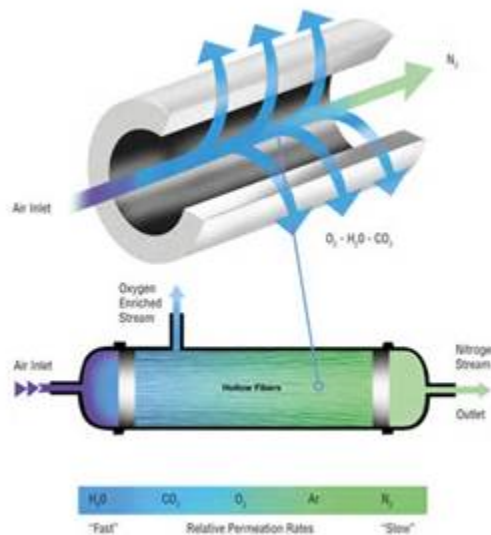
Hollow Fiber Membrane Prism

That raises the question: where does this negativity come from? Well, I think the negativity comes from the water, because the EZ water inside the cell has a negative charge. The same is true of the gel - the EZ water in the gel confers negativity.

I think the cells are negatively charged because the water inside the cell is mainly EZ water and not neutral H2O.

Dr Jerry Pollack

Dr Jerry Pollack, 2014

Coming Next:
   Part 3: The 18 Phase of Water,
         and the Formation of the 4th Phase

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POWER TOOLS

FOR THE 21ST CENTURY

DR. RICHARD ALAN MILLER

Bioelectromagnetics Applications for Health and Healing
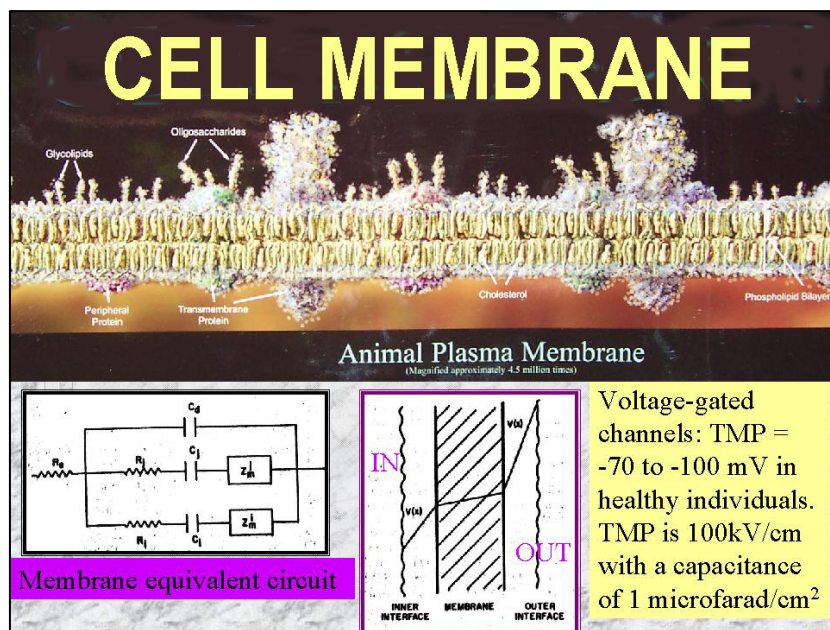
Thomas Valone, Ph.D. and Jacqueline Panting, N.D.
Integrity Research Institute
Beltsville, Maryland

The following information is provided for educational purposes only. It is not to be construed as constituting medical advice, nor do the devices described have FDA approval though some qualify for the FDA grandfather clause which is an exemption. This article is not intended for diagnosis or treatment of disease. Persons should seek medical counsel before any investigation of these experimental devices.

Introduction to Electromedicine

In 1898, Tesla published a paper that he read at the eighth annual meeting of the American Electro-Therapeutic Association in Buffalo, NY entitled, "High Frequency Oscillators for Electro-Therapeutic and Other Purposes." He states that "One of the early observed and remarkable features of the high frequency currents, and one which was chiefly of interest to the physician, was their apparent harmlessness which made it possible to pass relatively great amounts of electrical energy through the body of a person without causing pain or serious discomfort."[1] Tesla also concluded correctly that bodily "tissues are condensers" in the 1898 paper, which today is estimated to be about 100 – 300 pF. It is also the basic component (dielectric) for an equivalent circuit only recently developed for the human body. In fact, the relative permittivity for tissue at any frequency from ELF (10 Hz-100 Hz) through RF (10 kHz– 100 MHz) exceeds most commercially available dielectrics on the market. This unique property of the human body indicates an inherent adaptation and innate compatibility toward the presence of high voltage electric fields, probably due to the high **transmembrane potential (TMP)** gradient in healthy individuals, present across cellular membrane tissue. This surprisingly intense electric field, which averages 100 kV/cm or equivalently 10 MV/m as noted in our first figure, is extraordinary because it demonstrates the body's ability to withstand high electric field energy, like storing a lightning bolt in each cell. It is also one of the *only two ways that the human body stores energy* (electrical gradients or chemical gradients). We have found that debilitated people, with or without disease, will respond to a five minute exposure of a high voltage therapy device and report an increase in their liveliness and vitality almost immediately.

CELL MEMBRANE

Glycolipids • Oligosaccharides

Peripheral Protein • Transmembrane Protein • Cholesterol • Phospholipid Bilayer

Animal Plasma Membrane
(Magnified approximately 4.5 million times)

Membrane equivalent circuit

IN • OUT

INNER INTERFACE • MEMBRANE • OUTER INTERFACE

Voltage-gated channels: TMP = -70 to -100 mV in healthy individuals. TMP is 100kV/cm with a capacitance of 1 microfarad/cm²

For example, a client of ours named Susan R. wrote to us to place an order for our portable Tesla-coil-styled **Premier Junior** stating, "About an hour after I tried the device for the 2nd time on the last day of the conference I had so much energy I packed up and drove 7 hours to get home. After I got home I still had energy to burn! I cannot wait to have more of that on a regular basis!" This seems to be related to the "charging" of the body's condensers (capacitors) which are the cell's membranes. Another reason is that *electrons are the active ingredient in antioxidants* and have the ability to quench free radical damage faster than any pill or capsule (more explanation in a later section of this article). Tesla also

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[1] Tesla, Nikola. "High Frequency Oscillators for Electro-Therapeutic and Other Purposes," *The Electrical Engineer,* Vol. XXVI, No. 550, Nov. 17, 1898, p.477 (available online at www.electrotherapymuseum.com)

indicates that the after-effect from his coil treatment "was certainly beneficial" but that an hour exposure was too strong to be used frequently. This has been found to be still true today with the various Tesla coil therapy devices.[2]

Throughout the early 1900's, thousands of electrical devices were invented and used by doctors to effectively ameliorate a variety of illness, disease, infection, and malady. As far back as September 6, 1932, Dr. Gustave Kolisher announced to the American Congress of Physical Therapy in New York that "Tesla's high-frequency electrical currents are bringing about highly beneficial results in dealing with cancer, surpassing anything that could be accomplished with ordinary surgery." Though a few devices and textbooks survive to this day, most have been wiped out by the special interests of the A.M.A. and the F.D.A. Today, it is ironic that cancer, AIDS, and a host of other diseases remain in the limbo of research almost indefinitely with only incremental improvements in care revealed by all of the medical institutions. On the other hand, there is a resurgence in the science of bioelectromagnetics (BEMs), which is the study of the effect of electromagnetic fields on biological systems. There are presently many instruments and devices re-emerging that bring beneficial health changes to human organisms, including one developed by this presenter. Electromedicine, electrotherapy or electromagnetic healing are the terms applied to such developments in the ELF, RF, IR, visible or UV band, which when properly used, represent the ideal, noninvasive therapy of the future. Studies by numerous doctors and scientists have demonstrated incontrovertible evidence for the benefits of BEM healing, for a wide variety of illnesses, with a surprisingly lack of harmful side effects. Another example of the benefits we hear about firsthand is from Elliott who wrote down his experience: "I have been suffering from nerve damage in my back for several years now. I have had several operations, physical therapy and tons of pain killers.   I heard you on Coast to Coast[3] and decided to order the Premier Junior! Wow, I experience relief immediately, so much so, that I brought it to my Neurosurgeon's office, and ask that they include it in my treatments. My doctor was so impressed that he bought one as well! When I first got the Premier, I was using a wheelchair, after 4 months, I was walking with a walker and now I am walking with a cane! I use it every day, morning and night and will never be without it! Thanks so much!"

One of the many interesting examples of how sophisticated high voltage electrotherapy was a century ago is the book, *Use of Electricity on the Face and Scalp* by Emily Lloyd (Marinello Pub., 1924) with many examples and illustrations which we now distribute through our institute. Another more extensive publication is the *Medical Electricity* textbook by Sinclair Tousey M.D. which we borrowed from Jeff Behary (Electrotherapy Museum) and copied four major chapters for distribution by our nonprofit organization (www.IntegrityResearchInstitute.org) which is available in a computer CD format. Below is the table of contents for the textbook excerpt on the CD and a sample illustration from the book. Dr. Tousey was a consulting surgeon at St. Bartholomew's Clinic in New York City when the book was published by Saunders and Company in 1916.

Medical Electricity by Sinclair Tousey, M.D.
(Selected chapters now on CD)

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[2] For a more extensive history and theory, see "History and Physics of High-Voltage Electromagnetic Medicine" by Thomas Valone, *Explore!*, Vol. 12, No. 4, 2003, p.37-46

[3] A four hour radio interview with Dr. Valone from "**Coast to Coast with George Noory**" (April 28, 2008) is now online at IRI in four MP3 files under "Related Links". The first few hours deal with energy, inventors, propulsion and suppression. The last hour is on *health and healing with electrotherapy* and was the most popular. Each is free and about 13 Meg (mp3) and very entertaining as well as educational:
http://www.integrityresearchinstitute.org/Valone-CoasttoCoast-Apr28,2008-Hour4.mp3
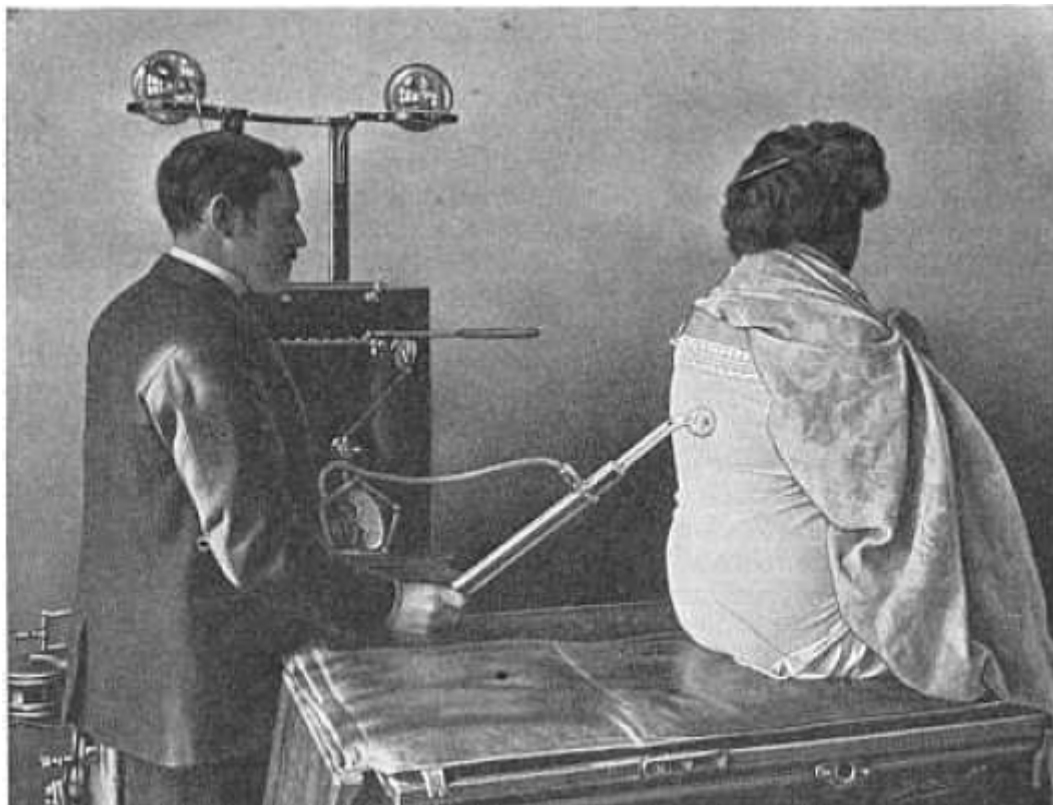
Fig. 354.—Application of vacuum electrode by means of the author's completely insulated handle.

Tesla Coil Electrotherapy Devices

Our experience with variations of Tesla's original coil design, accentuated with noble gas tube delivery system, has run the gamut of large tower style Tesla coil machines and more compact models like the "suitcase" style coil and gas tube combinations. Two models which we invented are the PREMIER 3000 and 2500 models (shown side by side) where the PREMIER 3000 has an additional pulsing toroid following Larry Azure's patent #6,217,604 in which he claims in the patent that it helped to cure cancer. The acronym **PREMIER** is a combination of therapeutic terms: Photonic Rejuvenation Energizing Machine & Immunizing Electrification Radiator. The PREMIER 2500 is shown in the photo operating with the gas tubes lit up by the high voltage and has a wand applicator.

PREMIER 3000 with toroid in front.
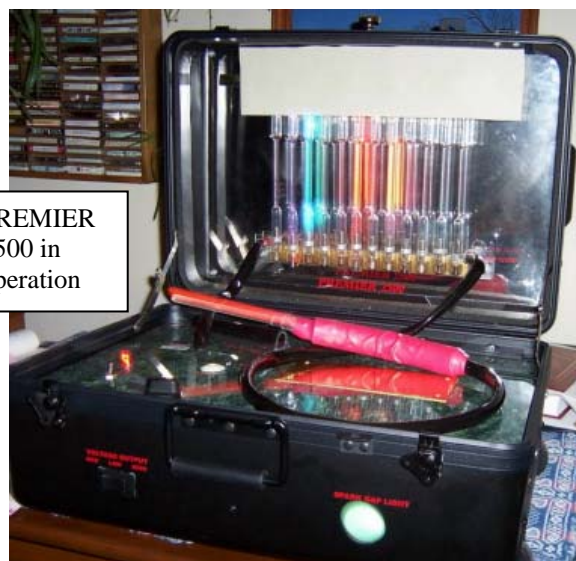
PREMIER 2500 in operation

The PREMIER 3000 and 2500 are experimental models which take about a month to manufacture and the case is specially designed with an extendable handle and wheels for moving it around. An innovative addition was the static mat at the top so the client can actually contact the high voltage extending through the gas tubes and charge up the body. The "wand" as we call it, is the other method to accomplish the same goal, with a well-insulated high voltage cable and handle with a noble gas vacuum electrode tube at the end, much like the Fig. 354 from Dr. Tousey's book. A ten-minute timer is also installed in every unit to limit the exposure and heating of the quiet, internal spark gap.

It is important to explain that the spark gap in every Tesla coil is the underlined mysterious but necessary "randomizer" that introduces the *chaotic oscillations of high voltage discharge* in the circuitry and accomplishes an amazing superposition of frequencies in the kilohertz, megahertz and gigahertz, as verified by spectrum analysis.[4] The value of such a plethora of frequencies of electromagnetic radiation, *for short term exposure*, is that Bioelectromagnetics teaches that the human body has lots of frequency-specific storage sites, too numerous to mention in this article. As Lakhovsky suggested with his work, the human body can absorb the frequencies that it needs, which also equates to specific quanta of energy, by the Einstein equation $E = h\,f$ where h is Planck's constant.

The more recent and the most popular model that we have developed is the **Premier Junior** mentioned previously, with interchangeable noble gas tubes, which is a handheld, portable version of the other PREMIER models. Fashioned after the century-old "Violet Ray" devices and the "Branston Junior" shown in the photo, it is the same as the "Fig. 354" but more compact. We improved the electrical insulation of the high voltage coil interface with the gas tube with two layers of silicon rubber sleeves for long-lasting, safe use of the model. Its durable design has convinced us and many clients of the efficacy of this renewable and non-consumable medicine. Richard is another case study who purchased a Premier Junior (PJ) and reported back to us, "I've been using the PJ for a couple days now. It seems to be helping a condition that I have had reoccurring that is similar to gout (knees and ankles). I've used it in the morning and evening as prescribed. I've used it along my adrenals and lymph nodes, as well as the back of the neck, with very invigorating results. Thank you for your time. I'm very happy with the purchase."

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[4] Valone, Thomas. *Bioelectromagnetic Healing: A Rationale for Its Use*, Integrity Research Institute, 2011 edition

Chronic Fatigue Syndrome

Another area which seems ripe for a new electrotherapy protocol is Chronic Fatigue Syndrome (CFS). It is a condition that has become quite prevalent in the last 50 years. It is defined as a debilitating lack of vitality that includes symptoms lasting at least 6 months. These symptoms may include:

- Sore throat
- Muscle pain
- Tender lymph nodes
- Joint pain
- Interrupted sleep
- Unexplained persistent and relapsing fatigue that is not alleviated by rest
- Substantial reduction in previous levels of activity

More women are affected than men are by this syndrome. Even more disturbing, a muscle disorder that also causes weakness, called fibromyalgia, has been found in many CFS patients, according to a study conducted by the Center for Disease Control (www.cdc.gov). With more than three-quarters of a million people in the United States exhibiting a CFS-like condition, it is becoming a serious health concern.[5] The causes for CFS are still undetermined. Some studies suggest multiple nutrient deficiencies can trigger chronic fatigue. Therefore, proper nutrition, consisting of a well balanced diet is vitally important. Fresh fruits and raw foods are especially recommended. Herbs that are helpful include ginkgo, astragalus, red clover, dandelion and short term use of echinacea to help boost the immune system, which is always affected by CFS. To help improve the interrupted sleep pattern, valerian root or melatonin at bedtime is helpful.

Although numerous studies have been conducted to find the underlying causes of CFS, *none have succeeded in understanding its physiological or chemical pathways*.[6] Some studies have shown that deficiencies of the adrenal or thyroid glands have been found in CFS patients. This has prompted the belief that stress can trigger CFS, whether it is of mental or physical origin. Therefore energy boosting therapies as well as vitamins and antioxidant supplementation to combat free radical proliferation is often considered to be extremely important.

How do free radicals deplete cellular energy? Free radical proliferation is linked to pathological changes that cause cellular malfunction or mutation (i.e. cancer) as well as protein degradation. Free radicals also play a large role in causing damage to all cells of the body but particularly the immune system. Free radicals also *deplete cellular energy* by interfering with mitochondrial function and contribute to shortened lifespan, according to studies with animal species.[7] Cellular energy generation in the mitochondria is both a key source and key target of oxidative stress in the cells. Seeking an electron to complete the radical, free radicals cause chain reactions as electrons are ripped from molecules, creating another free radical. Cellular energy generation in the mitochondria is both a key source and key target of oxidant stress in the cell. One can therefore envision a model whereby the inevitable increased production of free radicals compromises mitochondrial efficiency and eventually energy output in a detrimental feedback loop.[8]

Co-author Dr. Panting using PREMIER 2500

[5] Gerrity TR, et al., "Chronic fatigue syndrome: what role does the autonomic nervous system play in the pathophysiology of this complex illness?" *NeuroImmunoModulation*, V. 10, p. 134-141, 2002

[6] Fukuda K, et al., "The chronic fatigue syndrome: a comprehensive approach to its definition and study." *Annals of Internal Medicine*, V. 121, p. 953-959, 1994

[7] Smith P, editor, "Pathways of aging" *Life Extension*, January, 2004, p. 33

[8] Campisi J. "Aging, chromatin, and food restriction—connecting the dots" *Science*, Sept., 2000, V. 289, No. 5487, p. 2062-3

Antioxidants such as vitamin A, vitamin E, selenium and coenzyme Q10 supply free electrons and are usually prescribed by naturopathic doctors in order to provide limited relief in counteracting free radical ravages, as long as they are taken regularly. However, electronic antioxidants produced by bioelectromagnetic (BEM) therapy can also satisfy and terminate free radicals, by abundantly supplying the key ingredient usually found only in encapsulated antioxidant supplements…the electron.[9] Indeed, such a pattern of confirmation has been found through our preliminary studies before and after electrotherapy with the *Pharmanex BioPhotonic Scanner* which tests for carotenoid (vitamin A) levels in the blood. The carotenoid levels of the blood are noticeably higher after high voltage electrotherapy, suggesting that free radical levels have dropped since they are not consuming carotenoids at the same rate as before therapy. The accompanying bodily feedback to quenching free radicals is a relief of pain as James reported to us: "Your device seems to be healing my damaged knee. I have been using for 2 weeks am & pm. Less pain = can stand and walk better, also in a peculiar way I have more energy and better mood. Been using all nutrition protocols plus pulsed light from 'light force' co. all helped, but your Premier Jr. has already made a huge advance. I am very grateful. You are doing good work. Thank you. I am going to get the book on meditation, thank you over and over."

Dr. Richard Gerow using Premier Jr.
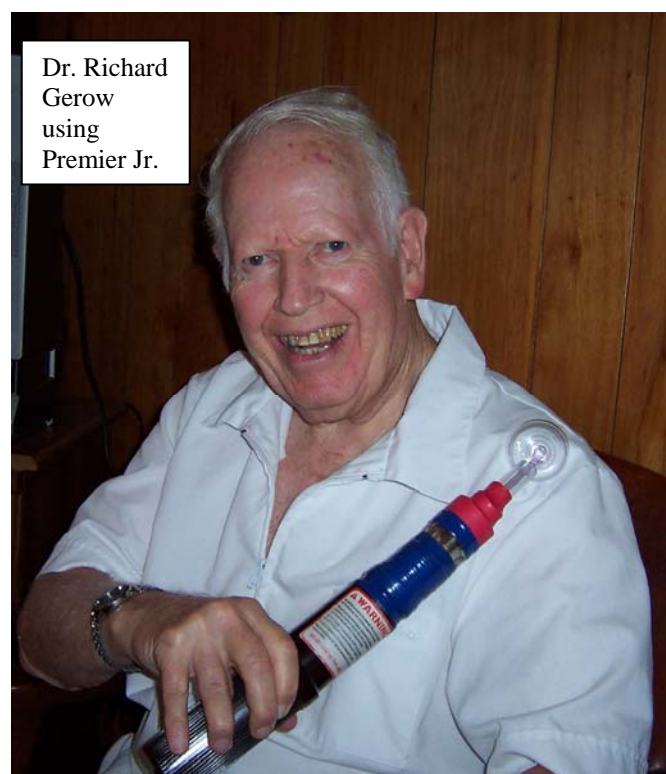
Another indicator for the body's immune system status and energy storage level is literally the lightning bolt voltage that is maintained across all of its cell membranes! The so-called transmembrane potential (TMP), shown in the first illustration slide to this article, is typically a hundred thousand volts per centimeter, and often found to be much lower during stress and disease states, indicating lower energy levels in the body. In the case of CFS, modern medicine does not offer a chemical supplement or pharmaceutical concoction to provide relief. However, the high voltage electric fields presented to the body by bioelectromagnetic therapy can be reasonably expected to boost the TMP directly.[10] Similarly, with a higher voltage setting of the electrotherapy device, some people report extra benefits such as Larry who also refers to the Premier Jr.: "I am starting to notice it working for me because I hurt my elbow joint about 4 months ago and now I can put my own shirt, pants, etc. on with both hands instead of one. I very much enjoy the product. Now, I'll use the highest power as I am use to it. Even though I always stay just over the minimum to get the gases flowing."

It is known that damaged or diseased cells present an abnormally low TMP about 80% lower than healthy cells.[11,12] This signifies a greatly reduced metabolism and, in particular, impairment of the electrogenic sodium-potassium (Na-K) pump activity and therefore, reduced ATP production. The sodium-potassium pump, within the membrane, forces a ratio of 3Na ions out of the cell for every 2K ions pumped in, for proper metabolism. An impaired Na-K pump results in edema (cellular water accumulation) and a tendency toward fermentation, a condition known to be favorable toward cancerous activity.

[9] Valone, T., *Bioelectromagnetic Healing: A Rationale for Its Use*, Integrity Research Institute, 2003, p. 37

[10] Valone, p. 27

[11] Ceve, G. "Membrane Electrostatics," *Biochim Biophys Acta,* 103(3):311-82, 1990 **Medline 91027827**

[12] Malzone, A. et al, "Effect on cellular and tissue metabolism of induced electrical currents" *Arch Stomatology* 30(2):371-82 **Medline 90314754**

A Nobel Prize winner, Dr. Albert Szent-Gyorgi, proposed that cell membranes also rectify alternating currents since structured proteins behave like <u>solid-state diodes</u>.[13] (A diode passes electricity in only one direction.) It is reasonable therefore to conclude, based on these biophysical principles, that an endogenous high voltage EMF potential of sufficient strength will theoretically *stimulate the TMP, normal cell metabolism, the sodium pump, ATP production and healing*. This far-reaching generalization has already been found in the literature: "*TMP is proportional to the activity of this pump and thus to the rate of healing*."[14] Furthermore, "increases in the membrane potential have also been found to increase the uptake of amino acids."[15] Electromedicine therefore, appears to connect to and recharge the storage battery of the TMP, just as sunlight baths connect to and recharge the storage battery of biophotons in cellular DNA, while helping the body to synthesize vitamins.

Will high voltage electrotherapy become the medicine of the future? Similar expectations were voiced 100 years ago when pioneers such as Tesla, Rife, and Lakhovsky, who were ahead of their time, served medical doctors with their remarkable inventions in electromedicine. Only superior clinical studies along with perseverance and determination to change the pharmaceutical dependency in this country may make the difference this time around. In the meantime, those suffering from chronic fatigue syndrome may find that relatively simple steps can be taken to reduce debilitating free radical attack and boost ATP production through TMP recharging by regular, brief (less than 10 minutes) electromedicine treatments.

Perhaps the most unusual story that we have received surprisingly came from a healing professional we call Dr. Garl: "I am a chiropractor and have used many machines in the past. The Premier Junior is amazing! I have no health challenges, but enjoy the extra energy I receive from it. I use it morning and night for 5 mins each. The other day, I was late and did not have a treatment in the morning, so I decided to have two in the evening. I did my first treatment and then 15 mins later I did another. To my amazement, after I finished the second treatment, I started to hear the most beautiful, rhythmic sounds coming from my spine. I felt total joy and bliss… Since that episode I have learned that the sounds I heard were that of my chakras. I cannot explain why it happened, but it was definitely related to my using the Premier 2 times that evening and I am convinced that this machine can create altered states of consciousness besides all the wonderful physical effects. Thanks so much!"

Note: All of the above-mentioned client anecdotes have been reproduced in the same syntax as we received them with all of the abbreviations in the original emails or letters except for the last one which was received as a personal phone call. The originals are on file.

Further information on TMP, ATP and BEM therapy can be found in the book, *Bioelectromagnetic Healing: A Rationale for its Use* by Thomas Valone available from www.amazon.com or bookstores. Related websites are www.zephyrtechnology.com , www.designmed.com, www.lightbeamgenerator.com , and our site, www.IntegrityResearchInstitute.org . Call 888-802-5243 or 301-220-0440 any afternoon (EST) for more information or to request our product catalog. A thirty (30) day trial is available for the Premier product line.

