

The Psychophysics of Consciousness: A Hypothesis

*"Hypothesis: a very poor choice of word
to designate the supreme spiritual act
by which the dust-cloud of experience
takes on form
and is kindled at the fire of knowledge."*

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Abstract

Gustav Fechner, the German experimental psychologist, coined the term psychophysics in 1860, publishing the first mathematical equation to model human consciousness.¹ Fechner assumed that any future approaches to consciousness would include mathematical and physical underpinnings. In 1995, the cognitive scientist and philosopher David Chalmers coined the phrase "the hard problem" as being that of connecting consciousness with some physical substrate. According to Chalmers, "The really hard problem of consciousness is the problem of *experience*. Most existing theories of consciousness either deny the phenomenon, explain something else, or elevate the problem to an eternal mystery."² As Chalmers points out, unfortunately, the modern scientific community has not yet produced a model of consciousness supported by mathematics and physics, thus no progress in Fecher's "psychophysics."

However there is growing interest among the scientific community in string theory, the only branch of mathematical geometry that has successfully explained recent discoveries in high energy particle physics. The mathematical proof of string theory requires the existence of a ten dimensional universe. But in trying to map consciousness, science continues to limit its data search within time and the three spatial dimensions, ignoring six of string theory's ten dimensions. Perhaps because mainstream science tacitly limits itself to four of the ten dimensions, progress has come to a dead end. Accordingly, the most widely accepted theory among neurophysiologists is that consciousness is somehow a "byproduct" of the electrical sparking of neurons, an accidental epiphenomenon of the activities of nerve-filled wet meat.

This paper considers data beyond the four dimensional constraints of the scientific establishment. It is my contention that many recorded accounts of philosophers, mystics, and shamans can and should be considered as data. My thesis is that these accounts express experience and observation within one or more of the additional dimensions predicted by string theory. Any advance in understanding consciousness must take into account not only the language and domains of mathematics, particle physics, and neurobiology, but also the experiential domains of philosophers and mystics. It is in regarding data from these multiple domains of inquiry that a new model of consciousness will emerge. In this paper I hypothesize a psychophysics of consciousness, woven of strands from mathematics, mysticism, and physics, as well as contemplative participatory practice, to address and solve "the hard problem."

Keywords: *Consciousness, the hard problem, psychophysics, integral, communication, Teilhard, Jung, Whitehead, Steiner, emf field theory, string theory, centration, isosphere, noosphere, Patanjali, centro-complexity, contemplation, yoga, samadhi, mantra, yantra*

¹ Gustav Fechner, *Elemente der Psychophysik* (Leipzig: Breitkopf and Hartel, 1860):

"In order that the intensity of a sensation may increase in arithmetical progression, the stimulus must increase in geometrical progression." or $P = k \ln(S/S_0)$, p. 6.

² David Chalmers, *Journal of Consciousness Studies* 2(3):200-19, 1995.

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1.0 Introduction: The Integral Approach To Consciousness

1.1 Fechner, Psychophysics, and the Hard Problem

*"... the whole material universe is conscious
in diverse spans and wavelengths, inclusions and
envelopments."*

G.T. Fechner

The term psychophysics first appears in a work by Gustav Theodor Fechner in 1860 in his ground-breaking *Elemente der Psychophysik*, a thousand page publication of results and conclusions from a decade of experimental work in his laboratories in Leipzig exploring the relationship of physical stimuli to contents of consciousness.³

Originally trained as a physicist, Fechner was an amazingly multi-dimensional character who wrote and published poems in French, introduced the concept of the *median* into the analysis of data, established several fundamental electromagnetic constants, and is recognized as one of the founders of experimental psychology. Fechner's "psychophysics" can be seen as Western science's earliest approach to "the hard problem."⁴ But in all of these areas of discovery Fechner was fully active as a participatory cocreator and a panpsychist: "Man stands midway between the souls of plants and the souls of stars, who are angels."⁵ And perhaps this is why his name, and psychophysics, has been largely ignored.

³ Gustav Theodor Fechner, *Elemente der Psychophysik*, Leipzig: Breitkopf und Härtel, 1860. Note: While early psychological/sensory testing apparatus was the work of many hands, the first methods, rationale, and systematic use of mental measurement was essentially the contribution of one person, Gustav Theodor Fechner.

⁴ David Chalmers, "Facing Up to the Problem of Consciousness", *Journal of Consciousness Studies*, 2(3):200-19, 1995.

⁵ Marshall, M.E. (1969), "Gustav Fechner, Dr. Mises, and the comparative anatomy of angels.", *Journal of the history of the behavioral sciences*, (1):39-58, 1969 Jan.

Fechner believed in the continual dance of transformation of energy and consciousness leading to eventual reunion with the origin, and wrote clearly concerning life after death: "... only when death loosens the knot and removes the body which envelops every living soul, will there be added to the union of consciousness the consciousness of union."⁶

The first mathematical equation to model a psychophysical phenomena is Fechner's Law (or the "Weber-Fechner Law"; being both humble men, Fechner referred to the law as "Weber's Law" and Weber referred to the law as "Fechner's Law"):

In order that the intensity of a sensation may increase in arithmetical progression, the stimulus must increase in geometrical (logarithmic) progression.

$$p = k \ln \frac{S}{S_0}$$

Figure 1. Fechner's Law

Fechner's Law indicates how perception varies with stimulation. The two are not linear, that is, twice the stimulation does not equal twice the level of perception. In the equation, the perception (p) caused by the stimulus (S) will *not* vary arithmetically (i.e. when graphed, it is a curve, not a straight line)⁷.

For example, if an originally stimulating sound (S_0) is quadrupled in strength to (S), the observing human perception (p) will only double. Fechner's discovery of this relationship produced the first application of a mathematical equation to precisely model a phenomenon in the domain of consciousness. "Fechner's Law" models perceptual sensation

⁶ Gustav Theodor Fechner, *The Little Book of Life After Death*, (Cambridge: Little, Brown, and Company, 1904), 50.

⁷ Note in Fechner's equation, that "k" is a constant, and "ln" indicates the logarithm of S/S₀.

with a mathematical equation. Fechner's work not only systematized an introspectionist approach to the exploration of consciousness, but produced an empirical mathematical model. Following Fechner's success, the founders of modern psychology worked with introspection as a valid tool of scientific inquiry late into the 19th century.⁸

However by the 1930s introspection was discounted by empirical materialists in favor of observable, repeatable stimulus-response relationships as being the only valid "evidence" to be accepted in any study of consciousness. Thus was excised the first person participatory observer from whatever the system of consciousness being studied and data collection (and consideration) limited to the domains of time and space (only four of string theory's ten dimensions).

Even more self-limiting is the the twenty-first century curriculum in which psychologists are taught to approach mathematics primarily as a tool used for the analysis of statistical data obtained through observations of behavior. There is no discussion of psychophysics or approach to the use of mathematics in the modelling consciousness or behavior. The abstract mathematics required for modelling is taught only in the physics, engineering, and mathematics departments.

Though Fechner and psychophysics seem to have gone into sleep mode by the end of the 19th century, nevertheless the great William James in his fascinating *Preface* to the 1904 publication of an English translation of Fechner's *Little Book of Life After Death* (originally published in German in 1834), predicts a striking trajectory for Fechner's thought:

⁸ Wilhelm Wundt in Leipzig in 1879 established a laboratory of experimental psychology using introspection as a primary method of collecting data, and in 1890 William James published the results of twelve years of introspection research in a two volume, fourteen hundred page work, *Principles of Psychology*.

His belief that the whole material universe is conscious in diverse spans and wavelengths, inclusions and envelopments, seems assuredly destined to found a school that will grow more systematic and solidified as time goes on.⁹

1.1.1 Physics, Psychophysics, and Psychology

The roots of psychology's dissociation from physics and mathematics can be seen, perhaps, as early as the 3rd century BCE, in the physical arrangement of documents by subject in the earliest Greek library. A Greek philosopher (actually a Greek librarian organizing the works of Aristotle along a shelf) ranked the works of physics and mathematics first, and even coined the word "metaphysics" *μετά* (*meta*) ("following after", "beyond") for the following, perhaps lesser subjects. Unfortunately, this early tacit split between physics and metaphysics has grown so acute that opportunities for a better understanding of the cosmos have been obscured through this early artificial segregation.

On this bookshelf where would we locate the subject of psychophysics? Perhaps psychophysics is in the center, between physics and metaphysics, a connecting bridge.

1.1.2 The "Hard Problem" and Panpsychism

The phrase "hard problem" seems to have been coined in 1994 by the physicist David Chalmers in the Times Literary Supplement:

The hard problem is that of *experience*: why does all this processing give rise to an experienced inner life at all? Even Crick and Penrose concede that so far they have little idea how the problem might be solved. They simply hope that if we do enough investigation in neuroscience (for Crick) or in physics (for Penrose), the faint outlines of a solution *might* be revealed. At this point, such remarks are not much more than an expression of faith. ... How can we explain why there is something it is like to entertain a mental image, or to experience an emotion? It is widely agreed that experience arises from a physical basis, but we have no good explanation of why and how it so arises. Why should physical processing give rise to a rich inner life at all? It seems

⁹ Fechner., xii.

objectively unreasonable that it should, and yet it does.¹⁰

For several decades, the generally accepted view of conscious experience is that it is a byproduct or emergent feature of an electro-chemical computational activity among brain neurons:

The status quo or the currently accepted view is that the substrate of consciousness emerges as a property of an ever-increasing computational complexity among neurons.¹¹

Terrence Deacon, in the closing chapter of his 2012 publication *Incomplete Nature*, in the chapter titled simply "Consciousness," exhibits this view in his opening sentence, in which he states, "The central claim of this analysis is that sentience is a typical *emergent* attribute of any teleodynamic system."¹²

This assumption that consciousness is an "emergent attribute" of lower-order forms (here Deacon gives examples such as neuronal sentience or the vegetative sentience of brainless organisms and free-living cells) finds virtual unanimity among the established scientific community. A striking example can be found in the words of Susan Greenfield, a British neuroscientist, commenting on an exposed brain she had been viewing in an operating theater:

This was all there was to Sarah, or indeed to any of us ... We are but sludgy brains, and ... somehow a character and a mind are generated in this soupy mess.¹³

¹⁰ David J. Chalmers, "Review of *Journal of Consciousness Studies*", The Times Literary Supplement, October 1994, 48.

¹¹ Jack A. Tuszynski, ed., *The Emerging Physics of Consciousness*, (New York: Springer-Verlag, 2006), 2.

