White Paper VII

Why We Need to Create a New Reference Frame (RF) For Viewing Nature and How Do We Do It?

by

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Introduction

Our present Quantum Mechanical (QM) paradigm has been mathematically formalized in spacetime and thus is only capable of dealing with potential functions that are spatially and temporally dependent. However, in our daily life, we all meet human-related phenomena like consciousness, intention, emotion, mind, psychophysiology and psychoenergetics that our present QM paradigm must totally neglect as natural phenomena because they are not spatially dependent phenomena. Further, in White Paper V[1] we learned that the fundamental wave that creates, moves and guides the pilot wave of the de Broglie particle/pilot wave phenomenon, a cornerstone of today's QM, must travel faster than the EM velocity of light, c, in physical vacuum.

The work of Harrison[2] tells us that, if both particle and wave are simultaneously present in spacetime, all the other mathematical aspects of QM are immediately calculable. Thus, once again, from reference 1, a special coupling agent is needed for the fundamental wave set, moving at $v_w>c$ to continuously interact with the de Broglie pilot wave moving at $v_p<c$, a seeming violation of relativity theory (RT). Further, this fundamental wave set must function in the physical vacuum because all normal waves of which humans have cognition are merely modulations of particle density (like water waves) or particle flux density (like EM photons or phonons).

These many reasons should be sufficient justification to be a rational force for change in our RF for tomorrow's physics! However, the design of the RF needs to be of a duplex nature consisting of two subspaces, one for electric substance particles traveling at $v_p<c$ and the other for magnetic substance waves traveling at $v_w>c$. To satisfy all the features present in White Paper V[1] and VI[3], a coupling substance with $v_c\geq c$ and $v_c\leq c$ must be added to the mix. This coupling substance has been labeled "Deltrons". Thus if there are zero coupling deltrons present, these two domains of substance could not interact with each other so there would be no de Broglie particle-pilot waves and thus no possible atoms, molecules, EM or QM.

The Proposed Duplex Space

As a choice for a new RF, I have proposed a duplex space consisting of two reciprocal subspaces, one of which is spacetime. For such a case, electric substance particles at $v_p<c$ are operational in the spacetime subspace and have been studied in classical physics for centuries. Since N/distance is a spatial frequency and M/time is a temporal frequency (N and M are undetermined numbers), the reciprocal subspace is a frequency domain perfectly suited as a wave domain. This might apply to figure 1 of White Paper VI[3] so the substance in the reciprocal domain (R-space) could be of negative mass and negative energy while the substance in the direct spacetime domain (D-space) could be of positive mass and positive energy. In this case, if negligible coupler medium were present, the two subspaces would be isolated (or invisible) to each other because of the relativity theory (RT) constraint. However, if a mechanism is present to activate a coupling agent between the two subspaces

then they can interact with each other and change the properties of physical matter.

Experimentally[4], we have shown that it is possible to imprint a specific intention from a deep meditative state into a simple electronic device and (1) have the device activate "consciousness" into an experimental space sufficient for coupling to occur between the substances of these two subspaces so that the EM gauge symmetry state of the space is significantly lifted from the U (1) level to the SU (2) level[5] and (2) the space is tuned specifically to either enhance or diminish a particular material property of interest[4]. Thus human consciousness, in the form of a specific intention, is capable of altering the properties of materials. Subsequent experiments showed that it was the magnetic information wave domain of the physical vacuum that was altered by this process and not the E>0 domain in figure 1 of White Paper VI[3]. If we call the net material property value for the partially coupled state, Q_M, and the unaltered value of the E>0 and E<0 substances Q_e and Q_m, respectively, then the zeroth order approximate result is

$$Q_M(t) = Q_e + \alpha_{eff}(t)Q_m(t) \qquad (1)$$

Here, α_{eff} is the coupling coefficient associated with deltrons that are presumed to leak out of the intention-host device into the experimental space. If α_{eff} ~0, then the right hand term in equation (1) is negligible and we obtain our normal, uncoupled state, U(1) EM gauge symmetry state reality[4]. If α_{eff} ~0.1 to 1.0, the second term in equation 1 is of significant magnitude so that Q_m (t) can either increase or decrease relative to Q_e. If α_{eff} leaks away from the experimental space for a variety of reasons, then $Q_M \neq Q_e$ slowly returns to $Q_M = Q_e$. At present, we have developed an experimental measurement system for the continuous measurement of $Q_M(t)$.

The point of all this is that (1) an experimental space can be taken from the uncoupled state of physical reality (the $U_e(1)$ EM gauge symmetry state), via an intention-host device containing a specific intention, to the coupled state of physical reality that exhibits a higher magnitude of thermodynamic free energy as measured by our detector device[6]. We assume that this is due to patches of SU(2) EM gauge symmetry state mixed into the continuum of $U_e(1)$ EM gauge symmetry state material of the experimental space. But what does all this mean from a theoretical perspective?

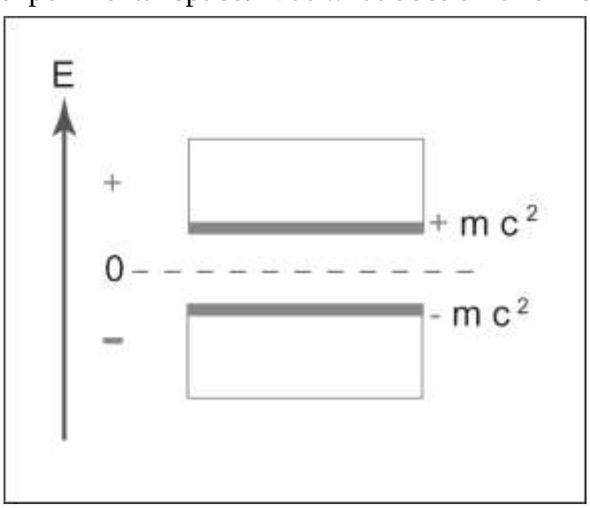


Figure 1. Schematic energy spectrum associated with the Dirac Equation.

In The Beginning

Figure 1 is a repeat of figure 3 of white paper VI[3] and, with the E>0 band of states completely empty, is thought to represent the condition of the physical vacuum before anything like a "big bang" has occurred. All the E<0 states in the (1) magnetic information wave band, (2) the emotion domain wave band and (3) the mind domain wave band are presumed to be completely filled. Further, all of this is presumed to be imbedded in the thermodynamic potential well of the spirit domain!