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[13] Szent-Gyorgi, A., *Introduction to Submolecular Biology*, Academic Press, NY, 1960. Also, *Bioelectronics*, Academic Press, NY 1968, and *Electronic Biology*, Marcel Dekker, NY 1976   (See Appendix, p. 46)

[14] Jorgenson, W. A. and B.M. Frome, C. Wallach. "Electrochemical Therapy of Pelvic Pain: Effects of Pulsed Electromagnetic Fields (PEMF) on Tissue Trauma," *European Journal of Surgery*, 1994, Supplement 574, p. 86

[15] Bockris, J.M. et al. *Modern Aspects of Electrochemistry*, No. 14, Plenum Pub., New York, 1982, p. 512

On First Volumes of Influential Journals About Psychic Phenomena

Carlos S. Alvarado, PhD, *Research Fellow*, <u>Parapsychology Foundation</u>

I recently published a review of the first volumes of three journals that were historically important in the study of psychic phenomena. The review article is entitled "On First Volumes and Beginnings in the Study of Psychic Phenomena: Varieties of Investigative Approaches" (*Journal of Scientific Exploration*, 2015, *29*, 131-153; if you want a copy write to me at: <u>carlos@theazire.org</u>). The journals in question were: *Revue Spirite: Journal d'Études Psychologiques*, 1858, *Proceedings of the Society for Psychical Research*, 1882–1883, and the *Journal of Parapsychology*, 1937.

In my introduction I mentioned different research styles in the history of psychology, including, for example case studies and experiments. "A similar situation and the topic of this Essay Review is the different approaches in the study of psychic phenomena over time. The purpose of this Essay Review is to introduce to modern readers some of these approaches in the forms of summaries of the contents of three different journals from the past. These are comments about the first volumes of influential publications concerned with the study of psychic phenomena that are probably not familiar to current students of psychic phenomena."

The *Revue Spirite*, produced by Allan Kardec, was an important resource in the spreading of Spiritism in France, and elsewhere. Most of the content of the *Revue* was devoted to mediumistic communications that were seen as authoritative as regards moral, philosophical and scientific issues. There was no attempt at external verification and many of the communications were not

Allan Kardec

verifiable in principle. "In a two-page paper entitled 'Utilité de Certaines Évocations Particulières' (Utility of Some Particular Evocations . . .), it was stated that these messages were valuable because the spirits in question 'have acquired a high degree of perfection' . . . that allowed them to 'penetrate the mysteries that exceed the vulgar reach of humanity. . .' "
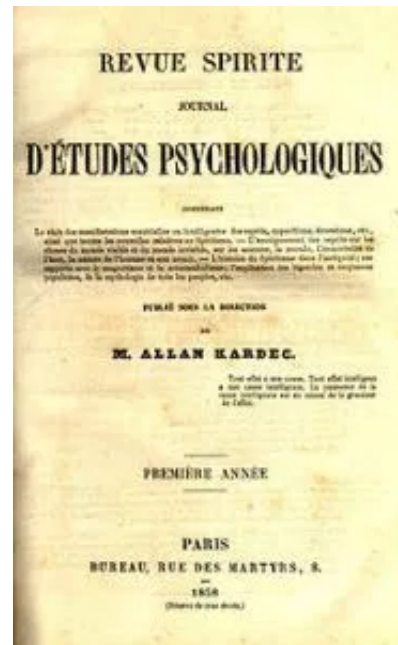
The cases described in this volume were not original investigations, but accounts reprinted from popular sources. "Examples include 'Visions' . . . , 'Le Revenant de Mademoiselle Clairon' (The Ghost of Miss Clairon . . .), 'L'Esprit Frappeur de Dibbelsdorf —Basse-Saxe' (The Rapping Spirit of Dibbelsdorf—Lower Saxony), . . .), and 'Phénomène d'Apparition' (Apparition Phenomena, . . .)."

I argued, "to consider the content of the *Revue*, and Kardec's work, as a scientific research program . . . begs the question of what science is. It is one thing to observe nature and develop hypotheses based on observed patterns, or to be tested by further observations or actual experimentation, and another thing to use communications through seances, which source is uncertain, as shown in this volume of the *Revue*, to get teachings and answers to questions about the nature of topics such as the workings of psychic phenomena and a variety of moral and philosophical issues. Similarly, it is one thing to report on non-evidential spirit communications and on cases of apparitions and other phenomena discussed in the press and other sources, and it is another to study these phenomena with attention to evidence."

A very different approach was that found in the first volume of the *Proceedings of the Society for Psychical Research*. "The *PSPR* was[63] the main organ of the Society for Psychical Research (SPR), which was of basic importance for the development of parapsychology. Its work . . . systematized research into psychic phenomena in England, but it was also influential in other countries."

PROCEEDINGS

OF THE

SOCIETY FOR PSYCHICAL RESEARCH.

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VOLUME I.

(CONTAINING PARTS I-IV.)

1882-83.

———

London :

TRÜBNER AND CO., LUDGATE HILL.

1883.

PSPR 1882-1883, Vol. 1, Table of Contents

William F. Barrett

Some of the authors in the first volume of the *PSPR* were William F. Barrett, Edmund Gurney, Frederic W. H. Myers, and Henry Sidgwick. "The first volume, containing four issues appearing in 1882 and 1883, was formed of papers reporting on the collection and analysis of evidence for psychic phenomena coming from accounts and from experiments. Some of these were . . . Barrett, Gurney, and Myers' 'First Report of the Committee on Thought-Reading' (1882 . . .) . . .Barrett, Keep, Massey, Wedgwood, Podmore, and Pease's 'First Report of the Committee on 'Haunted Houses' ' (1882 . . .), and Barrett, Massey, Moses, Podmore, Gurney, and Myers' 'Report of the Literary Committee' (1882 . . .). These, and other reports such as Barrett's 'On Some Phenomena Associated with Abnormal Conditions of Mind' (1883 . . .) and Malcolm Guthrie and James Birchall's 'Record of Experiments in Thought-Transference, at Liverpool' (1883 . . .), point to the empirical approach prevalent in the SPR even if such attempts seem methodologically crude by modern standards."

238   *Abnormal Conditions of Mind.*   [April 24,

IV.

ON SOME PHENOMENA ASSOCIATED WITH ABNORMAL
CONDITIONS OF MIND.*

By W. F. Barrett, F.R.S.E., M.R.I.A., &c.

There are certain conditions of the mind, either temporarily induced or habitual, which appear to be associated with many remarkable phenomena that have hitherto received but partial attention from scientific men. On various occasions during the last ten years I have had the opportunity of observing some of these singular states, and in the hope of eliciting further information or of stimulating inquiry by those more competent than myself, I venture to bring the following facts under the notice of the British Association.

The observations to be described belong mainly to the class known by the names of mesmerism, hypnotism, or induced somnambulism, for these terms express very similar mental stages. The experiments of the late Dr. Braid have led physiologists to recognise the existence of the fact that an extraordinary condition of the mind can be induced in certain susceptible or sensitive individuals by merely fixing the attention rigidly for several minutes upon any bright object. Whilst staying with a friend in Westmeath, now some years ago, I had the opportunity of frequently witnessing the production of this morbid condition, and, further, of observing some phenomena that are usually denied by eminent physiologists of the present day.

Selecting some of the village children and placing them in a quiet room, giving each some small object to look at steadily, it was found that one amongst the number readily passed into a state of reverie, resembling that drowsy condition between sleeping and waking. In this state the subject could readily be made to believe the most extravagant statements, such as that the table was a mountain, a chair a pony, a mark on the floor an insuperable obstacle. As Dr. Maudsley observes in his *Mental Physiology*, "the mind of the patient becomes possessed with the ideas the operator suggests, so that his body becomes an automatic machine set in motion by them."

In the Proceedings of the British Association for 1855, is a paper by Mr. Braid in which the phenomena of mesmerism are referred to

* This paper was originally read before the British Association, at the Glasgow Meeting, September, 1876. By permission of the Council of the S.P.R., it was included in the proceedings of the meeting on April 24th, after a verbal revision and the omission of a few paragraphs. Though this paper was the subject of much animadversion when first read, students of the Reports published by the S.P.R. will be able to judge how far the opinions expressed seven years ago have since received confirmation.

Different from the *Revue*, the SPR had high evidential standards with cases. As stated in the "First Report of the Committee on 'Haunted Houses' ", published in 1882: "In the first place, we . . . begin by tracing every story to the fountain-head. But we do not consider that every first-hand narration of the appearance of a ghost, even from a thoroughly trustworthy narrator, gives us adequate reason for attempting further investigation. On the contrary, our general principle is that the unsupported evidence of a single witness does not constitute sufficient ground for accepting an apparition as having a prima facie claim to objective reality. To distinguish any apparition from an ordinary hallucination . . . it must receive some independent evidence to corroborate it. And this corroboration may be of two kinds; we may have the consentient testimony of several witnesses; or there may be some point of external agreement and coincidence—*unknown, as such, to the seer at the time*—(e.g., the periodic appearance on a particular anniversary, or the recognition of a peculiar dress), to give to the vision an objective foundation."

The volume also had the beginnings of an experimental tradition in the study of ESP, something that would be developed in later volumes. An example was "Records of Experiments on Thought-Transference, at Liverpool," by Malcolm Guthrie and James Birchall (1883). Furthermore there were instructions about precautions to follow in conducting such experiments.

"While the *PSPR* included some reports of experiments (and this became more frequent in later volumes), this approach was not the main one taken by SPR researchers. But it was the research style predominant in the *Journal of Parapsychology*." This is clear in the first volume of this publication, appearing in 1937.

The *Journal of Parapsychology* (JP) came from Joseph Banks Rhine research group at Duke University and represented an experimental and quantitative research tradition. "According to my count of types of paper in the first volume, excluding correspondence and notes, there were 16 experimental reports, 4 editorials, 3 reviews of specific topics, 3 summaries and reviews of specific experiments, and 3 discussions of statistical issues."

J.B. Rhine

"Examples of experiments include ESP studies such as J. G. Pratt's . . . 'Clairvoyant Blind Matching' . . . , J. L. Woodruff and R. W. George's 'Experiments in Extra-Sensory Perception' . . . , Lucien Warner's 'The Role of Luck in ESP Data' . . . , and Vernon Sharp and C. C. Clark's 'Group Tests for Extra-Sensory Perception' . . . The experimental approach was not limited to proving the existence of ESP. The *JP* carried interesting experiments to study ESP in relation to other variables, such as J. B. Rhine's 'The Effect of Distance in ESP Tests' . . . , Margaret H. Pegram's 'Some Psychological Relations of Extra-Sensory Perception' . . . , and Edmond P. Gibson's 'A Study of Comparative Performance in Several ESP Procedures' . . . In addition, several studies were reported about ESP tests with special participants."

J.G. Pratt

In conclusion: "The journals discussed here . . . had to carve out their own territory, so to speak, when they started. The *Revue* appeared in a context in which mesmerism was better known, a movement that was not always open to spiritism . . . Similarly, to some extent the *PSPR* and the *JP* represented 'new' beginnings in terms of spiritualism and psychical research, respectively. However, it would be wrong to reduce everything to breaks and discontinuities. In fairness, the issue was more one of general trends, and it is important to recognize that there were clear conceptual and methodological connections between the movements."

"While different, the three journals presented in their pages material showing empirical attempts to study psychic phenomena, even though they represent different research styles. Of the three approaches—the teaching of the spirits, the analyses of testimony, and the conducting of experiments—only the last two are still pursued in parapsychology. In fact, I doubt that today many parapsychologists . . . will consider the use of mediumistically obtained teachings as a reliable approach to study psychic

phenomena, although one may argue that it may be useful to generate hypotheses that may be put to test by other means.[67] But leaving aside modern standards and practices, we must admit that Kardec saw his work as empirical, different from faith, an attempt to collect information from the natural world, albeit from an unusual source."

"Different from the above, the *PSPR* and the *JP*, not to mention other journals . . . , emphasized cases and experiments as the means to generate knowledge for psychical research. Later developments within the SPR and the Duke group, as articulated in the *PSPR* and the *JP*, significantly affected the study of psychic phenomena, transforming it into a more systematic endeavor . . ."

Finishing Einstein Point by Point:
The Unification of Quantum and Relativity

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It might seem that the unification of physics within a single paradigm has been the primary goal in science for only the past few decades, but this would not be true. Unification was the original goal of Einstein and a few other physicists from the 1920s to the 1960s, during a period of time when quantum theorists were ironing out their own unique problems. Their original notion of unification was based on relativity theory rather than the quantum. Unification in the guise of the quantum paradigm only emerged during the 1970s and has since overshadowed all other attempts to unify physics. Quantum theorists believe their work is more accurate, fundamental and even more practical than relativity even though there is little or no evidence to support that belief. For all intents and purposes, the two theories seem mutually incompatible, so the unification of physics has recently proceeded along the lines of an either/or strategy: Either the quantum theory is correct and relativity is wrong, or relativity is correct and the quantum theory wrong. In fact, quantum theorists have been very aggressively trying to replace the space-time curvature of general relativity with gravitons, quantum gravity, other mythical particles and equally speculative gimmicks for several decades and all of their attempts have been futile. In reality, both approaches are basically flawed because both theories are incomplete as they are now understood. Had either side of the controversy just simplified their worldview and sought commonality between the two instead of concentrating on false made-up differences, unification could have been accomplished long ago. The point is, literally, that the discrete quantum, continuous relativity, basic physical geometry and classical physics all share one common characteristic – a paradoxical duality between a dimensionless point and an extended length in any dimension – and if the problem of unification is approached from an attempt to understand how this problem relates to each paradigm all of physics could be unified within a single new theoretical model. Unfortunately, there has traditionally been no method by which a three-dimensional space can be generated from dimensionless points, raising the question – how can dimensionless point particles be extended to account for the three-dimensional space in which the physical interactions they describe occur? This very question is basic to both the quantum theory and relativity, but neither has attempted to answer it although Einstein and others' attempts to develop classical unified field theories have come closest to the answer. The unification of physics is impossible until this question is answered, but once it is answered the unification follows naturally and easily.

Introduction

Every physical theory since the days of the ancient Greek philosophers has fallen prey to the same problem: What is the difference between a point and an extension in space or time? General relativity describes matter and energy as a metric surface of curvature, yet the theory falls apart at various singularities – individual dimensionless points where matter density goes to infinity. Quantum theorists debate whether particles are extended bodies or dimensionless points, but those who believe particles are points are unable to explain how simple extensions in space are generated let alone a full three-dimensional space or four-dimensional space-time. Even then quantum theorists must adopt some form of pseudo-geometrical continuous-like but unspecified quantum field to complete their theory. So both views are thus plagued by unique but similar problems. The Standard Model of particles is based upon the reality of point particles, as are the quantum loop and superstring theories, but all such theories suffer from the same fundamental problem – how can dimensionless point particles be extended to account for the three-dimensional space in which the physical interactions they describe occur?

On the other hand, there is as yet no theorem or method, whether mathematical or physical, that can be used to generate or construct so much as a simple one-dimensional line out of dimensionless points (such as those used in the Standard Model of the quantum), let alone a three-dimensional extended space or four-dimensional space-time (such as that used in relativity theory). Yet it is generally understood in geometry that every continuous line, no matter how small and even as its length approaches zero, contains an infinite number of such dimensionless points. Modern mathematics contains many continuity theorems that prove this very fact. Yet at best, modern mathematicians only partially overcome this difficulty in calculus, the mathematics of change and motion, by defining a differential at a point as a limit of the ratio of small changes in distance over time as the change in time approaches but never reaches zero. The metric differential geometry of Riemann, upon which general relativity is based, takes advantage of a similar mathematical gimmick and only addresses the curvature of n-dimensional surfaces that approach zero dimension or extension without ever reaching that limit.

Even the Heisenberg Uncertainty Principle falls victim to the same problem. The uncertainties in position and time approach but can never go to zero since the corresponding uncertainties in momentum and energy would become infinite. These various difficulties define the central problem of physics and unification, but they also do far more than that. They describe similarities in the theories that can lead to a point of unification between seemingly incompatible and different theories, instead of the differences that render relativity and the quantum mutually incompatible that are usually cited.

Quantum theory, relativity theory and classical theories in physics and mathematics are not as different as is generally thought when viewed within this context. The evidence is clear; the question of how non-extended points in physical space and

dimensionally extended lines, surfaces or measurements are related must be discovered before physical unification can move forward. Therefore disputes whether the quantum or relativity is more fundamental, whether the discrete nature of reality or continuity is more fundamental, whether reality is deterministic or indeterministic, and whether classical or modern physics describes reality better are completely useless, misguided and ultimately misleading.

Both relativity and the quantum theory work and they both work very well, so they are both equally fundamental and necessary to any new unified theory. Otherwise, there is no such thing as determinism and indeterminism and these irrelevant concepts need to be banished from science as gross exaggerations and misconceptions stemming from the notion of simple predictability in the experimental and scientific methods. The naive concepts of determinism and indeterminism have been used for nothing other than propaganda to prove that the quantum theory was a step forward from the older Newtonian theories of reality. Recognizing these facts is the first step toward a more open-minded worldview that allows an understanding of how these challenges can be overcome. Only then can our commonly sensed physical reality be properly interpreted leading to the emergence of a unified paradigm.

An extended geometry that can be constructed from individual dimensionless points has now been developed and this construction in physical mathematics gives a great deal of insight into both the physical origins and meaning of the quantum as well as its relationship to relative space and time. The method used was actually implied in Riemann's original 1854 development of the differential geometry of surfaces [1] as well as elsewhere in physics and mathematics. The resulting theorem generates a three-dimensional space with the same properties observed in our commonly experienced three-dimensional space and could thus be considered a physical reality theorem. However, the physical conditions that the theorem imparts on our commonly sensed physical space have consequences that will shake the very foundations of physics as well as unify the quantum and relativity.

Since physics, mathematics and geometry all suffer from the same problem – differentiating between dimensionless points and real extended bodies or ideal theoretical objects (lines, areas, volumes and surfaces) – the quantum and relativity theories can only be unified by solving this one simple problem and since there is one, and only one, possible mathematical solution to this problem and that solution is based on a simple new geometrical construction that completely defines individual discrete points within the context of continuous space, all other attempts to unify physics are nothing but futile attempts of one theory or another to stretch physical reality to fit the mathematical imagination of any particular theorist or group of theorists in question.

1. The central problem of physics

The calculus and methods of calculation used in all of physics ultimately depends upon a rigorous mathematical definition of instantaneous velocity, speed or rate of change which can then be applied to any quantity varying over time, such that

$$\lim_{\Delta t \to 0} \left(\frac{\Delta x}{\Delta t} \right) = \frac{dx}{dt} \qquad (1)$$

This definition depends on two fundamental ideas: (1) the idea of a moment or instant that is really all but (essentially) a zero measure of time; and, (2) a notion of continuity whereby any unbroken temporal or spatial extension would be made up of an infinite number of connected dimensionless points.

On the other hand, the speed in our commonly perceived material reality only approaches the quantum limit within the context of either the uncertainty in momentum or the uncertainty in energy. Neither speed nor mass alone are considered fundamental quantities of change in quantum mechanics, so they are replaced as active measures of change by either momentum or energy. On the other hand, all scientists believe that the real physical speed or velocity of a material object cannot exceed the speed of light, which poses yet another non-mathematical limit on physical reality. This situation creates a logical paradox that has gone completely unrecognized in science, whereby purely mathematical structures are accepted completely and wholly as applicable to physical situations without question or limitations. Yet mathematics is a product of the human mind meant to interpret nature rather than a logical structure that tells nature how to act and react in any given instance.

This situation results in a gross conceptual divide between the mathematical system of calculus and Heisenberg's interpretation of reality (the discrete nature of the uncertainty principle) even though calculus and differential equations, which depend on a concept of continuity, are used every bit as often in quantum mechanics as classical physics. On the other hand, quantum mechanics and other extensions of the quantum theory are considered completely non-geometrical and based upon the existence of individual causally unconnected events in nature. Quantum theory seems to depend upon a physical concept of a dimensionless point that exists at some undefined position in space and time. Calculus only depends on the dimensionless point as a limit to what can be conceptually justified as physical, but also guarantees the existence of dimensionless points by the necessity of including continuity theorems over extended spaces. The quantum is discrete and completely anti-continuity, but is still part of a larger reality.

On the other hand, space-time theories in general are based upon extension-geometries, while general relativity is based on the concept of a metric extension in which the slope or the amount of curvature in/of space can be determined as a small volume of three-dimensional space (or any such surface) shrinks and approaches the zero point limit.

$$ds = \sqrt{\sum_i (dx_i)^2} \Rightarrow 0 \qquad (2)$$

Put another way, while both geometry and calculus use extensions to explain the concept of a spatial point as a measuring limit in size or use the concept of extensions or an extension-geometry to represent space itself, there exists no method or logical argument by which dimensionless points in space could gen-

erate extensions let alone an extension-based geometry to represent the concept of space in physics.

Within the quantum theory, the closest method that exists is the quantum method of perturbation which mathematically (but not physically) smears a dimensionless point over an already existing three-dimensional space, but making an approximation by perturbing the system introduces an unnatural uncertainty into the real point location in either space or time and thus into nature itself. This method gives rise to such misconceptions as a fuzzy point, quantum foams and quantum fluctuations to explain the lowest possible level of reality even if that reality seems unrealistic for all other intents and purposes.

One would think that a mathematical method of generating an extended space or time from dimensionless points should have already been developed since the inverse logical argument is a necessary requirement for mathematical rigor in both geometry and arithmetic (calculus). But such a method has never been developed.

> We know that individual points exist in space-time, but how do we even locate an individual point? Given that
>
> $$ds = \sqrt{\sum (dx)^2} \quad \text{and} \quad \lim_{\Delta t \to 0} \left(\frac{\Delta x}{\Delta t} \right) = \frac{dx}{dt} \quad ,$$
>
> and a line consists of an infinite number of points, we cannot even build a simple line from two or more points

The problem has never even been directly identified or discussed by mathematicians although related problems have been noted. This oversight creates a gaping hole in mathematical logic, to put it lightly, especially in cases where the concept applies to physical realities such as our commonly experiences three-dimensional space.

To form a continuous extension, two points must at least be contiguous, *i.e.*, making contact or touching. Contiguity is the minimum requirement for continuity, but individual geometrical points cannot be made contiguous under ordinary circumstances. The major obstacle to solving the continuity problem then becomes how to define contiguity relative to continuity. In other words, a conceptual definition of contiguous dimensionless points must be established before the continuity necessary to define physical space can be established. Yet two dimensionless points, A and B, could never be contiguous through contact because contact would render them 'overlapping' which would render the dimensionless points A and B coincident. So the contiguity of points necessary to define the continuity of space in any number of non-zero dimensions is difficult to define in normal terms. However, there is a way to indirectly solve this abstract mathematical paradox: Two different independent dimensionless points could be considered contiguous without actually depending on contact between them if and only if they were so close to each other that no other dimensionless point could be placed between them to separate them. This situation is hard to imagine, but the concept is mathematically valid.

Now to apply this concept: take two dimensionless points, A and B, in close proximity to each other. In order to generate a one-dimensional continuous extension from them, these two points must ne placed at positions contiguous to each other. But having no dimensions in themselves for reference as to their relative positions to each other, this cannot be accomplished. There are literally an infinite (indefinable) number of directions either point could be placed to position itself contiguous to the other point. However, this problem can also be easily overcome. Points are only restricted to be dimensionless in the particular dimension(s) they share in real three-dimensional space.

According to Gödel's [2] theorem, only the internal logical consistency of a mathematical system can be proven within that system. The validity (reality) of that system, based on the primary foundational theorem from which the system is generated, can only be determined or proven logically from outside of the system. So, all that present mathematics or physics can determine – prove of verify in either case – is the logical consistency of the system based upon their theorems and/or theories of the three-dimensionality of space. A reality theorem in physical mathematics would therefore necessitate a higher four-dimensional embedding space (manifold) to guarantee that our commonly perceived three-dimensioned space could be generated from dimensionless points. This very solution to the problem is implied in Riemann's original development of the concept of space curvature whereby an *n*-dimensional surface (space) is embedded in an *n+1*-dimensional manifold.

Applying this concept to the problem, it becomes necessary to draw perpendicular lines in the external embedding direction from both the dimensionless (relative to three-dimensional space) points A and B that are an infinitesimal distance apart in three-dimensional space according to the new definition of contiguity. These lines would normally remain parallel and equidistant apart in the embedding direction no matter how far they are extended, which does nothing to verify the reality of the three-dimensional space. This is the case in all of the non-Riemannian geometries that were originally developed to unify gravity and electromagnetism a well as Kaluza's five-dimensional geometry, which carries over to superstring theories as well as quantum loop theories.
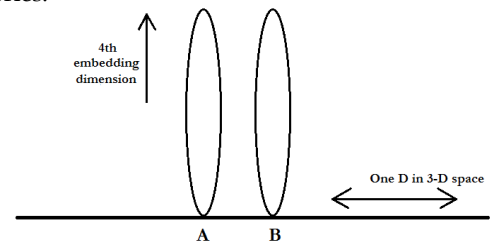
Given this structure, continuity is never guaranteed nor proven mathematically in the one dimension in our three-dimensional space that contains the points. Nor is there any continuity associated with that one-dimension perpendicularly at any point along the lines extending into the embedding dimension since the two loops never come together at any point in the higher embedding dimension..

However, if the one dimension along which points A and B are placed in three-dimensional space is internally curved in a second dimension, such that the lines drawn from the dimensionless points in the embedding dimension would draw closer together three-dimensionally the further they are extended in the

fourth direction, then continuity along the one dimension between A and B would be guaranteed.
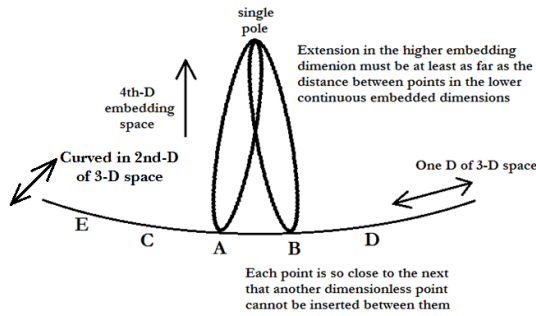
This method thus requires the minimum of a two-dimensionally curved one-dimensional line in a further embedding space (manifold) to distinguish reality. Once the extended lines in the embedding direction have moved at least as far as the infinitesimal distance between them they would meet. The extension in the fourth direction would then turn back to the other side of the three-dimensional space and return to the points from which they originated, maintaining continuity of the dimensionless points in three-dimensional space and closure in the embedding dimension.

