Bridges

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Bridges, *the ISSSEEM Magazine, is published primarily for the purpose of establishing a professional resource for practitioners and individuals who are interested in the study of informational systems and energies that interact with the human psyche and physiology, either enhancing or perturbing healthy homeostasis.*

The Magazine is published quarterly and includes theoretical or informational papers, short research articles, case studies, reports, book reviews, and interviews with leading figures in the study or uses of subtle energies. Readers are encouraged to submit manuscripts to be considered for publication. Articles should be related to subtle energies and/or energy medicine and may range between 500 and 2500 words.

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The Quantum Plenum:
The Hidden Key to Life, Energetics and Sentience[1]

Mark Comings

Mark Comings is a theoretical physicist and engineer who has been working to more deeply understand the nature of what is conventionally called "Energy." He has also delved deeply into the world's spiritual wisdom traditions and has discovered deep congruences with many scientific principles. For over 25 years he has been working to articulate a coherent, mathematically rigorous, clear, precise and comprehensive spirit-based science (or science of consciousness) that can serve to bridge and resolve the long standing conceptual and epistemological rift between science and spirituality.

For a long time, I've been aware of some fundamental mysteries around energy. First of all, the basic question: what is energy? This is a big topic itself. But in the context of living systems, the problem or the challenge is to really understand energy as it pertains to organisms; this is known as bio-energetics. The question here involves not only the issue of the nature of energy but understanding precisely how living systems engage with energy; how they're powered so to speak. This is a central feature of the mystery of life itself, and it is far from well understood.

Jim Oschman has directed me to some very interesting research that indicates clearly that this matter is far from settled. The fact that there are some serious gaps in our understanding of the bioenergetics of life has been more or less conveniently forgotten by the life sciences. As an example; there is the basic question of how do we as organisms move? Or put more specifically: Where does the energy for muscle contraction come from? Well, there is a standard model, which is the reigning paradigm. It says that the high-energy phosphate bond of adinosine triphosphate (ATP) is the immediate energy source for all biological processes. If you ask most biologists, this is where the conversation starts and very often ends. Everything involving living systems is seen as being driven by this chemical reaction going on inside the mitochondria of cells. The mitochondria are thought to be the dynamos of the cell, and to power living systems. And muscle contraction is the example that is usually used to show how this works.

A. V. Hill was the noted British physiologist and bio-physicist who received, with Otto Meyerhof, the Nobel prize in Physiology or Medicine for discoveries concerning the production of heat in muscles. In 1950 and then again in 1966 he challenged biochemists to account for the source of energy for muscle contraction.[3,4] In other words it hadn't yet been accounted for, in his opinion. By the first law of thermodynamics, in a closed reaction system, the heat plus the work produced must be equal to the sum of the energy. That's the first law of old paradigm thermodynamics and it has some relevance.

In 1962, Davies and colleagues showed that ATP really does break down during the contraction of muscle.[5,6] Here they were actually moving toward quantifying the hypothesis.

In 1970, Jim Oschman heard a lecture by D. R. Wilkie at Woods Hole. Wilkie described experiments that enabled him to determine how much ATP was consumed during a single muscle contraction. He had to rapidly freeze the tissue in order to get these quantitative measurements. Wilkie and his assistants showed the relation between heat produced and the ATP and phosphorylcreatine splitting during the isometric contraction of frog muscle.[7] Wilkie's experiments have shown that ATP splitting does not produce enough energy to account for all the heat plus work liberated during this contraction.[8] The difference is referred to as the "unexplained energy." The total energy liberated during muscle contraction cannot be entirely accounted for by ATP or PC splitting, therefore Wilkie and others concluded, "additional reactions during contractions are not yet known but must occur."[9,10]

There is something missing in our understanding of bioenergetics. This is just one example. Jim Oschman, who is such a thorough researcher of literature, said he went to the citation index, to see if anyone had cited these two

review papers. They were not cited, thus the problem has been conveniently forgotten.

Though there are many ways that this unexplained energy could be accounted for, the important thing is that it has not yet been accounted for and that there is in general very little awareness that there is even a problem.

The obvious scientific approach to solving this problem would be to try to find the additional chemical reactions that can account for the unexplained energy that is involved in muscle contraction. This is a worthy research pathway but I want to talk today about another direction from which possible explanations for this gap in our understanding of basic bio-energetics could come.

When contemplating this issue of the energetics of life, the energy in the quantum vacuum state that is embedded in the very structure of space itself immediately comes to mind. This is something I've been focusing on and studying for a very long time as a physicist. It is turning out to be central to one of the great conceptual revolutions happening in science right now. This revolution in our thinking about fundamental processes has to do with the discovery of the quantum vacuum state and assimilating the vast implications of this discovery into the frameworks of physics, chemistry, biology and science as a whole.