As is, this picture does not represent the optimum and stable thermodynamic condition for the vacuum state. In analogy with the perfect elemental semiconductor single crystals in the E>0 plenum of reference 3, thermodynamics tells us that the spontaneous formation of configurational defects in these three vacuum bands of filled states will alter the entropy of the entire system in such a way that the system moves towards its thermodynamic equilibrium state. What this means is that vibrational phonons and photons of a variety of kinds will appear in association with ceaseless configurational defect formation and recombination both within and between the subtle energy substances that populate these vacuum bands. In particular, one would expect to see radiations from the bands deeper in the potential well interacting with the "stuff" of the upper information wave band to create e^+e^- pair formation along with other types of configurational defects (perhaps of the m^+ and m^- magnetic charge type that remain superluminal). This would seem to be a preferable model for the initiation of our normal electromagnetic physical substance in nature than that proposed by Dirac[4].

If this is eventually proven to be a reasonable conjecture, at least two important consequences must be addressed:

(1) Since the formation energy for the e^+e^- pair is ~1 MeV and for the p^+p^- pair ~1000 MeV, the magnitudes for natural energetic events in the E<0 vacuum bands of nature are at least 10^5-10^{10} times larger than those found in the E>0 physical band of nature. This difference could be accomodated if the analogue to the E>0 Boltzmann constant, k_v, for the vacuum information wave band, was given by $k_v \sim (10^5\text{-}10^{10})k_B$. This would imply the involvement of a very different kind of statistics for the energy distribution in the information wave band of energies than those of the Maxwell-Boltzmann type for the E>0 band. For qualitative purposes, we shall assume that the average configurational defect formation energy magnitude is smallest for the information wave band, larger for the emotion domain band and largest for the mind domain band. This may also require that the Boltzmann constant analogues k_{vI}, k_{vE} and k_{vM} also increase as one moves in the vacuum from the information wave band (k_{vI}) to the emotion domain band (k_{vE}) and then to the mind domain band (k_{vM}), respectively, and
(2) As far as the initiation of these proposed configurational entropy formation processes is concerned, one must be open to the possibility that their origin may begin via radiations from the imbedding domain of spirit.

The Mathematical Aspects of the Duplex Space Coupling Transform

For the various scientific and technological problems faced by our evolving society, we have created a number of very useful mathematical processes for mapping information from one geometry or experimental variable to another. This enhances our understanding of the overall process and allows easier resolution of the basic technical problem. In essence, because these various transforms are all internally self-consistent with the foundations of mathematics we have used for centuries, they are really constraints on the underpinnings of the philosophical structure of our accepted world.

A few of these that are familiar to most of us are:

(1) Complex variable theory and mapping transforms that were found to be remarkably useful in electrical engineering,
(2) LaPlace transforms for converting second order partial differential equations to the much more easily solved simple differential equations in electrical engineering and physics,
(3) Fourier transforms in classical physics and
(4) Fourier transforms in quantum physics. This last pair have been importantly modified to resolve mathematical complexities arising in our duplex space model and consciousness – inclusive physics.

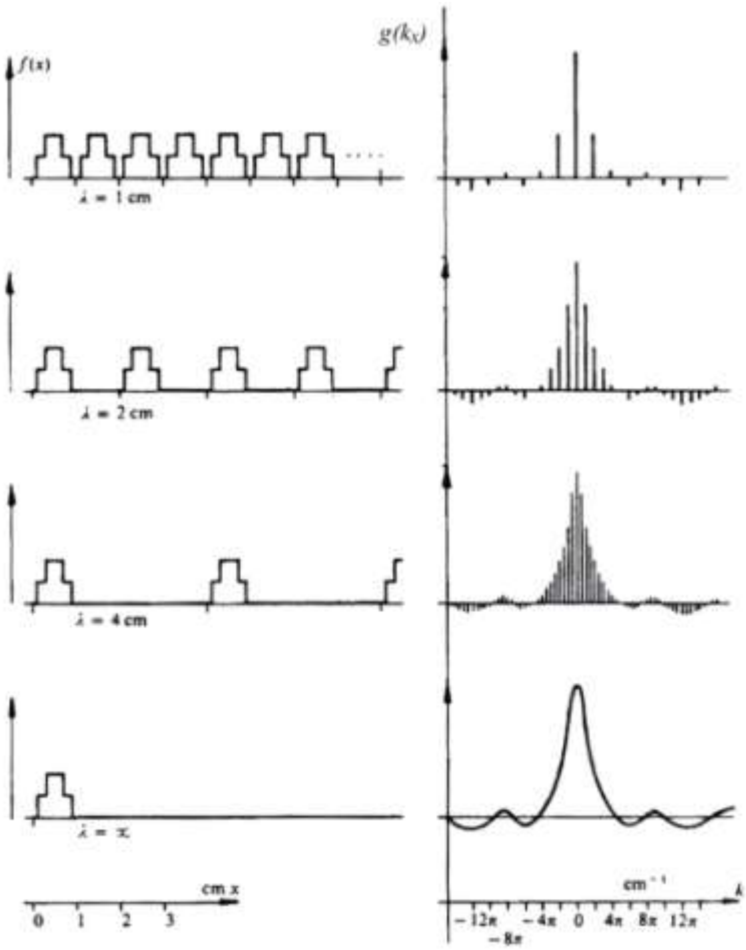


Figure 2

Illustrating the progression from Fourier series to Fourier transform.

The classical Fourier transform process can be most simply illustrated via figure 2. In our normal experimental world, we gather data that can be represented as a function of distance, x, or time, t, or both. Fourier showed us about three centuries ago that such experimental data could be alternately discriminated into a set of waves of different frequencies and amplitudes. These two representations of the same data generally helped our understanding of the physics process involved and usually provided a simpler vehicle for solving differential equations of physics of the spacetime type.

In figure 2, f(x) on the left represents the mathematical form that describes a spacetime object as a function of x. On the right, $g(k_x)$ represents the conjugate amplitude spectrum for the wave-set that also describes this object. Here, each vertical line is the amplitude of a single harmonic wave (sine or cosine). As the spacetime periodic length (on the left) increases from a λ=1 cm. spacing to a λ=∞ cm. spacing, the frequency domain pattern (on the right) fills in with vertical lines until only the envelope (ends of the lines) can be easily discerned. This plot of g(k_x) at the bottom right is the <u>Fourier transform</u> (wave amplitude distribution or spectrum) of the spacetime object at the bottom left.