Now take another point, C, at the same infinitesimal distance from A, but in the opposite direction in three-dimensional space and repeat the procedure. C and A would coincide at one point in the embedding direction that is at least equal to or greater than the infinitesimal distance between them in three-dimensional space. In fact, A, B and C will all come together at the same point in the embedding direction, but that common point is now further away in the embedding dimension from the one-dimensional line containing A, B and C. Two more points to either side of B and C – designated as D and E – would follow the same procedure and coincide at the same point in the fourth direction as A, B and C. Eventually an infinite number of points to either side of B and C would converge and form a closed circular surface (space) in two of the three-dimensions of three-dimensional space.
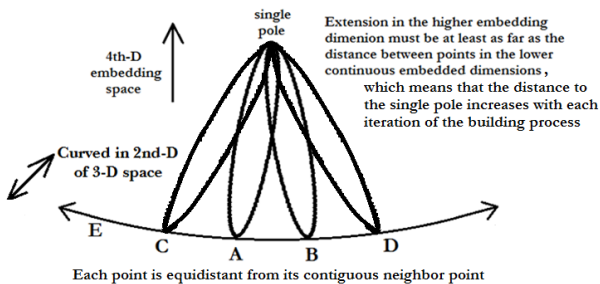
The resulting one-dimensional line would then form a closed double-polar circular space (surface) that would be both infinite and bounded as well as embedded in a closed single-polar circular manifold. This configuration could just as well represent a circular magnetic field **B** generated around a charged particle moving along an axis perpendicular to the circular field as well as a wave spreading across a two-dimensional surface from a central point. In other words, this particular structure is common to our normal three-dimensional physical space and perhaps even explains why waves and fields spread either circularly or spherically around their sources in three-dimensional space.

This construction could then be easily extrapolated to develop a three-dimensional spherical surface (space) in a four-dimensional embedding manifold as Riemann envisioned in 1854 and reported in his *Habilitationsschrift*. The difference between this construction and Riemann's original work on the embedding manifold is simply that Riemann did not identify any properties with his embedding manifold, but now properties of the embedding manifold (space) can be readily indentified. All of the continuous lines extended from these points in a three- or n-dimensional space would coincide at the same point in the higher fourth or nth dimension of space. In other words, the embedding space must and can only be single polar, a fact which has important and previously unrecognized consequences for physics, while continuity in three-dimensional space can only be guaranteed (mathematically proven) if and only if real three-dimensional physical space is configured as a three-dimensional double-polar spherical surface as Einstein proclaimed in general relativity.

When the same procedure is conducted for the other two dimensions of three-dimensional space, all points extended in the fourth embedding direction of space would coincide at a single point that is at least as far from three-dimensional surface generated (our physical space) as the sum of an infinite number of infinitesimal distances that separate the infinite number of points that make up the closed three-dimensional space. The real three-dimensional space that is formed by this logical procedure would be internally double-polar elliptical (spherical), but the embedding higher-dimensional space would be single-polar elliptical (spherical) and at least as large as any of the dimensions in the real closed three-dimensional spherical space. This embedding space is exactly the type of physical hyperspace proposed by William Kingdon Clifford [3] and envisioned by other mathematicians and scientists in the late nineteenth century after they were first introduced to and became familiar with Riemann's geometry.

In fact, the natural geometrical duality of space - point space versus extension space - which requires a higher-dimensional embedding space (Riemann's manifold concept) to guarantee continuity is clearly implied in the classical Maxwellian electromagnetic concept of the magnetic vector potential. The vector potential is defined as **B** = del cross **A**, where **B** is the magnetic field strength in three-dimensional space and **A** is the vector potential. The del function (or operator) is defined as

$$\nabla = (\hat{i}\frac{\partial}{\partial x} + \hat{j}\frac{\partial}{\partial y} + \hat{k}\frac{\partial}{\partial z})$$

(3)

As this equation indicates, the del function includes operations that are conducted simultaneously in all three dimensions of our physical space as defined by their unit vectors **i**, **j**, and **k**, so the cross product of del with the vector potential **A** that yields the field strength **B** in three-dimensional space must and can only be perpendicular to all three dimensions of normal spaces simultaneously. This can only be true if **A** extends from a point in three-dimensional space along a perpendicular line into a fourth embedding dimension of space. Clifford saw this fact of nature and tried to interpret Maxwell's electromagnetic theory within the context of a four-dimensional embedding manifold during the

1870s, thus becoming the first person to attempt to develop a unified field theory.

Otherwise, electromagnetic theory describes two different co-existent and interdependent fields, the electric **E** and the magnetic **B**. Both fields are three-dimensional, but each is directionally different in normal three-dimensional space. **E** interacts radially along a line between charge centers and **B** interacts centripetally around moving charge centers. The combined force is described by the Lorentz equation, which was only written after Clifford's death:

$$\vec{F}_{EM} = q\vec{E} + m\vec{v} \otimes \vec{B}$$

.   **(4)**

The cross product in the second term implies a four-dimensional component as compared to the three-dimensional components of the first term. The scalar potential field **E** is similar to the scalar gravitational potential field **g** in that the resulting forces for both are radially directed towards a center and can be expressed by metric or extension geometries. However, a metric geometry cannot be used to describe the vector potential since the second term is centripetally directed around a point center; hence the force is derived from the cross product. Instead, a point-based rather than an extension-based or metric geometry must be used, clearly demonstrating that electromagnetism reacts in accordance with the dualistic extension/point nature of space.

The significance of the point-based geometries as opposed to extension-based geometries was first noted by Clifford [4,5] in the 1870s and no one else until shortly after Einstein developed general relativity. So while Clifford [6] is only known and credited for 'anticipating' general relativity by stating that matter is nothing but curved space and the motion of matter is nothing but variations in that curvature, which reflect the extension-based or metric geometry of Riemann as later used by Einstein, his real theoretical work dealt with the first concepts of a point-based geometry as applied to magnetic induction in Maxwell's' theory.

So when Clifford developed a theory of matter, he did not use pure Riemannian geometry to develop a metric theory of gravity as Einstein did four decades later. He instead developed a infinitesimal theory of magnetic induction based on a hyperspatial point geometry of his own design using his own biquaternions. Biquaternions represented magnetic vector potentials extended in the fourth dimension of space from individual geometric points in three-dimensional space that Clifford called 'twists'. Clifford's theoretical work is all but forgotten today, but in its day it influenced a great deal of development along the line of infinitesimal theories utilizing Riemannian structures as well as a whole new form of non-Riemannian geometry by Felix Klein [7], who published his version of Clifford's geometry after Clifford's early death, and Élie Cartan [8] who developed a point 'torsion' (a three-dimensional spatial torsion results from Clifford's 'twist') geometry based on Clifford's efforts. Cartan later developed [9] his own unification model based on his new geometry with torsion characterized by anti-symmetry. Cartan's geometry was then used by Einstein [10] in another attempt to unify general relativity and electromagnetic theory in 1929, based on a concept called distant parallelism and anti-symmetry.

A group of Russian scientists tried to revive the Einstein-Cartan geometric structure of space-time a few decades ago and announced they had discovered a new form of gravity termed the torsion field [11]. The concept of a torsional gravity field is also related to the efforts of scientists to develop a concept of gravitomagnetism (also called gravito-electromagnetism or GEM) based on an equation first written by Oliver Heaviside [12] in 1893.

$$\vec{F}_{grav} = m\vec{g} + m\vec{v} \otimes \vec{\Gamma}$$

.   **(5)**

However, Heaviside only came to this formulation through an analogy between electromagnetism and gravity rather than any theoretical insights about space itself. All of these scientists have been unknowingly trying to reinterpret or rewrite gravity and electromagnetism in terms of combined point/extension geometries, but they have missed the point of unification by not placing their interpretation of these equations in those terms. Heaviside did not consciously, although he may well have subconsciously, realized that space is dualistic in that it takes both a point- and extension-based geometry (absolute and relative space according to Newton, point-element and metric-element in the words of Riemann) to fully describe the workings of any natural forces.

In the case of electromagnetism, the electrical field **E** is extension-based and the magnetic field **B** is point-based and thus associated with the magnetic vector potential **A** which exists at each and every point in space, even when the field **B** goes to zero. The apparent paradox that the vector potential can be non-zero when the overall magnetic field is zero has been experimentally verified by the Aharanov-Bohm and other experiments that demonstrate the reality of non-zero **A** outside of long thin magnetic coils where the field **B** is essentially zero. The proven existence of the magnetic potential clearly demonstrates that space itself is dualistic and the fact that the magnetic vector potential cannot be directly measured in three-dimensional space strongly implies that the vector extends in a higher embedding dimension.

Since space is dualistic in this manner, gravity must also be affected in a similar dualistic way having two components: One metric or extension-based and the other point-based. Yet strict Newtonian gravity where **F=m**g only represents the metric or extension-based geometric characteristics of gravity. The second term in Newtonian gravity that was added by Heaviside is necessary to completely demonstrate how gravity interacts with dualistic space. Therefore the second term represents a point-based rather than an extension-based or metric gravity field, call it a gravnetic field, in which every point is associated with a gravnetic vector potential which extends from every point in three-dimensional space into the higher embedding fourth dimension of space.

This structure, however intriguing, does not yet completely answer the question of how the individual dimensionless points in three-dimensional space can be contiguous to each other and thus form continuity in any given direction within three-dimensional space. Continuity was assumed along lines in the fourth direction of space and not proven by mathematical construction. In other words, do the above mathematical constructions account for absolutely each and every point in all four dimensions that were discussed? The answer to this dilemma is implied by the geometrical structure and can be easily explained by reversing the construction process. As the construction pro-

cess is reversed, we start from the single-polar point in a four-dimensional space and continuously extend this point along a line as points peel off and move into successive parallel and continuous three-dimensional spaces. If this procedure continues and accounts for all points along the continuous four-dimensional line that is drawn, then the reconstructed three-dimensional space must be complete and continuous without any holes or null points. The resulting three-dimensional space continuum would be spherical and internally continuous. Therefore the reality and existence of a three-dimensional space that is built of dimensionless points is both realized and guaranteed accurate to represent our commonly experienced space and space-time continuum. The interesting part of this procedure and the ensuing geometrical structure is found in the physical attributes that emerge for explain our own physical space of experience.

2. Classical unification models

The original unified field theories based on general relativity were never quite 'that' popular during their heyday between 1918 and 1960. [13] They were overshadowed by the growth of nuclear physics and the quantum paradigm which had no need to unify with gravity (and electromagnetism) at the time. Furthermore, Einstein had become estranged from the quantum physics community by his criticisms of the Copenhagen Interpretation at the Solvay Conference in 1927 and thereafter. His criticism reached a peak with the 1935 publication of his EPR paper [14], but the prejudice against him continued unabated for the whole period during which he worked on his unified field theory.

Even though the classical unification theories have now been discredited (although that perception is questionable since it was enforced by a quantum bias) and all but abandoned in favor of quantum based unification, those first attempts are still valid if not for anything else but their vastly limited successes. While no physical progress came from these unification attempts, they did lead to numerous mathematical advances and they at least demonstrated which ideas were useless for unification and should not be used in future attempts. At first glance it looked as though Einstein and the others attempted any new and different ideas that they could imagine (like they were shooting in the dark) to advance unification and this mistaken view soiled Einstein's reputation within the physics community. In other words, there seemed to be no rhyme nor reason nor any overall pattern to the different unification attempts and Einstein became something of a pariah within the physics community. Yet by carefully studying and analyzing these different failures, a very pronounced pattern arises and noting this pattern leads to clues to the problems inherent in all of the seemingly unrelated physical paradigms that science cherishes so highly. In other words, examples of all of the present problems of science and mathematics can be found to have influenced and played a role in the classical search for a unified field theory. This begs the question 'Why did these attempts to unify the different paradigms fail even though they were based upon more generalized and advanced versions of the Riemannian geometry that had so successfully explained gravity alone?' Answering this question is easy. They failed be-

cause the new generalized geometries that emerged were misunderstood and misrepresented by the physics with which they became associated. The advances in mathematics and geometry that emerged emphasized the dual nature of physical space – point and extension – rather than the physical differences between gravity and electromagnetism, but no one made any attempt to find similarity, connection or continuity between the two members of the dualistic pair.

The commonly accepted history of classical unification is a 'phallacy' that has doomed general relativity to remain a static (unchanging or non-progressive) theory since unifying electromagnetism and gravity seemed to be the only option considered for advancing relativity theory even though scientists and mathematicians determined that the Riemannian geometry used by Einstein to explain gravity alone was itself incomplete. In other words, the more general non-Riemannian geometries that were inspired by general relativity should have been used to extend gravity theory itself, independent of any attempts to unify gravity and electromagnetism, but they were never used properly and the 'phallacy' that general relativity offered a complete theory of gravity mistakenly grew stronger over the ensuing years and decades. .

This historical 'phallacy' was further enhanced by the fact that no one, not even Einstein, seemed to understand exactly what his work showed, *i.e.* how all the different attempts were actually linked to one common geometrical problem – how an individual dimensionless discrete point was to be interpreted within space-time physics – which actually indicated a gravitational anomaly rather than a new way to express electromagnetism. So Einstein's efforts were consistent throughout all of his varied attempts even though his work became something of a joke based on his seemingly unending and unrelated supply of hypotheses. The physics community joked about how Einstein came out with a different theory every month, but the whole time there was a single unrecognized underlying principle to Einstein and others' attempts of unification: how to express the natural forces with respect to both the point geometry and extension geometry that equally and simultaneously characterized physical space.

Under these circumstances, relativity theory surrendered the high ground of theoretical physics to the quantum paradigm and the quantum theory alone has since led science down an ever narrowing path of progress as did Newtonianism in the last few decades of the nineteenth century. In the end, the first work on unification resulted more from the observation that the Riemannian geometry that Einstein used to express general relativity was incomplete, so the unified field theories were more attempts to render relativity even more general by expanding the geometry and hoping that the expanded geometry would include electromagnetism which was impossible under the conditions. This problem was further enhanced by the fact that all classical unification theories, including Kaluza's five-dimensional theory, wrongly assumed curvature to be an intrinsic property of the space-time continuum based on the new non-Riemannian geometries.

2.1. Intrinsic curvature models

In 1917, the mathematicians Gerhard Hessenberg [15] and Tullio Levi-Civita [16] were inspired by the initial success of general relativity to expand and further generalize Riemannian geometry. The physicist Hermann Weyl [17] also began his unification in 1917 from a strictly mathematical expansion of Riemannian geometry to include (eventually) his concept of gauge in 1918 and 1919 [18]. However, his gauge theory of unification was susceptible to fundamental problems and he abandoned his attempts to unify physics, but not the mathematics of his gauge theory. Gauge theory subsequently found a home in quantum theory precisely because it was a point-based geometrical theory that better fit the point interpretation of the quantum as opposed to the purely metric interpretation of gravity. Arthur Eddington is better known for his observational confirmation of light bending during an eclipse at Tenerife in 1919, but he continued Weyl's lead and developed a unification theory based on an affine connection in 1921 [19]. In many ways these non-Riemannian geometries implied the existence of a higher-dimensional embedding manifold, but the geometries were instead limited to infinitesimal dimensionless points that were intrinsic to the four-dimensional curvature of the space-time continuum. But then you can justify anything in mathematics no matter what physical implications and inferences are demonstrated by how you define your parameters, even if what you do is physically illogical.

The mathematician Élie Cartan next developed an alternative form of non-Riemannian geometry in 1923 [20] and applied the geometry to the question of unification in 1924 [21]. This path led to Einstein's attempt to base unification on the idea of parallel transport (distant parallelism) using Cartan's geometry in 1929 [22]. The Einstein-Cartan theory employed an anti-symmetric tensor to represent geometry 'at' or 'inside' a point in space in addition to the normal symmetric tensor that was used to represent gravitational curvature 'through' or 'approaching' a point in space-time. The anti-symmetric tensor represented a 'twist' or torsion at surrounding points in space that was completely (and purposely) absent from the original Riemannian geometry used by Einstein. Some scientists still use the Einstein-Cartan model and have attempted to develop a theory regarding a new fifth fundamental force in nature called gravitational torsion [23], but their work has not been well received by the scientific community at large.

All of these men, scientists and mathematicians alike, noticed that the tensors (symbols) used to represent the metric curvature of space-time in general relativity were located at points of space, but only took account of the continuity of the curvature 'through the point' rather than any specific physical characteristics of space-time 'at the point'.
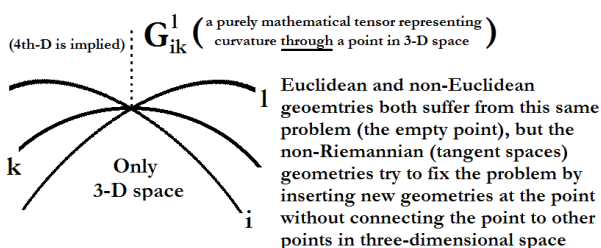
The new geometries that emerged were thus based on how the characteristics of the points themselves could be modified to generalize the Riemannian geometry used in general relativity. However, the new geometries seemed to be tied up within or limited to some form of internal geometry to the point without addressing (1) the issue of 'point to point' continuity within the three-dimensional Riemannian manifold and (2) without introducing any new dimensions to space-time. Pauli later referred to these geometries as 'tangent spaces' [24] because they only altered the geometry at the points in space-time tangent to the standard Riemannian curvature.

Yet even these geometries missed the point because they treated points and the metric curvature differently, *i.e.* they noted the geometrical problem of points, but did not relate their solutions to the continuity through the points that was already thought to have been (but was not completely) explained by the Riemannian metric. Moreover, by implying a higher dimension embedding space or manifold as Riemann had required, their geometries lacked any method for maintaining continuity of either the parallel three-dimensional spaces along the fourth perpendicular direction of space-time or continuity in the fourth direction of space itself. So they recognized the geometrical problem of the point/extension duality correctly but interpreted and treated it incorrectly.

In other words, the point-to-point continuity assumed in normal geometry was not carried over to the geometries of the points themselves, so the points themselves remained independent and discrete from the four-dimensional curved space-time continuum of general relativity. All that connected the different geometries (Riemannian and non-Riemannian) were the individual unconnected points in space whereas connection should have been maintained through all points in the different spaces (manifold and embedded) consecutively and simultaneously. Yet the same was also true for the hyper-dimensional unification theories (Kaluza and later) even though they assumed that curvature is an extrinsic property of the space-time continuum.

2.2. Extrinsic curvature models

Kaluza sought to solve the same problem of unifying gravity and electromagnetism in 1921 [25] by assuming that the four-dimensional space-time continuum was embedded in a five-dimensional manifold, just as Riemann had suggested in his original geometrical development. Kaluza's theory enjoyed a limited albeit short success, but no one at the time seems to have noticed that he made the same mistake as those who sought unification by solving the point problem intrinsically within the four-dimensional space-time framework of general relativity.

Einstein tensor in 3-D space

G^1_{ik} (a purely mathematical tensor representing curvature through a point in 3-D space)

(4th-D is implied)

Euclidean and non-Euclidean geometries both suffer from this same problem (the empty point), but the non-Riemannian (tangent spaces) geometries try to fix the problem by inserting new geometries at the point without connecting the point to other points in three-dimensional space

Einstein-Kaluza tensor in 4-D space

4th-D G^1_{ik} (a purely mathematical tensor representing curvature through a point in 3-D space, but the hyper-dimensional extension implies physical reality at the 3-D point)

Only 3-D space
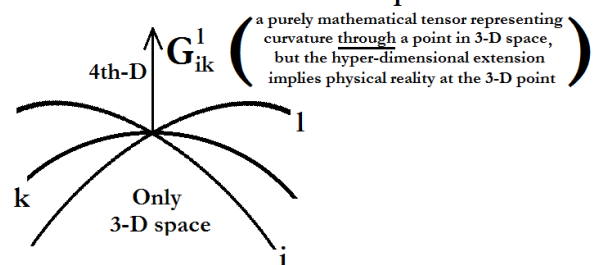
In other words, he did not tie the individual discrete points to each other in normal space-time let alone four-dimensionally across the fifth direction of space-time. Kaluza merely assumed without demonstrating continuity in both normal space and four-dimensional space-time as had everyone else as well as along the A-lines which extended from points in normal three-dimensional space into the higher embedding dimension. Having assumed continuity in all cases, Kaluza never attempted to tie the continuity in four-dimensional space-time to any characteristics of the higher embedding dimension and his theoretical model suffered from that short-sightedness.

Each point in normal space-time was individually extended into the higher dimension and each individual discrete point was subject to the same mathematical conditions in Kaluza's structure. The linear extension into the higher embedding dimension was called an A-line, but all of the A-lines were equally discrete from each other, which later allowed Klein to use Kaluza's model to explain quantum discreteness. Each A-line looped around into itself so the higher dimension was closed with respect to each point and each A-line was the same length.
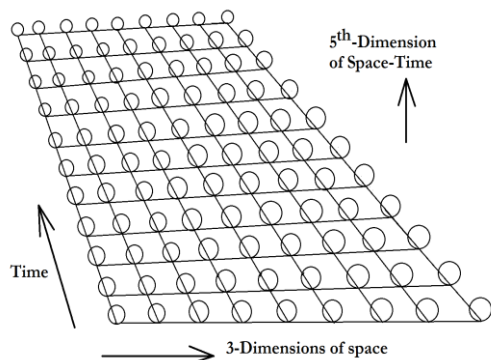
These conditions, together called the cylindrical condition, were necessary for Kaluza to develop the mathematical model that he did, but the cylindrical condition also limited the five-dimensional model to only replicating the Maxwell electromagnetic equations at best without providing any new physics or predictions by which the theoretical model could be tested.

The cylindrical condition was sufficient to develop and support Kaluza's particular mathematical model, but it was barely sufficient without being necessary. So the cylindrical condition was also the source of the downfall of the theory because it over restricted the theory leading to an inherent incompleteness of the extended higher-dimensional geometry. Although it seemed a necessity at the time, the cylindrical condition merely implied and never proved mathematically that each point was connected to the next point providing continuity in four-dimensional space-time let alone a continuity in three-dimensional embedded space or time.

This implication has been all that holds individual points together to make a continuous line or surface ever since Euclid first wrote his original books on geometry in ancient Greece. Mathematical and geometrical continuity have always been nothing but an unproven and unverified illusion, including whenever the geometry is modeled along a space-time diagram and the three dimensions of normal space were reduced to one dimension on drawing paper.
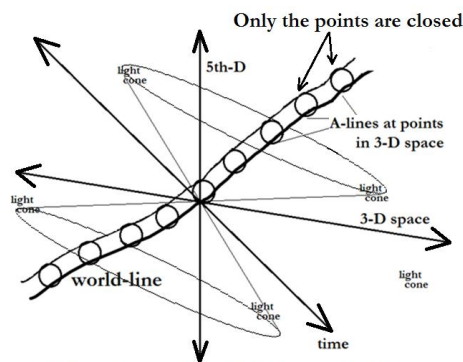
The world-line of an event in the light cone of 4-D space-time is an infinitesimally miniscule cylinder in the 5th-D of space-time

So Kaluza's model suffered from the same over-restriction and incompleteness from which the intrinsic non-Riemannian models suffered – the lack of demonstrating continuity between consecutive infinitesimal points in normal space as well as Riemannian space or space-time. It is just this misconception concerning continuity that has allowed the discrete argument of the quantum theorists to survive for so long.

Kaluza further suggested that the A-line loops must be extremely small because the higher dimension was beyond observation and even related that notion to the quantum. But it was not until five years later that Oskar Klein [26] published papers extending Kaluza's five-dimensional model to include the quantum. Klein noticed that the A-line loops formed a periodicity that could be quantized and thus the Kaluza-Klein model of the quantum was born. Klein continued his theoretical research trying to quantize the Kaluza model over the next three decades [27], but each successive model proved to be a failure. Einstein and a few others also continued to develop the hyper-dimensional concept, but Einstein abandoned all such attempts in the early 1940s because he could not justify the simple fact that the higher embedding dimension could not be observed or sensed.

The hyper-dimensional approach perhaps seemed the most natural method to extend general relativity and include electromagnetism because Riemann had mandated that every *n*-dimensional space was embedded in an *n+1*-dimensional manifold. Although Kaluza was the first to try and expand Einstein's relativity using this method, W.K. Clifford had tried to develop theories based on four-dimensional spaces as early as the 1870s and his work was influential during the late nineteenth and into the twentieth century.

Together, Riemann and Clifford's work was enough to overcome scientific prejudices against using higher-dimensional spaces in physics due to the simple fact that they cannot normally be sensed or detected. However they also caused a philosophical backlash against applying non-Euclidean geometries and hyperspaces to real observational space in physics which came in the form of positivism, so their greatest influence in physics was delayed until the 1980s with the development of supergravity and superstring theories.

2.3. The final assault on classical unification

After his hyperspatial interlude of the 1930s, Einstein returned to his 1925 [28] attempt to expand general relativity to include electromagnetism by adding a non-symmetric portion to his curvature tensor, but the final thrust toward unified field

theories of this type had actually begun in 1944. They were made by Frank Saxby [29], Erwin Schrödinger [30] and Einstein [31] who came upon the same model – the non-symmetric model – independently from different theoretical approaches. Schrödinger came upon the model by combining the 1929 Einstein-Cartan anti-symmetric model with the earlier work done by Eddington on affine geometries, while Einstein just added a non-symmetric portion to his symmetric (metric) tensor describing gravity to create a more generalized curvature tensor.

the anti-symmetric tensor (with a hat) denotes the twist or torsion at the point associated with electromagnetism while the Einstein tensor (without a hat) still represents the 3-D curvature of space associated with extension

But as originally proposed in 1929, both were still intrinsic to the three-dimensional curvature of the space-time continuum
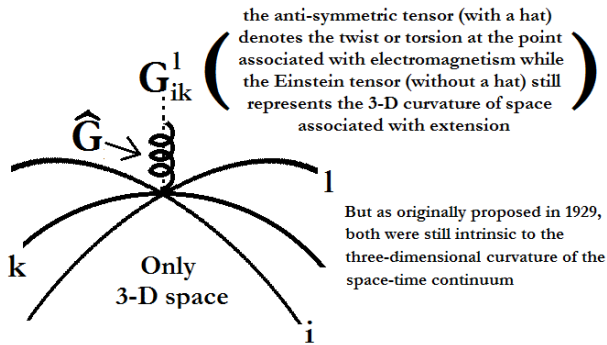
Yet the resulting models were fundamentally equivalent, so the final Einstein-Schrödinger non-symmetric theory can be viewed as the heir to and culmination of all the previous intrinsic curvature theories.

Einstein worked on this model until his death in 1955 [32], but the calculations from his non-symmetric model for charged particles always yielded values that were far too small (in fact negligible) to account for electromagnetism [33]. Einstein also obtained the same results for the motion of charged and non-charged particles, which implied a problem with his fundamental assumption that the non-symmetric portion of the tensor represented electromagnetism and not something else. Einstein's calculations were confirmed and expanded by Peter Johnson [34] who debated with Einstein over the merits of his non-symmetric model in the 'Letters to the Editor' section of *Physical Review* in 1953. But Einstein stuck to his guns until his dying day despite this setback because he was completely convinced that his non-symmetric model was valid and the non-symmetric tensor represented electromagnetism in some form. These problems have never been worked out and the non-symmetric model was all but abandoned shortly after Einstein's death, at least until now.

If any questions were to arise concerning the value or merits of Einstein's search for a unified field theory in general, or his non-symmetric model in particular, they could be easily demonstrated as false and unnecessary concerns. In 1950, Schrödinger [35] used his anti-symmetric theory, which was more general and far more restrictive than the non-symmetric model, to derive Einstein's non-symmetric equations. Upon doing so a new term, equivalent to Einstein's old "cosmological constant" Λ, literally popped out of the calculations. Given this fact and the fact that Einstein's attempts to calculate the effect of his non-symmetric model on the motion of charged particles yielded negligible speed differences (at least in proportion to normal strong influence of electromagnetism) that were independent of the charge on the particle as well as if the particle was charged or not, one and only one conclusion can be made.