¹² Terrence Deacon, *Incomplete Nature: How Mind Emerged From Matter*, (New York: W.W. Norton, 2012), 508.

¹³ Susan Greenfield, quoted by Rupert Sheldrake in *Science Set Free*, (New York: Random House, 2012), 213.

But isn't this really putting the cart before the horse? Could it not be sentience, consciousness, that activates the "soupy mess" of the brain, not the other way around?

Panpsychism, on the other hand, can be seen as an antidote to the extreme of logical positivism, though perhaps it is simply another extreme. Panpsychism is the assumption that sentience is to be found everywhere in the universe, that consciousness is the underlying strata of manifesting existence. Fechner shared his century's belief in panpsychism with such notables as Thales, Plato, Spinoza, Leibnitz, Schopenhaur, William James, Whitehead, and Jung. Although panpsychism fell out of favor and was displaced by logical positivism in the 20th century, it has re-emerged:

As philosophy moves into the 21st century, we may distinguish five viable approaches to panpsychism: (1) that of *quantum physics*, as initiated by Haldane in the 1930s and elaborated by Bohm, Seager, Hameroff, and others, (2) that of *information theory*, as developed by Bateson, Bohn, and Chalmers, (3) that of *process philosophy*, originating from ideas of Bergson and James, articulated in detail by Whitehead and further elaborated by Hartshorne, Griffin, and others, (4) that of *part-whole holarchy*, as envisioned by Cardano and developed by Koestler and Wilber; and, most recently, (5) that of *nonlinear dynamics*, as begun by Peirce and articulated by Skrbina.¹⁴

It is the contention of this paper that the theory of panpsychism, that sentience underlies every facet and dimension of the universe, must be accepted as foundational in any development of psychophysics in addressing "the hard problem."

1.2 The Participatory Approach

As we have discussed, modern science, with its reliance on the gathering of measurable, quantifiable evidence in four dimensions (when string theory itself posits at least ten), has excluded from consideration many categories of the very data that is required for development of a psychophysics. Direct introspective, participatory experiences are

¹⁴ David Skrbina, *Panpsychism in the West*, (Boston: MIT Press, 2005), 246.

excised from modern scientific consideration because they are assumed to be not measurable and not "objective," in the scientific, exclude-the-observer, approach. The acceptance of introspection had been challenged as early as the 1830s by Auguste Comte, who raised the objection that one cannot have an identity between the observer and the object of observation in science.

A century later, Comte's critique had morphed into logical positivism, with its emphasis on mathematical models and repeated experimental verification, while tacitly condemning the consideration of "data" derived from metaphysics, theology, philosophy, aesthetics, and ethics as simply meaningful nonsense. It is thus rare to find trained professional scientists in the 21st century who have interest (under the tacit threat of ridicule, censure, or unemployment) in focusing primarily upon the science of participatory consciousness in any concerted effort. Thus there have been few concerted attempts at mapping a cognitive consciousness that might truly bridge physics and metaphysics.

By the mid 20th century logical positivism was firmly entrenched in the scientific community, and research was focused not on consciousness but on the atomic and subatomic material world. Research flowed primarily from voracious military budgets, and funding went to experiments exploring the thermodynamics of steel and hydrocarbon chemistry, rather than with the introspective domains of consciousness and cognition.

Universities produced cognitive scientists to whom introspection as a tool was anathema. The exclusion of introspection and the insistence on separation of observer from observed limited data significantly, even affecting the curriculum in psychology programs, where mathematics became primarily a tool for statistical analysis of data collected in

behavioral experiments. This left few cognitive scientists with sufficient training in calculus and physics to model introspectively gathered data in the language of 'real science.'

However at the end of the 20th century Francisco Varela¹⁵ and other young cognitive neuroscientists begin to revive and renew enthusiasm for an introspective approach to the study of consciousness. Now, in the early 21st century, it is the participatory turn in psychology¹⁶ and religious studies¹⁷ and a participatory epistemology¹⁸ that argues for the reintroduction of the acceptance of introspection as a valid tool in the development of a noetic science of consciousness.

Participatory events that involve new ways of knowing have been characterized as being those "that are presential, enactive, and transformative. ... Participatory knowing is knowing by presence or by identity ... it embraces an enactive paradigm of cognition, and .. is transformative."¹⁹

It is a premise of this paper that an introspective, participatory approach is essential for obtaining the wide bandwidth of information necessary for discovering patterns in the dynamics of consciousness and upon which to construct our theory of psychophysics.

¹⁵ Francisco Varela, Jonathan Shea, *The View from Within: First-person approaches to the study of consciousness*, MIT Press, 1999.

¹⁶ Gregg Lahood, *The Participatory Turn and the Transpersonal Movement*, in *ReVision*, Vol. 29 No. 3, Winter 2007, 2.

¹⁷ Ferrer & Sherman (2008).

¹⁸ Heron, J., and Reason, P., "A Participatory Inquiry Paradigm", *Qualitative Inquiry*, 3(3), 274-294, 1997.

¹⁹ Jorge N. Ferrer, *Revisioning Transpersonal Theory: A Participatory Vision of Human Spirituality*, (Albany: State University of New York Press, 2002), 122.

1.3 String Theory and Multiple Dimensions

The modern scientific method tacitly confines itself only to consideration of data extracted from four dimensions plotted on grids, a method invented by Decartes almost four hundred years ago. Basically only data that can be plotted somewhere within these dimensions of space and time, are mapped onto Cartesian grid coordinates. This "scientific method" is a bedrock procedure in the majority of experiments. No other dimensions are considered, in general. However contemporary developments in particle physics and mathematical geometry presses against this self-imposed limitation to simply a four dimensional analysis of the universe.

In mathematical physics it is string theory that has become the most widely accepted contemporary understanding of the structure of the existing universe. String theory posits ten unique dimensions which neatly tie together all currently known particles and forces. Physicists had been discovering a growing number of previously unknown fundamental particles, for which classical mathematical geometries could not account. String theory is the only working hypothesis that has been found successful when applied to the problem of predicting and explaining the action and interaction between these the many particles. It is string theory, with its symmetry requiring six additional dimensions, that has consistently been used to solve the problem.

String theory's model of ten dimensions has been named the Calabi-Yau manifold.²⁰

Shing-Tun Yau, the Harvard mathematical geometer who helped envision and develop the

²⁰ A manifold is the mathematical expression of a geometrical "shape" (also called a topology). A proven manifold includes rich potential for connection and interconnection in non-obvious ways. For example, standing on the earth we perceive the shape to be flat, to be two dimensional. But Columbus and others have proven to our satisfaction that the Earth is really a sphere, that it is not a flat plane, but that it is continuously connected, has

proof for the Calabi-Yau manifold (now carrying his name) describes string theory in words as follows:

At its core is the notion that the smallest bits of matter and energy are not pointlike particles but are instead tiny, vibrating pieces of string, which assume the form of either loops or open strands. Just as a guitar is capable of playing many different notes, these fundamental strings can vibrate in many different ways. String theory posits that strings vibrating in different ways correspond to the different particles in nature as well as the different forces.²¹

String theory requires an additional six dimensions beyond the currently accepted four (the time dimension and three spatial dimensions), and it was Shing-Tun Yau and his Italian colleague Calabi, who developed a workable geometrical model of the ten dimensions which they named the Calabi-Yau manifold.

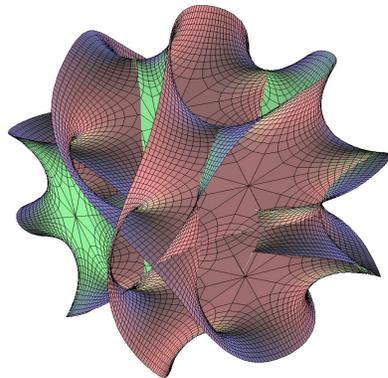


Figure 2. Two Dimensional "Section" of a Calabi-Yau Manifold²²

The ten dimensions are required to support the concept that the universe is composed, at the most fundamental level, of vibrating energy, vibrating like infinitesimally small strings, no hard lumps of matter we have been calling atoms and their various constituent "particles." The ten dimensions give these energy strings an

an inside an and outside. Mathematical geometers would classify the shape of the Earth as a "two dimensional manifold."

²¹ Shing-Tung Yau and Steve Nadis, *The Shape of Inner Space: String Theory and the Geometry of the Universes's Hidden Dimensions*, (New York: Basic Books, 2010), 124.

²² Image of Calabi-Yau Manifold retrieved on July 17, 2013 from http://de.academic.ru/pictures/dewiki/81/Quintic_1.png

enormously greater range of possible vibration scenarios, or degrees of freedom, than would energy strings vibrating in what we consider to be our "normal" spatial dimensions of up, down, forward, backward, and of course our fifth dimension, that of the supposed linear flow we call the time dimension.

That recent string theory posits ten or eleven dimensions in order to account for the observed dynamics of quantum particle physics, and contemporary experiments in particle physics have supported these additional dimensions, has not yet significantly impacted the traditional scientific established approach to consider only Newtonian, timespace data. Should the scientific community begin to accept data from these additional dimensions where would they begin to search? The contention of this paper is that the data is there enfolded in other dimensional domains, not typically considered (nor mapped) by modern industrial science research. We have the many verbal accounts, written records, and symbolic diagrams, all attempts at describing contact with and exploration of additional dimensions beyond the four mapped by classical physics. Such accounts are to be found in virtually every culture, globally, and throughout human history: the accounts, both written, verbal, and diagrammed, of what scientists might refer to as mystics, shamans, and saints.

1.4 Multiple Dimensions and Data Warehousing

Recently the concept of the data warehouse has evolved among software engineers working to provide tools for searching out correlations among rapidly increasing categories of data being collected. New database structures, called data warehouses, allow as many as 64 dimensions to be established and searched with multi-dimensional queries. These dimensions of data are categorically and qualitatively different domains, and yet parallel searches for interconnections and patterns can be extracted from this data through multiply-dimensioned

queries. Among software engineers, the search for pattern among multiple lines of data is called "data mining."

Using data mining techniques provides the ability to make queries and comparisons to reveal previously unperceived patterns. A similar approach is taken in this paper. Information from multiple domains is presented and "mined" for cross-correlations that may reveal new perspectives, strengthen our assumptions, and shed light on our theory of psychophysics.