Written in conventional mathematical formalism, the Fourier transform pair relationships for figure 2 are

$$g(k_x) = \frac{1}{(2\pi)^{1/2}} \int_{-\infty}^{\infty} f(x) e^{i2\pi x \cdot k_x} dx \tag{2a}$$

and

$$f(x) = \frac{1}{(2\pi)^{1/2}} \int_{-\infty}^{\infty} g(k_x) e^{-i2\pi x \cdot k_x} dk_x \tag{2b}$$

This pair of equations can be generalized to any number of dimensions[7]. Shifting now to the quantum mechanics application of the Fourier transform (FT) process, I will follow a brief description from Schubert[8].

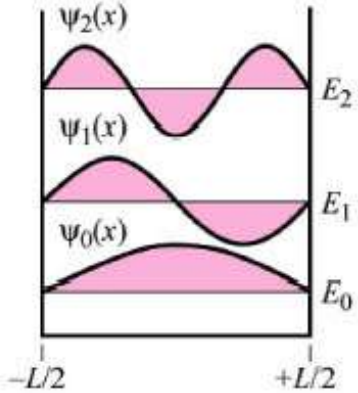
A stationary wave function in one dimension, ψ(x), has a clear physical meaning and the probability density for the particle's spacetime position is given by the product of the wave function and its complex conjugate, ψ*(x), (obtained by replacing the imaginary number, i, in ψ(x) with, -i). The wave function, ψ(x), can also be represented in momentum space via the function, Φ(p), with the same physical content. The two representations are related by a Fourier transform pair relationship. i.e.,

$$\Phi(p) = \frac{1}{(2\pi\hbar)^{1/2}} \int_{-\infty}^{\infty} \psi(x) e^{-ip \cdot x/\hbar} dx \tag{3a}$$

and

$$\psi(x) = \frac{1}{(2\pi\hbar)^{1/2}} \int_{-\infty}^{\infty} \Phi(p) e^{ip \cdot x/\hbar} dp \tag{3b}$$

Here, Φ(p) is the amplitude of the momentum space wave function for momentum p. The Fourier transform, here, provides a unique relationship between the momentum space and position space representation of a particle. That is, for a specific wave function, ψ(x), there is only one representation in momentum space, Φ(p). Further, another property of the FT is that the normalization condition holds for both the position and momentum representations. If ψ(x) is normalized, then Φ(p) is also normalized as in



$$\int_{-\infty}^{\infty} \psi^*(x)\psi(x)dx = \int_{-\infty}^{\infty} \Phi^*(p)\Phi(p)dp = 1 \tag{3c}$$

Figure 3a. The three lowest wave functions, $\psi_{\square}(x)$, $\psi_1(x)$, $\psi_2(x)$, of an infinite quantum well.

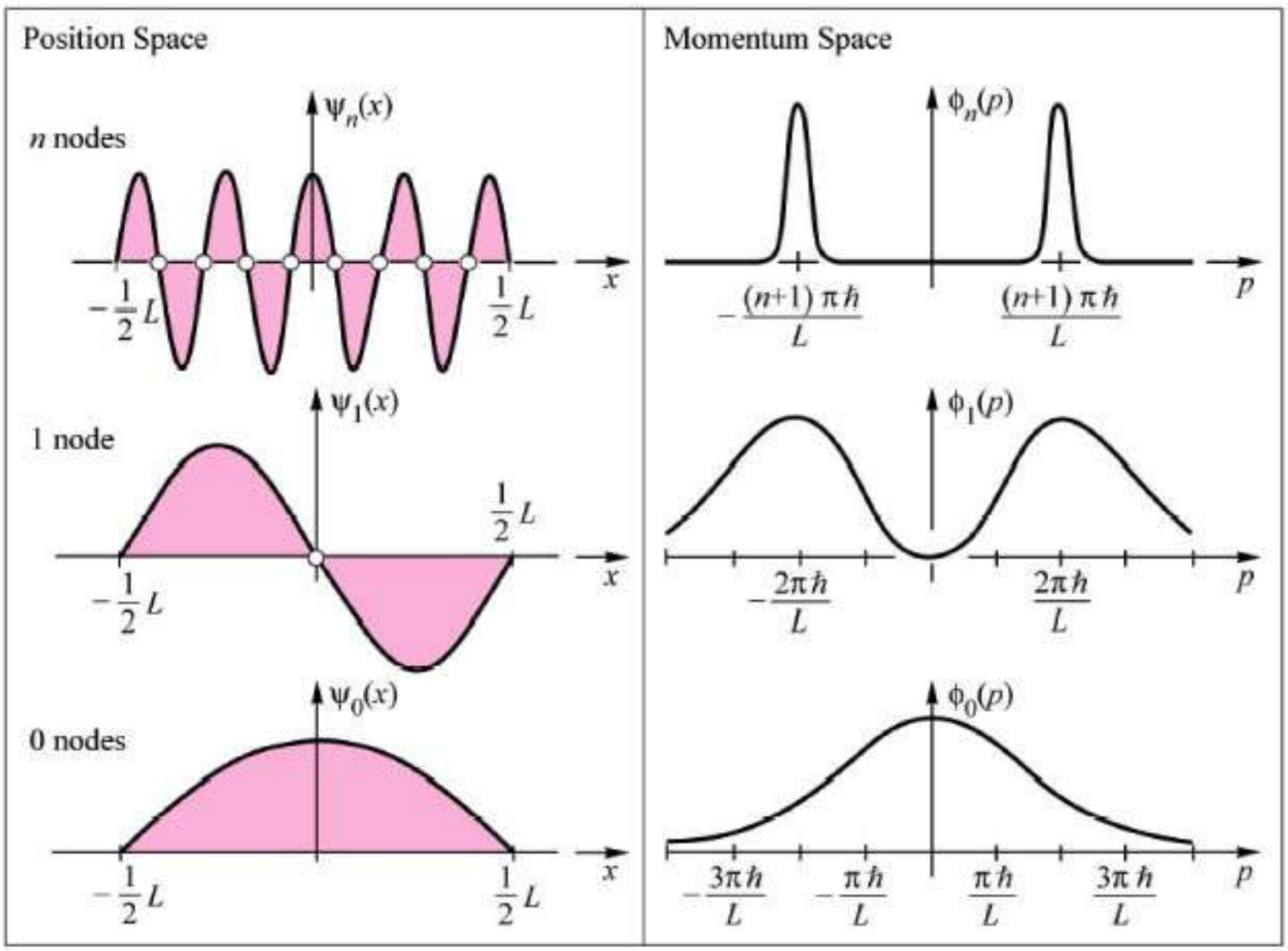


Figure 3b. Position space representation and momentum space representation of three wave functions $\psi_{\square}(x)$, $\psi_1(x)$, $\psi_n(x)$. The subscript n refers to the number of nodes (nodes at $x = \pm 1/2L$ are not counted).