The Λ (lambda) factor that resulted from Schrodinger's mathematical derivation was in reality the first 'prediction' of a gravitational effect that is today known as Dark Matter (Λ-CDM) and Einstein's calculations referred to an unsuspected Dark Energy effect on all material particles rather than an electromagnetic effect. Had Einstein and Schrödinger not wrongly assumed that the anti- or non-symmetric portion of the gravitational tensor somehow represented an electromagnetic effect, as did everyone else who worked with the concept, and instead interpreted them as an additional or secondary gravitational effect, they would have predicted the existence of Dark Matter and Dark Energy nearly four decades before they were discovered through observation. No other possible event or observation demonstrates so clearly, precisely and strongly that space is dualistic according to the geometries that we use to describe it and that the natural forces of electro-magnetism and gravity-gravnetism reflect the dualism of the space in which they operate.

3. Quantum unification models

Modern quantum unification theories do not really try to unify gravitation theory (either Newtonian or Einsteinian) with the quantum. Instead, they try to completely replace the classical Newtonian force of gravity as well as general relativity and all of classical physics at the most fundamental level of reality. Quantum theorists over the past few decades have readily and openly displayed an either/or attitude toward the final unification of physics: Either the quantum is more fundamental than relativity and forms the basis of unification or any unification between the quantum and relativity is impossible. In the new dominant physics worldview, it is either the quantum or nothing and the curvature of the space-time continuum is a myth. They do not even consider the possibility that relativity is more basic or better still that neither concept is more basic but both are equally fundamental and necessary for unification. Furthermore, modern quantum theorists totally dismiss out of hand the possibility that relativity could be of any use in a final unification and are trying to rewrite modern physics without the input of general relativity and the concept of a positively curved space-time universe.

Yet of any of these choices for unification only one is true and that 'one' must take into account the simple fact that both relativity theory and quantum theory are incomplete as they now stand so relativity and the quantum only seem to be mutually incompatible. The shortcomings and incompleteness of the quantum theory are easy to find. Quantum mechanics is a completely non-geometric discrete infinitesimal point system that finds it necessary to adopt some form of pseudo-continuous field such as the quantum vacuum, quantum foam or hypothetical Boson fields to compensate for the geometric structure that is observed in physical reality. On the other hand, relativity is a completely geometric and structural theory that employs a metric surface represented by a curved space-time continuum. In other words, the quantum theory is about points and either neglects extensions or makes up excuses why extensions in space and time are meaningless, while relativity is about extensions in space-time and breaks down when it comes to individual infinitesimal points in space. Yet in reality, space and space-time, the background against which both theories play out their versions of physical reality, are dualistic in nature and any complete description of space and time requires the simultaneous application of both point- and extension-based

geometries. Therefore, both theories are incomplete as they now stand and in reality they both complement and supplement each other.

So the most recent attempts to unify physics based upon the Standard Model, quantum gravity, quantum loops, supergravity, superstrings, branes and other quantum and mathematical gimmicks have proven difficult if not impossible because they are all based upon a flawed interpretation of quantum mechanics which is and has always been incomplete without even considering how it has failed to explain gravity. Physicists working within the quantum paradigm simply and completely ignore any possible effects of gravity at the quantum level of reality, *i.e.* within atoms and particle physics. It would be difficult to even justify the quantum theorists' oft repeated claim that the quantum is complete as well as more fundamental than relativity when quantum theory completely dismisses gravitational effects described by relativity as irrelevant inside the atom and even inside the LHC accelerator.

Therefore, unification on the basis of the quantum would be more of an overthrow or coup d'état against the relativity paradigm than a real unification of physics. This attitude is so deeply ingrained in the quantum worldview that the large particle colliders designed to verify certain aspects of the quantum theory do not take gravity into account and all of their results should therefore be suspect. Nor do they take into account the simple fact that the magnetic vector potential **A** is not necessarily zero just because **B** is zero within in the cloud chambers where they try to create a field-less environment to detect new particles. Furthermore, quantum theorists do not even attempt to explain the many relativity theory successes in quantum terms and just assume that the quantum theory will eventually explain everything. Simply declaring the existence of a new particle such as a graviton or gravitino or the assumption of quantum gravity does absolutely nothing to explain gravity or unify the quantum and relativity.

4. Simple unification within a single field

For his part, Einstein envisioned the four-dimensional space-time continuum of our world as a unified field out of which both gravity and electromagnetism emerged. He further hoped that the quantum would emerge as an over-restriction of field conditions. His worldview was that of a purely three-dimensional brain-logical external world. He seemed unable to completely break loose from his positivistic semi-Newtonian beliefs and perspective. However, from the perspective of the non-Newtonian fourth spatial dimension (or a five-dimensional space-time), the four-dimensional expanse of space is filled with a single field of potential that is the precursor to everything that exists in three-dimensional space – gravity, electricity, magnetism, matter, quantum, life, mind and even consciousness. These physical 'things' are just different aspects of field interactions (single field density patterns or complexes) modified by the physical constants that describe the physical nature of the single field.

This worldview thus introduces a certain duality to our world that has already been discussed to some extent in science as the wave/particle duality, but its nature as an unsolvable but necessary paradox has dominated the scientific debate even though it represents a solvable problem. Einstein, Bohr, Heisenberg, Schrödinger an DeBroglie as well as other scientists have all fallen prey to the same point/extension duality of space ibn one or another of its many disguises in their individual worldviews, although it is perhaps more accurate to say that they have been held prisoners by it. This fundamental duality, whether it is called yin and yang, male and female, certainty and uncertainty or discrete and continuity, is fundamental to the very fabric of space-time. In physical geometry, this duality takes the form of the difference between a space made from dimensionless points and one made from extensions such as lines, areas and volumes (1, 2 and 3-dimensional surfaces). Even pure mathematics suffers from this same duality, if in no other reason than at least in the form of any formal proofs that the number line actually represents all possible points and thus has no holes or unaccounted for discrete points even though proven continuity theorems for the number line exist.

The mathematical conditions required for a three-dimensional space with the same physical properties as our normally experienced physical space to emerge naturally from an embedding four-dimensional space are quite straightforward. They are four in number. The first two are easily recognizable: (1) a one-dimensional line extending in the fourth direction of space from a dimensionless point in three-dimensional space (Kaluza's A-line) must complete a circuit and return to that same point from the opposite direction; and (2) all lines extending from all dimensionless points in three-dimensional space must be of equal length. These are just the mathematical conditions that Theodor Kaluza [36] placed on his five-dimensional extension of Einstein's four-dimensional space-time continuum in 1921. This was also the structure that Oskar Klein adopted in 1926 [37] in his first of several attempts to quantize general relativity. The subsequent Kaluza-Klein physical model of space-time was adopted and expanded by the superstring theorists in the 1980s. Consequently, all of these theories and physical models of space-time suffer from the fact that they are incomplete without considering the other two conditions required for the higher embedding dimension.

The third and fourth conditions are not so readily recognized, at least not for someone trained exclusively in physics or the history of physics during the last century. These ideas were popular in the late nineteenth century when scientists first searched for curved space in their observations of distant stars, but disappeared when spatial curvature was never observed. Late nineteenth century astronomers and scientists concluded that if curved the local areas of space that they observed were too near flat to observe the suspected non-local curvature. Otherwise, the conditions are straight forward: (3) The one-dimensional A-lines extending into the higher dimension from three-dimensional space must all be at least as long as a circumference line that completely encircles any direction within the embedded three-dimensional space; and (4) All of the one-dimensional lines that extend from the dimensionless points in three-dimensional space must pass through a single common point (a single pole) in their circuit before returning to the three-dimensional space in the opposite direction. This means that the higher embedding dimension is so large that local space curvature would be far too close to flat for an earlier era of astronomers to observe or meas-

ure, but those astronomers would not have known this because they never even suspected that out universe is as large as we know it to be today. Late nineteenth century scientists thought that our Milky Way galaxy represented the whole of the universe even though we now know, a century later, that it is only one of more than two-billion such galaxies.

These last two conditions can only be fulfilled if the higher embedding space is macroscopically extended, just as Einstein and his colleagues proved in the 1930s, and the fourth dimension must have the geometry of a single-polar closed Riemannian surface. In laymen's terms, each of the one-dimensional lines extended in the fourth direction of space (Kaluza's A-lines) would wrap around the higher dimension like a Möbius strip, meaning that each point in three-dimensional space would have an inherent half-twist to it. If this potential twist did not occur at each and every point in three-dimensional space, rotational motions in three-dimensional space would be impossible.

Einstein actually placed one last brief condition on the adoption of a higher embedding dimension in physics, but this last condition deals with the mind and consciousness of the observer observing and interpreting external physical reality and is thus non-mathematical. Einstein was enamored from the very beginning with the five-dimensional concept, but he could not wrap his mind around the simple fact that the higher dimension could be neither sensed nor otherwise detected. In his final edition of the *Meaning of Relativity*, he briefly stated that the hypothesis of a real higher embedding dimension could not be adopted in physics unless the fact that it was non-detectable and could not be sensed could be explained. Yet that explanation is easy for the non-positivistic mind if it is assumed as observed that our normal five-senses are evolutionary products of our existence in a three-dimensional space with time. It would therefore stand to reason that at least one extra sense, such as our intuitive notion of ideas and concepts that are not normally perceived or learned through our normal five senses, must still exist. In other words, the higher embedding dimension of space must be the realm where our consciousness comes into direct contact with the rest of the universe without being filtered by our sensations of three-dimensional space and time passing through and being interpreted within our three-dimensional material brains. This concept of consciousness and the resulting higher sense of physical reality conform completely to the stated model of dualistic space and time, but further explanation of such a physical model of consciousness is beyond the present essay.

Otherwise, this is the same structure as the four-dimensional space that Clifford envisioned in the 1870s, but the physical consequences imposed by these necessary conditions are extremely important to modern physics. They rule out the possibility that the superstring theories depending on infinitesimally small and compactified higher dimensions could completely represent physical reality. All such physical theories and models, including the Standard Quantum Model of particles, are no more than partial incomplete theories and highly accurate approximation methods that do not really portray material reality as it is because they cannot offer any rationale or method for the emergence of three-dimensional space, continuous or otherwise, from the dimensionless point-particles that they hypothesize. All quantum field theories suffer from this same problem and are therefore just physical approximations and/or mathematical methods that do not accurately portray physical reality as it exists and is observed.

The association of a notion of 'twist' with particle spin is not new. In 1913, Cartan developed the mathematical concept of a 'spinor' [38] based on the earlier work of Felix Klein, which in turn dated back to Clifford's geometry based on twists. Spinors are purely mathematical entities somewhat like tensors except that they allow a more generalized geometrical notion of invariance under rotation. Spinors can normally be applied to the real world without any reference to relativity (somewhat like a point space in which relative position of points has no meaning), but they do arise naturally in reference to the Lorentz group which is of great importance to relativity theory. In fact, spinors became very important within physics when the spin, an intrinsic type of angular momentum, of particles was first discovered. Spin associated with this type of intrinsic angular momentum is correctly described by Cartan's spinor theory. Both Wolfgang Pauli and Paul Dirac later incorporated spinors into their mathematical models of quantum dynamics and field theory. In this sense, twistors can be pictured as vectors pointing along a Möbius strip stretching into the higher embedding dimension of space and returning to our three-dimensional space after undergoing a half rotation, just as the single field model envisions, but these earlier attempts made no reference to higher-dimensional spaces and the spinor remained an intrinsic three-dimensional attribute of points.

Still later Roger Penrose developed his theory of 'twistors' [39] which were directly related to Clifford's twists as well as Cartan's spinors. According to Penrose "the basic aims of twistor theory are to provide an alternative framework for physics in which the space-time continuum and the complex continuum of quantum mechanics are merged into one and to eliminate the continuum concept from the basis of physical theory." [40] Penrose further associated his twistors directly to individual points that generated a space without continuity and thereby transferred quantum uncertainty to the very points of space. However, in so doing he made the same mistake as Einstein and others and failed to note the duality of space in which the individual points specified the quantum (as associated with Cartan's' antisymmetry of 'spinors) while extent or the metric was still necessary to specify the electric and gravity fields.

The half-twist associated with each dimensionless geometrical point of our real three-dimensional space in single field theory means that rotations of extended lines around a central point are possible in our common experiential space. Without this, rotational motion in our commonly perceived three-dimensional physical space would not be mathematically possible. In other words, three-dimensional space can be characterized by its support of either translational (along an extension) or rotational (point-centered) motions, which just happens to be observationally and experimentally true. Furthermore, the characteristic twist in each geometrical point in three-dimensional space accounts for the half-spin of elementary material particles and, in fact, establishes the requirement that all real stable material particles must have half-spins. Material particles can only be stable and real if they conform to the geometrical condition of a half-spin in the higher fourth dimension.

Only protons, neutrons, electrons (muons and tauons) and neutrinos are real material particles, meaning, of course, that all of the geometrical points within the space they occupy are constrained by the half-spin of A-lines extending from three-dimensional space as opposed to other possible artificially constructed and temporary intermediary energy states (single field resonance patterns usually with spins of 0 and 1). Three-dimensionally extended particles must therefore consist of A-line bundles of like spin points projected into the higher embedding dimension.

From a three-dimensional perspective, fundamental particles are merely quantum sized and quantum restricted bits of three-dimensional symmetrical curvature of the continuum (single field density maximum 'sheet') extending in the fourth direction of space. The center of mass point in particles cannot be a singularity as previously thought because the higher embedding dimension is closed and therefore no infinity can occur in the fourth direction.
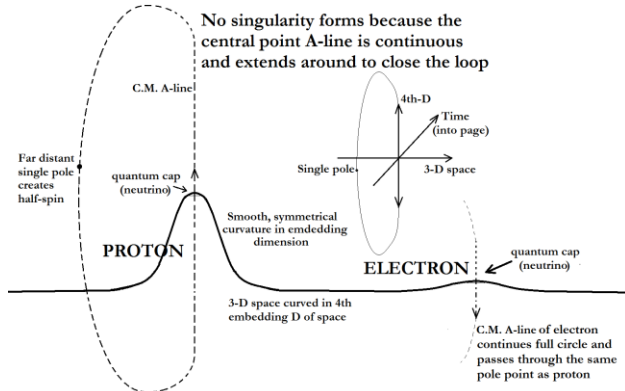
A neutron is merely an electron stacked on top of a proton in the embedding or fourth direction of space. Outside of a nucleus, the free neutron structure is not stable and quickly decays into a proton, electron and neutrino because it is no longer forced by its immediate higher-dimensional (stacked) connection to other particles in the nucleus to conform to the quantum and geometrical standards and conditions of the universe. In a strict mathematical sense, all points in three-dimensional space are directly connected to each other and co-exist with one another since all points in three-dimensional space pass through a single point, the single pole in the higher dimension. This simple fact alone is sufficient to explain quantum entanglement and how it manifests in our world.

Einstein [41] adopted the geometrical structure of a double-polar Riemannian sphere to model gravity as four-dimensional space-time curvature, but it was really space alone that he curved in a higher fourth dimension of space independent of the connection with time. The four-dimensional space-time continuum itself, as expressed in special relativity with a +++- signature, actually conforms to a Lobachevskian negative curvature. Einstein's positivistic philosophical leanings just got the better of him when he interpreted his mathematical model of intrinsically curved space-time as opposed to extrinsic curvature, which would require the reality of a higher embedding space or manifold, just as positivism was the dominant philosophical force behind the earlier development and interpretation of the quantum theory that has limited later development and advances in quantum theory.

In both cases, positivism misled advancing science and still does so. Perhaps the strict positivistic attitudes were necessary to shield the newly developing theory from outside negative influences and distractions when the quantum theory was first developed, but the positivistic restrictions first laid out (such as the overly restrictive Copenhagen Interpretation) have since become pathological to theoretical advances. The Riemannian geometry that Einstein used is only a metric or extension-based geometry and could not directly account for the individual points in space or the physics that depends on the geometry of the individual dimensionless points. Since classical electromagnetic theory already implies the existence of both extension- and point-based geometrical structures, all of Einstein's attempts to unify gravity and electromagnetism were incomplete from the start because electricity has a three-dimensional scalar potential (metric, symmetric or extension) structure and magnetism has a four-dimensional vector potential (point or anti-symmetric) structure, while Kaluza's unification attempt was only partially successful because his mathematical conditions did not include the third and fourth conditions governing the structure of a higher embedding space as explained above.

On the other hand, common Newtonian gravity only necessitates an extension-geometry which misled Einstein's early development of general relativity as well as his later unification attempts, but allowed him to develop a proper working theory of normal gravity alone that was more accurate than Newtonian gravity theory. Even Newton was aware of this problem to some extent as illustrated by his structural adoption of an absolute space and time (equivalent to point-based geometries) and a relative space and time (based on extension geometry) upon which all of his mechanical models of physical reality depended. As a metric theory alone, gravity theory has long faced difficulties with the n-body problem and can only be used directly to solve a two-body gravity system while electromagnetic theory merely maps the multi-particle fields and uses field variations to solve their own n-body problem. Once the duality of space is taken into account with regard to gravity theory, the n-body problem in gravity could be resolved in a manner similar to the way it is handled in electromagnetic theory.

The fact that gravity has yet to take into account the point-based geometrical structure of space and time, however, does not mean that the task of unification is impossible. Einstein was on the right track when he adopted Kaluza's five-dimensional space-time framework in the late 1930s [42,43] as well as when he adopted Cartan geometry in 1929 and the symmetric/non-symmetric tensor calculus [44,45] after 1945. All of these geometric systems offer some limited or over-restricted form of a combined point- and extension-geometric structure. So combining these different unification methods into a single structure easily overcomes the shortcomings and limited nature of any of the individual methods. In pursuing these particular solutions, Einstein failed to realize two potential solutions. The first was that a combination of the anti- and non-symmetric geometries would generalize gravity alone and that this new combined structure could be supplemented by a Kaluza five-dimensional structure that unified gravity and electromagnetism, thus leading to a single unified field theory that was ready to be quantized.

A true unified field theory should (and does) reflect the anti-symmetry in the fifth dimension embedding space which reduces to the non-symmetry in the normal four-dimensional space-time that we observe and experience as well as real potential vectors with torsion extended in the higher embedding dimension from individual points with Clifford-like twist in normal space-time.
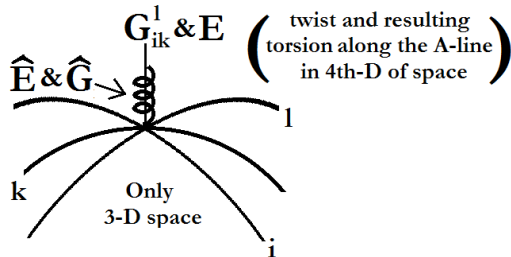
According to the extension/point dualism of physical space any natural force acting in space should have two components: A symmetric and an anti-symmetric part. So a true unification model would constitute a two-component tensor in the single field in 5-D space-time (one component for electromagnetism and the other for gravitaton) that would break down into a dualistic electricity/magnetism tensor plus a dualistic gravity/gravnetism tensor in 4-D space-time

A geometrical structure such as this would easily unify gravity in the form of general relativity and electromagnetic theory, leaving only the quantum to contend with. Unfortunately, Einstein only attempted his unifications of physics with these different geometric structures individually and thus never reached his goal, while this unification was a necessary first step before the second step of unifying relativity and the quantum could be accomplished.

4.1 Incorporating the quantum

Secondly, Einstein never fully realized that the quantum could not possibly emerge from an over-restriction of the mathematics of his geometrical structure as he hoped because the quantum is itself a fundamental intrinsic property of space-time. In fact, the quantum is the constant that binds space and time together to form space-time whether space is considered in either its three- or four-dimensional interpretations or whether it is curved or non-curved. Moreover, Einstein's attempted unification models only represented space curvature in a higher spatial dimension independent of any possible combination or connection to time – they were non-time based structures – although he used them dynamically by utilizing variational principles to show how the spatial structure of curvature altered motion over time. Therefore, the various space-time geometries that he tried individually could never have provided a source from which the quantum would emerge naturally and logically from points in the geometrical structure. His geometrical structures of curved space were fundamentally independent of time since space is only bound to time by the quantum.

Put another way, the quantum is more about function (physical processes) and relativity is more about structures (form). Together, the functionality of the quantum and the structural (formal) properties of gravity represent a different level of duality in which certain areas of physical reality overlap, but neither one can completely replace the other within our commonly experienced four-dimensional space-time continuum. For their part, modern quantum theorists do no better because they dismiss geometry altogether and in so doing they either try to base reality on incomplete pictures of quantized processes or develop statistical excuses as a substitute or alternate mapping method to replace the geometric structure of space-time. Maps simply cannot replace the actual surface structure that they depict. Statistical methods merely smudge out the dimensionless points of space and time (mathematically perturb the system) into surfaces that can only mimic true geometric extensions while establishing an alternate probabilistic mapping of physically real space and time.

Proponents on both sides of the debate – quantum theorists and relativists – need simply look at reality and analyze what they are doing in a serious but critical manner to find the theoretical keys to unification. Then, and only then, will the method of unification become obvious. In reality there are no fundamental differences between the physics of Newton, Einstein, Bohr, Heisenberg, DeBroglie and Schrödinger that cannot be overcome as indicated in this analysis while inventing artificial mathematical entities and physical gimmicks such as virtual particles, supposedly real particles (quarks) whose existence can never be verified, strings, superstrings, branes, boson fields, quantum vacuums, virtual photons, quantum loops and many more dimensions of space than are necessary can only work for so long. Scientists have failed to realize why the difference between the quantum and relativity even exists and have therefore missed the only solution of how to unify them.

4.2 Quantizing the continuum

Given all of this new information, the next questions asked by science should be obvious: What is the quantum and how, exactly, does Planck's constant fit into our commonly experienced material world? In spite of all the grandiose successes of the quantum theory, many of the top theorists have readily and often admitted that they have no idea what, exactly, the quantum is or what it all means. Without these last pieces of the puzzle, these questions cannot be adequately answered and unification cannot proceed any further than the past dismal failures of scientists to unify physics.

The real conceptual discrepancy between the quantum and classical physics (whether Newtonian or relativistic) comes from the questionable notion that the uncertainties in momentum and energy, as expressed in the Heisenberg uncertainty principle, are in themselves completely and totally fundamental physical quantities that can be directly measured. If the Heisenberg relationships are to hold true, then neither momentum nor energy need be nor even can be broken down into more fundamental quantities at the quantum level such as mass and speed and time. The fundamental nature of momentum and energy at the quantum level are only implied by the conservation laws of momentum and energy because they can be further broken down into mv and $\frac{1}{2}mv^2$, but that implication neither necessitates nor guarantee that they are absolutely fundamental at any other level of reality including the quantum level. Heisenberg's uncertainty can only be guaranteed valid if the momentum and the energy are fundamental quantities in themselves, such that they represent a simple concept of physical 'change' without direct reference to corresponding quantities into which they can no longer be rendered such as mass and speed.

As such, this common view raises the question 'is it possible to change position, represented by the uncertainty in position (spatial change), and momentum while there is no corresponding

change in time?' This question is physically nonsensical yet it is directly implied by the Heisenberg uncertainty principle and it is exactly this characteristic of the uncertainty relationships that has led to Einstein and others' criticisms that quantum mechanics is incomplete. If momentum and energy are not fundamentally unique and independent physical quantities, then the Heisenberg uncertainty principle is not fundamental enough to determine either material or physical reality without reference to 'hidden variables' or unsuspected fundamental elements.

From the perspective of the macroscopic world and classical physics, whether Newtonian or Einsteinian, there is every reason to believe that the momentum and energy of moving material objects have real values at every infinitesimal point location along any material object's path through space as well as along every infinitesimal point along its passage through time even though the values of the momentum and energy at those geometrically dimensionless points cannot possibly be measurable according to the Heisenberg uncertainty principle.

Newton was fully aware of a similar problem in his calculus of fluxions in the limit where the ratio of Δx to Δt (in this case Δ refers to 'change' rather than 'uncertainty') gets smaller and smaller with Δt approaching zero, but it is impossible for Δt to actually reach zero because relative time approaches zero until it gets close enough for the minimum of absolute time to take over, at least in Newton's original version of a calculus of 'fluxions'. This analogy raises the question of whether it is even possible for Heisenberg's uncertainties to ever go to zero especially in a world governed by special relativity, which is fully recognized by quantum theories and supposedly accounted for in the standard model, where it would seem that no change could ever take place without reference to some minimal amount of time. This suggests that there must be fundamental interpretational problems with the uncertainty principle that have not yet been solved.

There are certainly mathematical proofs of continuity from point to point along an extended geometrical line in space that apply to every physical action possible to guarantee the unbroken continuity of physical reality. However, there is no guarantee that these mathematical proofs hold true for the sub-microscopic physical world described by quantum mechanics since the quantum notion of 'uncertainty' in position, time, momentum or energy, by design, represents an ideally (although not especially an actual or practically) isolated or 'discrete' event that occurs completely independent of past and future events at an individual unconnected point in space. In other words, there is no reason, whether scientific or mathematical, to conclude with anything approaching any certainty that momentum and energy are completely fundamental quantities at the subatomic realm of physical reality (as are space, time and mass) other than a faith in that *a priori* assumption by quantum scientists and some modern philosophers.

This point of contention between the classical and quantum worldviews can be better illustrated by a comparison between space-time and the dimensionless point or 'moment' of time that lies at the origin in a space-time diagram. Technically, a space-time diagram would be impossible given the Heisenberg uncertainty principle separation of space and time in its equations. Even if space and time could be considered a combinable pair (in classical quantum mechanics) the uncertainty in position would correspond to a line infinitely long extending throughout the whole of space if the uncertainty in momentum were precisely measured. This line would correspond to the Schrödinger Ψ function before collapse which would represent all of the infinite number of position possibilities (anywhere or everywhere simultaneously) in space. A similar situation would exist for the relationship between the uncertainties in time and energy. However, quantum events can be legitimately represented in a space-time diagram because quantum theorists have accepted and accounted for special relativity upon which the space-time diagram is based. Furthermore, the original equation published by Schrodinger was time independent and thus spatial only, but soon after its publication the Klein-Gordon equation rewrote the Schrodinger equation in a time-dependent form and Schrodinger did likewise. This form of the wave equation suggests the possibility of expressing wave mechanics on a space-time diagram.

During a quantum experiment of observation, the wave function collapses into material reality within space-time. This collapse could be represented as a specific area on the space-time diagram that is defined by an ellipse (or sphere) with the diameters of ΔE and Δp along its axes.
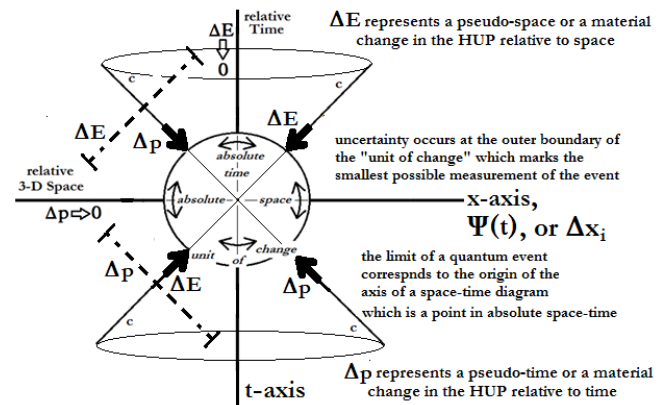
The 'sphere' of reality that results from the collapse of the wave function could be called the fundamental 'unit of change', the quantity that for any given physical restrictions, conditions or limitations is the smallest possible measurement that yields reality. For example, the width of a proton as determined during a high energy collision experiment. The central point (axes origin) would correspond to a discrete quantum point 'event' which occurs at a particular location in three-dimensional space relative to the experimenter/observer rather than the 'event' itself. In other words, the central point at the origin of the space-time axes is where all of the quantum theory, the standard model, quantum loops, superstring theory, Newtonian physics, the Newtonian concepts of absolute and relative space and time, tensor theories, gauge theories, special relativity and general relativity all come together as one theory.