There is now widespread recognition that the quantum vacuum is not really a vacuum at all because it's actually filled with enormous amounts of energy and potential. In fact it is so full of energy that calling it a vacuum (which means a total emptiness or vacuity) is a serious misnomer, thus I prefer to refer to the quantum vacuum as the "quantum plenum" as a way of reminding us of what we are actually dealing with. The word plenum means an absolute fullness and that's what we've got with the quantum plenum. It appears that the fundamental nature of so-called empty space is enormously energetic. Space is, in fact, a very energy dense medium filled with radiant potential to degrees that far exceed, by many orders of magnitude, the energies constituting matter. I believe that this issue directly bears not only on bio-energetics, but indeed goes to the very heart of the nature of life itself.

The fact is that there is more to life than simply mechanical dynamics, and this "more" is what we at ISSSEEM have been calling "subtle energy." Yet we are very aware of how hard it is to rigorously integrate this into our existing scientific paradigm. A number of new ideas coming from physics have fundamental applications for biology. They involve a deeper appreciation of the nature of space and light.

For instance, by many estimations, there abides in one cubic centimeter of empty space an amount of energy greater than the total amount of energy contained or expressed in all of the matter in the known universe. This is a very, very profound point to seriously contemplate in our attempts to understand, not only the missing energy in bioenergetics, but the nature of life itself. I want to take some time here to explore what this might mean.

In 1963, John Archibald Wheeler in his book, ***Geometrodynamics*** came up with a calculation by applying the principles of general relativity to the quantum realm.[11] He was looking at particles, not as just objects of matter, but as points of extreme curvature in the space/time continuum. This means that matter itself may be nothing but space in a highly curved or distorted mode. He was exploring the idea that all matter may simply be the topological or geometric dynamics of emptiness. [His calculation in this very brilliant book has been improved upon and developed by many physicists since then]. He computed the amount of energy present in one cubic centimeter of space, and he examined the amount of energy of the quantum fluxuations as you go down towards the planck length. The planck length is10^{-33} centimeters, an extremely short distance. It is, in fact a distance at which space and time, as we know them, break down into a turbulent froth of fluctuations sometimes called the quantum or sub-quantum foam. At this scale there exists a very dynamic realm of fluctuations, and when you add up the total amount of energy that can actually do work from those fluctuations, you end up with a number that's 10 to the 94th power grams per cubic centimeter. That's 1 with 94 zeros behind it. Now notice this is grams, a unit of mass. But as we know $E = mc^2$. So this huge number is the m in the equation and in order to get E, you have to multiply it by c^2, which is about ten orders of magnitude more. c^2 is a large number that serves as a conversion constant between mass and energy. And so that brings us to 10 to the 104^{th} power ergs of energy, which is present and pervading and potentiating every cubic centimeter of space. That is so much energy, one is challenged to merely contemplate it. It is estimated that the number of atoms in the visible universe is somewhere in the order of 10 to the 80^{th} power. So this is 24 orders of magnitude beyond that, but we're talking about grams here. A gram can include many many trillions of

atoms. I did some calculations and it is accurate to say that if you took all the mass in the visible universe and fissioned it into pure energy, into pure light, and then you took all that energy and you compressed it into one cubic centimeter, you still have to add about 24 orders of magnitude (or zeros) to get to the magnitude of energy enfolded in the potential of a single cubic centimeter of space.

I've spent over twenty years trying to wrap my mind around what these extraordinarily large magnitudes attributed to the sub quantum level could actually mean. And I've really explored it in quite a bit of depth. It points to the fact that we (i.e. our bodies) are arising in the midst of an infinitely coherent field. With the energy density of the quantum plenum being so extreme, it must be an immensely coherent field. Perhaps infinitely coherent! I think it's safe to say that, but that may be partially inaccurate because you know infinity is a big concept. But I think as far as we're concerned, dealing with a number like that, it might as well be infinite. It's at least a pretty good approximation compared to the human scale of things. So we can ground our consideration of this space in which our bodies, all life forms, as well as all forms in general are arising in the midst of, by recognizing that it is a very profoundly coherent field . . . much more coherent than matter which can be thought of as arising as deformations or asymmetries within this immensely coherent and radiant quantum plenum.

To continue elaborating the significance of this extreme energy density, let's consider that the density of water is by definition 1 gram per cubic centimeter. The density of our bodies which are mostly water is slightly more than that but not that much more, perhaps 2 to 3 g/cm^3 if you include our bones. The density of lead is just a little more than 11 g/cm^3, which for us is considered heavy. Now what is the heaviest or densest form of matter that we know of? It is the proton itself in the nucleus of the atom and/or a black hole. Protons are very tiny but they contain most of the mass of a given atom. Most of the atom, when measured from the outer electron orbit, is empty space, which from this new perspective is anything but empty. The density of the proton is actually around 10^{16} g/cm^3 and interestingly that is also the estimated density of a black hole, causing some physicists to speculate that protons and neutrons (which have only a slightly different density than the protons) making up the nuclei of atoms are in fact mini black holes or singularities. Now the fact that the densest known forms of matter have a density of 10^{16} g/cm^3 is most interesting in light of the fact mentioned above that the estimated energy density of the quantum plenum of space is on the order of 10^{94} g/cm^3! That indicates a highly curious fact: that the energy density of the space that we are presently pervaded by is 78 orders of magnitude (78 zeros) greater than the density of a black hole or the proton! This stunning fact is generally being ignored by a materialistic science that, instead, is focusing entirely on the tiny dynamic modifications on the surface of this powerful field of radiant wholeness that we call matter, and forgetting about the rest of the field, which although invisible is saturated with immense energetic potential.