Figures 3 illustrate, for an infinite quantum well, both the position space representation and the momentum space representation of the three wave functions $\psi_{\square}(x)$, $\psi_1(x)$ and $\psi_n(x)$. Now, let us turn to the <u>similarities</u> and <u>differences</u> between my duplex space coupling transform and the standard Fourier transform.

A very important mathematical property of a duplex space consisting of two reciprocal subspaces, one of which is spacetime, is that a unique quality functioning in one subspace has an equilibrium quantitative connection to its conjugate quality in the reciprocal subspace given by an equilibrium FT pair relationship. Thus, if we know a mathematical description of a quality in one subspace one can, in principle, calculate the equilibrium conjugate quality in the other subspace. However, in our duplex space case, the deltron coupling substance must be present to allow a substance quality of one subspace to interact with the conjugate substance quality of the reciprocal subspace. Without the deltron coupling, the thermodynamic equilibrium between the two uniquely different kinds of substance could never be achieved. For example, in figure 4, the top portion shows in (b) a Gaussian -shaped packet of reciprocal space substance ($g(k_x)$ in equation 2b) while (a) shows an FT wave packet of a Gaussian envelope shape in spacetime (f (x) in equation 2b). The bottom portion shows in (c) a spherical particle of spacetime substance (another f (x) in spacetime within equation 2a) while (d) shows its $F(k_rR)/2\pi R^2$ analogue (in equation 2a). Here items (b) and (c) are substances while items (a) and (d) are only calculated ghosts. However, when sufficient deltrons are added, the substances b and c interact with each other and we have a functional de Broglie particle/pilot wave system in both subspaces that can seek thermodynamic equilibrium between its three distinguishable parts.

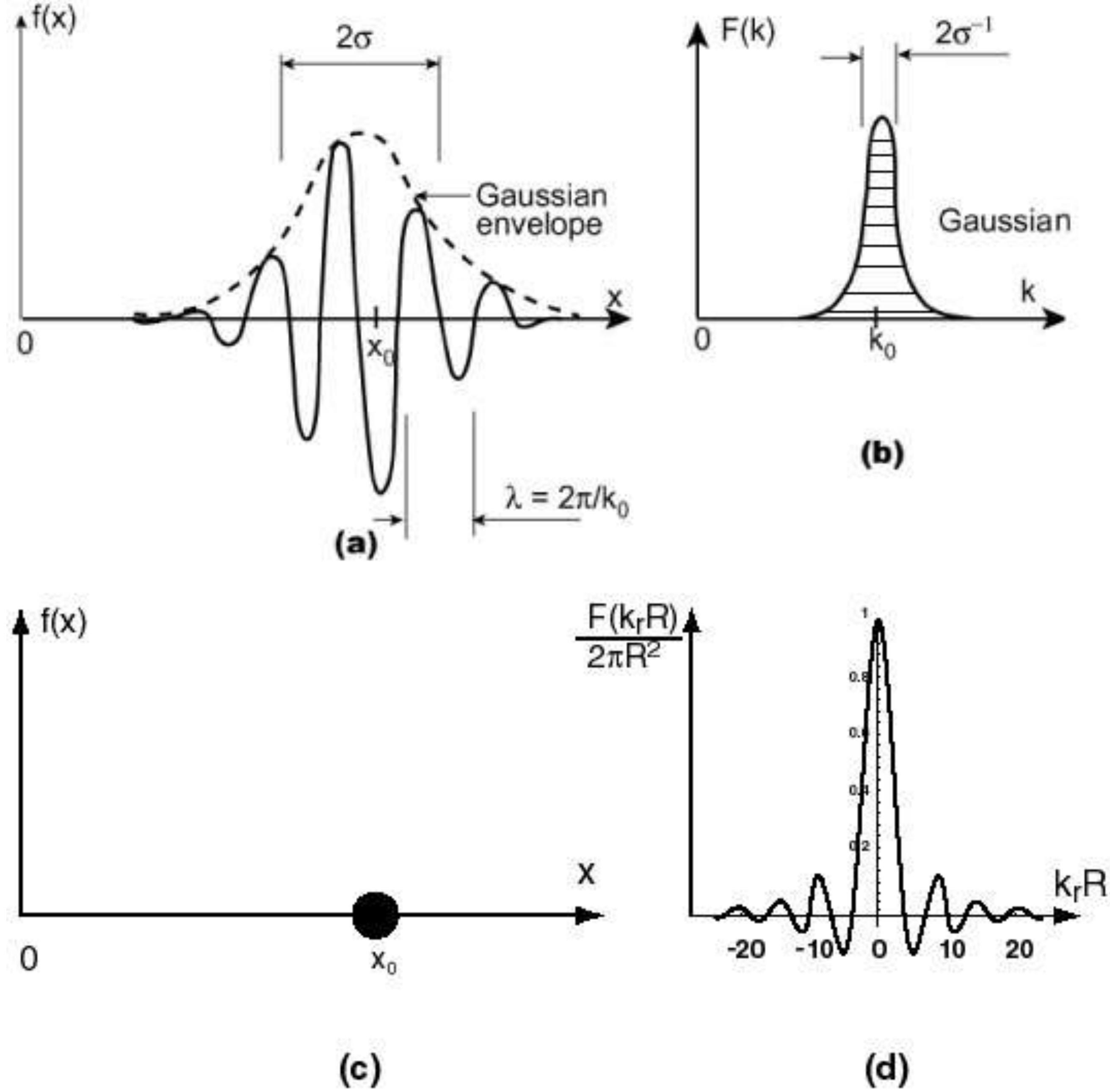


Figure 4. (a) a "ghost" calculated D-space wavegroup for (b) a real R-space, Gaussian substance packet, (c) a real D-space 2-D particle of radius R and (d) its "ghost" calculated R-space conjugate wavegroup. For an atom, one would choose R~10^{-8} cm.