On the other hand, the coexistence of relative time and relative space implies the existence of a 'point' in space-time where their axes meet. This point would be the same point that is theorized in the mathematics of calculus when the limit of the time interval grows small enough that it approaches zero time during the measurement of an instantaneous velocity or speed. However, recognizing the existence of that point alone is insufficient to explain either the physical importance or the significance of that point. Momentum and energy still have to be identified within

the context of the same space-time diagram whether a quantum or relativistic analogy is being made since quantum theorists fully accept special relativity even though they reject general relativity. Hence there is a 'zone' of misunderstanding and physical confusion surrounding the point origin of the space-time axis, which can be called the basic 'unit of change'.

Different paradigms interpret the 'zone' bounded by the basic 'unit of change' differently, hence the fundamental problems and discrepancies between the quantum, relativistic and Newtonian worldviews. The basic quantum 'unit of change' would be determined by Planck's constant and the uncertainties under consideration in any given experiment or observation. Given that the basic axes of space and time, familiar to relativity, imply the existence of a point in time where the two come together, relativity is a continuity theory wherein the idea of a dimensionless point is no stranger although the concept has never been defined beyond the purely mathematical necessity for continuity to complete the abstract pictures of geometry and calculus. In other words, the physical necessity for dimensionless points of space and time has been largely ignored by physical scientists as well as mathematicians, possibly because it sounds too much like absolute space and time as much as the fact that it raises the likelihood of true physical infinities (singularities). The simple relativity of Newtonian theory separates space and time, but also accepts the concepts of absolute space and absolute time that are constituted of point locations in space and point moments in time.
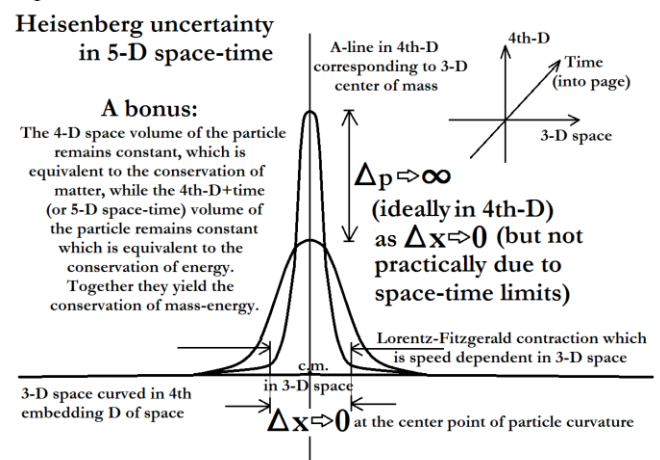
4.3 Uncertainty within space-time curvature

At this point in the analysis, quantum physicists and philosophers would normally invoke the concept of indeterminism as an intrinsic property of the fundamental 'unit of change' and argue that the whole universe is therefore inherently indeterministic according to the quantum theory as opposed to deterministic according to classical physics. In effect, real geometric points do not exist but rather indeterministic zones around points exist, at least that is what is implied by the space-time diagram. Yet both determinism and indeterminism are false concepts and have no place in real science. Even though the quantum event corresponds to but is not exactly the individual dimensionless point at the origin of the space-time axis, it still has to conform to the dimensions set by the relative space and time axes outside of the 'fuzzy zone' within the sphere that marks the quantum or smallest measurable 'unit of change'. Real geometrical points must exist, whether quantum philosophers accept that reality of not, because point centers of rotation are real at all levels of reality.

However, changing from the dimensionless existence of a point to a dimensioned existence relative to the whole universe poses a problem when the quantum event becomes a four-dimensional space-time reality by collapse of the wave function. Put another way, the dimensionless point at the location where the space and time axes come together – the independent idealized space-time 'now' of the observed event – can occupy only one of an infinite number of possible locations or orthogonal directions (thus the ↕↔ symbols used in the diagram) corresponding to the x, y, z, and t axes of normal space-time.

The idealized point 'event' must conform to the already established direction of relative time because time must go on (other point-events continue to occur throughout the universe independent of any one discrete point-event in question), or moves forward, external to the 'fuzzy zone' surrounding the 'event' once it has been observed, measured by or interacted with something external to the 'fuzzy zone'. When the time-axis of the single quantum event collapses from all of its infinite number of possible orientations around the central point in the 'fuzzy zone' and aligns with the flow of time surrounding it, its spatial axes automatically align with the external spatial directions x, y, and z that define the common external three-dimensional space. Only then does the action of the event conform to the geometrical and quantum rules and restrictions on reality established by the universe as a whole and thus become a physical reality.

Fortunately, there exists a very important precedent for this particular interpretation of the quantum paradox. This alignment process utilizes a Hilbert space of infinite dimensions in which each point-located event establishes its own independent relative space-time framework, but there are an infinite number of point-locations in this singular universe created by the event and all are pegged to the one central point of a normal space-time diagram origin. So the problem of 'uncertainty' inside the 'fuzzy zone' bounded by the 'unit of change' surrounding the origin point of the space-time axes reduces to the singling out of one of the infinite number of possible axes orientations rather than a 'collapse of the wave function' that extends throughout all of space.

This alignment of time and then spatial axes of the event to the universal standard is really what occurs when the wave packet collapses to create 'reality' within the normal space-time continuum. In this case, it is easier to think of the collapsing wave function as representing a longitudinal wave expanding along a line if the fourth direction of space rather than a transverse probability wave extended over the whole of three-dimensional space while still centered on one individual point in the space-time continuum.

Heisenberg uncertainty in 5-D space-time

A-line in 4th-D corresponding to 3-D center of mass

4th-D

Time (into page)

3-D space

A bonus: The 4-D space volume of the particle remains constant, which is equivalent to the conservation of matter, while the 4th-D+time (or 5-D space-time) volume of the particle remains constant which is equivalent to the conservation of energy. Together they yield the conservation of mass-energy.

$\Delta p \Rightarrow \infty$ (ideally in 4th-D) as $\Delta x \Rightarrow 0$ (but not practically due to space-time limits)

Lorentz-Fitzgerald contraction which is speed dependent in 3-D space

3-D space curved in 4th embedding D of space

c.m. in 3-D space

$\Delta x \Rightarrow 0$ at the center point of particle curvature

This longitudinal wave would represent three-dimensional particle curvature which undergoes Lorentz-Fitzgerald contraction along the direction of travel within three-dimensional space. The uncertainties in momentum and energy that are coupled to positions in three-dimensional space and time would now become properties of the embedding fourth direction of space related to the changing curvature due to the requirements of special relativ-

ity. So while momentum and energy can be reduced to the more fundamental quantities of space, time, speed and mass in three-dimensional space, they are fundamental and cannot be reduced to these quantities along the embedding direction of space, thus fulfilling the restrictions of the uncertainty principle.

Placing the quantized properties of matter in the fourth direction of space (the fifth direction of space-time) is not a new idea. Klein did just this when he related the periodicity of Kaluza's cylindrical loops to the quantum. Wilson also used the same idea, independent of Kaluza and Klein, when he likened Schrödinger's wave function to a five-dimensional volume of the particle's curvature structure in the fifth dimension. Flint, who with Wilson founded the Bedford College group (University of London) that pursued a five-dimensional unified field theory for four decades, went even further and associated a five-dimensional momentum of m_0c and a five-dimensional energy of m_0c^2 to every elementary particle. Flint even stated that "$\mathbf{X^5}$ is periodic in the value $\mathbf{l_0}$ or $\mathbf{h/m_0c}$ and no less value than this is of physical significance", [43] which meant that the overall length or extension of our commonly perceived space in the higher dimension required a lower limit to measurement in three-dimensional space proportional to the value $\mathbf{h/m_0c}$. This notion was in complete agreement with Flint's more classical non-Copenhagen Interpretation of the quantum theory, which implied that uncertainty is not inherent in nature as was commonly thought.

The problem with the fundamental nature of momentum and energy within the Heisenberg uncertainty principle in quantum physics as opposed to classical physics can thus have a completely different interpretation that corresponds quite well with concept of the curved space-time in relativity theory. In our commonly experienced three-dimensional space, space (location) and time are more fundamental and give rise to the fundamental nature of mass and speed, which implies that momentum and energy cannot be fundamental physical quantities in themselves in three-dimensional space. However, everything that occurs or happens in three-dimensional space or four-dimensional space-time has an equivalent effect along the fourth dimension of space or fifth dimension of space-time. Yet in this higher embedding fourth dimension of space, distance and time as well as mass (point-inertia or the gravity inertia of curvature) are inseparable, which means that momentum and energy must be fundamental quantities along the fourth direction of space that are equivalent to their speed-mass reductions in three-dimensional space. So it is only the real curvature of the space-time continuum in the higher embedding space (or manifold) that guarantees the fundamental and independent nature of momentum and energy within the Heisenberg uncertainty principle.

Mathematically speaking, location or position in space and momentum are non-commuting variables as are time duration and energy in the other form of Heisenberg's equations. Yet the mathematical concept of non-commutability normally has no physical meaning or interpretation. Perhaps that is because the quantities in question are only non-commuting in three-dimensional space, but fully connected in a different way in four-dimensional space that cannot be so easily defined in pure mathematics. Furthermore, this dichotomy allows for some other new interpretations of physical reality as a bonus. If the four-dimensional spatial volume of the particle beneath the curvature

remains constant during some event, the conservations of mass and momentum hold true in spite of relativistic changes in mass as a function of speed, while if the five-dimensional space-time volume of the particle under the curve remains constant then physics finds itself with a new way of expressing the conservation of mass and energy.

Given that the quantum point structure of an infinite-dimensional space-time first suggested by Hilbert [45] is intimately related to the mathematical concept of a Hilbert Space, these facts point to yet another interpretation of general relativity. (See for example Brody and Hughston [46]) Hilbert space is a purely mathematical projective space of rays that is non-linear with curves and described by Riemannian metrics, which fits this physical model of space-time quite well if the rays are interpreted as extensions along the fourth direction of space as are the fundamental uncertainties of momentum and energy. A precedent for this interpretation already exists in general relativity. David Hilbert [47] used such a construction to develop his own general relativistic structure of space-time at about the same time that Einstein initially developed his own version of general relativity. Einstein noted Hilbert's contribution for developing an alternate derivation of his theory while Hilbert gave full credit for the discovery of general relativity to Einstein.

In other words, the first and most pertinent question asked of quantum theory should be – what is the probability that the individual random four-dimensional space-time framework of a measurement beginning from a random dimensionless point in space-time would conform to the external physical and geometrical restrictions (requirements) of the relative space-time established by other material bodies in the universe? This question is necessary since the experimenter/observer conducting the measurement exists relative to the rest of the universe even if the measurement event itself does not. Yet the probabilistic interpretation of the Heisenberg uncertainty principle and quantum mechanics is a far cry from assuming that the point-position in space and the point-moment in time corresponding to a quantum event are smeared out as a probability cloud over an infinite number of possible locations corresponding to all of space-time before the collapse of the wave packet, as is presently assumed in all standard interpretations of the quantum theory. The probability of an infinite number of possible orientations of space-time axes spinning around randomly within the 'unit of change' or fuzzy point before 'collapsing' to a singular unique alignment with the normal ongoing passage of time axis to move the event forward in time relative to the whole universe is far more realistic than the alternative quantum explanation of the pre-collapse wave packet. Yet this picture limits the indeterminate nature of the quantum to somewhere inside the 'unit of change' while the external universe still remains classical.

Logically speaking, all of the probability is wound up inside the 'fuzzy zone' and the universe is still left deterministic outside of the 'fuzzy zone', at least until the collapse of the wave packet brings the event into question and then alignment with external deterministic reality as well as Newtonian physics. In other words, the indeterminism is not inherent in nature and physical reality, but has been forced on nature by the unnatural attempt to split space and time apart and thus invoke or recall the suppressed quantity called Planck's constant. Thus we have a meth-

od and interpretation of quantum theory that corresponds well to the model of reality posed by both special and general relativity as well as Newton. Both the indeterminism of the quantum inside the 'fuzzy zone' and the determinism of relativity outside of the 'fuzzy zone' coexist to create physical reality. The width of the 'fuzzy zone' in both space and time is defined by the quantum as expressed by Planck's constant, so the fundamental quantum is and can be nothing other than the smallest possible measurement that yields a physically real event according to the rules of our universe as a whole.

In the end, scientists 'create' the uncertainty that they normally attribute to nature by their attempts to mimic mathematician's ideal mathematical abstractions on the stage of physical reality. We are truly creating our own abstract reality by experiment, but it is not and cannot be the true reality of our external world. The smaller we make the 'unit of change' size limit, either by abstraction or experimental measurement, approaching the zero point, the greater the radical rate of 'change' of orientation of the event point's axes, the harder it becomes to align the time axis of the point to the external passage of time and thus the external space-time geometry. This creates a greater uncertainty in the 'quantum measurement' and, in fact, is the source of the measurement problem in quantum theory. The very notion that the universe as a whole is indeterministic is based on false logic as is the same sentiment in determinism. Indeterminism and determinism only refer to the concept of theoretical predictability in the formalized scientific method within the local area where the experiment of observation is taking place and cannot logically be extrapolated beyond that simple concept.

4.4. Suppressed rather than 'hidden' variables

The situation described is reminiscent of a moving particle that is confined to bounce around inside an ideal box (the fundamental 'unit of change') that is decreasing in size and volume. Collisions inside of the box are perfectly elastic so no kinetic energy is lost by the particle to the box. The box also shrinks in such a way (adiabatic) that it gives no energy to the particle. Although the total energy within the box remains constant, the particle's motion grows increasingly more radical and erratic as the box's volume decreases while the internal pressure of the particle on the wall increases because the particle bounces off of the interior wall of the box more and more often as the box shrinks. The increasing erratic motion, the increasing pressure of the particle and the shrinking size of the box can all be equated to the 'basic unit of change' and Planck's constant because they are proportional. It is normal to associate Planck's constant with both, depending on the circumstances, but in reality Planck's constant is related only to the size of the box and not the erratic nature of the motion which is only dependent on and proportional to the size of the box.

Meanwhile, the uncertainty of position at any given point of space in the box is tied to the erratic motion of the particle, not the shrinking size of the box or the pressure. As the volume of space in which the particle is confined during measurement (which yields the uncertainty in the position) approaches the outer surface of the extended particle, the randomness of the motion of the particle increases proportionally until the box sur-

face (technically a measuring device) coincides with the outer surface of the particle and its motion (momentum) ceases altogether. But just before this occurs, the erratic motion and pressure both go to infinity, at least theoretically.

On the other hand, the energy density of the particle, with constant kinetic energy over a decreasing volume of the box, increases as the box shrinks even though the total energy remains constant. Mathematicians could abstract this situation and say the energy density approaches infinity (zero point energy) as the volume difference between the outer surface of the particle and the inner surface of the box decreases to zero with constant energy. But the real situation is that the volume of the box cannot go to zero; the volume of the box can only grow as small as the extended particle size at which time the radical erratic motion of the particle must go to zero because there would be no room in the box for the particle to bounce around, *i.e.*, the uncertainty tied to the erratic motion would go to zero as the box stopped shrinking when the empty space (that is not particle) in the box disappeared, rather than when the box's size shrinks to zero. This presents a paradox. At this juncture, mathematics and physics begin to part ways. According to physics, the box would assume the shape of the particle as momentum goes to zero and the energy in the erratic motion would be converted. Beyond this, the important question that needs to be answered becomes – what happens to the (kinetic) energy of the moving particle when it becomes constrained in this manner? The answer to this question is debatable.

The uncertainty in position may have gone to zero to define the measurement event, but the point location in space never went to zero. The corresponding randomness in motion (uncertainty in momentum) went to a maximum value, but when the measuring container closed in on the particle the momentum must have gone to zero as energy was apparently, but not necessarily, lost to or absorbed by the container. In this case, the center point of the particle would correspond to the axis of the space-time diagram describing the event. Altogether there are several variables in this description and the Heisenberg uncertainty principle is either violated or not depending upon which variables Δx and Δp are thought to be isolated.

The energy of the particle could be absorbed by the box or rather the ideal situation of perfect bounce which previously conserved the particle's energy from dissipation would disappear as the particle's energy was absorbed as a whole by the box which had reached a constant (non-shrinking) size. Otherwise the kinetic energy of the particle could turn inward and be converted to internal energy, changing the physics of the particle itself. The energy remained constant during the shrinking box process even though the energy density increased, but then mathematics alone would have the energy density going to infinity as the box size approached zero. Clearly the mathematics and physics of the situation do not match each other. So how is the uncertainty principle to be justified or even interpreted in this little experiment? In fact, the mathematics yields physically impossible answers. The same is true for the mathematical formalisms of quantum mechanics, which is the main source for problems and discrepancies between the quantum theory and other physics paradigms.

Before the moment when the shrinking box isolates the particle, the motion of the particle was predicted by the uncertainty principle dealing only with the uncertainties in position and momentum alone, but at the moment of 'collapse' the uncertainties in energy and time had to be invoked. At that moment, the two different forms of the uncertainty principle could be equated, thereby eliminating any reference to Planck's constant. The uncertainty relationship thus reduces to

$$\Delta x \Delta p \geq \hbar / 2 \leq \Delta E \Delta t \text{ ,} \qquad (6)$$

which simplifies to become

$$\Delta x \Delta p = \Delta E \Delta t \qquad (7)$$

Given this last relationship, both the equations of special relativity and Newton's second law of motion can be derived [48] by noting how the uncertainties involved change relative to one another. In other words, when the moment of measurement occurs or is completed, a 'collapse' of uncertainty reestablishes the relationship between the quantum event and the relative space-time continuum, as designated by the above space-time diagram, and the fundamental 'unit of change' is established. The quantum situation thus reduces to a problem in normal classical physics by the act of measurement and in spite of the mathematical and physical paradoxes that the uncertainty principle forces on the physical event prior to and approaching the moment of collapse.

This analysis indicates that there were not exactly any 'hidden variables' in the quantum uncertainty relationships, but rather specific variables had been 'suppressed' by the act of splitting space and time apart from their relativistic configuration of a combined space-time. There was no accounting for time (position in time) in the relationship between the uncertainties in position and momentum before the 'collapse', so the position in time was unknown until the moment of 'collapse'. Under similar circumstances, there would be no accounting for position (spatial location) in the uncertainties in the relationship between energy and time. Time and space, respectively, are the 'suppressed variables' in the different equations of the Heisenberg uncertainty principle, yet there is still one more 'suppressed quantity' in the classical view of space-time, and that is Planck's constant itself.

If we invoke quantum mechanics
and try to find a point

as $\Delta x \to 0$,   as $\Delta t \to 0$,
$\Delta p \to \infty$ $\Delta E \to \infty$

⇩   ⇩

time is   space is
suppressed   suppressed

Δp and ΔE are substituted for time and space
to account for 'change'

When space and time are reunited as space-time, Planck's constant is suppressed, so Planck's constant, which does not normally appear in either Newtonian or relativistic physics, must and can only be the binding constant for space and time. If positions in space and time are considered independent of one another at the quantum level of reality, then Planck's constant and uncertainly must be invoked, but if a location in space-time is measured instead, or the same experiment is varied to do so and the particle is located in space-time, then Planck's constant must remain suppressed and classical physics invoked to describe the same set of physical circumstances. In other words, the uncertainty represented by Planck's constant only comes from the attempt to artificially separate space and time in the measurement process on the smallest possible (and practical) physical scale of reality.

Whatever the moment that defines the event is called – collapse, measurement, observation – the concept has created a conceptual conundrum (mess) that has seldom if ever been analyzed properly by scientists, mathematicians or philosophers. It would be far more accurate and realistic to call this 'zone' the smallest possible 'unit of change' that can be measured or observed during any subatomic physical interaction. It is also questionable whether the concept can legitimately be applied simultaneously to all points over all of the space-time continuum given that no other 'events' could possibly be causally related to just the one event occurring at the one point at the center of the 'unit of change'. Yet that is exactly what is normally done whenever quantum scientists talk about a ubiquitous quantum foam or similar absolute background (in essence a quantized aether filling a Newtonian absolute space) that exists at the lowest subatomic level of reality. Quantum foams and other such explanatory gimmicks are no more than quantized visualizations of Newton's absolute space with the slight addition of possible random quantum fluctuations (miracles that only mind and consciousness can contemplate) at different points in absolute space.

In reality, quantum theory is only supposed to deal with unrelated and physically unconnected events (unless entanglement can be taken into account), so the empty space and time between different independent events cannot be characterized by any one individual event. The only possible justification for doing so would be the *a priori* assumed probabilistic (purely mathematical) nature of quantum mechanics and the corresponding spread of the wave function over space prior to the moment when the wave function collapses to the single point at the origin of the space-time diagram to create 'reality', as quantum theorists would say. However, the mathematical model of a wave that corresponds to a particle that is somehow smudged out simultaneously over the whole universe is nothing more than a prosthetic gimmick and red herring. Mathematical possibilities such as those represented by the wave function do not necessarily represent physical realities. Perhaps David Bohm's notion of a quantum potential field would be more accurate in this case, but even this concept is not generally accepted in the quantum physics community.

The shrinking box or surface is not that bad an analogy, nor is it unprecedented. Such an imaginary closed surface surrounding a real object would normally be called a Gaussian surface in mathematics. The concept of a Gaussian surface is a useful and often used analytical tool in physics. When the ideas and analogies of the shrinking box are applied to nature a new and startling result emerges – the shrinking box analogy provides a realistic description of how the Schrödinger wave function collapses to form an extended material particle during a quantum interaction event or alternately how the quantum energy of a light wave is absorbed as a photon, while the erratic process of axes align-

ment inside the box describes a corresponding purely quantum mechanistic, indeterministic and mathematical (and thus non-natural) view of the event. In either case, the width of the enclosing surface in space accounts for the uncertainty in position (Δx) and the width of the event in duration the uncertainty in time (Δt).

In the real world, this limit – the quantum limit – could be used to explain the creation of either a pseudo-particle or a real particle. The energy density in the box would either convert to a momentary semi-stable field resonance or become a real a particle as the quantum limit (basic unit of change) of the box is reached. Which type of particle would depend on the extent to which the particular situation conformed to the geometrical restrictions of reality, *i.e.*, real particles must have half-spin. If the limit is approached in such a manner that uncertainty inside the 'fuzzy zone' collapsed and the resulting quantity conformed completely to the geometric restrictions of space-time, then a real particle such as an electron or positron would emerge from the process – be created. Otherwise a momentary 'energy resonance' (such as a Higgs boson) would emerge or be created, but it would very nearly instantaneously deteriorate into some other form of energy (gamma rays), a real particle (particles) with energy or a combination of both. This is exactly what occurs in high energy physics experiments such as the Large Hadron Collider at CERN.

5. Single Field Theory

The theoretical structure that results from combining all of these ideas is called the 'single field theory' or SOFT. The phrase 'unified field theory' is usually associated with Einstein's less comprehensive attempts of combining the fields to produce a single field rather than thinking of the more fundamental single field in the embedding manifold as splitting up into the electromagnetic and gravito-gravnetic component fields in the lower four-dimensional space-time.

The Neo-Classical Forces of Nature

Lorentz equation:
$$\vec{F}_{EM} = q\vec{E} + q\vec{v} \otimes \vec{B}$$

Heaviside equation:
$$\vec{F}_G = m\vec{g} + m\vec{v} \otimes \vec{\Gamma}$$

General Relativity
$$T_{\mu\nu} = G_{\mu\nu}$$
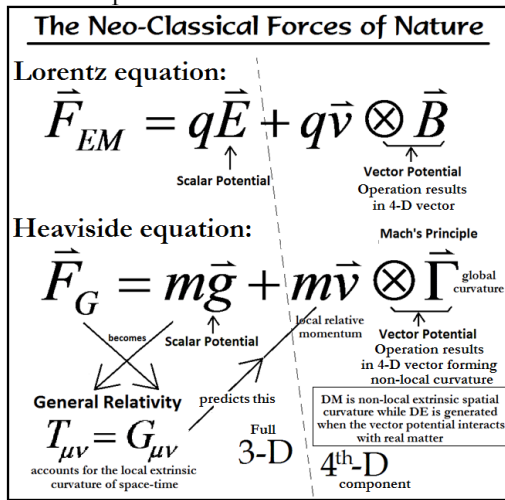
But Einstein's perspective on the final results was different. He envisioned the field as a unification of common three-dimensional physical fields intrinsic to four-dimensional space-time whereas this model holds that the common fields are merely specialized (quantized) field density structures within the five-dimensional single field. In any case, gravitation and electromagnetism can only be unified (the first step in full unification)

after completing the gravity equation to account for the dualism of space (yielding DM and DE). This change places gravity on an equal footing with electromagnetism with respect to the geometry of space so they can be unified. In both the Lorentz equation for electromagnetism and gravity the first term represents the contribution to force by three-dimensional scalar potential fields while the second term represents a three-dimensional contribution to net forces within four-dimensional vector potential fields. Each four-dimensional vector potential field consists of a three-dimensional field (**B** and **Γ**), but each point in the three-dimensional field extends into the fourth dimension as vector potential.

Like magnetism which acts circularly around a moving charged particle (q), the new additional gravitational force acts centripetally toward the center of gravitational attraction but the motion is circularly around the center of the moving mass because it is associated with (or following) an orbiting mass. The vector velocity (**v**) is only that due to the normal gravitational attraction to the central body toward which the mass m is directed. In this case, the centripetal acceleration that is equal to the gravitational force along a radial direction is counterbalanced by a real centrifugal force directed radially outward toward the rest of the mass of the universe along that line just as Heaviside said in the 1890s. In this sense, the actual momentum of the orbiting mass is related to Mach's principle since all the matter in the universe determines the 'change' in momentum of any orbiting object and technically all objects in the universe can be interpreted as naturally orbiting (or non-naturally breaking through orbits) other more massive objects. True mass can only be measured with perfect accurately if that mass is non-restrained and in equilibrium relative to a central mass and the rest of the universe which fulfils the ideas set forth as Mach's principle.

The new variable **Γ** represents the collective gravitational attraction of the rest of the universe or all other material bodies except the one about which the mass orbits. In essence, **Γ** represents the overall or global curvature of the universe. The cross product between **Γ** and the orbital momentum thus yields the higher orbital speed that is observed in stars and star systems orbiting galactic cores. However, this effect would influence all orbital speeds around all central material bodies and not just galaxies, thus accounting for the small speed increases NASA has detected in artificial satellites that slingshot around planets and the sun. This effect also accounts for the slightly higher speeds of the Voyager satellites that are presently exiting the solar system. The model also yields several other testable predictions [51,52], but this venue is too short to list them all. In any case, the quantum can now be incorporated into relative field theory quite easily.