I simply want to initiate this issue as a topic of serious consideration, exploration and discussion for this organization. I would like to see us all join together in a creative cross-disciplinary effort in bringing forth this new context involving a deeper appreciation and understanding of the fundamental nature of energy as evidenced by the mysterious potency of the quantum plenum and then bring these new ideas to bear on many areas of scientific interest, e.g. issues such as bio-energetics. We need to clarify and illumine the domain that we have been referring to as "subtle energies," the "life force" and the biofield.

I feel that we can do this in a way that is congruent with what our great spiritual wisdom traditions are telling us about the fundamental nature of Reality which is often referred to as Spirit, a non physical field that is the ultimate source of all that temporarily arises into form. For me it is a huge fringe benefit when our scientific models are elegantly in phase with spiritual wisdom. That is the sign that we are on the right track of the new synthesis that we are searching for.

The articulation above by Wheeler of the energy density of the quantum plenum is only one of many different approaches in conceptualizing the nature of space at the sub-quantum level. There is the general recognition of space being filled with what is called zero point energy, which is typically conceived of as being purely electromagnetic energy. It is called "zero point energy" because it was discovered that even at or around absolute zero which is, by definition, the temperature where all thermal motion is supposed to cease, there is still this irreducible motion which is clearly non thermal in nature. This energy was thus named the zero point energy and it has became abundantly clear that it

is a fundamental feature of the ultra microstructure of space. The zero point energy spectrum is homogeneous (uniform) and isotropic (identical in all directions) as well as ubiquitous (being present everywhere). It also has the interesting property that the intensity of the energy at a given frequency is proportional to the cube of that frequency.

This is significant because it results in the intensity of this energy spectrum increasing exponentially with higher frequencies, resulting in an infinite energy density that fills all of space. This is just another way of approaching the fact that we are inescapably immersed in a field of nearly infinite energy density in the guise of what appears to be a rather neutral empty space.

The standard approach of looking at the zero point energy filling all space as purely electromagnetic in nature, in my opinion brings with it an unnecessarily limiting assumption. Speaking of electromagnetism in general, we all know that subtle energy cannot be reduced to electromagnetism. There is something about the life force that includes, yet transcends, electromagnetism. The Biofield is not explainable in a satisfactory way solely as an electromagnetic phenomenon. This is part of the reason that ISSSEEM was formed, to address this mysterious domain that is intrinsic to life processes that cannot be reduced to purely electromagnetic phenomena as they are typically understood in the physical sciences. This brings me to another important aspect of the quantum plenum: it's radiant aspect.

It is very important to note that the quantum plenum is also primarily characterized by radiance, which means light. But there is overwhelming evidence that there is more to this light-energy of the quantum plenum than what can be fully accounted for by the standard models of the electromagnetic spectrum. Our existing models of electromagnetism have great power and utility but it just may be that their usefulness is limited when applied to the ultra microstructure of the quantum plenum. There is a tendency for us scientists to become electromagnetic reductionists because we have such a strong grasp of the electromagnetic field: we can measure it, we understand a lot about its behavior as part of the material universe and have very sophisticated theoretical models of how it operates. Electromagnetism is broadly applied to many areas where it seems to fit. It turns out however that these models are not as comprehensive or consistent as one may think. Upon careful inspection, our understanding of electromagnetism has numerous holes, omissions and internal contradictions within it. New phenomena have been discovered that call for extensions and expansions of our models of electromagnetism. There are aspects to our basic models of light that do not always correspond to empirical data. It is important to remember that the map is not the territory and that we may need to extend and adapt our cartography when it comes to these mysterious micro realms of the quantum plenum. Even our models of basic electromagnetism or 3-dimensional light need more work. What we call Maxwell's equations actually leave out a whole oscillatory component of light, the longitudinal component. So we have been operating from a truncated model of even 3-D light. That is to say nothing about our models of higher dimensional light, which are hardly ever seriously considered, and yet they may end up being the most important of all in the long run. There is clearly more to light than meets the eye!

There are additional aspects of light that are deeply connected to the mystery of awareness or sentience itself. Electromagnetism is the light that we see with our eyes or measure with our 3-D instruments, but what of the light of consciousness, or sentience itself, which enables us to be having an experience in the first place? This has been called the "inner light" by many spiritual traditions. I believe that hidden within the mystery of light (as well as space) there lies the potential for an elegant precise and deeply satisfying resolution of the long standing rift between science and spirituality. Consider for a moment that this inner light is not just a poetic metaphor but is in fact a real light that is just different from the outer 3-D light of electromagnetism. Taking this step out of the third dimension in our conceptualizations of the phenomenon of light is a huge step in the right direction in my opinion. It seems to me a very simple and elegant yet profound conceptual leap to conceive that this inner light is actually higher dimensional light and has a physics to it which can be elucidated mathematically. Consider that this higher dimensional light is distinct yet connected to the ordinary and familiar electromagnetic field. What is this connection? This is an important question. If you add new degrees of freedom (i.e. dimensions) to our equations of light you get a higher dimensional description of light which which operates within and comprises a higher dimensional embedding space. Standard electromagnetism is a dynamic subset of this space, resonating within the parameters of 3 dimensions. To put it simply, consider this rough analogy: perhaps ordinary three dimensional light or electromagnetism is a crystallized and condensed form of this higher dimensional or inner light in a similar way