In our mathematical formalism, the quantitative relationship between the interacting substances of the two, reciprocal subspaces are given in one dimension by

$$g(k_x) = \frac{1}{(2\pi)^{1/2}} \int_{-\infty}^{\infty} C_\delta(x, k_x) f(x) e^{i2\pi x g k_x} dx \qquad (4a)$$

and

$$C_\delta\left(x,k_x\right)f\left(x\right)=\frac{1}{\left(2\pi\right)^{1/2}}\int_{-\infty}^{\infty}g\left(k_x\right)e^{-i2\pi x\cdot k_x}dk_x \quad . \tag{4b}$$

This pair of equations are importantly different from both the equation 2 pair and the equation 3 pair. Our unknown in equations 4 is the deltron activation function, $C_\delta(x,k_x)$, whose <u>zeroth order approximation</u> is α_{eff} in equation 1, and about which we presently know very little from either a theoretical or an experimental perspective. Our path forward will be to (1) postulate various functional forms for $C_\delta(x,k_x)$, (2) calculate duplex space dynamic behavior for a proposed form of $C_\delta(x,k_x)$ (3) experimentally observe $Q_M(t)$ in equation 1, given Q_e for the special case of $\alpha_{eff}=0$ and (4) for the real case of $\alpha_{eff}\neq 0$, evaluate the magnitude and sign of $\alpha_{eff}Q_m(t)$. In this way, step by step, we will learn more and more about the functional structure of $C_\delta(x,k_x)$.

<u>Some Closing Comments</u>

To expand the reader's understanding of the <u>coupled</u> state vs the <u>uncoupled state</u> of physical reality, let us consider figure 5. Figure 5 is a <u>metaphorical</u> representation of these two different states of physical reality.

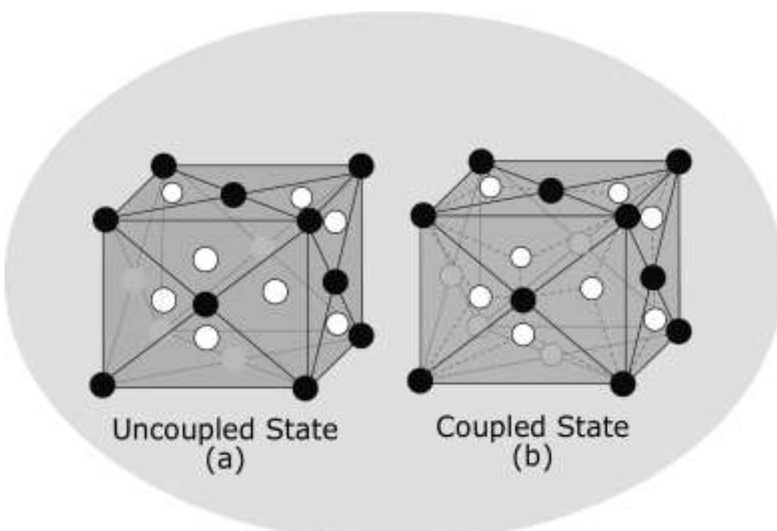


Figure 5. The physical reality metaphor; (a) the uncoupled state and (b) the coupled state.

Here, the black balls represent pieces of electric atom/molecule substance while the smaller, white balls represent a category of substance which appears to function throughout the physical space (the white balls may be many, many orders of magnitude smaller in size than the black balls but, for pedagogical purposes, the much larger size is useful to give them visual meaning). In figure 5a, the black lines linking the black balls are meant to indicate that the electric atom/molecule substances are interacting with each other. However, because there are no linkages between the black and white balls, this is meant to indicate that these two different categories of substance do <u>not</u> interact with each other. This lack of interaction leads to what I label the *uncoupled state* of physical reality. In figure 5b, the black lines still link the black balls into an interactive network; however, in this case, the dashed lines now link the white balls to the black balls and this is meant to indicate that they are now interacting with each other. I call this the *coupled state* of physical reality.

In EM gauge symmetry form[(5)], this deltron coupling process is thought to be just the reverse of a symmetry-breaking process. It is thought to occur in two major steps, (1) first a reaction between deltrons and vacuum information waves, w, to create "rope-like" information waves carrying magnetic charge type of properties plus various stoichiometries, $w_j\delta_k$ ratios followed by (2) interactions between the Ue(1) substance and the $U_{w_j\delta_k}(1)$ substance to form SU(2) gauge substance. This overall reaction is illustrated qualitatively via Equations 5

$$U_e(1) \square U_w(1)+C_\delta \quad \Leftrightarrow \quad U_e(1) \square U_{w_j\delta_k}(1) + C'_\delta \qquad ; C'_\delta < C_\delta \qquad (5a)$$

$$\Leftrightarrow U_e(1) \square U_m(1) + C_\delta' \qquad (5b)$$

$$\Leftrightarrow SU(2) + C_\delta' \qquad (5c)$$

The "rope-like" magnetic information waves carry stoichiometric amounts of deltrons which allow coupling to occur and a patch of the SU(2) gauge state material to form. Any additional C_δ' can just adsorb to the SU(2) patch.

The concept of gauge was introduced in 1918 by Herman Weyl to mean a standard of length whereby the gravitational force could be formulated in terms of the curvature of space and the various geometries involved. In general, Gauge Theories were constructed to relate the properties of the four known fundamental forces of nature to the various symmetries of nature (see Figure 6[(9)]). The most familiar symmetries are spatial or geometric in appearance, like the hexagonal symmetry of a snowflake. An invariance in the snowflake pattern occurs when it is rotated by 60 degrees. In general, the state of symmetry can be defined as an invariance in pattern that is observed when some transformation is applied to it (e.g., a 60° rotation for the snowflake or a 90° rotation for a square). One example of a non-geometric symmetry is the charge symmetry of electromagnetism. For the case of a collection of electric dipoles, if the individual charges are suddenly reversed in sign, the energy of the ensemble is unchanged so the forces remain unchanged. The same behavior occurs for magnetic dipoles and electromagnetic fields in general (this is because the energy is proportional to E^2 and to H^2 so it does not change by a 180° rotation of the dipoles). Another symmetry of the non-geometric kind relates to isotopic-spin of particles, a property of neutrons, protons and hadrons (the only particles responsive to the strong nuclear force). The symmetry transformation associated with isotopic-spin rotates the internal indicators of all protons and neutrons everywhere in the universe by the same amount and at the same time. If the rotation is by exactly 90 degrees, every proton becomes a neutron and every neutron becomes a proton so that no effects of this transformation can be detected and this symmetry is invariant with respect to isotopic-spin transformation.