Also, like electromagnetic theory, a secondary equation relates this gravitational vector potential to the quantity **Γ.**

$$\vec{\Gamma} = \nabla \otimes \vec{I}$$

(8)

The potential vector *I* is the source of Dark Energy, thus Dark Matter and Dark Energy are directly related. But the vector *I* also represents mass inertia. In truth there is nothing Dark or mysterious about what is mistakenly referred to as Dark Matter and Dark Energy. They are merely secondary effects and non-local

properties of normal matter. Mass inertia is a point property of material bodies as opposed to the gravitational inertia which is described by the metric curvature. The total mass inertia of a body is the collective property of all the points within the body that fit under the extrinsic spatial curvature of the body that represents the gravitational mass. This structure gives physics a new and far more general equivalence principle that applies directly to general relativity and the concept of curvature of the continuum.

This model and the new concept of mass inertia also yield an alternate explanation of the Higgs boson proposed in the Standard Model of particles. The Higgs boson is not an exchange particle since no particle exchange is necessary to create the mass of a material body, it is just the point inertia **I** under the metric curvature that distinguishes the particle from open space, while the Higgs field is none other than the external space-time continuum of the particle as expressed by general relativity. However, outside of the boundaries of an extended material particle the very points of space under the curvature **Γ** are points of Dark Energy. So Dark Energy is no more than gravitational vector potential in open space.

After the cross product is completed, the equation would take a new form with

$$\vec{F}_G = m\vec{g} + m\vec{v}_4\,\Gamma$$

However, the second term could be interpreted as a new acceleration due to the gravity field of the rest of the universe such that

$$\vec{\mathbf{g}}_4 = \vec{v}_4\,\Gamma$$

and finally a completely new Newtonian equation emerges.

$$\vec{F}_G = m\vec{g} + m\vec{\mathbf{g}}_4 \tag{9}$$

This new gravitational field potential acts across all four dimensions of space. This new component can be further differentiated since

$$m\vec{\mathbf{g}}_4 = m\,\frac{d\vec{v}_4\,\Gamma}{dt},$$

so

$$m\vec{\mathbf{g}}_4 = m\Gamma\frac{\partial\vec{v}_4}{\partial t} + m\vec{v}_4\frac{\partial\Gamma}{\partial t}.$$

The new quantity v_4 can be split into two components such that

$$\vec{v}_4 = \vec{v}_{3\text{-space}} + \vec{v}_{4\text{th-D}}$$

The 3-space component represents the additional speed of an orbiting object due to the new potential gravity term while the second $v_{4\text{th-D}}$ component represents the Dark Energy added to system. This yields a final equation

$$\vec{F}_G = m\frac{\partial\vec{v}_3}{\partial t} + m\Gamma\frac{\partial\vec{v}_3}{\partial t} + m\Gamma\frac{\partial\vec{v}_4}{\partial t} + m\vec{v}_4\frac{\partial\Gamma}{\partial t} \tag{10}$$

This equation represents all components of gravity, both local and non-local. The first and second terms represent local and non-local (Λ-CDM) contributions to the orbital speeds (v_3) of

stars and star systems (and all other orbiting bodies all the way down to particles), the third term represents the halo (or non-local warped curvature beyond the galaxy edge) and the last term represents the changing gravitational field potential (Riemannian curvature) due to expansion of the universe or what is mistakenly called Hot Dark Matter.

In this last equation, the $m\Gamma v_3$ contribution would amount to the normal gravitational attraction of far distant material bodies in the universe of extended space similar in fact to the normal gravitational attraction of nearby material bodes. However, the third term $m\Gamma v_4$ is far more interesting because it represents what would basically amount to the Dark Energy contribution, a four-dimensional extension from the individual points in three-dimensional space, to the three-dimensional speeds of orbiting bodies.

Graphing the results of this last equation clearly explains how the orbiting star and star system speeds in the arms of spiral galaxies maintain nearly constant speeds throughout the rim of the galaxies. The quantities $m\Gamma v$ can be changed to their energy equivalent by simply expressing them in terms of classical kinetic energy. So, $m\Gamma v$ becomes $2KE/v$. Since the kinetic energy is inversely proportional to the speed v due to normal gravitational attraction to the general body (galactic core), the quantity $m\Gamma v$ graphs as a straight line from the origin of the graph (galactic center) and increasing as the inverse of the Newtonian predicted speed to the galactic edge.
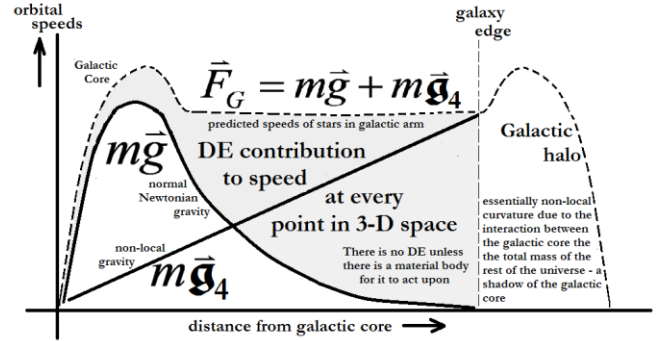
When the two curves are added together, the resulting complex curve predicts that the stars and star systems in the galactic arm will maintain approximately a constant speed out to the edge of the galaxy, which has been observed. The difference between normal Newtonian (and Einsteinian) predicted gravity and observations comes from the addition of Dark Energy to the orbital energy of the stars and star systems.

However, writing the equation for gravity in the Newtonian fashion and further analyzing the new second term also opens other possibilities such as a method to demonstrate the cheap first order quantization of matter. Since the momentum can be related to a DeBroglie matter wave, the new form of Newtonian gravity can be rewritten (or mathematically interpreted) as

$$\vec{F}_G = m\vec{g} + \frac{h}{\lambda_m}\,\hat{r}_4\,\Gamma \tag{11}$$

But once again the unit vector r_4 can be broken down into three-space and fourth-dimensional components such that

$$\vec{F}_G = m\vec{g} + \frac{h}{\lambda_m}\hat{r}_3\Gamma + \frac{h}{\lambda_m}\hat{r}_{4th}\Gamma \quad . \quad \text{(12)}$$

This static equation (it becomes dynamic once it is differentiated relative to time) would represent a picture taken at a moment when a particle or body is suspended in a gravitational field associated with a central mass M. At that moment, the mass m is equally attracted to the central mass and the rest of the universe in the opposite direction. The mass at that equilibrium point could be associated with a matter wave (collapsed into the point) in three-dimensional space, but it would also be associated with an extension in the fourth direction of space from that point. The extension into the fourth direction of space corresponds to the DeBroglie 'pilot wave', a longitudinal wave coupled to the three-dimensional matter wave that directs the motion of the particle or body. Since this equation represents a static picture of a moment in time of the forces acting on a particle or material body, it is completely structural rather than functional (at least until differentiated with respect to time) and could be interpreted as demonstrating how classical forces act on a particle as the uncertainty in position (Δx) goes to zero (a zero point) in classical space or space-time.

This mathematical expression is significant because the last term quantizes the space-time continuum along the fourth direction of space, which in turn quantizes every bit of matter in the ordinary three dimensions of space. Furthermore, this quantization would represent the lowest energy level or n=1 quantum state of the extrinsic curvature in the higher embedding dimension. Taking into account higher possible energy levels, the equation can be rewritten in the more general form

$$\vec{F}_G = m\vec{g} + \frac{nh}{\lambda_m}\hat{r}_3\Gamma + \frac{nh}{\lambda_m}\hat{r}_{4th}\Gamma \quad . \quad \text{(13)}$$

Here then is a new quantization of the Newtonian space and time continua, without yet developing a model requiring Riemannian curvature of a single connected space-time continuum itself. This equation implies that quantizing the curvature expressed in general relativity would be something like forming a stack of curved 'sheets' (like pages in a book except that they form a large ring that swings around a single-polar circle and closes on itself from below in the form of a Möbius strip) in the higher embedding dimension of space.

The first 'sheet', corresponding to the n=1 energy state, would correspond to our naturally sensed material space-time continuum. From the point of view of the higher dimensional-space, the first or primary 'sheet' would contain the densest part of the single field, with the single field growing exponentially less dense the higher the quantum number n, or rather the greater the distance from our primary n=1 three-dimensional 'sheet' of space-time. This 'sheet' could also be likened to David Bohm's concept of a quantum potential field [53] since all of the various wave equations associated with all of the point-particles in space would overlap within this single 'sheet' so the 'sheet' would represent all of the probabilities expressed in the nearly infinite number of Schrödinger's Ψ-functions for every possible quantum event in the universe. Henry Stapp [54] has also expressed the personal opinion that the substantial universe may be no more

than the continuous superposition of all possible quantum wave functions in the universe, a super superposition of all points in space, which could just as easily describe the extrinsic curvature of the 'sheet'.

This primary 'sheet' at the n = 1 quantum level would correspond to Kaluza's configuration of a unified model embedded in a fifth space-like dimension except that each point along the A-line loops would be continuous in both three-dimensional space and along the fourth dimension with their neighboring points in the new geometry.
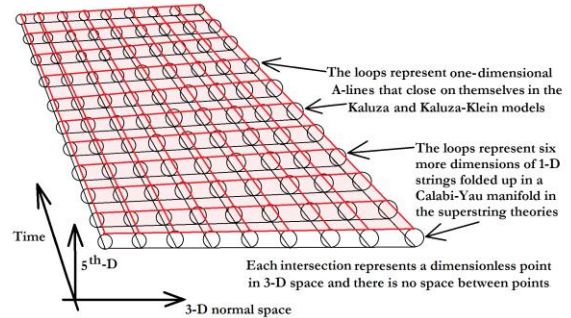
Kaluza's A-line loops now form the 'substance' or the 'effective width' of the stacked 'sheets' along the fourth direction of space

Not only are Kaluza's A-line loops incorporated into the n = 1 'sheet', but the Calabi-Yau bundles of the superstring theory are also incorporated into the 'substance' of the 'sheet'. Incorporating Kaluza's theory into this theory allows the use of Kaluza's mathematical method of using a "cut transformation" and a "four-transformation" to generate the electromagnetic and gravitational fields from the corresponding tensor equations.

Moreover, this interpretation gives the two forms of transformations a new and more natural meaning. The "cut-transformation" is the mathematical equivalent to cutting perpendicularly across or through the 'sheet' to obtain the electric and magnetic fields, while the "four-transformation" is the mathematical equivalent to slicing along the top of the 'sheet' (parallel to the fourth spatial direction) which renders gravity a form of 'surface tension' between material particles that acts across the 'sheet'. This explains why electromagnetism is two directional (in and out of particles through the 'sheet' or positive and negative) while gravity is only one directional. Electricity is reduced to a stress within elementary particles which causes a strain or tension within the space surrounding particles directed toward the center of a particle.

Expressing the quantum and quantized space-time curvature in terms of the DeBroglie wavelength also implies another alternative interpretation of the quantum structure of physical reality based on the DeBroglie matter waves which also happen to form the basis of Schrödinger's wave mechanics in quantum theory. Gravity in the form of a modified Newtonian equation has now been quantized by inclusion of the matter waves, which should make the job of quantizing general relativity that much easier. An important precedent for this interpretation also exists so this particular interpretation is not so farfetched. Wilson derived the Klein-Gordon equation for the quantum in 1927 based on the premise that Schrödinger's wave function really represented a five-dimensional volume of space-time. [55] Furthermore, con-

sidering the fact that electrons orbiting atomic nuclei in each of the major quantum orbits form whole DeBroglie matter waves, the electronic shells in atoms can now be explained utilizing space-time curvature. [56] Only incoming light waves with specific magnetic vector potentials **A** can be absorbed by electrons in specific shells whose own magnetic vector potential **A** just matches them for the proper quantum leap to other orbits. Light waves as well as all waves in three-dimensional space have a longitudinal counterpart along the fourth dimension of space. The mathematics for the longitudinal electromagnetic wave was first worked out by Whittaker in 1903 and 1904 [57] although he did not relate his longitudinal light wave to the higher embedding dimension of space.

This formulation also indicates that the DeBroglie matter wave has two components: The first representing DeBroglie's 'pilot wave' extends in the fourth direction of space as a longitudinal wave while the second, described by the Schrödinger equation, is more like a transverse matter-wave in three-dimensional space and is thus equivalent to the modified Newton model of space as well as the Einstein-Kaluza five-dimensional model of space-time. These findings indicate that the quantum forces a limit to measurement that is restricted to the fourth dimension of space as it affects how our normal three-dimensional space evolves in time. In other words, Planck's constant is a coupling constant for four-dimensional space and time that manifests in conscious acts of measurement and non-conscious physical interactions (entanglements) in three-dimensional space.

Since continuity is a physical property of both space and time, the fundamental interaction between the single field and space-time would be limited by an 'effective width' of three-dimensional space in the fourth direction of the embedding space. Each successive quantized curvature 'sheet' in the higher embedding space would be characterized by the same 'effective width' even though the single field itself would remain continuous. The 'effective width' of space would be characterized by Planck's constant or rather proportional to the fine structure constant ($\alpha = e^2/4\pi\varepsilon_0\hbar c$) which would further consolidate electromagnetic theory into the single field model as well as electromagnetism into the fundamental gravitational structure of space-time. The lowest energy state, corresponding to the principle quantum number of $n = 1$, of the three-dimensional universe would specify or characterize the primary 'sheet' surface with this 'effective width' and each succeeding 'sheet' stacked on top of the other (giving continuity) in the fourth direction of space would correspond to succeeding quantum numbers.

Einstein's original formulation of general relativity in terms of tensors representing the curvature of space time yielded a simple equation of the form

$$\Gamma_{\mu\nu} = T_{\mu\nu}$$

(14)

The tensor **Γ** represents Einstein's intrinsic curvature metric of four-dimensional space-time while the **T** is called the energy-stress tensor and represents the matter and energy content of the universe. It is commonly understood that matter curves space-time and space-time curvature directs the motion of matter. However, this equation does not take into account the contributions of Dark Matter and Dark Energy, but then it only represents

the metric geometry implied by the original form of Newton's gravitational equation **F=mg**. The new term added to Newtonian gravity and extending it to include point geometry changes everything.
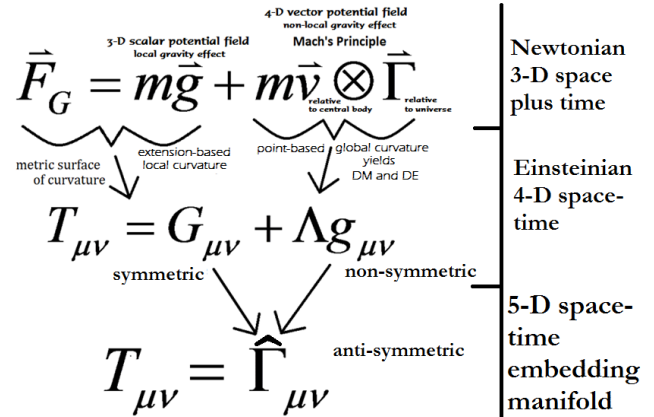
The second Newtonian gravity term becomes what is called Lambda-CDM, which is now being used successfully in Einstein's equation to explain the Cold Dark Matter halo surrounding galaxies. Yet another historical episode throws additional light into this matter.

In the mid 1940s, both Einstein and Schrödinger developed new forms of the unified field theory. Schrodinger was interested in Eddington's original affine connection with parallel transport approach to unification as well as the Einstein-Cartan model of 1929 which employed Cartan's generalized anti-symmetric point-based geometry. So he combined these efforts to develop his own anti-symmetric unification model in 1945. [58] At nearly the same time, Einstein dropped his efforts to expand Kaluza's five-dimensional model and after a short flirtation with bi-vectors returned to his non-symmetric model of 1925. He continued to develop the non-symmetric model until his death in 1955. [59] These models alone are not any more meaningful than earlier attempts except for two details. In 1950, Schrödinger derived Einstein's less restrictive non-symmetric from his more restrictive anti-symmetric model and showed that they were essentially the same model. [60] However, in doing so Schrödinger came up with an extra term in the non-symmetric model and he equated that term to Einstein's earlier attempt to stabilize the universe using a cosmological constant. In the past two decades Einstein's mistaken cosmological constant (he had added the right thing for the wrong reason when he developed the concept of the cosmological constant more than eight decades ago) has once again entered cosmology and astrophysics to account for the Lambda-CDM or dark matter halo that surrounds all galaxies. In other words, had Schrödinger and others not been so intent on using these additional terms to gravity theory as excuses for introducing electromagnetism and unifying the field, he would have noticed in 1950 that there was a secondary effect of normal gravity and he could have predicted the later discovery of Dark Matter. Yet that is not even the end of this story.

Einstein used his non-symmetric model to calculate the effect of the non-symmetric portion of the tensor on charged material particles a few years later. [61] He found that the effect was the same whether particles were charged or not and that the effect of the non-symmetry was miniscule or negligible, far too small to be

electromagnetic in nature, so he concluded that his non-symmetric model had failed. Yet, if the effect depended on mass alone instead of mass and charge and was negligibly small relative to the much stronger known electromagnetic forces, then the non-symmetric effect could only have been due to a secondary gravitational effect such as Dark Energy, rather than electromagnetism. Obviously, if Einstein had not been so intent on the non-symmetric component that he added to the tensor could only represent electromagnetic forces, then he would have discovered or predicted the existence of Dark Energy nearly five decades before its effects were first observed. Neither of these scientists, let alone any other scientist either before or since then, had ever equated the point-based geometry problem to explain the fundamental problem of geometric space (point/extension) and therefore had never even considered using their mathematical discoveries to modify gravity rather than add electromagnetism to the relativistic model.

Unfortunately, today the origin and meaning of the Lambda CDM term has so far only been the source of speculation by modern scientists (giving it names such as the 'quintessence') when it should have been predicted from theory more than six decades ago. Now the source of the Lambda-CDM, as well as all forms of Dark Matter (both hot and cold) and Dark Energy in the universe can be equated to the extra terms in both the Newtonian and Einsteinian models of gravity which is no more than a product of the point-based geometry which Riemann originally called point-elements and equated to the infinitesimal structure of space as quanta as early as 1854. [62]

Furthermore, the whole model can be stated more clearly by noting that the new Einstein equation in four-dimensional space-time can be written as

$$\mathbf{T_{ik}} = \mathbf{G_{ik}} + \hat{\mathbf{\Gamma}}_{ik}.$$ (15)

The second or non-symmetric term accounts for Dark Matter and Dark Energy such that

$$\mathbf{T_{ik}} = \mathbf{G_{ik}} + \Lambda_{CDM}.$$

The $\Lambda_{\mathbf{CDM}}$ term is derived from the anti-symmetric tensor that represents the gravity portion of the single field in the full (extrinsic) five-dimensional space-time continuum. The complete single field equation in five-dimensional space-time would have two components,

$$\mathbf{T} = \mathbf{E} + \hat{\mathbf{G}}.$$ (16)

The symmetric tensor **E** represents that part of the single field which reduces to electromagnetism before the split into electricity (symmetric) and magnetism (non-symmetric) and the anti-symmetric tensor **G** represents that part of the single field that reduces to gravito-gravnetism before the split into gravity (extension or metric) and gravnetism (point or non-symmetric). All of these tensors would derive from a single tensor placed at the single pole of the five-dimensional Riemannian sphere in a six-dimensional bulk (an undefined embedding manifold) designated by the constants that define the physical characteristics of our space-time, $\mathbf{S^{\hbar}_{\mu\epsilon}}$. This tensor within the still higher embedding space is implied by the changing single field density in five-dimensional space-time.

After the reduction split from five-dimensional single field to four-dimensional space-time, Riemannian curvature can be interpreted as intrinsic for practical purposes as Einstein did in his formulation of general relativity. The symmetric component represents the geometry of the metric curvature and reduces to $\mathbf{G_{ik}}$ in normal four-dimensional space-time, while the non-symmetric portion represents the new point contribution to the more generalized geometry of space-time that can be interpreted as the source for $\Lambda_{\mathbf{CDM}}$ and both Hot and Cold Dark Matter as well as the Dark Energy associated with each point in our commonly experienced three-dimensional space.

6. Conclusion

In some respects the single field and five-dimensional space-time are mathematically and perhaps even physically indistinguishable, which begs the question whether or not they are inseparable. They are distinguishable as individual and unique things since a primary difference between the two does in fact exist and it can be identified, but for all intents and purposes they are inseparable. This difference rests in the simple fact that the single field varies in density from one position to another in the fourth direction of space, but the density clumps (particles) and curvature variations (the 'sheet' that is our experienced three-dimensional space that varies or ripples through time as matter moves) are apportioned (by Planck's constant h) and relative (by the speed of light c) to both the quantization and geometry of our normally experienced four-dimensional space in the overall five-dimensional space-time continuum.

Normal space-time is essentially the collection of dimensionless points from which it is constructed and does not vary in density from point-to-point in three-dimensional space (since curvature is extrinsic). The single field density does vary independent of time, but only along the fourth direction of space. Normal four-dimensional space-time (in the 3+1 configuration that we normally sense) must in reality be extrinsically curved although the curvature has previously been interpreted as a point-by-point density variation (by Einstein and others) intrinsic to three-dimensional space. The material extensions in normal space-time that we call elementary particles are thus arbitrary (in the sense that the original creation of elementary particles occurred at random positions throughout the full extension of three-dimensional space) and limited and thus equal in size, mass, electrical charge and other physical characteristics because they are regulated (must follow the rules established) by the quantized geometry of five-dimensional space-time.

Extended material particles and bodies are limited and given both meaning and relevance by the single field which occupies the whole extent of space-time as characterized by the quantum (ℏ), electric permittivity (ϵ_o) and magnetic permeability (μ_o). In other words, elementary particles are governed in their most basic interactions as well as their original evolution (creation) by the two physical constants – Planck's constant (h) and the speed of light (c = $(\mu_o\epsilon_o)^{-1/2}$). Planck's constant is an intrinsic property of space-time while the speed of light is a geometric property of the single field that occupies space alone since the permittivity and permeability are properties of the single field that fills space-time. They combine together to yield our physical and

material reality. The permittivity ε_o is the binding constant between points along the three-dimensional extension of the single field occupying normal space, the permeability μ_o is the point by point binding constant of normal three-dimensional extension of the single field along the fourth direction of space and Planck's constant is the binding constant of all points in all four dimensions of space to time.

Perhaps a better way to understand this structure of space-time and the single field would be to consider it from the higher-dimensional point of view of the fundamental tensor **S**. Take a single infinitesimal point in a void or geometrically and dimensionally undefined bulk. From that point extend a line point by point in a single direction giving the void a single dimension of space. As the line is extended to the second and each successive point along the line, other points branch off to form the parallel three-dimensional spaces but the branches can be no larger, point by point, then the point they branch from. The change that created the first point past the initial starting point along the line and each successive change initialize the flow of time. The very act of extension itself creates potential, not energy, because the very act of extension does no work against anything while pushing into the void. This potential characterizes the single field which in turn necessitates a dimensionalized space to determine and differentiate points at various positions position within it.
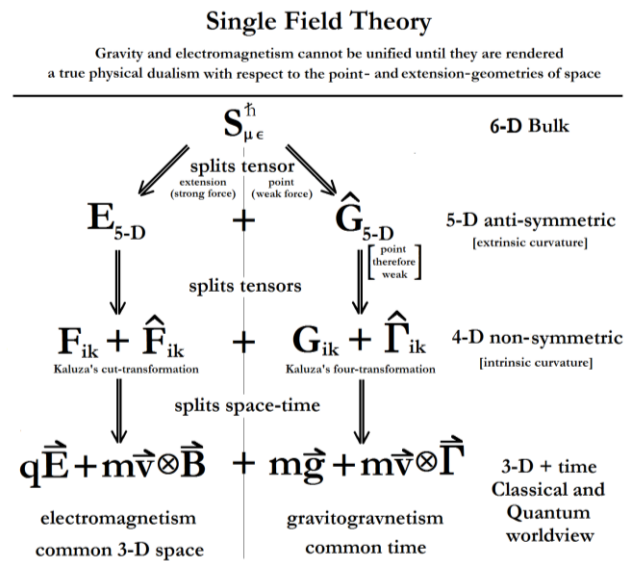
Since time and space are bound together by Planck's constant, it rules over a very important part of their existence. The points along that line are also bound together by another constant, permeability, which is a single field constant. As each new point is added to the extending line, the potential spreads outward into three alternate dimensions perpendicular to the line, forming a three-dimensional space or 'slice' perpendicular through each point on the line. The points in the parallel three-dimensional spaces are bound to each other by the permittivity constant and the points in each successively generated parallel three-dimensional space of slice curves around until the end-points meet which closes three-dimensional space to create a Riemannian spherical space. Each point in the parallel three-dimensional spaces is are also connected to corresponding points in each other four-dimensionally by the permeability constant.

Since all of the points along the line, now designated as the fourth dimension of space, are connected to time by Planck's constant, all of the points in the various parallel three-dimensional slices are likewise connected to time by Planck's constant. This structure constitutes the five-dimensional space-time continuum that we experience. However, there is still more to this picture. The original undefined void from which this five-dimensional space-time was generated must be at least six dimensional as implied by the fact that the single field potential density varies along the fourth direction of space. The adoption of a sixth dimension to explain physical processes and phenomena in a five-dimensional space was first used by Kasner in 1921 [63] before Kaluza ever published anything about his five-dimensional space-time model.

The single field of potential coincides point by point with this spatial structure. Single field potential is sort of the meat on the bones. It shares the constants with the space and time manifolds that it occupies, with one major difference: Whereas space

must be constant and continuous, the density of the field increases as the line in the fourth dimension moves away from the starting point which means that each parallel three-dimensional 'sheet' or 'slice' is infinitesimally denser than the previous 'sheet' or 'slice' as the distance from the original point in the bulk where the primary tensor (the single pole point) is located increases. This forms the basic structure (form) of the single field, but since it is a field of potential it is also characterized by function.

The function can be distinguished or characterized by tensors. A single tensor **S** with three variables – Planck's constant, permeability and permittivity – marks the original point, but that tensor splits into two tensors - **E** and **G** - representing the extension and point characteristics of the single field. The symmetric tensor **E** is none other than the electromagnetic tensor in the fourth dimension of space and is the stronger of the two since it represents extensions in the fourth direction of space. The tensor **G** is anti-symmetric and represents points along the fourth direction of space. Therefore gravitation is a very weak force in three-dimensional space compared to electromagnetism.

Single Field Theory

Gravity and electromagnetism cannot be unified until they are rendered
a true physical dualism with respect to the point- and extension-geometries of space

$$\mathbf{S}^{\hbar}_{\mu\,\epsilon} \qquad \text{6-D Bulk}$$

splits tensor
extension (strong force) · point (weak force)

$$\mathbf{E}_{5\text{-D}} \quad + \quad \hat{\mathbf{G}}_{5\text{-D}} \qquad \begin{array}{l}\text{5-D anti-symmetric} \\ \text{[extrinsic curvature]}\end{array}$$

[point therefore weak]

splits tensors

$$\mathbf{F}_{ik} + \hat{\mathbf{F}}_{ik} \quad + \quad \mathbf{G}_{ik} + \hat{\mathbf{\Gamma}}_{ik} \qquad \begin{array}{l}\text{4-D non-symmetric} \\ \text{[intrinsic curvature]}\end{array}$$

Kaluza's cut-transformation · Kaluza's four-transformation

splits space-time

$$q\vec{E} + m\vec{v}\otimes\vec{B} \quad + \quad m\vec{g} + m\vec{v}\otimes\vec{\Gamma} \qquad \begin{array}{l}\text{3-D + time} \\ \text{Classical and} \\ \text{Quantum} \\ \text{worldview}\end{array}$$

electromagnetism · gravitogravnetism
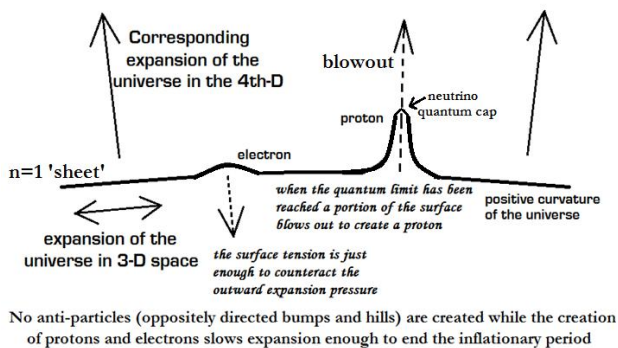
common 3-D space · common time

As we move down another level to four-dimensional space-time the two tensors again split into symmetric and non-symmetric components.