1.5 Psychophysics and Integral Consciousness: Beyond Gebser

Jean Gebser, writing in Switzerland in the late 1940s, made the conjecture that consciousness itself is evolving, and that it is undergoing a mutation that will surpass the current mental rational stage. In *The Ever-Present Origin*, Gebser observed that the evolution of consciousness is indeed the underlying framework for human development.²³

Gebser observed that history could be measured in terms of unfolding structures of consciousness. He described how each of these structures reflects a cognitive paradigm or worldview through which human beings naturally progress. He suggested that the next structure of consciousness, the integral structure, was only now emerging, observable in only a very few historical and contemporary individuals, but that this evolutionary shift in the operation of human consciousness, once it reached a sort of critical mass (here we are reminded of Teilhard's Omega Point), would erupt in a radically new individual and global worldview, a new mode of regarding the universe and the human place within the cosmos. This emergent mode of human consciousness he described as an aperspectival, an integral

²³ Jean Gebser. *The Ever-Present Origin: Part One: Foundations of the Aperspectival World*. Translated by J. Keckeis. (Germany: Deutsche Verlags-Anstalt GmbH, 1949), 72.

sense, an integral mutation of consciousness that must operate both individually and collectively. Gebser called this structure of consciousness “the Integral consciousness.”²⁴

1.5.1 Mathematical Dimensions and Integral Consciousness

The legacy of modern science is that the four dimensions of time and space have been thoroughly explored, mapped, and explained in the language of mathematics. It is a very bedrock assumption of modern science that mathematics rules in the physical world. The language of mathematics is based solidly on the fact that every moving thing in nature can be accurately described and tracked with mathematical equations.

Early on, civilizations found mathematics useful. With mathematics a general could know the height of a defending wall, and once Isaac Newton's laws of motion were successfully used in predicting trajectories of cannon balls, mathematics has had the support of all military establishments. The assumption that mathematics models nature has become a tacit belief that there is a real connection, a sort of perfect mirroring, between some strange but eternal mathematical dimension and the observable, measurable, physical dimensions of space and time.

1.5.2 Integral Logic: Indra's Net

An integral approach, then, must be an expansion of the traditional scientific method beyond four dimensions. An integral approach considers and puts an emphasis on searching for and the discovery of patterns of information, dynamic data structures resonating in a mesh or matrix of widely disparate domains or dimensions (more than the usual four).

²⁴ Ibid., 93.

Compared to the traditional linear approach, the integral approach is a ninety degree dimensional shift in approach. Material science currently limits itself to considering elements of data, and even logical operations, sequenced linearly in time. This is in accord with an old Western tradition going back to the 6th century B.C. in the work of Pythagoras. And while the traditional scientific approach is modelled thus in the flow of sequential logic in computer architecture, an integral approach embraces multiple streams of data in parallel. The integral approach can be imagined as a landscape view over a myriad of data points in multiple data domains simultaneously, in parallel. The modern scientific method, in contrast, requires multi-domained filters to restrict data intake, and has become ever better at learning more and more about less and less.

An integral methodology, on the other hand, is an opening to acquiring increasing skill using wide bandwidth search and discovery techniques, to discover more about a wider bandwidth, a broader, more inclusive perspective. Applied to the hard problem, an integral methodology includes not only the participatory, experiential, approach, but also opens the ability to data mine in more than the usual four dimensions of spacetime (x,y,z,t). It is a multi-dimensional pattern recognition effort.

We live in an amazing time when vast topics of information are accessible within moments over the internet. Our task now as a species is not so much to specialize more, learning more-and-more about less-and-less, but to adopt an integral approach, casting our search net across a vast sea of information presented in a broad spectrum of topics, searching for patterns, vectors of understanding that might answer our ever more complex questions. A good metaphor for this task can be found in a story from the three thousand year old Rig Veda, in this description of the cosmic net of Indra, the king of the Gods:

Far away in the heavenly abode of the great god Indra, there is a wonderful net which has been hung by some cunning artificer in such a manner that it stretches out infinitely in all directions. In accordance with the extravagant tastes of deities, the artificer has hung a single glittering jewel in each "eye" of the net, and since the net itself is infinite in dimension, the jewels are infinite in number. There hang the jewels, glittering "like" stars in the first magnitude, a wonderful sight to behold. If we now arbitrarily select one of these jewels for inspection and look closely at it, we will discover that in its polished surface there are reflected *all* the other jewels in the net, infinite in number. Not only that, but each of the jewels reflected in this one jewel is also reflecting all the other jewels, so that there is an infinite reflecting process occurring.²⁵

We are reminded here of the fractal nature of the universe, which, since the availability of high speed computing and graphics, has been explored by Benoit Mandelbrot and others.

1.5.3 Integral Methodology: Vectors of Understanding

We have seen that a major difficulty lies not only in adoption of an integral approach for pattern recognition and structural perception, but in the subsequent *communication* of any integral patterns thereby discovered. The traditional use of the printed word reveals thoughts in a linear mode, word by word, topic by topic. This tends to focus our awareness in a linear, sequential mode, as contrasted with what is needed, the integral mode of awareness, the non-linear parallel wide bandwidth perspective, which views patterns in multi-disciplinary considerations.

Thus a major difficulty lies in any verbal or written expression of a theory derived from the wide ranging, broad spectrum, integral method. The very nature of the integral approach does not lend itself readily to sequential expression. An analysis using this

²⁵ Francis Harold Cook, *Hua-Yen Buddhism: The Jewel Net of Indra*, (New York: Pennsylvania State University Press, 1977), 2.

approach relies more on presentation of multiple frames of data which must then be transparently overlaid or projected simultaneously in order to see resonances, poles and zeros, and corresponding perceptual patterns that open up the integral approach to a significantly wider perspective than is possible in the typical linear Cartesian approach.

But either in conveying results or developing a theory, the difficulty in expression, in communication, lies not in the logical sequential flow of information in a word stream, but in the multivalence threads that links all previous experiences, images, discussions, sequences, weaving them into an emerging pattern. The information in these emerging threads of matrixed connections begins to be perceived as a coherent pattern, a dawning knowledge of structural dynamics. Once a sufficient number of "dots" or threads of understanding have been connected, tied together, a pattern begins to be perceived in the resulting "web", nexus, or resonating image.

Here we introduce the concept of "vectors of understanding." More than simply identifying dots and then connecting them, vectors indicate a directional flow in a pattern. Vectors (in mathematics, physics, and epidemiological research) are additive in multiple dimensions, and indicate the non-linear nature of reality. Where there is congruence among vectors, their force is additive, conrescint, and form patterns.

Accordingly, in this paper we will develop a hypothetical model for a psychophysics of consciousness using an integral methodology. We will identify and present congruent vectors of understanding, that is, through exploring connections and parallels among multiple strands of data from philosophy, psychology, mathematics, mysticism, neurophysiology, and physics. In developing this integrally vectored approach to a

psychophysics of consciousness, we will begin by examining relevant support in the ideas of several major twentieth century thinkers: Jung, Teilhard, Whitehead, and Steiner.

Carl Jung in discussing his theory of the psyche, describes the need for a mathematical basis of psychic energy and even elaborates a metaphor of psychic energy as existing in some energy spectrum, similar to that of light, whose bandwidth spans a range of consciousness from infra-red unconscious to ultraviolet superconscious.

Teilhard de Chardin explores a geometry of psychophysics in his vision of the isospheres, centration, and the role of centro-complexity in the evolution of consciousness.

Alfred North Whitehead, the mathematician turned philosopher, who wrote his dissertation on Maxwell's equations describing the electromagnetic field, in his major work *Process and Reality (1926)* discusses "societies of electromagnetic occasions."

Rudolf Steiner throughout his voluminously recorded lectures and written works describes the primary modes of consciousness open to human perception, and, more importantly, provides clear and precise information on techniques and exercises for developing and acquiring "superensible perception" in more than one mode of consciousness or dimensions of awareness.

After examining the psychophysically relevant ideas of these four thinkers, we will outline the mathematical basis, electrical basis, magnetic basis, geomagnetic basis, and cosmological basis of this hypothetical model of a psychophysics based upon the three domains of an emf energy field.

Following the discussion of the scientific underpinings for a psychophysics, we will describe Eastern metaphysical vectors toward a psychophysics in the form of yoga practices

and related experiences that corroborate the operational dynamics of our psychophysical model of consciousness.

Finally we will explore the experiential vectors of consciousness. The final chapters will provide a range of information on how the understanding of this model can be used to develop, join, and explore a wider human, planetary, and cosmic network of consciousness.

But we will begin with the following section that explains the essence of our hypothesis: that consciousness is a manifestation of an electro-magnetic-frequency field of energy that is ubiquitous, and of which our universe consists.

2.0 The Psychophysics of Consciousness: A Hypothesis

This paper presents a theory of the psychophysics of consciousness using information as data from multiple, traditionally disparate, domains of inquiry. In such an approach are sought vectors of understanding whose congruence taken together provide firm support for a hypothetical psychophysics.

A preliminary statement of the full hypothesis will be given in this section. This hypothesis will be provided a supporting structure through tying together tightly coupled strands of evidence from the following eight areas of consideration:

1. Panpsychism: that consciousness is the underlying physical substrate of the universe; that the universe, both organic and inorganic and in all dimensions, is sentient
2. String theory: that fundamental entities are not point-like particles, as early atomic theory conjectured, but instead that they are tiny two-dimensional vibrating filaments or "strings" of energy; these energy vibrations span frequencies throughout ten distinct dimensions in the Calabi-Yau manifold.
3. The electromagnetic field theory of consciousness articulated by the neurophysiologists Pockett (2011) and McFadden (2006): that consciousness is synonymous within resonating electromagnetic energy flux.

4. Quantum Brain Dynamics (QBD) proposed by Japanese neurophysiologists Jibu and Yasue: that quantum dynamical considerations indicate that circulating human blood plasma is magnetically polarized into an effective giant water molecule resonating along an axis parallel to the spinal column, and that this magnetic dipole flux field is a possible seat of consciousness.
5. The tripolar or Trinitarian metaphysical model: that consciousness, like emf energy, exists and transforms among three modes or domains of energy, all multi-dimensionally related to one another as in the electrical, magnetic, frequency domain: Father, Son, Holy Spirit; Sat, Cit, Ananda.
6. Communication engineering: a proven mathematical models (the Fourier Transforms) effectively applied to encode, transmit, and receive information via radio wave and laser, can also be seen to parallel encoding, transmission, and reception of consciousness via these same mathematical transformations operating within electromagnetic-frequency fields.
7. 20th century psychologists and philosophers: Jung, Teilhard, Whitehead, and Steiner, among others, all have attempted theories modelling consciousness in mathematical and electromagnetic terms, providing intuited support for a theory of consciousness operating in a bandwidth of energy frequencies throughout multiple dimensions that comprise the universe.
8. Participatory religio-metaphysical traditions: empirical introspective explorations such as those found in yoga in the East and hesychia in the West provide multi-generational direct instruction on psychophysical practices that imply and verify the theory of three modes of consciousness.