that mass is understood to be a crystallized and condensed form of energy. So this higher dimensional "inner light" and electromagnetism are not really separate but are distinguished by the dimensions in which they operate. If this is true, there is a critical part of the energetic step-down process into matter that we have ignored because it involves higher dimensional light and we are a very 3-dimensionally focused species at this time. So much so that taking higher dimensions seriously, i.e. as real, is not the norm. Perhaps there is a relationship between this higher dimensional light and electromagnetism that is analogous to the relationship between matter and energy. "Subtle energy" may refer to subtle effects that these higher dimensional levels of light have on or around living systems. But this implies that there is a special attraction or connection of some sort between living organisms and this higher dimensional light that is not the case with inorganic matter. We will consider this unique coupling between organisms and these higher light fields in more depth shortly.

An important question to pose here is: how do we explore these higher dimensions? Besides using our intellect and imagination to contemplate the structure of higher dimensions as abstract mathematical and geometric structures, we may simply look within . . . because "in" is "up" dimensionally! The mystics and sages say that the more deeply you can direct your attention to inner space the more you find freedom—inner freedom. The physicists tell us that higher dimensions are equivalent to higher degrees of freedom. That is an interesting co-relation. I believe that hidden within the mystery of light there lies the potential for an elegant precise and deeply satisfying resolution of the long standing rift between science and spirituality as well as a much deeper understanding of the deep nature of life and living systems. A simple and obvious way to begin thinking about this is to presume that there are forms of light that have greater degrees of freedom than the light of the electromagnetic spectrum. This simple assumption opens up a rich new territory for the mapping and understanding of radiance that includes yet transcends standard electromagnetism, as simply the three-dimensional aspect of a multi-dimensional radiant phenomenon that surpasses the perceptible world in it's activity and dynamics.

In order to begin to understand the mysteries of life we must begin to seriously and comprehensively think of life as an interdimensional phenomena with the familiar third dimensional material bio-crystalline matrix being only the material base or foundation of a multi-dimensional process or psycho-energetic dynamic that spans many higher dimensional spectrums of light.

What we know from physics about the quantum plenum is that it is a dynamic medium characterized by enormous amounts of luminosity; that space is literally efflorescing with what are called vacuum photons. That means that light is being emitted by space itself, and emitted in great quantities. These so-called vacuum photons or virtual photons are spontaneously arising and then being re-absorbed back into the quantum plenum extremely rapidly. Space is thus a dynamic radiant medium characterized by the emission and re-absorption of light. If you calculate the amount of vacuum photons being emitted in the space where you are sitting, it is a hundred times the intensity of the light coming off the surface of the sun. That's 100 times the brightness of the sun's corona! So we are sitting, that is we are arising, in the midst of this bright radiant matrix that has this infinitely coherent and highly energetically potentiated quality. Is it an outrageous idea to consider that this might have something to do with energetics of life at a fundamental level? This new perspective challenges us to reconsider the fundamental nature of energy itself. Looked at in the context of the mystery of life, understanding the central role of the quantum plenum brings us to a radically new perspective. By radical I mean, in the true sense of the word, going to the root of things. Living systems are, thus, not arising in an empty vacuum; quite the contrary.

We know that living organisms are literally efflorescing with bio-photons which are more and more being understood to be fundamental to their functioning. Looking at life in the context of the quantum plenum we can say that because space is also itself radiating an enormously intense flux of vacuum photons they must be pervading and thus somehow influencing living systems in fundamental ways that are not yet comprehended. Perhaps all this work going on in bio-photonics needs to be contextualized within the pre existing radiant flux of vacuum photons . . . or what I would prefer to call "plenum photons" . . . a large flux of which characterize the nature of space at a fundamental level.

Another unifying perspective is to look at all matter, all of manifest material existence as being a crystalline or para-crystalline manifestation. All mass can be seen as a crystalization spontaneously arising out of this radi-