All of these described symmetries are global symmetries (happening everywhere at once). In addition to global symmetries, which are almost always present in a physical theory, it is possible to have a local symmetry[(9)]. For a local symmetry to be observed, some law of physics must retain its validity (remain invariant) even when a different transformation takes place at each separate point in space-time. Gauge Theories can be constructed with either a global symmetry or a local symmetry (or both). However, in order to make a theory invariant with respect to a local transformation something new must be added. This new something is a new force[8].

The first Gauge Theory with local symmetry was the theory of electric and magnetic fields, introduced in 1868 by James Clerk Maxwell. The character of the symmetry that makes Maxwell's theory a Gauge Theory is that the electric field is invariant with respect to the addition or subtraction of an arbitrary overall electric potential. However, this symmetry is a global one because the result of experiment remains constant only if the new potential is changed everywhere at once (there is no

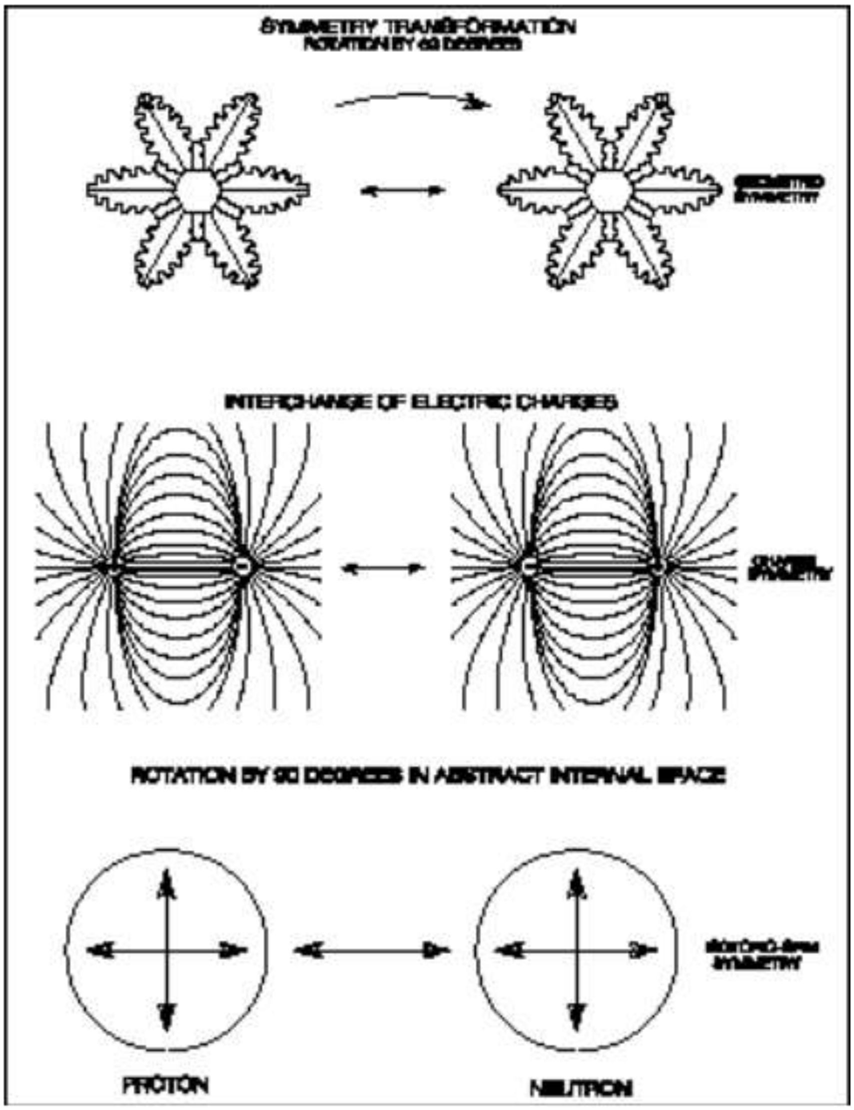


Figure 6. Symmetries of nature determine the properties of forces in Gauge theories. The symmetry of a snowflake can be characterized by noting that the pattern is unchanged when it is rotated 60 degrees; the snowflake is said to be invariant with respect to such rotations. In physics, non-geometric symmetries are introduced. Charge symmetry, for example, is the invariance of the forces acting among a set of charged particles when the polarities of all the charges are reversed. Isotopic-spin symmetry is based on the observation that little would be changed in the strong interactions of matter if the identities of all protons and neutrons were interchanged. Hence proton and neutron become merely the alternative states of a single particle,

the nucleon, and transitions between the states can be made (or imagined) by adjusting the orientation of an indicator in an internal space. It is symmetries of this kind, where the transformation is an internal rotation or a phase shift, which are referred to as Gauge symmetries.

absolute potential and no zero reference point). A complete theory of electromagnetism requires that the global symmetry of the theory be converted into a local symmetry. Just as the electric field depends ultimately on the distribution of charges, but can conveniently be derived from an electrical potential, so the magnetic field generated by the motion of these charges can be conveniently described as resulting from a magnetic potential. It is in this system of potential fields that local transformations can be carried out leaving all the original electric and magnetic fields unaltered. This system of dual, interconnected fields has an exact local symmetry even though the electric field alone does not[(9)].

Maxwell's theory of electromagnetism is a classical one, but a related symmetry can be demonstrated in the quantum theory of EM interaction (called quantum field theory). In the quantum theory of electrons, a change in the electric potential entails a change in the phase of the electron wave and the phase measures the displacement of the wave from some arbitrary reference point (the difference is sufficient to yield an electron diffraction effect). Only differences in the phase of the electron field at two points or at two moments can be measured, but not the absolute phase. Thus, the phase of an electron wave is said to be inaccessible to measurement (requires a knowledge of both the real and the imaginary parts of the amplitude) so that the phase cannot have an influence on the outcome of any possible experiment. This means that the electron field exhibits a symmetry with respect to arbitrary changes of phase. Any phase angle can be added to or subtracted from the electron field and the results of all experiments will remain invariant. This is the essential ingredient found in the U(1) Gauge condition.