The theory to be supported is, in short, that what we call consciousness is a phenomenon of the multi-dimensional emf (electrical-magnetic-frequency) field of radiant energy sentience that impacts and is the ground of all levels of consciousness and modes of being. There follows condensed summaries of these various aspects of the psychophysical theory that will be developed in detail in subsequent sections of this study.

2.1 "Three-Brained Beings" and the Electromagnetic Energy Spectrum

"Energy is Eternal Delight"
William Blake

We argue that this emf energy field is the actual panpsychic substrate of consciousness not only of human being and animals, but of the entire cosmos. What we call

consciousness is a contiguous ever-present energy field continually transforming among the three domains (the electric domain, the magnetic domain, and the frequency domain) of the multi-dimensional emf energy field.

The early 20th century Russian philosopher G.I. Gurdjieff developed an extensive model of consciousness in which he perceived humans as "three-brained beings." In the 1248 page *Beelzebub's Tales to His Grandson or An Objectively Impartial Criticism of the Life of Man*, Gurdjieff describes the experiences (and comments) of an extraterrestrial among the 'three-brained beings' of planet Earth.²⁶ Gurdjieff wrote that each of the three brains operates quasi-independently within one of three modes of consciousness, and to complicate matters, one of these brains (the electric) consists of many many micro-egos, micro "I"s.

We mention Gurdjieff at this point only as one example of the far ranging congruences or a vectors of understanding that will be seen to align with the hypothesis developed in this paper: that each of these three "brains" or modes of consciousness is to be found within one of the three electromagnetic domains: electric domain, magnetic domain, and frequency domain.

Furthermore, as we shall see, the bandwidth of our particular species of human consciousness, as evolved on planet Earth, occupies a relatively narrow bandwidth centered around 10 microns in the far infrared (this peak frequency of human radiation emission is calculated using Wien's Law and the median core temperature of a human being.)²⁷

²⁶ G.I. Gurdjieff, *Beelzebub's Tales to His Grandson*, (New York: Harcourt, 1950), 38.

²⁷ Wien's Law and this calculation is discussed in detail in this paper in Section 4.4, page 72.

2.2 First Brain: Neuronal Electric Domain

The "first brain" operates in the neuronal system and within the electric domain. The human nervous system has evolved to work primarily with the electric domain of the emf energy field. It resides in the actual wet, neuronal meat tissue. It is dominant over the other two brain modes in our contemporary, hyper-verbal society, and operates within the electric domain; this domain has historically been called the "etheric."

The electrical impulse fields within the brain operate in the time domain, and rely upon memory storage or engram recording facilities which it can address and recall, compare, and evaluate. The nervous system is designed somewhat like a network of laptop computers. With its bifurcated architecture (two separate hemispheric systems) the electrical wetbrain system has excellent holographic engram storage capabilities.

Recording and/or playing back a hologram uses interference patterns caused by two slightly differently sourced electromagnetic fields interacting, creating shadow patterns on an emprintable media, perhaps viewed or projected by the solitary pineal gland onto the cavernous walls of the ventricular cavity. In industry the two offset source beams are provided by a beam splitter (similar to a prism) that creates a primary beam and a secondary beam which has been split off of the first). This first brain system can do advanced comparison, pattern recognition, and logic, and it has the ability to self-program. It operates its peripherals (arms, legs, organs) through a complex wiring system of neuron fibers.

2.3 Second Brain: Bloodstream Magnetic Domain

The "second brain" operates within the blood system, and has been called the "astral" by theosophists. This brain is not made of neurons or tissue. It is the magnetic component of emf energy field resonating throughout the body. Swiftly coursing streams of hot ions in

the blood resonantly generate this magnetic field, which polarizes the billions of water molecules in the bloodstream, in effect creating one giant magnetically polarized water molecule with a polar magnetic axis running through the spinal column and out through the fontanelle, resonating with peak emf energy at about 10 microns wavelength at 98.6 F.

... in some sense everything has an electromagnetic element or basis, but a heart cell's electrical output is exceptional. That congregation within us, billions of little generators working in unison, produces two and a half watts of electromagnetic energy with each heartbeat at an amplitude forty to sixty times greater than that of brain waves - enough to light a small electric bulb. This energy forms a magnetic field that radiates out some twelve to fifteen feet beyond our body itself.²⁸

Thus, whereas the "first brain" operates in the neuronal system and within the electric domain, dominated by the brain, the "second brain" operates in the magnetic field in the cardiovascular system, sustained and generated by the beating of the heart.

Quantum field theory applied to the electromagnetic field describes all physical phenomena involving electrons and photons²⁹, and is called quantum electrodynamics, abbreviated QED. Stuart, Takahashi, and Umezawa (1978; 1979) propose a mechanism of human memory and consciousness consistent with quantum field theory which they have called quantum brain dynamics (QBD).³⁰ Building on this paradigm, Jibu and Yasue in 1995 describe the creation and annihilation dynamics of corticons, characterized as:

²⁸ Joseph Chilton Pearce, *The Biology of Transcendence*, (Vermont: Park Street Press, 2002), 56

²⁹ Roger Jones refers to photons as "the so-called quantum of the electromagnetic field," *Physics for the Rest of Us*, (New York: Barnes & Noble, Inc., 1999), 289.

³⁰ Stuart, Takahashi, Umezawa. *Mixed -system brain dynamics: neural memory as a macroscopic ordered state*, *Foundations of Physics* 9, (1979), 301-327.

... energy quanta of the water rotational field extending to the whole assembly of brain cells, and photons, that is, energy quanta of the electromagnetic field.³¹

They go on to describe a theory in which the polarization of water molecules plays an exceptional part, and on the macro level produces a single resonant magnetic water "macromolecule" in bodies of living, water based creatures. Within this polarized, non-local H₂O quantum field is embedded an electromagnetic field in the form of a plasma³² field. Quantum brain dynamics thus supports a potential locus of consciousness other than that of the electrical neuronal locus, a possible "second brain" or consciousness manifesting within the quantum mechanical plasma of the bloodstream system.

2.4 Third Brain: Ventricular Cavity Frequency Domain

The "third brain" operates within the frequency domain, which has no time nor space components, and was first discussed in what has been called the holographic paradigm in the early 1980s by Karl Pribram of Stanford and physicist David Bohm of the University of London.³³ It is synonymous with the third domain of any emf energy field, which has been revealed in the mathematics of the Fourier and Laplace transform. It is this frequency domain brain which connects all life, in fact all electric and magnetic energy fields, in

³¹ Mari Jibu, Kunio Yasue. *Quantum Brain Dynamics and Consciousness: An Introduction*. (Philadelphia: John Benjamins, 1995), 164.

³² A plasma is a state of matter in which a significant portion of the particles are ionized. Plasmas are by far the most common phase of matter in the universe, both by mass and by volume. All stars are made of plasma, and interstellar space is filled with plasma. Common forms of plasma include lightning, St. Elmo's fire, the polar aurorae, the solar wind, neon signs, and plasma displays in modern home television. Retrieved from site [http://en.wikipedia.org/wiki/Plasma_\(physics\)](http://en.wikipedia.org/wiki/Plasma_(physics)) on July 23, 2012.

³³ Ken Wilber, ed., *The Holographic Paradigm: Exploring the Leading Edge of Science*, (Colorado: Shambala, 1982).

morphic resonance in a nontemporal field, a dimension other than (for you cannot say "outside" in a nonspatial dimensions) of the time and space dimensions.

This three-brained system has been intuited independently in both in western and eastern cultures. The concept of Father, Son, and Holy Spirit is a reflection of the frequency domain, the electric domain, and the magnetic domain. Likewise in India, the Vedantic sages intuited Sat-Chit-Ananda: Sat ("Being") - the Frequency Domain; Chit ("Mindstuff") - the Electric Domain; Ananda ("Bliss") - the Magnetic Domain.

We remember, compare, think, talk through means of the electric domain. We feel pain, joy, emotion, etc. through means of the magnetic domain. We intuit, resonate, communicate and undergo transgenerational epigenetic inheritance through morphic resonance in the frequency domain.

Our civilization is currently dominated by the electric domain. We think, talk, chatter, read, tweet, and text incessantly within the verbal, linear, electric neuronal activity domain. In general, little time and conscious focus is spent in the magnetic or frequency domains, except during periods of escape from the electric into the domain of the magnetic, during experiences of "sex, drugs, and rock and roll." Thus we are fundamentally creatures of dual consciousness in a serendipitous relationship in which a magnetic self (Jung's #2) is currently dominated and drowned out in general, by a conscious electric self (Jung's #1), manifesting in an everflowing matrix of synaptic flashes among billions of neurons multi-tasking words, concepts, and imagery.

Conversely, experiences within the third domain, the frequency domain, are only able to manifest during the deeper stages of sleep, or during contemplative experience, described by saints, mystics, yogis, shamans, and/or when psychotropic organic compounds

radiate their entheogenic emf spectrums throughout the body, releasing unique spectral radiation as they release energy from molecular bonds and resonate within the blood being.

2.5 Morphic Resonance, the Frequency Domain, and Telepathy

There is converging, repeatable evidence, that telepathy exists beyond a reasonable doubt.

Dean Radin, IONS Conference,
Fri July 19, 2013

The biologist Rupert Sheldrake in a 2010 summer lecture at Shumacher College, states quite clearly that "what I'm arguing is that telepathy is a normal part of animal communication, it's the way animals communicate with one another at a distance."³⁴ He goes on to reference a 2010 research paper published in the Proceedings of the National Academy of Sciences "Scale-free Correlations in Starling Flocks."³⁵ Through the use of ultra high-speed digital photographic analysis of the 3-dimensional movement of flocks of starlings through a wide range of flock size and spatial dimensions (from ten bird to two thousand bird flocks), they arrived at the startling conclusion that flock motion response speeds were **completely** independent of the spacetime separating the birds, that reception and response occurs simultaneously in every member of a flock:

By reconstructing the 3D position and velocity of individual birds in large flocks of starlings, we measured to what extent the velocity fluctuations of different birds are correlated to each other. We found that the range of such spatial correlation does not have a constant value, but it scales with the linear size of the flock. This result indicates that behavioral correlations are scale free: The change in the behavioral state of one animal affects and is affected by that of all other animals in the group, no matter how large the group is. Scale-free correlations

³⁴ <http://www.schumachercollege.org.uk/community/mind-and-cosmos-an-open-evening-with-rupert-sheldrake>

³⁵ Giorgio Parisi, May 11, 2010, "Scale-free correlations in starling flocks". *Proceedings of the National Academy of Sciences of the United States of America*. Retrieved 10/20/2011 from web page <http://www.pnas.org/content/107/26/11865.figures-only>

provide each animal with an effective perception range much larger than the direct interindividual interaction range, thus enhancing global response to perturbations.³⁶

Such action-at-a-distance behavior among birds can be explained if we view a component of their communication as occurring within the frequency domain (f_d) of the electromagnetic field within which they exist and are moving, the domain in which there is no timespace and which allows instantaneous phase communication.