The five-dimensional electromagnetic tensor **E** splits into the four-dimensional symmetric tensor $\mathbf{F}_{ik}$ representing the force of electricity and the non-symmetric tensor $\hat{\mathbf{F}}_{ik}$ representing the force of magnetism. The five-dimensional anti-symmetric tensor $\hat{\mathbf{G}}$ also splits when reduced to a four-dimensional space-time tensor with two components. The symmetric or metric component represents normal (local) gravity as explained by general relativity while the non-symmetric component manifests as the secondary (non-local) gravitational which are misleadingly called Dark Matter and Dark Energy. Since the density of the single field along the fourth direction of space varies, the point-equivalent three-dimensional parallel 'sheets' or 'slices' group together to form a single quantum 'sheet' with an 'effective width' determined by the three binding constants of space-time. Only then does field structure allow (require) the formation of material particles as quantized and thus discrete portions of curved space-time continuum within the lowest energy potential

or primary 'sheet' that corresponds to n = 1 quantum state. And thus we have our commonly experienced physical universe.

From a more practical and timely point of view, this structure of the single field and space-time agrees completely with the Big Bang model of the universe. The Big Bang model is just a reverse sequence of the above explanation. Beginning from an initial infinitesimal point of seemingly unending (infinite) potential, the single field begins to expand into the undefined void surrounding it and thus creates space and time. The expansion occurs as a three-dimensional (surface) bubble of extremely dense single field expanding three-dimensionally as well as into the fourth dimension of space. When the single field density along the fourth direction of expansion reaches a specific quantum limit, quantum fluctuations (quantum stress points) in the single field cause points in the bubble to blow outward (and thus no anti-protons facing inward are created) creating protons when the blown-out portions of space cap themselves off according to the same quantum limits.

No anti-particles (oppositely directed bumps and hills) are created while the creation of protons and electrons slows expansion enough to end the inflationary period

The quantum caps are actually the first neutrinos. Neutrinos thus represent the least or minimum possible measure of discrete curvature of the 'sheet' while protons represent the greatest or maximum amount of curvature that allowed the blowout to occur.

After the initial blowout creating protons, inflation was still rapid enough to threaten a second blowout, but the three-dimensional surface tension across the 'sheet' at the new blowout points was enough to counteract the new blowouts and create smaller stable curves (bumps) in the 'sheet'. These stable quantized structures have an opposite electrical charge to protons. The expansion pressure on the quantum caps of protons is outward, but the counteracting pressure exerted by the quantum caps due to surface tension on these newly created electrons is inward. Electrons, therefore, represent the greatest or maximum amount of discrete measurable curvature that can occur without any blowout actually taking place. If any excess inflation still remains, it is only strong enough to cause minor quantized puckers (burble) in the 'sheet' that can be called free neutrinos.

The initial blowout simultaneously created the system of quantized 'sheets' (n = 1, 2 …) in the fourth direction of space, so the 'effective width' of the 'sheets' in the fourth direction of space is proportional to the three-dimensional size (width) of the protons. Since the expansion rate was still too great after the initial blowout and a second blowout occurred, the newly created 'sheets' were able to produce the 'surface tension' that capped the second blowout creating electrons. Since the 'sheet' pushed back against the outward direction of the blowout to create electrons, electrons have an electrical charge not only opposite but

equal to that of protons. Since the events that created the first protons, electrons and the first free neutrinos were due to blowouts or potential blowouts due to expansion outward, no anti-particle were created at the end of the inflationary period as quantum theory presently predicts.

Anti-particles would have oppositely directed curves (inward relative to the overall positive curvature of the Riemannian space-time sphere) and thus gravitational masses equal to particles with opposite spins since their curvatures would look like mirror images (downward) of real particles. Only after the inflationary period, could quantum fluctuations and other events within the 'sheets' create particles and anti-particles in equal numbers which could completely annihilate one another (like the superposition of oppositely directed waves traveling in opposite directions along a string) except for their combined energy which would appear in the form of gamma rays. After the final event created free neutrinos, the expansion rate significantly decreased and the universe settled down to allow the eventual emergence of stars, galaxies and other cosmic structures.

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Essay on the nature of mind

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1. *Premises*

There is a multitude of names encompassing the concept of mind: soul, spirit, thought, and etc., each one of them with connotations that a simple term may veil, at least for a time, by tacit inclusion within the concept of mind. An additional qualitative distinction is needed; i.e., the mind of man and the mind of god. To argue about the mind of god might be a productive exercise, but only to point out some of the contradictory features the human mind insists in assigning to it. In contrast, we do have first hand information on features of the human mind that allow more direct considerations.

Let's start with an evident, but at times neglected distinction between conscious and non conscious mind. Clearly, non conscious mind extends over vital domains much wider and deeper than those of conscious mind, and actually allows conscious mind to exist and operate (see section 4). The boundaries of non conscious mind is synonymous with the very spring of life.

People have argued about the features of mind for centuries. Philosophers were the first to undertake the endeavor, then, came the science experts. Among a wealth of virtues, flaws and trivial considerations, most claims of this virtual and protracted roundtable have been concerned with thought processes and states of mind analyzed from the perspective of the onlooker, or the acting subject. I am hardly aware of specific proposals on the nature of mind, except for some with a patently reductionist connotation, excluding the views of theologians and philosophers claiming that the nature of mind/spirit is unknowable because mind is an entity ontogenetically distinct from the physical world. To adopt this particular point of view would quickly lead to a dead end.

I deem it a more urgent task to note that any speculation on the nature of mind should be based on a potentially comprehensive list of its features/capacities that we may at least be able to attribute to it. What should be avoided are proposals only concerning a specific feature of mind, inasmuch as this temptation is often encountered when treating systems or processes of great complexity that may be conceived with the utmost difficulty in their entirety. When considering the concept of mind, it may not be possible to attain an exhaustive view because our quest is an introspective query into one's own mind. Nonetheless, we cannot exclude *a priori* the benefit of undertaking such an exercise even if the observer and the observed share similar dimension and the same nature. Hence, it is worth proceeding.

2. *Features/capacities of mind*

Let me formulate a first list of features/capacities of our mind, even if approximate and incomplete, by paying little attention to a proper order of priority.

a) We are sure that our mind is an integral part of our body, specifically identified with brain. These physical correlates are well defined biological objects, phylogenetically determined and endowed with a highly complex structural organization. As a result, while the association of mind and body may not necessarily exclude the existence of

disembodied minds, the notion raises the issue of the ontogenetic and philogenetic origin of the human mind. It is not just a question of journeying backwards in time to the very beginning of the evolutionary history of living organisms (a convenient, albeit an arbitrary point of departure), but of proceeding even further back, to reach the condensed and adimensional locus assumed to exist just before the 'big bang.'

b) We are equally certain that our mind is capable of representing the structure of the outside world with its many qualities, interrelations and complexities that pertain to our immediate environment, but may include remote domains of space and time (from infinitesimally small regions to astronomic dimensions). These perceptions arise from specialized sensory receptors, selectively sensitive to mechanical, chemical, thermal and electromagnetic forms of energy, originating in the external world, and also within our body. The inputs to the central nervous system from these receptors combine to generate the numberless qualities of mental states (qualia) that we can communicate to other human minds, albeit in an unrefined way. Representations give birth to concepts and logical connections, and lead to the emergence of rational thought. In so doing, they leave modifiable traces (memories) that contribute to the quality of our mental states, including dreams and nightmares. A curious enigma is how the transduction of various forms of energy, encoded into comparable patterns of neural impulses and chemical transmitter signaling, succeed in generating mental images of extraordinary diversity.

As all representations are valued, but ranked differently by the subject in terms of their potential impact on his/her wellbeing, mental states may assume emotional tonalities - at times weak and vague – at times intense and/or pressing, such as pains, sorrows and pleasures, sentiments and emotions. Efforts to control the social consequences of feelings and behaviors eventually generate an evolving capacity for moral judgments and ethical duties.

c) Our conscious mind is capable of well pondered choices that translate into taking command of bodily movements by means of that special type of potential energy that we call will. In comparison with these extraordinary but relatively superficial capacities, there are also the largely unfathomable faculties of our non conscious mind. They allow integration and coordination of external and internal bodily movements and activities that have evolved through phylogenesis and ontogenetic development and over the life cycle, upon which mental activity plays out, and experience having thoughts.

We cannot overlook the fact that our mind is also creative. All knowledge and cultures of man derive from it: not only the colorful languages of human communication, but poems and literature, music and theatre, expression of dance, graphic arts and sculpture, architectural masterpieces, mathematical and logical constructs, theological formulations, and scientific endeavors.

d) Last but not least, our mind is responsible for so called paranormal phenomena, including telepathy, precognition, telekinesis, white and black magic, mystical states and transcendental meditation. They imply a capacity to overcome temporal boundaries between present and future, to abolish spatial distances and operate on apparently distant objects. It is not a mystery that the very existence of these phenomena is given little or no credence by official science. However, we should remember Shakespeare's admonition that "*there are more things in heaven and earth that can be dreamt of by thy philosophy*". Even official science cannot claim to be the only judge of truth and reality.

If miracles and interventions of divine providence are included among these phenomena, their existence is accepted dogma by the Catholic church. But, where should the boundary with other paranormal events be placed? The existence of paranormal phenomena at large is supported by a multitude of human experiences common to many if not all cultures, accumulated over long distant epochs under a variety of climates. Doubtlessly, some of these experiences have been appreciated events by many of us; therefore, official science should pay heed to them.

e) Finally, our mind is capable to a large extent to address, contemplate, or generate the most diverse human activity, from the noblest of thoughts to the most reprehensible behavior, exhibiting emotions and behavior that range from deeply ingrained egoism and cruel hate to acts of love, devotion, and generous altruism; from a determination to pursue evil to an unquenchable longing for good; from violence towards other human beings to self-inflicted violence.

Of all features meriting further comments I deem those concerning the interactions between mind and the physical world, and those regarding the evolutionary history of mind most worthy.

3. *Mind and physical world*

Interactions between mind and physical world are bidirectional. Although the external world, in effect, is a mental construct comprising a perceptual reconstruction of selective attributes, mind is influenced by the physical world and by the physical environment of brain. Conversely, mind is capable of modifying brain and the external world. According to present understanding, our mind exerts executive function on body parts by triggering and coordinating voluntary and involuntary movements, activities and behaviors, at times of great importance, or extreme subtlety. Ostensibly, mind may also act on remotely placed physical objects involving telekinesis (F. Bottazzi*, 1909).

4. *Evolutionary history of mind*

With regard to the evolutionary history of human mind, inquiries regarding the mental faculties of animal species close to our own on the phylogenetic scale have so far yielded vigorous theoretical controversies. Yet, to determine the minimum requirements of biological complexity or, in more concrete terms, of physical structures still compatible with mental processes, it is more expedient to adopt one of the basic features of mind, rather than any of the complex capacities of human mind. Among them, I consider most appropriate the capacity to sense a stimulus, since it implies the distinction between the sensing entity and the impinging stimulus (in human terms, between self and non self in the context of the external world).

If this criterion is accepted, it follows that basic mental events do exist not only in highly evolved animal species, but also in primitive organisms (down to unicellular life forms). Furthermore, one may run the risk of crossing the biological divide, and crossover into the realm of chemical and elementary particles, as they do interact with

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*At that time Bottazzi was Professor of Physiology and Director of the Institute of Experimental Physiology of the Royal University of Naples. The experiments described in the book were performed in his institute, and witnessed by several people, many of whom were full professors).

material/energetic entities in their environment. Of course, at these basic levels, the concept of a sensing entity, acceptable in the biological world, must merge with the concept of an entity modified by interaction with an impinging stimulus, in analogy with what takes place with sensing entities (e.g., sensory receptors) in higher organisms of the biological world.

If this extreme view of the mental event is rejected because of its contrast with the common way of thinking, and as such, it is unacceptable, I would appreciate being informed of what logical tools we might use to identify a definite dividing line between physical structures endowed, or devoid of mental events. To be sure, from the chemical level downwards, a sensing entity and an impinging stimulus become interchangeable. Such a dual role is widespread in the biological world, where it may display highly complex features, as exemplified by the reciprocal interactions we experience with our fellow man. In such instances, each one of us is at the same time a sensing entity and a stimulus.

5. *Properties of systems*

From what we know of the structure of the universe and living organisms, a general principle appears to underlie the emergence of complex systems out of the integration of elementary units, and, eventually, from the integration of complex systems into even more complex entities. One moves from strings to atoms, from molecules to cells, from organisms to ecological systems. At each level of complexity, the properties of the constituent units are partially modulated by their inclusion in a more complex system, whose collective features are not present in the units. As an illustrative analogy, let's take the aromatic carbon compounds, in which π electrons arise from single carbon atoms but are distributed over the entire aromatic ring. At least in this example, the integration of parts in a whole requires that a fraction of individual energies be shared in support of the whole and its novel properties.

Could a comparable sharing of individual energies be occurring at all levels of organization, from the simplest to the most complex? It seems obvious that the very existence of any entity made up of parts implies the coexistence of an energetic structure that prevents the dissolution of the system by keeping the parts together. At the same time, any system that is not a monad is potentially able to associate with other systems of similar or different levels of complexity, by virtue of energetic interactions. One may then entertain the hypothesis that in a system of systems, energetic exchanges of great complexity take place among units of comparable levels of complexity, as well as among those of a given level and the more complex units that include them or the less complex units that support them. By reference to our own level, we may use the term "soul" to denote the energetic structure responsible for the dynamic cohesion of any system. From this point of view, π electrons should be considered the "soul" of aromatic carbon compounds.

But let us ask whether energetic links do exist between contiguous levels of integration. The entire field of chemistry provides a positive answer. Chemical bonds that hold molecules together arise from the energetic structure of atoms, just as the bonds that hold atoms together arise from the energetic fields of its components. Likewise, progressively more subtle, diverse and evanescent bonds assure the existence of more complex systems such as cells, organisms, and ecological systems. At each level, such

bonds arise from the components of these systems. In brief, the very concept of integration implies that the dynamic cohesion of any system is based on the energies flowing among its components and within the whole.

This concept may be generalized by stating that, at any level of complexity, each integrated entity owes its existence to the energetic structure created by its constituent units. Such a principle remains valid in the relatively simple construct between two contiguous levels of integration (such as molecules and atoms) as well as in the more complex systems encompassing more than two levels of integration. Accordingly, even the topmost level may be assumed to share part of the energy arising from the lowest level, unless there are reasons to suspect the presence of unlikely discontinuities in the whole energetic framework. Hence, our human self may share some of the energy arising from less complex levels of our being, down to elementary particles and mass-free energy, and may be contributing to the energy fields of the systems we belong to (family, corporation, society, etc.).

It is worth recalling that energy fields may be limited to infinitesimal spaces, or may extend throughout sidereal distances. In addition, thanks to our improved understanding, elementary particles have become smaller and smaller, to assume lately the configuration of strings. Hence, we may agree with Bertrand Russell that "*matter is a convenient concept to describe what is occurring where there is no real matter*", and with Albert Einstein that "*we may thus consider matter as insisting in space regions where field is strikingly intense ... In this novel type of physics, field and matter cannot coexist, as field is the only reality*".

6. *Conclusion*

How then, do I conceive the nature of mind? Simply, by identifying it with energy fields. This implies a consideration of their primitive assets but special attention to the energetic structures progressively appearing on earth since the beginning of time as a result of the evolution of dynamic systems, and systems of systems. By the progressive moulding of elementary particles into molecules, primitive cells and multicellular organisms, all the way up to the astonishing structure of brain, it is conceivable that energy fields comprising the qualities and capacities of human mind may have evolved from an energy field primordium.

This way of thinking implies a unitary view of the universe in which mind and matter are two sides of the same coin. It follows that mind is believed to be all pervasive in the universe (panpsychism), despite the fact that it identifies with features of the universe that are less easy to perceive, since our senses are stimulated by the outer appearance of things that are not readily conceived as mental entities. Yet, upon further analysis, material entities tend to merge into energy fields. According to Einstein "... *In this novel type of physics, field and matter cannot coexist, as field is the only reality*".

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These are my thoughts on the nature of mind. I regard them as plausible as the ephemeral figures drawn by bird's flocks that fly over our cities. Those changing and living clouds undergo never-ending fragmentation and restructuring, according to a collective logic I do not understand, but I take as a metaphor of freedom. Our thoughts on

the nature of mind should be just as free, to avoid sticking to scientific or theological dogmas, and at the same time to make good use of the precious humility derived from the freedom of being wrong in a quest to reach the truth.

The nature of mind that we seek is a beloved child of spirit. As everyone knows, spirit blows where it likes, like the wind. Hence, how could we hope to succeed in understanding the nature of mind with rigid formulations and subtle distinctions, or by cherishing preconceived ideas, in which we may remain entrapped as birds in a net?

Perhaps, the best way to get close to the nature of mind, the same mind that is now holding these thoughts and a moment ago was suggesting different images, might be to try and describe its multifarious appearances in a poem. Accordingly, the elegant turning of flocks of birds free to fly in the sky, majestically joined in large multitudes and happily indifferent to their sudden mutual departures, could be the best metaphor of mental processes.

They plough the sky in charming multitudes
free to tail each other and fly together
free to suddenly break the moving flock
and build up smaller merry companies.
Their bands plunge down in the air
and later arise to renew further bands.

They are the town birds.
They happily turn around
bounded by invisible threads
but for a brief moment.
Other threads they spin
and other cards of novel figures.

Our private thoughts also turn and elapse
in the valleys of mind
unbelievably thin and deep as sky.
They never long for rest.

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An Introduction to Siberian Shamanic Animism

西伯利亞薩滿的泛靈論（萬物有靈的論說）

By Jacqueline Lee

(To translate to any other language, you can use Google Translate.)

在過去的幾十年裡，泛靈論（萬物有靈的論說）似乎不被大多數的宗教學學者關注。然而，萬物有靈這個概念，仍然對歷史遺留下來的世界觀和西伯利亞北部民族的薩滿相當重要。本文將會談及不同類型的靈魂(Soul)的概念和西伯利亞薩滿泛靈論之間的關係。

要了解不同的靈性助手及其代表性之前，我們必須先要明白西伯利亞北部薩滿的象徵。宏觀整個西伯利亞薩滿系統，我們見到他們的工作包括參與大量祖先和山區的崇拜和動物獻祭儀式。由此可見，西伯利亞的泛靈論的精髓顯然是把人類和大自然平衡起來。

泛靈論（萬物有靈論）一詞是由19世紀的英國人類學家 [1] EdwardTylor爵士創造的，在他1871年的作品"原始文化"（Primitive Culture）中，Edward Tylor為靈魂 (Soul和Spirit)做不同的定義。他宣稱只有人類有靈魂（Soul），而自然靈(Spirit)是一個抽象的概念，可能與範圍廣泛的自然現象有關。這位英國學者認為泛靈論必須從夢中經歷，人們通常會感到他們自己的身體是獨立存在的另一個個體。即是說，人們會感到靈魂會飛出體外去經歷另外一些"旅程"。憑藉這些"夢幻之旅"，人們就能看到死去的親人，朋友，或其他存在。

Edward Tylor爵士的概念發表後，得到很多學說所採用(尤其是俄羅斯的宗教歷史學院)。薩滿傳統中的一個重要理念是靈魂的旅行，有俄羅斯研究人員認為泛靈論是一個宗教，而薩滿是偶像崇拜的始祖。學者S. A. Tokarev，寫了一個以馬克思主義為主導而且非常全面的文獻，他卻認為西伯利亞薩滿只是把泛靈論實體化和優化，[2] 因為族群都以狩獵方式生活，因此他們與被獵殺的動物的靈魂有著密切的關係：薩滿的任務就是要維持這些密切的關係。歐亞大陸北部的學者Ivar Paulson從事薩滿現象研究多年，在他的著作"Seelenvorstellungen"寫道[3]，"薩滿是一種萬物有靈論的意識形態，它的特徵之一是使用離體遠視的技術"。歐亞薩滿的另一個顯著特點是二元靈魂的心靈概念。當地的學者有"自由的靈魂"的概念，祭司可以離開自己身體，把"自由的靈魂"發送去靈界，換句話說，這是薩滿所實行的靈魂飛行。

西伯利亞北部民族以打魚及狩獵維生，他們每日和大自然的互動成就了一套獨特的世界觀，因此泛靈論的概念是不單只人類有靈魂，他們認為萬物皆有靈。在這種形式下的思維，環境是最重要的，換句話說：這些神話式的世界觀有助我們理解薩滿的靈性助手的概念。

以下是一些提及到"自然靈" (spirit) 的西伯利亞民間傳說供大家參考[3]：

Shors相信山靈 (tag-azi)和水靈(shug-azi)的存在，每個氏族都有自己的氏族山和山靈，作用是保護氏族的成員。每三年舉行一次祭祀儀式。為了表達對自然靈的敬意，每位Shors會向高山或河流的靈扔祭品。他們相信水域的自然靈是一位長臂的裸體女子的Kumandines。Tuvans人亦曾經相信有水的靈。他們把石頭和乾枯的樹枝拋向她，例如在河的上游和附近的渡口。他們會搭建小屋，屋內放置祭品：石頭，破布，馬鬃等"。"據南方阿爾泰語系民族的信仰，每一座山，每一個湖泊或河流都有自己的自然靈，該自然靈擁有地方，牠們會聽從動物和鳥類命令。它可以保護住在那裡或越過這些地方的人。自然靈被認為是能夠理解人類的語言，以及與之相關的神話，跟人類一樣，牠們也有孩子，人們可以通過祈禱，懇求和犧牲來得到牠們的庇佑"。

雅庫特神話是這樣的："據雅庫特信仰，Icci 是一種非常獨特的存在，牠出現在某些特定的物品上和自然現象中，當地人視牠們為神秘的內力量。如果信徒遵守一定的規則，他們可以幫助人類，人們可以把它們看作是保護神，Icci的崇拜不會涉及殺生。

"當Yakut獵人準備打獵之前，他們會向森林靈祈求：首先，獵人會倒一些油在火上。然後他彎下膝蓋，把他的手放在他的心臟，對火鞠躬，然後說alghis（請求祝福的禱告）。"儀式開始之前，他們有時會掛一個祭品（salama）：獵人會把一條約手臂高度的繩子在兩棵樹之間，其長度是"七個小物"。"其中包括兔子的皮毛，和白馬的馬毛和啄木鳥的羽毛。目的都是為祭祀森林靈Bayanay。他們祈求黑暗森林的靈保佑。古時，祭司會為獵人進行儀式：。薩滿會節食；他把黃油與犧牲品的混合物獻給森林靈，高呼"Uruy！"，最後對獵人撒了些Q'umis（祝福物）"。

"Tuvans人著名於薩滿樹（arzhan）崇拜，假如他們發現泉水周圍的樹木生長形狀比較怪異，例如生長出雙幹，或葉子從不規則的樹枝上生長，他們都相信那些是薩滿樹。直至今時今日，途人看到這些樹時都會停下，把自己的硬幣，梳子或者個人小物件留下或者把衣服的一小部分繫在樹上。他們相信這些樹有特殊力量，可以保祐旅客平安。這些小信念無疑是對大自然的尊重和信任，亦喻為對自然靈的敬畏。"

"住在北西伯利亞北部的Nenets人至今都相信，萬物有靈的信仰今天仍然活著。傳統和禁忌是他們靈性生活的正面和負面。他們至今都奉行火的崇拜，每當晚飯前，長輩都會把小量的食物，湯或酒潑向火以示尊敬。因此，飼養火的自定義揭示了對火靈良好的心態的特點。這種風俗已存活到現在的時間。坐下來吃飯的時候，一位資深的人，如果不是所有的

人都出席了晚宴，是一定要扔了一塊食品的，倒些湯，茶或酒精火。 與火崇拜相關的禁忌主要目的就是不要傷害或污染火的純淨溫暖和生命財產，族人都不能倒大量的水入火中，拋入出任何不潔的東西，或者向火吐口沫。用尖銳的金屬物在火內挑起任何東西都曾經是被禁止的，因為這樣做的話，火的女主人可能會受傷。連婦女和女童跳過火堆都是被禁止的，因為女性被族人認為是不潔的，她們可能污染火"。

順帶一提，地球母親的靈被北美印第安人和西伯利亞人認為是非常重要的，因此會特別尊重。另外一點，西伯利亞人相信在儀式以外的祈禱是無用的，因為在儀式範圍之外，祈禱就會失去意義。他們的禱文不是劃一的，除了某些短語，禱文主要是即興的，他們相信除了開聲說祈禱文，也包括祈禱時的態度和行為。

西伯利亞人相信，自然靈是無形和具惡意的存在，牠們甚至可以殺人。一般來說是女性，住在地下腐朽的樹幹內，有時候呈現人類的外觀，並且擁有翅膀。

正如我們所看到的，西伯利亞薩滿的神話中，有關自然靈的內容都是十分豐富的，這為靈性指導的概念奠定了基礎。

一般來說，西伯利亞薩滿的靈性指導有兩種基本類型[5]：首先有些靈基本上受薩滿的控制，這些就被收為他們的知交。但也有更多其他的會成為薩滿的指導或助手，這些靈一般都只會在有需要時才出現。這些可能是次要的靈，或死去的薩滿祭司的靈魂：這些靈都會在獨特的領域保持一定的獨立性，某程度上，牠們不受薩滿的控制。除此之外，西伯利亞薩滿一般都有動物靈如熊，狼，狗，野兔，或者鵝，鷹和貓頭鷹等等。

有趣的是，假如薩滿想召喚逝世的巫師或薩滿祖先下凡，他們必須在儀式之前到他們的故居進行召喚。

大致上，薩滿源於4個類別：第一種源於土神和水神。這些信念毫無疑問與本土突厥民族的萬物有靈的信仰有關，因為萬物有靈神話中的人物之一，是掌管水和土的神Yer-Shub。第二種源於天空，牠們的名字是tengri boo（天空的巫師）。牠們與彩虹有聯係：牠賦予力量，或者給薩滿標示來履行薩滿儀式。薩滿祭司會唱頌各種自然現象的歌曲 - 風暴，雷和電; 族人甚至相信當一個人被雷電擊中的話，他便是一位力量強大的巫師。根據他們的泛靈論，我們可以假設這些就是協助Tuvian巫師天氣方面的靈性助手。

如果薩滿源於邪靈的話，他們就叫ALBIS（albistan hamnaan hamnar）。這些邪惡的靈，可以以男人或女人的模樣出現，牠們可以搶走準薩滿的人之靈魂，亦可以令他們得到重病（如癲癇或失去理智）。如果準薩滿們得到治愈，這樣的薩滿將被稱為"無性巫師"（uk chok hamnar）。這些類別當中亦有一些力量非常強大的巫師存在。最後一種巫師有收服邪靈的能力，這些巫師源於貌似邪魔般的靈Aza。這種薩滿總是喜歡邀請他/她的靈性助手幫忙對抗疾病（對付病靈）。看來與病魔戰鬥似乎就是這些巫師的主要功能。

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Mind Force - A Reproducible Effect
by Dale Pond

In science there are two operations often used to determine the validity or veracity of an alleged phenomenon. These two operations, performed reliably, can establish the existence and acceptance of a new fact, principle or law. When Stanley Pons and Martin Fleischmann reported the production of excess heat that could only be explained by a nuclear process ("cold fusion ") they encountered charges of fraud and worse because their experiment was not readily repeatable or reproducible by others. This sorry state of affairs was true for a period of time but changed when others from around the world began to successfully repeat and reproduce their original findings. Everything changed in that field when repeatability and reproducibility were achieved not by one other but by many other researchers.