ant field. It is known in physics, though not emphasized enough, that when two photons of the right energy interact at 90 degrees out of phase with each other they mysteriously join and become an electron! Two mass-less photons become an electron that has mass! It really begs the question: what exactly is mass? It is apparently some sort of geometrodynamic or topological modification of this field of radiance. Electrons can also spontaneously dematerialize back into two massless photons 90 degrees out of phase with each other. So mass is in a very real sense crystalized and condensed light. The nature of mass can be thought of or modeled in numerous ways but the most promising approaches appear to look at mass as geometric and or topological distortions of the plenum, seeing mass as arising due to dynamic asymmetries in this massless field of radiance. Mass can also be seen as quasi-stable vortices or vortical dynamics arising in this luminous medium which also has the characteristics of an incompressible super fluid aether. The frontiers of quantum biology are calling us to fundamentally recontextualize our understanding of life to be in alignment with our latest conceptualizations of the nature of matter or mass itself. In this model, mass is a dynamic modification or quasi-stable dynamic field asymmetry of the indivisibly coherent and thereby invisible background field of space itself. Space, not in the conventional sense of an insignificant nothing or vacuum, but instead space understood as a highly energetic medium that has the characteristics of an incompressible superfluid aether that can support sustained vortical dynamics due to its property of zero viscosity. That is what superfluidity means; it refers to a special kind of fluid with zero viscosity. Similar to the way that superconductivity occurs when a material substance has zero resistance, viscosity is the fluidic analog of resistance in solid matter. So a superfluid is a resistanceless fluid with no viscosity. The quantum plenum of space fits the bill for such a superfluid medium as it has no viscosity. That means that a vortex in it would spin forever and never dissipate. Vorticies dissipate due to the friction and resistance to flow caused by viscosity; no viscosity, no dissipation. One can actually think of the quantum plenum of space as being like an absolutely transparent fluidic medium, like a liquid diamond with zero viscosity, in which we and all creation are swimming. Our bodies and all matter composing the cosmos are thus arising as quasi-stable vortices and turbulences in this highly coherent transparent medium that we rather naively call "empty space."

We need to keep our minds open to the real possibility that there is more to the quantum plenum than just the electromagnetic zero point fluctuations and that this "more" may have to do with the fundamental pre-electromagnetic nature of energy at this level. In this connection an exploration of the geometry and topology of the quantum plenum may bring forth new insights into the deep nature of life itself.

This creates a genuine new area of scientific exploration that we could call "plenum biophysics." This is a wholly new context in which to think and re-think about the problems presented to us in biology as well as to re-conceptualize the ultimate nature of life and the physical world in general. In mystical, non-technical language, this context is the context of "infinity and eternity," a context outside or beyond conventional space-time, free of the ordinary constraints of 3-D space, and which is supersaturated with enormous vibrant potential. In this context, all matter (inclusive of living systems) may be conceived of as arising from a pre-physical substrate or domain of pure potential energy—a kind of "pre-energy" underlying all material forms—providing a vibrant radiant matrix, a sentient medium that is the source of the mysterious aspects of the subtle energetic forces enveloping and sustaining us.

Plenum Biophysics can be explicitly integrated and applied to our developing models of life and the bioenergetics of cells and organisms, giving us a marriage between physics and biology at the most fundamental level.

An important note here is that there are presently around the world a large number of people claiming to be tapping into the zero point energy filling space and drawing useful electrical power from this field. This is a highly controversial domain of research yet quite significant in its implications, namely that it is possible to extract useful energy out of the quantum plenum. This area of research may provide us with a seminal clue that could help answer or at least provide a new context within which to find the answer to the question of "where does the unexplained energy that drives muscle contraction (and presumably a much broader range of biological processes basic to life) come from?" It is very possible if not highly probable that this missing energy may come directly from the quantum plenum, and that living organisms are in fact uniquely geometrically designed at the molecular level to function as bio-crystalline transducers that tap into, channel and utilize the zero-point energy of the quantum plenum for essential aspects of their energetic functioning. This transductive bio-coupling with the quantum plenum may be a central yet so far largely unrecog-

nized feature of the mysterious nature of life, a hidden source of the capacity that enables living systems to do the many remarkable things that they do that distinguishes them from non-living or inorganic systems.

From the point of view of plenum biophysics we can now shed some new light on the long standing mystery of the nature of the division between living systems and organic matter and so-called non-living systems considered inorganic and often thereby called "inanimate." The difference between organic and inorganic matter has never satisfactorily been understood. Both systems are composed of atoms that are in the same periodic table of elements. Plenum biophysics sheds new light on the long-standing mystery of the difference between living and non-living matter. Both systems are composed of atoms that are found in the same periodic table of elements. Yet there is an obvious difference not yet understood with enough clarity. How can certain groupings of atoms participate in the dynamic activity that characterizes organic matter, including the molecular synthesis of large polymer chains, the elaborate formation into cells and DNA helixes that replicate, the activity of metabolism from photosynthesis to the oxidative phosphorylation cycle to respiration, which drives the electron transport cycle by which ATP is created, which provides an energy reaction based on the breaking off of phosphate groups from a phosphate chain in the molecule? This reaction enables the remarkable capacity for the building of complex proteins, motility, muscle contraction (in part), and the capacity for regeneration, repair & reproduction that characterize organic life from the individual cell to entire organisms. Interestingly there are vast numbers of groupings of inorganic atoms that simply cannot and do not participate in such dynamic self-organizing activity at all. There must be some subtly hidden feature within the chemistry of life that enables this remarkable energetic patterning that is characteristic of life. It is reasonable to presume that there may be something about organic chemistry (which is primarily composed of Carbon, Hydrogen, Oxygen & Nitrogen atoms: C-H-O-N) that induces or makes possible some kind of as yet not clearly understood direct energetic exchange with the quantum plenum of space that provides the basis and enables the self organizing dynamics that characterize living systems. This dynamizing "something" is perhaps the essential feature of this not yet satisfactorily understood distinction between living and non-living material ensembles.