Sheldrake says they move "as if they have one mind", and goes on to state, "... I think that the field through which these effects takes place, the field of the social group is an actual field, is a means through which communication can pass, just as iron filings line up, so the field can affect the way the birds line up." These fields he calls morphic fields, and he describes how they have a kind of memory. However we postulate that the mechanism operates in the frequency domain (f_d) of the existing, measurable geomagnetic field, translating dynamically via Fast Fourier transforms into the spacetime domain, and allowing flocks of birds, schools of fish, and globally separated thoughts to coalesce within the frequency domain (f_d). It is this information energy in the frequency domain (f_d) that collapses out of that domain into the timespace domain, emerging as butterfly and zebra, planets and people, all that we perceive and classify as visible reality in the spacetime domain (t_d).

2.6 Trinitarian Vectors to Psychophysics

If consciousness does manifest in three dimensions, it is reasonable to assume that we should be able to find evidence of this recurring Trinitarian structure at the root of

³⁶ Ibid.

multiple metaphysical world views. According to the renowned scholar of comparative religion Raimundo Panikkar, "My surmise is that it is reality itself that discloses itself as Trinity - at least to me, and I am inclined to add to Christians and to an immense number of people seriously concerned with the problem of the Divine."³⁷

The concept of the Trinity is not exclusive to Christianity, but can be found as one of the expressions and visions of an organizing structure to the manifest universe as recorded in some of the most ancient cultural records in existence. In India, the *Atharvaveda*, emerging at the end of the 2nd millennium BCE, speaks of Agni, the King of the Gods, as 'one energy whose process is threefold.'³⁸ And in ancient Egypt, reference to the Trinity is explicit: "All gods are three: Amun, Re and Ptah, whom none equals. He who hides his name as Amun, he appears to the face as Re, his body is Ptah."³⁹ Moreover, during the Puranic period (c. CE 300-1200) arose the concept of the Trimurti, the widespread acceptance in India of the manifestation of the supreme God in three forms of Brahmā, Viṣṇu, and Śiva.

While the earliest Christian acceptance of God as Trinity is documented in the Nicene Creed, still recited by most Christians, the wording of the creed was agreed upon during the first ecumenical council of Christianity held in 325 c.e., one year after the transfer of the government of the Roman Empire from Rome to the ancient Greek outpost of Byzantium on the Bosphorus strait that now is seen to separate Europe from Asia.

Raimundo Panikkar, whose mother was Roman Catholic and father was Hindu Indian, is

³⁷ Panikkar., 256.

³⁸ Atharvaveda-Samhita, Saunaka recension, I,12.1c: "*Ekam ojas tredhā vicakrame.*"

³⁹ Jan Assmann, *Of God and Gods: Egypt, Israel, and the Rise of Monotheism*, (Wisconsin: University of Wisconsin Press, 2008), 64.

clear that "the symbol of the Trinity is not a Christian monopoly, but in fact is common in many other traditions."⁴⁰ If, as Panikkar says, this is "reality itself that discloses itself as Trinity," then we should be able to find this same Trinitarian reality disclosing itself in the realms of modern science.



Figure 3. Trimurti at Ellora near Aurangabad, Maharashtra State, 5th-7th c.CE

We can draw the trinitarian analogues exhibited in the following Figure, an "Two Trinitarian Diagrams: West and East."

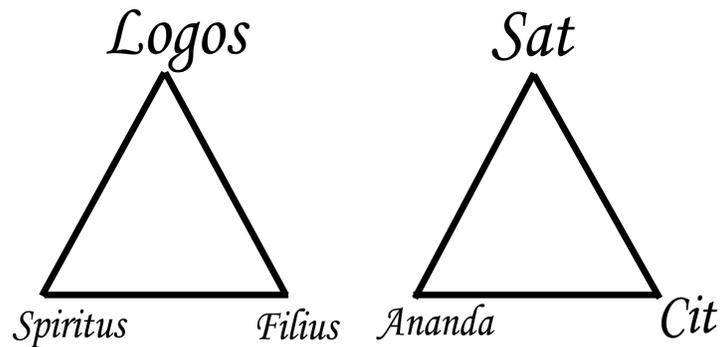


Figure 4. Two Trinitarian Diagrams: West and East

An more speculative model of a trinitarian psychophysics is illustrated below:

⁴⁰ Raimon Panikkar, *The Rhythm of Being: The Gifford Lectures*, (New York: Orbis Books, 2010), xviii.

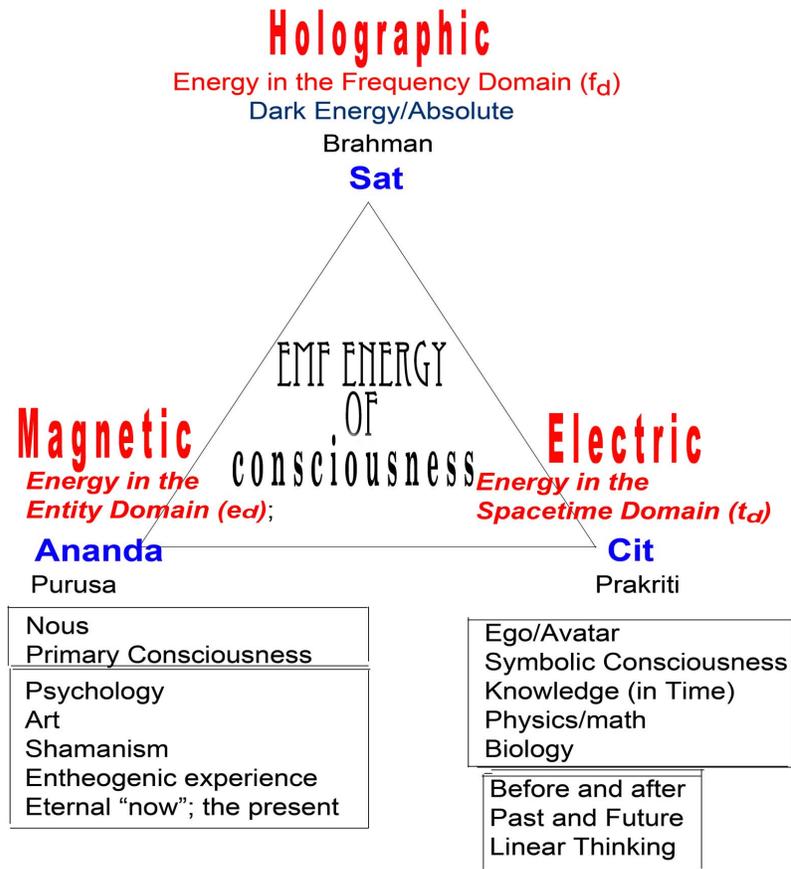


Figure 5. Speculative Diagram of a Trinitarian Psychophysics

2.7 Psychophysics: Breaking the Death-Barrier

It is the contention of this paper that humanity stands on the edge of a vast new realm of exploration, and that, like the first sea creatures lifting their heads above the waves on the beach, we are just beginning to learn how to rise up out of the ocean into a new, previously unperceived continent. Only a relative few have thus far developed this new mode of perception, but it is open to all "three-brained beings."

Once we begin to understand consciousness as our underlying energy field, and become able to observe our own consciousness on the basis of a triadic, three-domained structure, we can more easily acquire the skills, the consciousness command and control

techniques, which will lead us to unfold various new states, and through intention, to begin to open portals into new dimensions which were previously imperceptible. Activation and integration of new modes of supersensible perception have heretofore been accessible to only a limited few, but our conscious being is beginning to learn to integrate all three components of electromagnetic energy: our electric domain being (wetbrain/nervous system), our magnetic being (hotblood brain/ionic-magnetic flux system), and our frequency domain being (transparent cerebrospinal fluid system).

With these newly integrated capabilities we will find ourselves with an integral vision, with a new dimensions for exploration, and through which we find ourselves transformed, in a real way, breaking "the death-barrier."⁴¹ When we are able to quiet down the electric, withdrawing electrical activity from the normal 'monkey-mind' of firing neurons, triggered memories, and intents, then the center of gravity of consciousness shifts first into the magnetic brain in the heart and bloodstream, and beyond that into the timeless nondual frequency domain which mystics have had such difficulty describing.

3.0 Western Metaphysical Vectors to a Psychophysics of Consciousness

Approaches to a psychophysics of consciousness can be found throughout the writings of major 20th century thinkers in the fields of psychology, philosophy, metaphysics, mathematics, physics, and biophysics, to name just a few. All of these experienced harsh criticism and neglect within their own professional communities at times in their careers. Their subject matter, observations, and conclusions had been judged to

⁴¹ Teilhard, *The Death-Barrier* in Activation of Energy, ??.

have strayed outside of the pale of the four dimensional data and associated dogma sanctioned by their colleagues and professional communities.

The following sections outline major ideas and concepts from four of these 20th century psychophysical scientists, all having attained fame (and some notoriety) in their fields. Their ideas are directly relevant to, and support, a model of psychophysics outlined in this paper. Accordingly, the following four sections will present summaries, key ideas, and observations from the following four thinkers, each a unique pioneer in humanity's exploration of consciousness:

- Carl Jung
- Teilhard de Chardin
- Alfred North Whitehead
- Rudolf Steiner

3.1 Carl Jung's Spectrum of the Psyche

Drawing on an additional twenty years of research, experience, and thought since he had first elaborated his model of consciousness in “*The Structure of the Psyche (1927)*”, Jung, in his essay “*On the Nature of the Psyche (1946)*” presents a more mature model, expressing a newfound interest in aligning his model more closely with new models from the domains of physics and mathematics, an interest likely strengthened by his close acquaintance and interaction with the Nobel Prize winning Austrian theoretical physicist Wolfgang Pauli (1900-1958) who had become one of Jung’s analysis patients over several years.