REPEATABILITY
Repeatability or **test–retest reliability** is the variation in measurements taken by a single person or instrument on the same item, under the same conditions, and in a short period of time.[1]

REPRODUCIBILITY
Reproducibility is the ability of an entire experiment or study to be duplicated, either by the same researcher or by someone else working independently. Reproducing an experiment is called replicating it. Reproducibility is one of the main principles of the scientific method .[2] A particular experimentally obtained value is said to be

reproducible if there is a high degree of agreement between measurements or observations conducted on replicate specimens in different locations by different people—that is, if the experimental value is found to have a high precision.[2]

Dynaspheric Force is repeatable and reproducible
During the past twenty years, five dynaspheres were fabricated. They were constructed by myself in four different geographic locations: Valentine, Nebraska; Billings, Montana; Colorado Springs, Colorado; and La Junta, Colorado. The finished dynaspheres have been shown and demonstrated in dozens of locations within the US from coast to coast. Each of these units has displayed similar subtle energy dynamics to countless witnesses. Granted, no standard quantitative measuring device was used to detect and record these subtle energy dynamics because no such instrument has been invented and available. Yet countless individuals noted, felt and interacted in a similar fashion with all five dynaspheres. These interactions have occurred so many times by countless individuals, unknown to each other, and in dozens of distant locations, that there can be little doubt there is something going on that warrants deeper investigation.

If there had been just one dynasphere constructed that evoked these subtle energy interactions, such would be considered "anomalous" and of little importance. It would be easily dismissed. The fact that these interactions have been noted from five different dynaspheres, produced at different times in different locations and exhibited in diverse locations, shows that the noted effects are no

longer "anomalous" or singular, but are indeed noteworthy and deserving of deeper scrutiny. One is forced to admit: "There is something going on...."

Note carefully that these subtle energy dynamics are not solely of the dynasphere units themselves but are also of the individuals interacting with them. There are 1) the subtle energies associated with or from each dynasphere; and there are 2) the subtle energy "senses" of those perceiving, qualifying and describing them. Here is one such interaction recently
recorded: https://www.youtube.com/watch?v=hMzBJMxCh5g
Another earlier recorded reaction is
here: https://www.youtube.com/watch?v=94LciVBYJe0

These interactions are typical of hundreds of others not recorded by this author, but many were recorded by others on their own equipment.

Bottom Line
These subtle energy effects were **repeated** with each dynasphere and such effects have been **reproduced** five times in each of the five dynaspheres.

Why is this important?
It is a generally held view so-called Free Energy devices tap into various unobservable[3] scalar potential sources as their primary source of power. The Free Energy device then transmutes the unseen scalar potential into some form of seen kinetic energy whether light, electrical, magnetic or mechanical. The subtle energies noted around and in the dynaspheres are a form of this

unobservable scalar potential, higher than electrical or magnetic yet slightly lower than full harmonic scalar potential which is taken to be undetectable by any known means. In the dynasphere instances the mode of detection is the human physiology - a sixth sense if you will.

So why Dynaspheres?

Dynaspheres were originally invented by John W. Keely in the 1880s as prime movers for industry as also (bench) demonstrations of the subtle energy physics he had been work with since the 1870s. He did demonstrate their full operation to countless and reliable witnesses powering various loads such as a sawmill and locomotive.

Fundamentally dynaspheres perform two primary functions in stepping down the scalar to kinetic transformation. These are 1) detect and accumulate a scalar potential and 2) transform that scalar potential into kinetic rotation.

It is obvious the first function is being performed. Is it being performed sufficient to actuate the second function? Perhaps but is not known as we have yet to achieve the second function to any level of satisfaction.

Scalar Potential

It is to be noted there is a quality to scalar potential as has been observed during the past twenty or so years of exposure in a variety of situations. Scalar potential naturally has a high "Q" of harmony or harmonic states of vibration. This "Q" is not always and under all situations of high quality. The quality varies according to

those individuals in its proximity. Let it be known the scalar potential is of its own nature high quality. The quality of individuals close to it have a modulating effect usually reducing its quality but in many cases and in special circumstances actually enhances the quality. These increases and decreases in quality and therefore 'strength of field' are readily sensed by some sensitive individuals.

Obviously to operate a fully functional dynasphere one wants the highest quality and quantity of scalar potential from which power transformations into kinetic modes can be derived.

It has been noted on many occasions a decrease of the quality and quantity of the scalar field occurs when there are negative mental or emotional attitudes evidenced by individuals in its proximity. A cynical, skeptical, scoffing or judgmental demeanor significantly reduces the field.

Increases in the field strength and quantity are readily noted in the presence of an accepting, joyful and playful mental and emotional environment.

Why mental modulation?

These scalar fields are "felt" by those sensitive to them. Sensing and feeling are attributes of consciousness - the mental state. The scalar potential and fields are therefore sympathetic to human emotion and mental states. Scalar potential is a state of Mind or Consciousness.

"*If it walks like a duck and quacks like a duck then it can be safe to assume it is a duck…..*"[4]

Keely made many comments advocating this state of affairs:

"*All motion is thought, and all force is mind force.*"[5]

"*All forces are indestructible, immaterial, and homogenous entities, having their origin and unity in one great intelligent personal will force.*"[6]

Besides all that if Princeton University Engineering Department says Mind Force is real then it is real.[7]

The elusive scalar potential sought by many researchers and inventors is therefore Mind Force. And it is clear Mind Force manifests as attributes of the human mental condition; i.e., emotion and mental sensitives - exactly as are being shown and demonstrated around dynaspheres.

If we see hundreds of people have same and similar interactions to the dynasphere field one tends to lean in that direction. If there were only one or two such interactions we could dismiss it - but not after hundreds of similar events. If all these interactions had been statistically recorded (which they weren't) there would be at the least a statistical validation.

We are at the same place in our science history now today with Mind Force as we were with electricity several hundred years ago. Electricity was a parlor game for a thousand years where people would rub silk and amber and shock each other. When Franklin, Volt, Ampere, Faraday and the others came along, underline each inventing a

<u>meter or gauge to measure some aspect of this thing called electricity</u>, then the parlor game became science and engineering. So what is missing today with Mind Force are meters and gauges to quantify these energies. The dynaspheres, over a 20 year period, have shown there is indeed something there. We simply lack the meters and gauges to make reproducible and objective measurements.

Dale Pond   Pond Science Institute
  http://www.svpwiki.com

[1] https://en.wikipedia.org/wiki/Repeatability
[2] https://en.wikipedia.org/wiki/Reproducibility
[3] Unobservable by standard and accepted means of detection and quantification such as an Ohm or Volt meter.
[4] http://www.svpwiki.com/tiki-index.php?page=Syllogism
[5]   Keely, Keely and His Discoveries, pg 252
[6]   Keely, Keely and His Discoveries pg 73
[7] http://www.svpwiki.com/tiki-index.php?page=P.E.A.R.+Proposition

2016 Society for Scientific Exploration (SSE) and Parapsychological Association (PA) joint Conference, June 20 - 23
Millennium Hotel in Boulder, Colorado

The 35th Annual Conference of the Society for Scientific Exploration and the 59th Annual Convention of the Parapsychological Association (PA) will be held at the newly renovated Millennium Hotel in Boulder, Colorado, from Monday, June 20, 2016, through Thursday June 23, 2016. The conference theme is *Accessing the Exceptional, Experiencing the Extraordinary.*

This is the first joint meeting of the SSE and PA and it promises to be an adventure and quite a learning experience. Although each organization has its own purview and style, the program will be integrated so that we will listen to and have a chance to comment on many talks that will have a different flavor. The meeting will have a single program committee, but co-chairs to facilitate evaluation of submissions from members of the two organizations.

This will be a lively and invigorating meeting. We're looking forward to seeing you there!

CALL FOR PAPERS

Joint PA and SSE Meeting

Accessing the Exceptional, Experiencing the Extraordinary

June, 2016

The **35th Annual Conference of the Society for Scientific Exploration (SSE) and the 59th Annual Convention of the Parapsychological Association (PA)** will be held at the newly renovated Millennium Hotel in Boulder, Colorado, from Monday, June 20, 2016, through Thursday June 23, 2016. A welcoming reception and registration is planned for Sunday evening, June 19, and an additional day for workshops, Friday, June 24, 2016. Although each organization has its own purview and style, the program will be fully integrated. Dr. Roger Nelson is the Executive Program Chair, working with his two co-chairs, Dr. Chantal Toporow for the SSE, and Dr. Renaud Evrard for the PA. The program will be a synergetic mix of presentations from PA and SSE members, and there will be no concurrent sessions. We will keep the meeting to 4 days by selecting the best submitted papers, and by using dynamic poster sessions as well as evening sessions for panels and special presentations.

The program theme describes the mission common to both organizations: *ACCESSING THE EXCEPTIONAL, EXPERIENCING THE EXTRAORDINARY.* Invited speakers will help define thematic topics to be developed further by members of the SSE ⊗ PA. The program will include papers assessing progress and issues, both scientific and social/political, in areas of longstanding interest to both societies. All conference sessions will be held at the Millennium Hotel. A poster session is included to accommodate work that requires extended discussion, and to encourage young researchers to present their work.

A program booklet will be published containing abstracts of all papers and posters. This requires both PA and SSE members to provide a long abstract of 300 to 500 words (about one page of single spaced text), which summarizes the main points of the paper including its intended goals and conclusions. A link to a template is provided below.

Preparation

For SSE members, Titles and Abstracts for papers and posters should be submitted electronically as an attachment to the SSE co-chair, Dr. Chantal Toporow, SSEaspiringexplorers@gmail.com. For PA members, full papers should be submitted electronically as an attachment to the PA co-chair, Dr. Renaud Evrard at convention_program@parapsych.org. The Title should be short and informative and should be followed by author name and affiliation, email and contact information.

Papers submitted for presentation should be accompanied by information about any special audio-visual aids required. We will have video projection for power point. Please bring a copy of your presentation on a USB thumb drive. If a paper has multiple authors, please indicate which author will give the presentation. *In absentia* presentations, either pre-recorded or by a non-author will be allowed only in exceptional circumstances. Indicate in a cover letter or email the presentation category for your paper (full paper, research brief, poster, panel).

Abstracts of accepted papers will be published in the convention booklet and on the PA and SSE websites, and videos of the convention presentations will be uploaded to a section of the websites available only to members. Selected presentations may be made available in a publicly accessible part of the website, with author permission. The first author's email address will be published in both places.

Poster Session

Some authors may prefer to present their work as a poster presentation. Poster presentations provide an interactive one-on-one discussion of work that is particularly amenable to visual displays (e.g., demonstration of equipment or techniques), or highly technical papers that cannot be communicated effectively in a brief lecture format to a general scientific audience. Copies of photographs and other materials to be used in the poster may be included with the submission. A short synopsis of the motivation, methodology, and conclusions should be included on the poster, with emphasis on outcomes. For posters, an abstract should be prepared and submitted in accordance with the paper submission process and indicate the preference for a poster presentation. The PA sub-committee requires a full paper for a poster submission.

If a poster is accepted, the available poster board will measure 1m width and 2m height. We recommend that poster pages use sharply focused, concise text, and high quality figures and illustrations. Simple but precise materials work best. The poster pages must be printed beforehand and brought to the meeting. We will supply materials to mount the poster.

Announcing the 38th Conference of the United States Psychotronics Association (USPA), 2016 and Call for Papers

The United States Psychotronics Association (USPA) will be hosting its annual conference, July 15th-17th, 2016, at the beautiful *Wyndham Glenview Suites* in Glenview, Illinois (near O'Hare airport Chicago).

The Conference theme is:
"Exploring Subtle Energy: The Past, Present, and Future"

Featured speakers will include: Dr. William Tiller, Karl Merit, M.D., Dr. Jon Klimo, Dr. Beverly Rubik, Dr. Glen Rein, Lutie Larsen, John H. Reed, M.D., and others. Further information will be sent out in the coming months as additional conference speakers join us for this special event involving leading edge sciences. Send your inquires to: uspsychotronics@yahoo.com

CALL for PAPERS: For an opportunity to speak at the 2016 USPA conference on any of the psychotronics subjects listed below, please send your title, abstract, and a short biography to the email uspsychotronics@yahoo.com . Please title your email with "2016 abstract - (your last name)" Abstracts are due by January 30, 2016, and please include a short bio of yourself. Accepted speakers will need to provide their own transportation and lodging, but the Conference fees will waived.

The USPA website: www.psychotronics.org
Join **USPA** on **Facebook:** https://www.facebook.com/uspsychotronics/?fref=ts

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WHAT IS PSYCHOTRONICS?

The **United States Psychotronics Association** defines psychotronics as the science of mind-body-environment relationships, an interdisciplinary science concerned with the interactions of matter, energy, and consciousness. Psychotronics involves the study, research, and applications of the physics and technology of the mind, brain, spirit, consciousness, and the underlying forces of life and nature – hence the term "psychotronics".

We believe that a true understanding of the universe must include the spiritual, as well as, the technical, and provide an opportunity for amateur researchers to present their findings along with the professionals. We stress research, with documentation of results, and practical applications, rather than personal experience and unsupported hypotheses.

Some of the forces, fields, waves, and energies studied and researched in psychotronics include: bioelectromagnetism, biophotons, biopotentials, electromagnetic wave pollution and harmful effects; coherent emanations of DNA, emanations of matter, "free energy", morphogenetic fields, non-hertzian waves, orgone energy, pyramid energy and power, qi (chi), quantum fields, scalar waves, subtle energies, ultra-weak radiation of living matter, zero-point energy, and others.

Some of the phenomena believed to be produced or involved with the above fields and energies: action-at-a-distance, the aura of the body and other living things, bioinformation, bioluminescence, chakras, consciousness, distant intercellular interactions, meridians of the body, mind-body interactions, non-locality, the placebo effect, quantum consciousness, spontaneous remission of cancer and other diseases, water memory, water structure, and others.

Related fields of study and research covering the above forces, energies, and phenomena of psychotronics: bioelectromagnetics, bioenergetics, biophotonics, biophysics, psionics, psychoenergetics, psychoneuroimmunology, quantum biology, radionics, scalar electromagnetics, and others.

Some practices, techniques, and applications related to psychotronics include: acupuncture, biogeometry, brain entrainment, clairvoyance, dowsing, energy healing and medicine, extrasensory perception, feng shui, homeopathy, kirlian photography, magnetic therapy, pendulum use and methods, prayer effects, psionic medicine, psychic healing, psychometry, qigong, radiesthesia, radionics, remote viewing, shamanism, sound and sonic healing, telekinesis, telepathy, and others.

Some Prominent People in the history of psychotronics research and applications (in alphabetical order):

Albert Abrams, Thomas Bearden, Robert C. Beck, Robert O. Becker, Jacques Benveniste, David Bohm, Harold Saxon Burr, George W. Crile, Ruth Drown, T. Galen Hieronymus, Vlail P. Kaznacheyev, Georges Lakhovsky, Nobelist Luc Montagnier, Michael A. Persinger, Wilhelm Reich, Royal R. Rife, Rupert Sheldrake, Nikola Tesla, Marcel Vogel, and others.

Membership Benefits

If you are interested in any of the above subjects, then the USPA is the place for you, where you can interact with, exchange ideas, and collaborate with other people who are interested in the same subjects. So sign up now for membership in the USPA using the form on the following page and start enjoying all of your membership benefits. These benefits include, but are not limited to:

1. **Free access to the USPA Psychotronics Library** of articles, periodicals, books, and certain audio tapes, videos, and other materials on the above subjects, useful to your research.
2. **Your free subscription to the USPA Newsletter;**
3. **Your right to freely publish articles in the <u>WISE Journal - The Journal of the World Institute for Scientific Exploration</u> (ISSN 2381-1536),** enabling the world to see your ideas or research, and thereby enhance your resume and credentials;
4. **Your right to use the USPA Literature Research Service**, whereby we will find any article, book, or other item you are seeking on the above subjects, and provide it to you;
5. **Your right to participate in the USPA "Research Assistance Program"**, especially useful to professors, authors, and other researchers, who need extra help on their projects. USPA will help find volunteers to help you with your research project(s).
6. **Your right to be part of the USPA Project Participation Program,** whereby you can volunteer to help on numerous available USPA projects, or help researchers who are conducting research on psychotronics and related subjects.
7. **Your right to make oral or poster presentations at the annual USPA meeting**, with the approval of the Annual USPA Meeting Planning Committee.
8. **Your right to discounts** on the purchase of certain items and services made available for sale or provided by the USPA and its members.
9. **Your right to freely advertise in the WISE Journal**, which goes out to thousands of people.
10. **Your right to participate in the USPA Psychotronic Literature Preservation Program (UPLPP).** The USPA, via its Library and Archives, has established a "Literature Preservation Program" to preserve your personal papers, files, records, and collection of articles, periodicals, books, and devices on psychotronics and related subjects, noted above. You may no longer need or use some of these items that you have, and you can send them to the USPA, and we will preserve them in our library and archives, so that they can be of use to other researchers.

MEMBERSHIP INFORMATION

The U.S. Psychotronics Association (USPA), was incorporated in the District of Columbia in August, 1977, and is a nonprofit, 501(c)(3), tax exempt organization, **and as such, you are able to make tax deductible donations to the USPA.** It is empowered to enroll members in the parent organization throughout the United States, Canada, and other foreign countries. Membership is open to all people who wish to join with the USPA on the new frontiers of science in working constructively for the qualitative improvement of man and his environment. **Please remember the USPA in your annual charitable giving, especially if you want to advance research in the above subject areas, which can greatly benefit humans, animals, plants, and the environment.**

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Among the Missing , by John H. Reed, M.D.

Missing Book: Contact with Space, by Willhelm Reich

Does anyone happen to have a copy, either xeroxed or original, of the book, **Contact with Space**, by Wilhelm Reich, M.D.? This book was published in New York by Core Pilot Press in 1957, and was the last book Reich published, before he was sent to prison for using and/or selling a device to treat cancer that had not been approved by the FDA, who also burnt Reich's books. Wilhelm Reich died in prison November 3, 1957, at the age of 60. Ironically, Reich escaped Nazi Germany in the 1930's after his writings were attacked by the Nazis, who burnt many authors' books, although it is not certain if any of Reich's books were among those burnt by the Nazis.

Only one library in the United States has a copy of this book, the University of Maine at Orono, Special Collections. However, it is not available via inter-library loan. If you have a copy, or know someone who does, please contact John H. Reed, M.D. at the following email address: joreed43@gmail.com.

Missing Device: The Hieronymus Machine

Has anyone ever seen a Hieronymus Machine or know anyone or any museum that has this device? The Hieronymus Machine was a controversial device invented by electrical engineer Dr. Thomas Galen Hieronymus (21 November 1895 – 1988), and was said to have amazing curative abilities in the treatment of plant and animal diseases. The device used some type of energy or radiation, but was said to be neither electromagnetic radiation of any wave length, nor ionizing radiation from any type of radioactive material. (1)

Hieronymus received a United States Patent Number: 2,482,773 , for his invention in 1949, which was described in the patent application as a device for the "detection of emanations from materials and measurement of the volumes thereof." (1) If you have any information about this device, or where it is located, please contact John H. Reed, M.D. at: joreed43@gmail.com

Reference: 1. Wikipedia: https://en.wikipedia.org/wiki/Hieronymus_machine#Theory
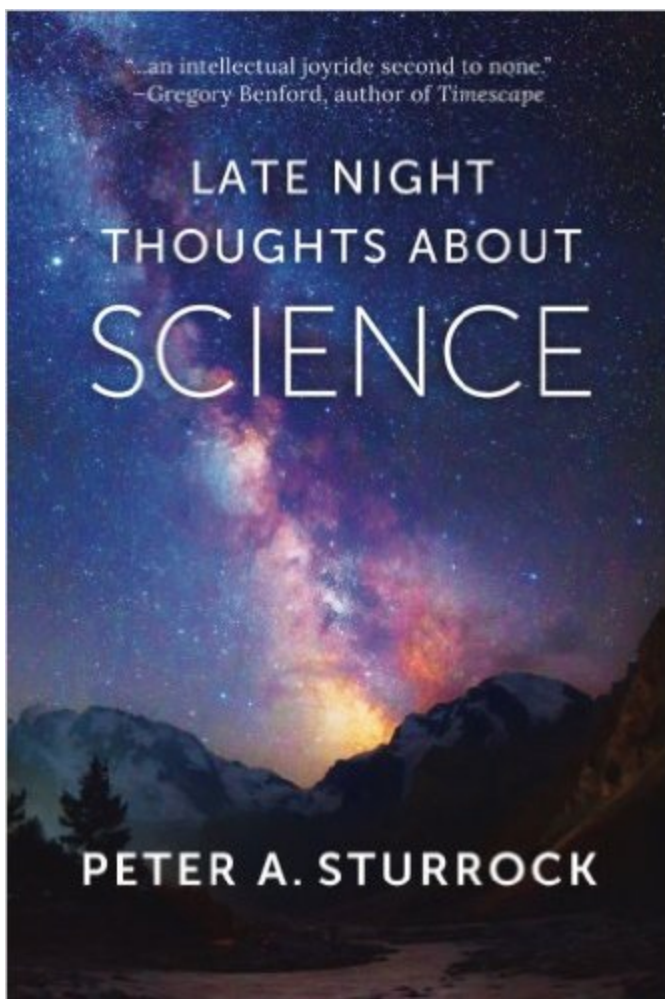
Late Night Thoughts About Science

by Peter A. Sturrock

Publisher: Palo Alto, CA: Exoscience Publishing (October 31, 2015)
Language: English
ISBN-10: 098426146X
ISBN-13: 978-0984261468
Paperback: 186 pages, illustrated
Product Dimensions: 6 x 9 inches

Available at Amazon.com

Most books that are written by scientists for the general public present what scientists know and understand. By contrast, this excellent book by the well know Stanford University scientist, Dr. Peter A. Sturrock, is concerned with topics that scientists do not understand. They are topics that are short of reproducible evidence and seem incompatible with current theoretical knowledge. However, these topics may be of keen interest to the general public.

The list of topics discussed begins with a puzzle well known to most scientists – ball lightning – an apparently simple phenomenon that has some very strange properties, and so far defies explanation.
The author then moves to less well-known physical phenomena: the peculiar behavior of some pendulums at the time of a solar eclipse; so-called "cold fusion"; and evidence that radioactive decay rates (usually considered to be constant for any element) may not be constant after all.

The topics continue with several so-called "psychic" phenomena – precognition,

clairvoyance, remote viewing, and psycho-kinesis – and some mind-body puzzles, including anomalous healing, out-of-body experiences, and reincarnation.

The list of subjects inevitably includes "Unidentified Flying Objects " (also known as "UFOs"), but also discusses the enigmatic "crop circles" (which are not always circles), and the catastrophic explosion that occurred at Tunguska in Siberia in 1908.

The subjects covered end with a puzzle that one would not expect to find in a scientific text, but can to some extent be addressed in scientific terms: *Who wrote the plays and poems conventionally attributed to "Shakespeare"*?

Each chapter contains one or two examples of the topic under discussion with notes on and portraits of the relevant investigators and references for further reading.

Appendices include a guide to further reading, a procedure for evaluating hypotheses, and a proposal for an "Office of Public-Centered Science", something that is very much needed.

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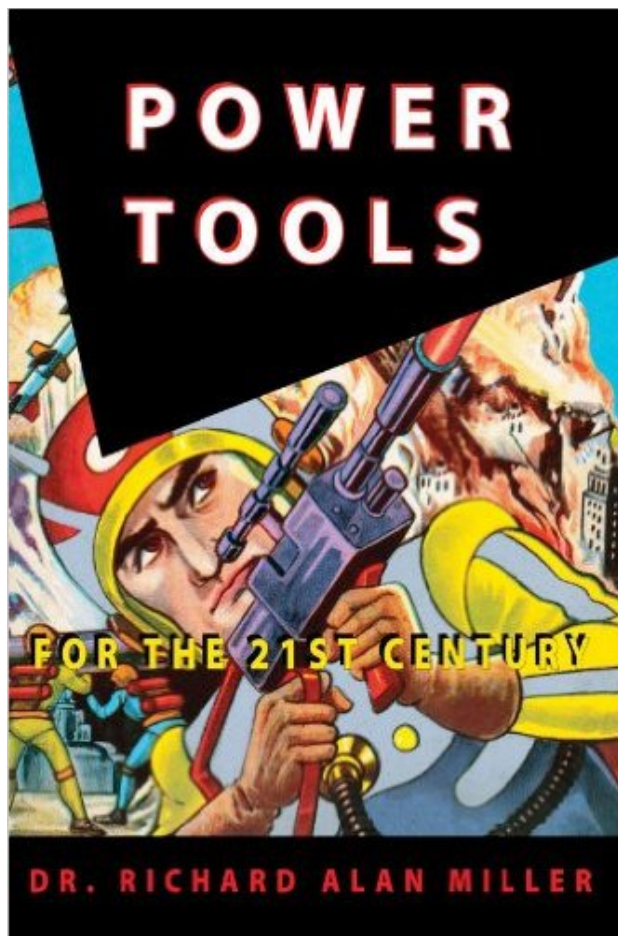
Power Tools for the 21st Century

and accompanying
Workbook 1- Exercise Supplement
By Dr. Richard Alan Miller

Available from:
RichardAlanMiller.com, and
Amazon.com

Second in his series "Toward the Evolution of Consciousness", Dr. Richard Alan Miller's *Power Tools for the 21st Century* and its accompanying *Workbook 1 – Exercise Supplement* are the protocols that were developed for the Navy SEALs to create super soldiers. These Power Tools can be used today for your own personal evolution of consciousness. Dr. Miller, a physicist, provides the full science of the work done for SEAL Corporation. Included is the rational as the basis for these tools and a historic perspective that applies to everyday usage now. Featured is BrainwaveTraining; Breath Control; Virtual Audio; Sacred Geometry; Belief Systems and Change of Values; ESP; Frequency Studies and Brainwave Entrainment; Archetype Encounters and Mythical Living; an Onthology of Mystical States and Free Will; plus current research on two powerful super foods.

Dr. Richard Alan Miller's mentor, Dr. Stanley Krippner, PhD., who coauthored the landmark publication in psychology called *Extraordinary Dreams and How to Use Them* says that "Dr. Richard Alan Miller is one of the pioneers in the study of the paranormal. From studies designed to enhance military performance, he has created invaluable tools for living life in the 21st century. These techniques and processes can help your own conscious evolution, and help you find your purpose in life."