There may be something special about the geometry of organic bio-molecules that enables them to somehow resonantly engage with the quantum plenum and couple into and access the vast field of energetic potential residing there. This energetic life current drawn directly from the quantum plenum enables organic matter—as opposed to inorganic matter—to self-organize, draw more atoms into the organizing field, overcome entropy and undergo syntropic evolution toward higher levels of complexity and orchestrated order. The bio-crystalline geometries of living organisms should be investigated with this hypothesis in mind. Perhaps there exists a kind of geometry or pre-geometry enfolded in the implicate order within the plenum of space that organic matter resonantly engages and couples to? Perhaps this kind of organic bio-transduction process accounts for and literally induces the mysterious subtle force field, which is called variously the life force, chi or the biofield that accompanies living systems. The autopoetic self organizing behavior of living systems may be fundamentally enabled or driven by just such an energetic exchange with the geometrodynamic topologies of the quantum plenum of space.

There may be something geometrically unique about the C-H-O-N based living matrix that comprises organic chemistry, that has a specific capacity to energetically, geometrically and even perhaps topologically engage and transduce energizing streams of aetheric current from the quantum plenum, which can be described as a super-fluid aether, and thereby utilizes this extra energy in fundamental energetic processes involved in the maintenance of living systems. This may be exactly what the life-force is actually comprised of: flux currents of the superfluid aether of space that are inductive to flow into the molecular assemblages of organic matter, which by their unique geometries, are rendered "plenum interactive" and act like waveguides for the induces flux of the quantum plenum conducting it through the organism in ways that enliven and support its living process.

It is becoming clear that our most fundamental understandings of life must be inseparable from our developing understanding of the fundamental nature of space, time, mass, light and energy.

This coherent field of the quantum plenum has the property of a fundamental pre-quantum coherence. This may well be the underlying source of and basis

for the important property of quantum coherence, a factor which is of fundamental importance in understanding the living matrix of organic matter. This phenomena of quantum coherence is a situation in which a large assemblage of quantum states comprising atoms and molecules come into a stable quantum phase relationship, such that together they act as if they were in a single larger quantum state, amplifying quantum phenomena into the macroscopic domain so that quantum phenomena manifest and become operative in domains typically dominated by the rules of classical physics. Examples of this kind of quantum coherence are superconductivity, superfluidity and lasers, all of which manifest phenomena characteristic of the quantum realm in the macroscopic domain.

Another useful conceptual framework to explore relative to the interface between biological organisms and the quantum plenum is that living systems may well resonantly couple into the higher dimensional light, which is enfolded within the quantum plenum, and thereby may be able to translate and thereby contribute some of its higher dimensional pre-energetic topological potential into the energy that drives living systems. This model necessarily involves some fundamentally new or extended concepts of the nature of energy. This is an important area for future research. Understanding the nature of energy more deeply will give us a richer context within which to understand the nature of life. Perhaps the source of the "unexplained energy" driving living systems has been missed because is not located in the third dimension. It is perhaps invisible and non-linearly enfolded into the dynamic quantum plenum. In other words, the power source for certain aspects of living systems may be a higher dimensional potential which may be somehow translated into utilizable energy in living systems.

The exact nature of the bio-coupling mechanism that translates the indwelling energy potential of the quantum plenum into useful bio-energetic currents has not yet been adequately articulated or even conceptualized. Nevertheless, I believe that we have a powerful clue to this mystery in the fact that there lies an indwelling reservoir of immense energy within the very structure of space itself, which radiantly pervades all living organisms, as well as all that arises into material form. It is clear that material form—mass and matter—is in fact nothing but a specific class of dynamic modifications of this pervasive medium which we call space. It is worthy to note that this perspective is precisely congruent with the perspective articulated in the Heart Sutra of Buddhism considered to express the pith essence or Heart of the Buddhist teachings: "Form is nothing but emptiness—emptiness is nothing but form." We are here beginning to see the outlines of a very elegant rapprochement between our emerging scientific models and time honored spiritual wisdom.

It is interesting to note that light and space are two great common metaphors that mystical spirituality (which has surpassed and/or transcended anthropomorphic conceptions of God) uses to refer to the nature and divinity of being. These are also two areas of focus in science that are undergoing fundamental new thought and re-definition. It is thereby interesting to look at whether these new and emerging scientific perspectives can offer us an opportunity to redefine our scientific framework in ways that are more congruent and continuous with the spirit based frameworks of our spiritual traditions. This new adaptation of science to a context congruent with fundamental spiritual wisdom or "dharma" may also help us gain newfound clarity and deeper insights into the hidden depths and deeper meanings encoded within our spiritual wisdom teachings that have been around for millennia.