In his early division of the psyche into unconscious and conscious contents, Jung’s model of the psyche was somewhat binary. He expresses interest in the *complexio*

oppositorum paradigm of Nicolo di Cusa⁴². Jung explores variations of these binary configurations of the psyche, casting the psyche into several binary models including “instinct” vs. “soul,” “No.1” vs. “No.2,” and “ego” vs. “Self.” However in his 1946 essay his vision has evolved somewhat, and he reveals a more complex model of the psyche, viewing it as the analog of the *range between* the oppositori, the spectrum, the intervals that lies between the dualities, between instinct and spirit, between the unconscious and the conscious, hypostases between the modalities of the ego and the Self within the larger spectrum of the psyche.

Jung discusses how the psyche might be seen as actually spanning such a spectrum:

Psychic processes therefore behave like a scale along which consciousness “slides.” At one moment it finds itself in the vicinity of instinct, and falls under its influence; at another, it slides along to the other end where spirit predominates⁴³

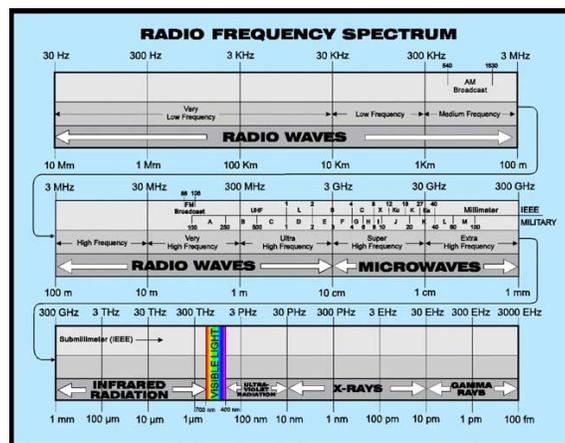


Figure 6. Electromagnetic Frequency Spectrum⁴⁴

⁴² Ibid., 207.

⁴³ Ibid., 207.

⁴⁴ <http://www.tvtower.com/CommercialTelevisionmVnFrequencies.html>

And Jung recurrently expresses almost a longing for some mathematical basis to the psyche, “the tragic thing is that psychology has no self-consistent mathematics at its disposal, but only a calculus of subjective prejudices.”⁴⁵

Jung further develops his model of a spectrum of consciousness along an axis analogous to the visible light region of the electromagnetic spectrum (see Figure 1). He maps two additional regions at either end of his spectrum, ‘the biological instinctual psyche’ to the infrared and ‘the archetype’ to the ultraviolet:

Just as the ‘psychic infra-red,’ the biological instinctual psyche, gradually passes over into the physiology of the organism and thus merges with its chemical and physical conditions, so the ‘psychic ultra-violet,’ the archetype, describes a field which ... manifests itself psychically.⁴⁶

With regard to parapsychological phenomena he has himself observed, Jung states that they are “... so far as I can see at present, completely explicable on the assumption of a psychically relative space-time continuum.”⁴⁷

Jung not only relies on his image of a frequency spectrum as analogue to the psychic spectrum but frequently mentions the connection between energy and psychic processes:

The psyche is not a chaos made up of random whims and accidents, but is an objective reality to which the investigator can gain access by the methods of natural science. There are indications that psychic processes stand in some sort of energy relation to the physiological substrate. In so far as they are objective events, they can hardly be interpreted as anything but energy processes.⁴⁸

⁴⁵ Jung., 216.

⁴⁶ Ibid., 215.

⁴⁷ Ibid.

⁴⁸ Ibid., 233.

And he concludes by stating that "... the concept of energy is a strictly defined mathematical quantity."⁴⁹

3.2 Teilhard de Chardin's Psychophysics of Energy

*"What we lack is a new domain of psychic expansion,
and it is right in front of us,
if we would only raise our eyes."*

Teilhard, The Human Phenomenon (1945), 179.

Energy is found to be a central element in Teilhard's more technical modeling of the cosmos. He says that while "in metaphysics the notion of being can be defined with a precision that is geometric", things are not so clear in physics, where the notion of energy is "still open to all sorts of possible corrections or improvements."⁵⁰

Skipping to the last page of his collection of essays on the Activation of Energy, he says, finally, of energy "... there are two different energies - one axial, increasing, and irreversible, and the other peripheral or tangential, constant, and reversible: and these two energies are linked together in 'arrangement'".⁵¹

3.2.1 Tangential and Radial Energy

Teilhard's model of energy thus has two components, perpendicular to one another: a tangential component, and an axial, radial component. The tangential component of energy is described in familiar terms as movement within space and time, while the radial component, which Teilhard links to the process of "centration" or a thermodynamic heating

⁴⁹ Ibid.

⁵⁰ Teilhard, *The Energy of Evolution in Activation of Energy*, 361-362.

⁵¹ Teilhard, *The Activation of Human Energy in Activation of Energy*, 393.

up of consciousness, is also referred to as "soul" and "spirit" in his essays. He talks about the radial component of energy as "a new dimensional zone" that brings with it "new properties,"⁵² and he describes how increasing centration along the radial component leads to increasing states of complexity-consciousness.

These two components of energy Teilhard also describes in physical and the psychic terms: "*physical energy* being no more than *materialized psychic energy*,"⁵³ but he is not able to posit a mathematical or physical relationship between these two dimensions, other than to express the hope that "there must surely be some hidden relationship which links them together in their development."⁵⁴ Yet he does attempt to develop a geometric model of energy in his description of the isospheres.

3.2.2 Isospheres

While energy is one key in Teilhard's visionary model of the evolutionary process, another is his understanding of "isospheres," which he defines as "surfaces of equal centro-complexity."⁵⁵ He sees evolution catalyzed on these isospheres when "a maximum density of particles with a corresponding maximum of tentative gropings is produced on each isosphere." There are many variously defined "isospheres", as listed in Figure 1 (ordered from "highest to lowest" or widest radius toward the center) you will find the Noosphere located just at or below the boundary of the Rocky Crust, or Lithosphere, in an equithermal band centered around 98.6° F., a location which will become apparent later in this paper.

⁵² Teilhard, *The Atomism of Spirit in Activation of Energy*, 29.

⁵³ Teilhard, Footnote 10, *Centrology in Activation of Energy*, 121.

⁵⁴ *Ibid.*, 120.

⁵⁵ *Ibid.*, 100.

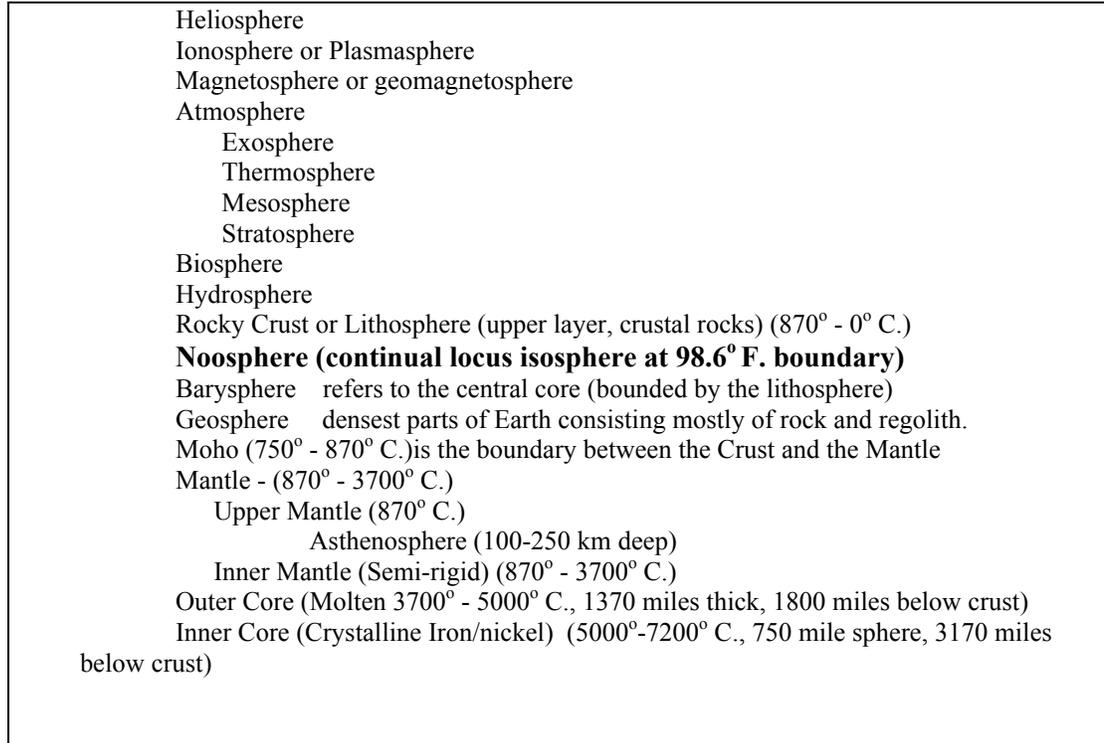


Figure 7. Isospheres of planet Earth

3.2.3 Centrology and Centrifigation

In his essay on "Centrology" in *Activation of Energy*, Teilhard describes biology as "simply the physics of very large complexes."⁵⁶ He points out that in a single protein molecule there are about 20,000 hydrogen atoms and that while this number rises to 25 million hydrogen atoms in a virus particle. In the human being however are "about a thousand million million" hydrogen atoms, many more than the count of stars in our galaxy. He says that "if the universe is observed in its true and essential movement through time, it represents a system which is in process of internal 'centro-complexification,'" and

⁵⁶ Teilhard, Footnote 1, *Centrology in Activation of Energy*, 102.

assertively defines evolution as "*a transition from a lower to a higher state of centro-complexity*."⁵⁷ (Teilhard's emphasis).

Teilhard, in a process he calls centrogenesis, indicates that once a certain critical mass is reached, a transformation of human consciousness, collective and individual, is catalyzed.

He says it is "by a direct tuning and resonance" that this noospheric centre, is born:

This noospheric centre, Omega, is not born from the confluence of human 'egos', but emerges from their organic totality....In nascent super-humanity ... the thousands of millions of single individuals function in a nuclear way, by a direct tuning and resonance of their consciousness.⁵⁸

3.3 Alfred North Whitehead's Electromagnetic Occasions

It should be noted that the theorized "strings" of vibrating energy that are the fundamental entities of which the cosmos is composed, according to modern string theory, can be seen to be clearly compatible with Alfred North Whitehead's concept of "actual occasions"⁵⁹ or "actual entities":

Actual entities'—also termed 'actual occasions'—are the final real things of which the world is made up. There is no going behind actual entities to find anything more real. They differ among themselves. ...