Although the absolute value of the phase is irrelevant to the outcome of experiment, in constructing a theory of electrons, it is still necessary to specify the phase. The choice of a particular value is called a Gauge convention. The symmetry of such an electron matter field is a global symmetry and the phase of the field must be shifted in the same way everywhere at once. It can be easily demonstrated that a theory of electron fields, along with no other forms of matter or radiation, is not invariant with respect to a corresponding local Gauge transformation. If one wanted to make the theory consistent with a local Gauge symmetry, one would need to add another field that would exactly compensate for the changes in electron phase. Mathematically, it turns out that the required field is one having infinite range corresponding to a field quantum with a spin of one unit. The need for infinite range implies that the field quantum be massless. These are just the properties of the EM field, whose quantum is the photon. When an electron absorbs or emits a photon, the phase of the electron field is shifted[(9)].

The gauge symmetry case of our interest in this white paper is the one where we have two unique levels of physical reality as indicated in Equation 1. In one, we have electric atoms and molecules restricted to travel at velocities less than that of c, the velocity of EM light. In the other, we have magnetic information waves restricted to travel at velocities greater than c. Our main interest, here, is how one describes the EM gauge symmetry state for the two cases (1) these two levels of physical reality are almost completely uncoupled and (2) these two levels are strongly coupled so that the second level is instrumentally accessible via the measuring instruments of the first.

In the first case, one could define a generalized potential function, Ψ, and EM gauge symmetry state where

$$\Psi = \Psi_D\,(x, y, z, t) + \Psi_R\,(k_x, k_y, k_z, k_t) \qquad (6a)$$

$$\text{and EM gauge state: } U_e(1) + U_m(1) \qquad (6b)$$

However, our commercial measurement devices, cannot access the phenomena associated with Ψ_R so it doesn't exist to us.

In the second case, a strong coupling coefficient, α_{eff}, exists between e and m substances so we have

$$\Psi = \Psi(x, y, z, t, \alpha_{eff}, k_x, k_y, k_z, k_t) \qquad (7a)$$

and

$$\text{EM gauge state: } U_e(1) \times U_m(1) = SU(2) \qquad (7b)$$

Now let us see how to interpret these EM gauge states.

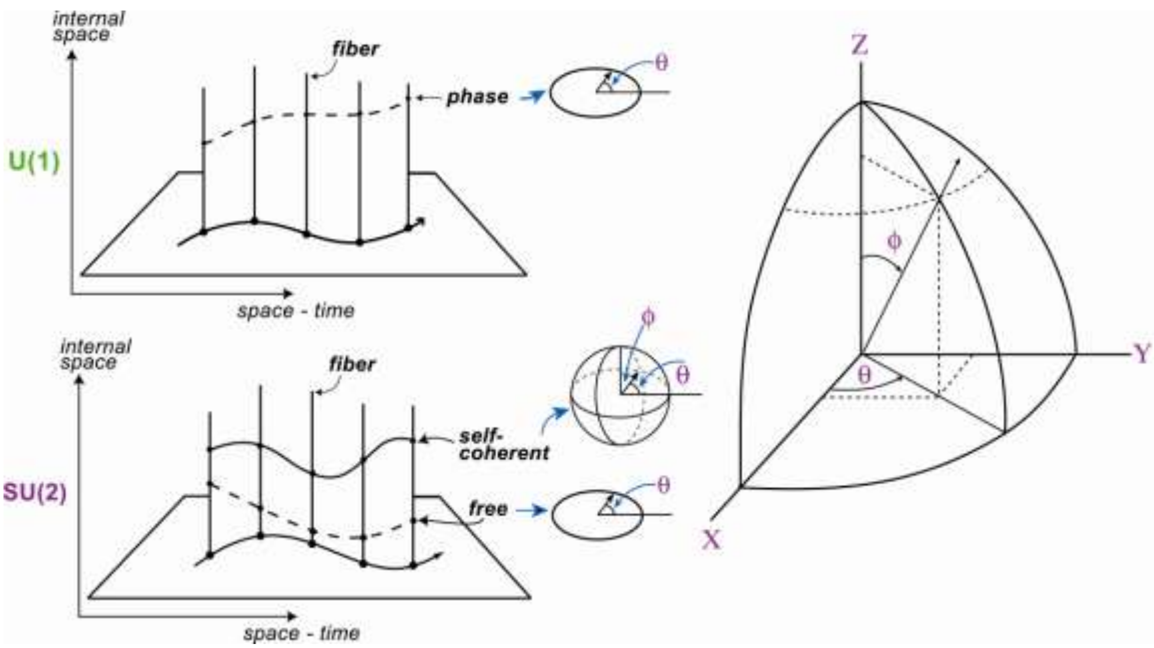


Figure 7 Illustrations crucial to meaning articulation or the U(1) and SU(2) EM gauge symmetry states.

Consider the top drawing in figure 7, it shows a unique space that combines an **internal space** (ordinate) with a two-dimensional representation of spacetime (abscissa). In this unique space, the spatial location of a particle is represented by a **dot** at a coordinate point in the horizontal, spacetime plane while the **phase-value** for the field in the internal space is specified by angular coordinates in this unique space. As the particle moves through spacetime (the sequence of dots), it also traces out a path in the internal space (the dashed line) above the spacetime trajectory at a distance proportional to the instantaneous phase angle for the electron wave. Mathematicians call this internal space distance a fiber.

When there is no external gauge potential acting on the particle, the internal space path is completely arbitrary. When this particle interacts with an internal gauge field (E or H), the dashed path in the internal space is a continuous curve determined by the gauge potential. In mathematical jargon, the unique space formed by the union of our four-dimensional spacetime with an internal space is called a "fiber bundle space".[(5)] When there is only **one** internal space variable, like the electron wave function, the internal space is designated as a **U(1)** EM gauge symmetry space because the state looks like the interior of a flat ring with the phase value represented as the **angle**, θ, of the point on the ring seen in figure 7 (top).