This brings me to propose another key feature of space. That is the recognition or understanding or active assumption that space is, at the most fundamental level, characterized by intrinsic sentience or a primordial awareness that is independent of matter and organisms. Taking this simple, yet profound leap by embracing this as a working assumption or hypothesis, in one sweep, removes and resolves a vast philosophical and epistemological rift at the core of modem science. We have been toiling under a matter-based paradigm in which matter is assumed to be fundamental and fundamentally insentient or inanimate. Yet somehow large assemblages of matter in the form of living organisms like ourselves are endowed with conscious awareness. How can this be possible? Science has generally presumed that consciousness is an epi-phenomenon of matter, that is, it is seen as a secondary derivative of matter, which is seen as primary. With our new understanding of the nature of matter as being derived from space, we have to wonder what role space plays in the mystery of consciousness or sentience. Could it be that space itself is conscious? Perhaps space or the quantum plenum is endowed with a kind of intrinsic sentience or awareness that is not derived from anything else, but is simply the underlying primordial condition of existence. What if Mind in its pure unconditional nature is co-extensive with space and manifests its dynamics via the effulgent display of manifest existence arising from the dynamic patternings of space.

This simple yet profound assumption, the assertion that space itself is fundamentally sentient, is not a new idea at all. It is explicitly stated as a fundamental principle throughout the world's spiritual and mystical literature. Yet taking it seriously as part of a new integral scientific perspective effects a sweeping unification of our scientific models with time honored spiritual wisdom and resolves a whole raft of philosophical problems automatically in the process. For example, it fundamentally impacts and alters the context of the so-called "hard problem" of how is it that we can be conscious at all. This problem is so "hard" because it is asked from a framework that presumes a material world that is inanimate and insentient and then tries to imagine how it is that such a world could give rise to beings that are able to have a subjective dimension of inner experience. How could we be conscious in such an inanimate world? Now that is a hard problem! But if sentience is understood to be intrinsic and primordial, pervading space, time and matter, then the question is turned around and it becomes hard to imagine how we could ever think that being conscious and having a subjective dimension to our existence is unusual or hard to understand at all. The point is that this is not hard to understand in such a new scientific framework which naturally embraces sentience (i.e. a basic kind of conscious awareness) as intrinsic to the very nature of space itself.

Perhaps the higher dimensions of "inner light" are also intrinsically sentient or aware and have even greater degrees of freedom to radiantly extend this effulgent awareness through the infinite expanse of being? Such perspectives are common in spiritual maps of Reality. However they tend to be ignored or marginalized as not worth taking seriously, as if they are not telling us something important about the nature of the field of being in which our universe is manifesting.

I hope that we can start to put the power of science in the service of the spiritual and emotional awakening and liberation of our species. This would powerfully support the process of awakening from the blindness and darkness of our collective ignorance, part of which manifests as our obsessive and myopic focus exclusively on matter in a way that it is seen as a solid and opaque end in and of itself. Science has really become obsessed with matter as if that is all there is to existence, while ignoring the even more substantial yet invisible underpinnings of matter that comprise what we perceive and conceive to be empty invisible space or nothingness pure and simple. One of the greatest discoveries in modem science is that this nothingness is something, a very substantial something in fact, the ignore-ance of which leaves us stranded in a very impoverished materialistic worldview. Such a worldview that sees space as a dead insentient vacuum is basically a worldview of scarcity, whereas with the discovery that space is a radiant plenum we can begin to establish, in a rigorous and scientifically sound way, a perspective that reveals that our universe is at bottom an infinitely abundant field of radiant potential. Taking this seriously has a huge impact upon not only our worldview but also, and perhaps even more importantly, upon our self-image. If we see that space is a dead empty void, and that we are utterly pervaded by this void such that our bodies are 99.99999 . . . with dozens of more 9's % empty void, what does that say about our ultimate nature or sense of who we are? Are we just our bodies or is there something more to who and what we ultimately are? Are we just a fragile atomic and molecular lattice suspended in the void, or is there something more to us than that? When we come to understand that space is a highly potentiated energetic medium shining with vast luminous force and shimmering with intrinsic sentience, this certainly engenders a completely different sense of what underlies our physical organism. This understanding can lead us to quite a different self image, to put it mildly. This infinite potential and radiance is continuous with who and what we are.

Such a perspective gives solid scientific footing to a fundamentally abundance-based world view which is a much needed antidote to the scourge of nihilistic materialism and the fear and scarcity-based world view that our culture suffers from and which is a major contributory factor to our species collectively behaving in ways that are a menace to our living planet. When you really understand that solid matter is not solid by any means, and your understanding of this can penetrate beyond just the intellect and enter the domain of direct experience or felt immediacy, matter, then, really can dissolve before our scientifically informed and experientially attuned eyes (and other senses) into an insubstantial web of interconnected fields that are actually arising from a much deeper, non-material, yet highly substantial source.