In fact, Whitehead's early career as a student and professor at Cambridge was as a mathematician, but one fascinated by electricity (he is said to have participated a demonstration conducted by Nicola Tesla in London in the early 1890s). He wrote his doctoral dissertation on the recently discovered Maxwell's Equations, which describe

⁵⁷ Ibid., 103.

⁵⁸ Ibid., 114-115.

⁵⁹ During his Gifford Lectures at the University of Edinburgh in 1927-28, Alfred North Whitehead developed a speculative cosmology derived from his meditation upon direct experience, discussing at length his conception of the process of "concrecence" into "actual occasions" within the temporal domain.

emf energy in a series of elegant equations that tied together all known phenomena related to electromagnetic fields. He later went on to write *Principia Mathematica*, a three-volume work on the foundations of mathematics, with one of his students, for Boston, where at Harvard he began studying and teaching philosophy and metaphysics. Here he developed in detail a number of his most famous ideas through a series of lectures and publications.

Whitehead goes on to define “societies” as collections of these concreting actual occasions, and describes such collections of concrecence in time as emerging into “society... in some portion of the universe.”

... the term ‘order’ evidently applies to the relations among themselves enjoyed by many actual entities which thereby form a society. The term ‘society’ will always be restricted to mean a nexus of actual entities which are ‘ordered’ among themselves ... The point of a ‘society,’ as the term is here used, is that it is self-sustaining; in other words, that it is its own reason.⁶⁰

He talks about the endurance of a society, how it arise from disorder, grows, transforms, and changes in time, but that “finally after a stage of decay passes out of existence.”⁶¹ Yet along with this image of the evolutionary arc of a society in timespace, Whitehead strikes a subliminal note of pessimism and seems to voice regret in the image of “a system of ‘laws’ determining reproduction in some portion of the universe that gradually rises into dominance ... has its stage of endurance” but gradually “passes out of existence with the decay of the society from which it emanates”.⁶²

⁶⁰ Ibid.

⁶¹ Ibid., p. 91.

⁶² Ibid.

3.3.1 Our Special Cosmic Epoch: A Society of Electromagnetic Occasions

But on what seems to be a new note of optimism he goes on to say that now “we are in a *special* cosmic epoch” (emphasis added), and that it is characterized by *electronic actual entities* (emphasis added) :

Here the phrase ‘cosmic epoch’ is used to mean that widest society of actual entities whose immediate relevance to ourselves is traceable. This epoch is characterized by electronic and protonic actual entities, and by yet more ultimate actual entities which can be dimly discerned in the quanta of energy. Maxwell’s equations of the electromagnetic field hold sway by reason of the throngs of electrons and of protons.⁶³

Does Whitehead here imply that these “electronic and protonic actual entities” are inherent in some way in each concreting actual occasion of human experience? And what are the abovementioned “more ultimate actual entities” which can only be “dimly discerned”? And why does he give such homage to Maxwell and his equations which model the electromagnetic field? Unfortunately Whitehead passes through this topic without significant development and begins discussion of the *Timaeus* of Plato and the *Scholium* of Newton.⁶⁴

Maxwell’s equations and the electromagnetic field express a reality that bridges the physical world of timespace with an equivalent nontemporal nonphysical world of the frequency domain (we shall develop this later in this paper). Whitehead had written his doctoral dissertation on Maxwell’s views on electromagnetism, and he had seen the visually

⁶³ Ibid.

⁶⁴ Ibid., p. 93.

impressive electromagnetic exhibitions of Nicola Tesla in London in 1891. By the time Whitehead developed his ideas on concrescence, the radio was the sole application demonstrating the power of Maxwell's equations in modeling and manipulating the invisible electromagnetic field. There was as yet no television, no transistor, no computer or internet or world of digital devices transforming energy signals between the timespace and the frequency domains, yet Whitehead had the vision to conclude "Thus our cosmic epoch is to be conceived primarily as a society of electromagnetic occasions ...".⁶⁵

3.3.2 Eternal Objects Influencing Electromagnetic Occasions

So how and where do the Eternal objects connect to concreting electromagnetic occasions in timespace? Whitehead makes clear that a society of actual occasions "does not in any sense create the complex of Eternal objects."⁶⁶ Since the eternal objects are not ontologically within timespace, but are by definition eternal and thus in timeless eternity, they cannot be the issue or creation of a society in timespace. Thus one can only infer that the complex of Eternal objects itself has some involvement in the creation of societies. But then by what vehicle or function do the Eternal objects "reach out" from their domain of eternity (the nontemporal, nonspatial, noncorporeal) to communicate with and/or to affect in any manner the concreting actual occasion in the timespace domain?

Whitehead goes on to contrast societies in "occupied space" with those that are a "physical field in empty space", by characterizing the former as "restricted type of corpuscular societies" while the latter, those physical fields in empty space, he characterizes

⁶⁵ Ibid., p. 92.

⁶⁶ Ibid.

as “the wider type”, and he concludes, “It seems as if the careers of *waves of light* illustrate the transition *from the more restricted type to the wider type.*”(emphasis added).

3.3.3 Electromagnetic Society As A ‘More Special Society’

Whitehead spends some time describing and contrasting various configurations of societies and goes on to a discussion “-largeley conjectural- of the hierarchy of societies composing our present epoch.”⁶⁷ After developing a number of geometrical descriptions of various societies based on geometrical abstractions including “geometrical elements”, “extensive abstraction”, and “extensive connection”, he concludes that the geometrical societies though of many sorts could not be readily compared in terms of hierarchy “... no one system being more fundamental than the other”, but that it is our very electromagnetic occasions that presently dominate:

Our present cosmic epoch is formed by an ‘electromagnetic society’, which is a more special society contained within the geometric society... by naming the members of the society ‘electromagnetic occasions. Thus our present epoch is dominated by a society of electromagnetic occasions. In so far as this dominance approaches completeness, the systematic law which physics seeks is absolutely dominant. As so far as the dominance is incomplete, the obedience is a statistical fact with its corresponding lapses. The electromagnetic society exhibits the physical electromagnetic field which is the topic of physical science. The members of this nexus are the electromagnetic occasions.⁶⁸

3.3.4 Electromagnetic Occasions and the Electromagnetic Spectrum

As we have seen that Whitehead’s electromagnetic occasions assume an importance in his hierarchy of societies, it would be useful to explore the intersection of electromagnetic occasions with what has been learned in the years following Whitehead’s work regarding

⁶⁷ Ibid., p. 96.

⁶⁸ Ibid., p. 98.

the electromagnetic spectrum and how it might be the architect of our electromagnetic societies.

The electromagnetic spectrum maps the range of energy frequencies appearing as energy waves within the timespace continuum that have been detected by human science. It is assumed the entire range goes to infinity in both directions, but thus far it has been generally mapped into the following subranges (in order of increasing wavelength) as can be seen in the following table.

Subrange in order of wavelength	Wavelength (Midrange, in Meters)	Frequency (Midrange, in Hertz)
Gamma Rays	10^{-12}	10^{19}
X-Rays	10^{-11}	10^{18}
UV Rays	10^{-10}	10^{16}
Visible Light	10^{-9}	10^{14}
Infrared ("heat")	10^{-8}	10^{13}
Terahertz Radiation	10^{-6}	10^{11}
Microwaves	1 meter	10^9
Radio Waves	1 Kilometer	10^6
Gravitational Radiation ⁶⁹	1000 Kilometer	10^1

Figure 8. Subranges of the Electromagnetic Spectrum

⁶⁹ No confirmed detections have been made of gravitational radiation, however there is speculation that black hole formation may create detectable amounts of this radiation.

3.4 Rudolf Steiner's Four Domains of Consciousness

In *The Evolution of Consciousness*, Steiner tells us that "For higher knowledge the human being consists of four members: physical body, etheric or formative-forces body, astral body, and Ego-organization."

	Domain 1	Domain 2	Domain 3	Domain 4
Steiner	Physical	Etheric	Astral	"I"

Figure 9. Steiner's Four Domains of the Human Being

As part of Steiner's instruction regarding the possible development of supersensible sense organs in the human being, he develops a map of four regions to describe what he perceives to be four differentiable yet interpenetrating domains of the human being.

3.4.1 Psychophysics of Steiner's Four Domains

In reviewing Steiner's four domains of the human being, we will examine how these ranges can be understood in terms of psychophysics. We will go further and view radiant energy itself as manifesting in these distinctly differentiable modes, paralleling water's ability to manifest in the distinctly differentiable modes of liquid, solid, and gas. We will thereby align Steiner's classification with the hypothesized psychophysical model of consciousness. This chart illustrates our bridge between Steiner's model and psychophysics .

Steiner's Four Domains of A Human Being	Four Ranges of Human Energy According to Psychophysics
Ego or "I"	Frequency domain- Cerebrospinal fluid system
Astral body	Magnetic domain - Blood plasma system
Etheric body	Electrical domain - Nervous system

Physical body	Biochemical domain - Chemical system
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Figure 10. *Physics of the Four Ranges*

3.4.2 The Physical - Electrocrystalline Domain

This is the dimension in which energy vibrationally resonates in orderly geometric alignment. In this configuration energy manifests macroscopically as particle, atom, organic or inorganic molecule, galactic cluster, liver, spleen, brain, and the seemingly infinite variety of complex semi-permanent geometrical systems that manifest as the human body, the biosphere, and the lithosphere of Gaia.

In a 1911 series of lectures Steiner describes the Physical on a more mundane level as it relates specifically to the human being, emphasizing that it comprises all of the systems for secretion, excretion, nourishment, and evacuation for "the actual process of nutrition and depositing of substances."⁷⁰ Steiner describes the Physical as the foundation or material framework for operation of the Etheric and Astral domains in his model of the human being.

Modern physical science deals almost exclusively with the subject of this physical realm. Scientific exploration of the Physical has resulted in extensive medical knowledge and technical development of innumerable physical devices we now take for granted in our 'wired world.' But a physical science has largely ignored a supersensible world.

Professionals have been ostracized for exploring beyond the boundaries of their fields of existing physical science as currently defined, and those who would explore without the backing and funding of a scientific establishment find that much exploration has even been prohibited by law.

⁷⁰ Steiner, *An Occult Physiology*, 125.

Steiner discusses development of the Physical at great length in his many lectures and written works in terms of nutrition, exercise, sports, and physical education, but for the purposes of this paper, we will focus instead on other levels, as our primary goal is to extract Steiner's framework of teachings for acquisition of supersensible perception within the three non-physical levels of the human body, the Etheric, the Astral, and the "I."