When there are two **coupled** variables in the internal space, such as the electron particle wave function, θ, and the magnetic information wave, wave function, ϕ, they must each make perpendicular plane designations in a sphere at each spacetime point as seen in the bottom drawing of figure 7. Thus, one has two fiber bundles to deal with and the group theory designation is SU(2). The lower internal space locus in the bottom diagram of figure 7 is labeled free because it is a U(1) state with only one phase angle, θ, to deal with. The upper internal space locus is labeled coherent because it is a SU(2) state with two phase angles, θ and ϕ, to deal with. What is called symmetry breaking is when the coupling between θ and ϕ disappears so the symmetry state drops from the upper locus to the lower.

In support of the foregoing, with respect to the appearance of a magnetic charge behavior when a space is raised from the uncoupled state to the coupled state of physical reality via use of an intention-host device, consider the following two pieces of independent evidence.

(1) In our normal reality, we have only electric charge, electric dipoles, magnetic dipoles and higher order multipoles but no magnetic charge. Thus, placing a disk-shaped ceramic DC magnet symmetrically under an aqueous solution containing a pH-electrode measuring the pH for several days (N-pole up for example) and then turning the magnet over so that the S-pole is pointing up and measuring the pH for several days, one should expect to see no difference in the measured pH. This is because the magnetic energy and the magnetic force from magnetic dipoles is proportional to H^2, the square of the magnetic field and is thus independent of the orientation of the dipole. Experimentally, for this case one sees no difference in measured pH between the north pole or the south pointing upwards.

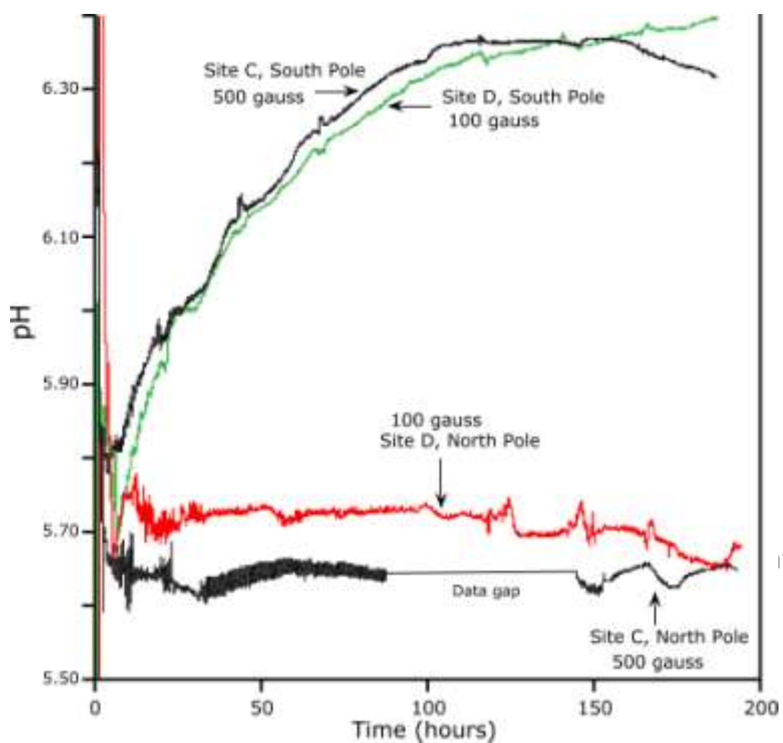


Figure 8.

pH changes with time for pure water in an IIED-conditioned space for both N-pole up and S-pole up axially aligned DC magnetic fields at 100 and 500 gauss.

On the other hand, after one has attained the coupled state of physical reality in the space, when one performs the identical experiment in that space, one observes a difference in the measured pH depending upon which polarity of DC magnetic field is pointing upwards. Figure 8 illustrates an extreme example where the pH strongly increases when the S-pole points upwards and significantly decreases when the N-pole points upwards. Such an effect could not occur if only magnetic dipoles or even-numbered magnetic multipoles were present in the aqueous solution. Only the presence of magnetic monopoles or odd-numbered magnetic multipoles could have produced such a result (by causing such species to be attracted and displaced over a significant distance towards or away from the DC magnet under the jar).

(2) In thermodynamics, one of the most important quantities is the Gibbs free energy, G(P, T, c, etc.), in terms of the intensive variables P (pressure), T (temperature) and c_j (concentration of j-species for j = 0,1,2…m) of the system. An important derivative quantity is the neutral species chemical potential for the j-component defined as

$$\mu_j = \left(\frac{\partial G}{\partial c_j}\right)_{P,T,c_k (k \neq j)} = \mu_{0j} + kT \ln a_j \qquad (8a)$$

Here, $a_j = \gamma_j c_j$ is the thermodynamic activity of the j-species and γ_j is called the activity coefficient of j, k=Boltzmann's constant and μ_{0j} is the standard state chemical potential for the j-species. In this regard, one can incorporate the AC (alternating current) $\underline{E}$ (electric field) and $\underline{H}$ (magnetic field) energy storage, $\Delta\mu_{0j}$, into the μ_{0j} term or the γ_j term where

$$\Delta\mu_{0j} = -\frac{\hat{\upsilon}_j}{2} \frac{d}{dc_j} \left\{ \varepsilon \underline{E}^2 + \hat{\mu} \underline{H}^2 \right\} \qquad (8b)$$

Here, $\hat{\upsilon}_j$ is the molal volume of j, ε is the electric permittivity of the medium while $\ddot{\mu}$ is its magnetic permeability. For ionic species rather than neutral species, one uses the electrochemical potential, η_j, defined as

$$\eta_j = \mu_j + z_j |e| V \qquad (9a)$$

where V is the electric potential (voltage), e is the electron charge and z is the ion valence.

The foregoing paragraph applies to our normal, present-day world level wherein the electromagnetic (EM) gauge symmetry state is at the U(1) level. This means that standard Maxwellian EM applies and only one internal space parameter, the phase-angle for the electron wave-function, needs to be defined to satisfy the U(1) requirement. For an IIED-conditioned space, the experimental data indicates that the thermodynamic free energy level moves away from that for the U(1) state given by Equation 9a and must now be defined by

$$\Psi_j = \eta_j + \delta G_j^* \qquad (9b)$$

In all probability, δG_j^* is given by

$$\delta G_j^* = q_{mj}\phi_{mj} \qquad (9c)$$

where q_m is the instrumentally accessed magnetic charge and ϕ_{mj} is the magnetic potential for the j-species. This new magnetic potential is definitely not the vector potential A of standard U(1) gauge electrical engineering. It is the magnetic charge analogue to the electric charge-created voltage, V, given in equation 9a.

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