Such a rigorous and clearly articulated scientific perspective that sees through matter to it's deeper originary substrate in space is an important feature of a post-materialist science of abundance. This new spirit-

based science would be based in an indivisible and invisible unitive order, the ultimate nature of which goes beyond that which we know how to analyze. Requirements for making progress in this new science are more like yogic abilities than just intellectual acumen. Both are required and integrated together into a new disposition of scientific exploration. Such a disposition requires a sincere, tenderhearted determination and courage to investigate the immediacy of pure, uncompounded, direct, lived-through and felt experience. Because the field is sentient, it can actually be felt and even directly embodied as our ownmost being. This is a very important aspect of this new participatory science that distinguishes it from standard scientific approaches, which are often profoundly disconnected or dissociated from feeling, from the felt-sense of the bio-energetic qualities of our embodiment, and instead take place purely in the conceptual mind and abstract intellect.

There is abundant evidence from advanced practices of human energy cultivation that if we can become more aligned with this immensely coherent background field we begin to manifest some of these remarkable macroscopic quantum states in our own bodies and literally demonstrate miracles. Because in this new context many so called "miracles" and paranormal phenomena are very comprehensible, and would even be expected, in the context of a field of this much potential. The question then becomes, why are such demonstrations of coherence and radiance in the human energy system not more commonplace?

I feel confident in saying that this field is what people who have profound and transformative spiritual experiences have direct contact with and experiences of in a variety of ways. In certain states of integration and balanced unfoldment of our nervous system, we can enter into varieties of coherent states where we are able to directly sense the seamless coherence, radiant contiguity and boundary-less qualities of the quantum plenum. Such experiences liberate one from the dense confines and material limits of the organism—and allow one to feel one's continuity with this radiant edgeless field. Presumably it is this very field of the quantum plenum of space which mediates our human experiences of infinity, peace, bliss and unity with all existence. Such domains of experience are examples of actually touching, with our sensing body, this all-pervading coherent medium of the quantum plenum.

It is important here to point out that the ultimate new synthesis that we are aiming for requires not only new ways of thinking but new ways of sensing, it requires us to rehabilitate our capacity for sensing throughout our organism as a whole. We must learn how to drop out of the conceptual verbal mind and engage directly with our sense fields, our whole bodily felt sense. This enables us to directly feel the field that we are describing in this new phenomenologically interactive scientific model of reality.

In my opinion it is desirable to have a science that is phenomenologically congruent, that is, a science that is in phase with what it actually feels like to be alive. The actual feeling of being which is experienced via the whole body as a vibrant sentient unity, is something that is so important to pay attention to as a way of collecting "data" about the nature of this field that we must take into careful consideration as we evolve our scientific models. The fact that we can directly sense the field that we are discussing here in our model is an extremely important point to not ignore.

Another desirable feature of such a science of sentience would be what I call "phenomenological utility," meaning that our science would provide us with the direct means to deepen the qualitative richness of our felt sense of being alive in this moment. It would provide us not only with precise conceptual maps of the luminous energetic territory in which we are arising but also would provide us with a practical tool-kit of awareness practices for dilating and refining our feeling function, thereby enabling us to enter directly and deeply into experiencing this vibrant and blissful territory as a sensitized whole-body, as a feeling body-mind.

First we need to arrive at a new set of understandings that are at once scientifically lucid, conceptually clear and rigorously tied to empirical data as well as being phenomenologically congruent with our direct experience of being alive. We need to come together and unify around some very fundamental universals, which provide a primary common ground that we can all agree upon despite our use of differing mental maps of reality, be they scientific or spiritual. Then on that basis we can get on to the work of redesigning our whole planetary civilization in a way that is sustainable, just, peaceful and such that it can work for everyone into the far future. A new spiritual-scientific synthesis could provide just such a grounding for this kind of worldwide solidarity, and could serve to invigorate new kinds of planetary, cross-cultural and interfaith dialogs that could go a long way toward engendering peace and unity in our troubled world.

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I believe that a deeper comprehension of the centrality of the quantum plenum of space as a fundamentally important and yet often ignored feature of our universe provides a strong basis and fertile ground from which we can enhance our scientific maps of the phenomenon of life, as well as find deep commonalities between these new emerging maps and sacred and spiritual perspectives as to the ultimate nature of Reality.

The underlying feeling of being itself is an expression of this radiant, transcendental, all pervading plenum of pure being. This field is directly equate-able to unconditional love . . . it has no edges and we are all ultimately and indissolubly That! We are all dynamic emanations of this singular unlimited unified field that connects and is the source of all manifest existence . . . this is indisputable.

Ultimately we ARE the plenum! We are utterly continuous with this field; there is really no separation at all anywhere except in our divided and dividing minds. It is an artificial dichotomy to say that there's matter and the quantum plenum; there really is only this singular shining radiant field that takes the form of matter as an integrated complex of asymmetries or vortices arising in this field that otherwise remains ever present as pure coherence, as un-manifest force at infinity, invisibly shimmering with infinite potential which radiantly pervades us and all that arises into form, as it is the very source condition and ever-present context of all existence. It is this unified field of pure potential that holds great promise as a new vitalized yet rigorously model-able context in which to re-conceive and re-envision our deepest comprehensions of the phenomena of life.

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