3.4.3 The Etheric - Electrical Domain

The name Etheric body is derived from the term for luminiferous *Ether* that was the hypothetical substance through which electromagnetic waves travel.

In 1925 a work was published by The Science Group of the Theosophical Research Centre in London, which was basically a compilation of work by Annie Besant and C.W. Leadbeater. The book, *The Etheric Double*, compiled by A.E. Powell, describes the Etheric Body as follows:

The correct Hindu name for the Etheric Double is *Prānamāyakosha*, or vehicle of *Prāna*: in German it is known as the "Doppelgänger". ... every solid, liquid and gaseous particle of the human body is surrounded with an etheric envelope...it acts as an intermediary or bridge between the dense physical body and the astral body, transmitting the consciousness of physical sense contacts with through the etheric brain to the astral body, and also transmitting consciousness from the astral and higher levels down into the physical brain and nervous system.⁷¹

Realizing that the nervous system and physical brain manifest a flow of electrical energy, conducted by nerve fibers, throughout the body, we will make the assertion that the Etheric Body consists of this flow or energy matrix of electrical energy abetted by millions of electrical pulses from firing neurons as it flows along and within the neuronal pathways and between the synapses of the physical body's nervous system.

⁷¹ A.E. Powell, *The Etheric Double* (Madras, India: The Theosophical Publishing House, 1925), 4.

In the etheric body the primary consciousness is a time-based reflective one. Our modern human ego includes memory storage and the ability to call up memories and compare multiple memories and apply logic, abstraction. It includes all of the activities that we usually identify with our "self." This small self or ego might be seen as nothing more than a very powerful laptop computer running on electricity. Putting the laptop into "sleep mode" releases awareness into the next level in which, untrained and undeveloped, the human wanders in a world dimly recalled as "dreams."

The Etheric Body can thus be seen as our sophisticated machine-like ego that manifests what we take to be ourselves as human beings. Yet on this level we are basically self-captured within an electrical system in the brain, spinal cord, and distributed nerves systems. We remain captivated within the Avatar of our Etheric Body, which acts as an outpost for deeper levels of conscious self located within the Astral body and the inner "I."

Steiner points out that the Etheric Body, the nervous system, has been designed to deal with external perceptions: vision with its color, form, and brightness, and sounds with their pitch and loudness. It is in the Astral Body, however, that supersensible perception is to be developed, and thus it is to this next level, the Astral Body, that Steiner directs the initial development of the typical modern human being who seeks to acquire supersensible perception.

3.4.4 The Astral - Magnetic Domain

Steiner refers to the third level or reality of the human being as the Astral Body. The term Astral body (from the Greek *Νεοπλατωνισμός* for "the stars"), widely used by Neoplatonists (3rd century C.E.) is found in a Dialog of Plato, at the end of *The Republic*, where he recounts the Myth of Er. In the Dialog, a fallen hero suddenly revives just as

about to be burned on a funeral pyre after being seemingly dead for twelve days. He tells of his experience travelling through seven planetary spheres which, Plato tells us, lead eventually to reincarnation, and he says that he has discovered in this journey that only the part of a human being that is "starry", or "astral", remains after death.⁷²

In the fifth century CE, an attorney in Constantinople, Proclus, published an elaborate exposition of Neoplatonism. He described two subtle "planes", bodies, or "carriers" intermediate between the individual physical human body and the immortal spirit: one carrier, the astral vehicle, was the immortal part of the soul, while the second carrier, which he considered mortal and not surviving after death, he aligned with the breath (*pneuma*).⁷³

	Level 1	Level 2	Level 3	Level 4
Psychophysics (21st c. CE)	Biochemical Domain	Electrical Domain	Magnetic Domain	Frequency Domain
Steiner (20th c. CE)	Physical (Crystalline)	Etheric (Thinking)	Astral (Feeling)	"I" (Immortal)
Proclus (4th c. CE)	Physical	Breath	Astral	Spirit
Patañjali (4th c. CE)	Annamaya Kosha Food Body/ Physical	Manomaya Kosha Mind Body/ Thinking	Vijnanamaya Kosha Astral Body/ Intuition	Anandamaya Kosha Bliss Body/ Joy
Plato (4th c. BCE)	Physical Body	Nervous System	Astral/ Starry Body	Immortal Spirit

Figure 11. Five Four-Level Maps: Psychophysics, Steiner, Proclus, Patanjali, Plato

⁷² The Myth of Er. http://en.wikipedia.org/wiki/Myth_of_Er.

⁷³ Ibid.

Max Heindel and the Astral Plane

Shortly after meeting with Steiner, the Danish engineer Max Heindel (1865-1919), was able to establish supersensory cognition in dimensions of the astral plane. Heindel, who before meeting Steiner had been a theosophical lecturer and Vice President in the Theosophical Society in California, later said of Steiner that "what he was doing was not appropriate for America where pragmatism and clear linear thinking is predominant."⁷⁴ Here Heindel describes his experiential observation of an astral body:

It appears to spiritual sight as an ovoid cloud extending from sixteen to twenty inches beyond the physical body. It has a number of whirling vortices (chakras) and from the main vortex, in the region of the liver, there is a constant flow which radiates and returns. It exhibits colors that vary in every person according to his or her temperament and mood. However, the astral body (or "Soul body") must be evolved by means of the work of transmutation and will eventually be evolved by humanity as a whole.⁷⁵

According to Heindel, the term "astral body" was employed by mediaeval alchemists because of its ability to confer the power to traverse the "starry" regions, and may also be the fabled philosopher's stone (*lapis philosophorum*) referenced in alchemical texts.⁷⁶ In 1909 Heindel founded the Rosicrucian Fellowship in Oceanside, California.

Blood System and Nervous System: Astral and Etheric

Physiologically, Steiner differentiates the activity of the Astral from the Etheric through their carriers, the blood circulatory system and the nervous system.

A ninety degree geometric relationship between the two is stressed by Steiner in his discussion of human duality in *An Occult Physiology*, where he gives us a description,

⁷⁴ from Max Heindel. http://en.wikipedia.org/wiki/Max_Heindel

⁷⁵ from Astral body. http://en.wikipedia.org/wiki/Astral_body

⁷⁶ from Max Heindel. http://en.wikipedia.org/wiki/Max_Heindel,

replete with diagrams, of how "nerve-activity" is at right angles to the alignment of the "blood-tablet."⁷⁷

This description accords well with the established physical geometries of the electric field and the magnetic field, the two components of the electromagnetic field which are always at ninety degree angles to one another (see Diagram 2).

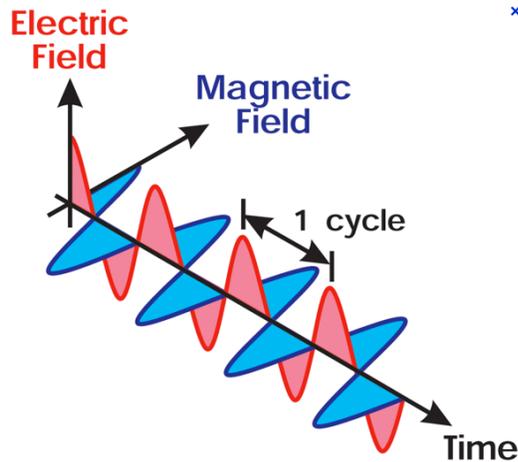


Figure 12. Structure of electromagnetic field

Human blood flow generates a strong magnetic field. This magnetic plasma is composed of hydrogen ions and heated water molecules flowing in a complex vortex of blood plasma around every cell and through every capillary of the body. The magnetic field created by the flow of this hot ionized plasma within the circulatory system is at right angles to the electric field created by the flow of electrons along the nerves generated by firing neuron synapses.

This right angle geometry differentiates the Etheric from the Astral, and it is the understanding that these can be separated, controlled, that is the basis for further progress in meditation. After discussing this ninety degree relationship of consciousness between

⁷⁷ Steiner, *An Occult Physiology*, 42.

nerves and blood, he gives us another key for further development of supersensory perception:

It is, therefore, possible purely through processes of inner concentration, to separate the blood-system from the nerve-system. ... Now, the peculiar thing is that when the human being once actually brings this about through such inward exertion of the soul, he has then an entirely different sort of inner experience. ... when, through inner concentration, he separates his nerve-system, lifts it, that is to say, through inner soul-forces out of his blood-system, he does not then live in his ordinary ego but another Self ... He feels a supersensible world uplifted within him.⁷⁸

It is through this "process of inner concentration," as Steiner says, that one is able to bring silence to the mental activity of the nervous system, sufficient quiet to allow the consciousness with the bloodstream to awaken to the supersensible.

Initially our mind continues "to think" on its own momentum, in its own relatively limited verbally cognitive habituated manner. We lack the understanding that there may be other ways "to think" without the constraining requirement of word manipulation and memory retrieval. But to attain to supersensible perception requires stilling the mind's senses and memories. We find further corroboration of this from St. Isaac the Syrian, a contemplative orthodox Christian monk who lived along the western shore of what is now Saudi Arabia in the 8th century CE:

When the senses, however are confined by stillness and not permitted to venture forth, and by its aid the soul's memories grow old, then you will see what are the soul's natural thoughts, what is the nature of the soul, and what treasures she has hidden within herself. These treasures are the perception of things incorporeal.⁷⁹

⁷⁸ Steiner, *An Occult Physiology*, 44-45.

⁷⁹ Saint Isaac the Syrian, *The Ascetical Homilies*. Trans. from Greek and Syriac. (Boston: Holy Transfiguration Monastery, 2011), 127.

3.4.5 'I' The 'Ego' Singularity: Frequency Domain

Even beyond the human being's existence within the nervous system's electrical (Etheric) and the bloodstream's magnetic (Astral) dimensional ranges of energy, Steiner insists that "we must give birth to a new, higher being within us", and that through developing the Astral we find that "something comes to life in us that transcends the personal or individual."⁸⁰ This is where the fourth realm, or fourth state enters the picture (in classical Indian philosophy the term *turiya* is Sanskrit for "fourth," and identified with the highest stage of human consciousness). It is the reception of energy, the cognition of another psyche, psychic entity, or entities, that characterizes Steiner's fourth realm or mode of consciousness.

In discussing this highest state of the human being, Steiner also refers to it with the terms "Ego", and "I", but in a particular way and not as commonly understood. Steiner's Ego and "I" refer not to the "little I" and "little ego" habitually active within the Etheric body of socialized human beings. The little ego is to a great extent a product of the wiring of the human nervous system laid down by DNA encoding, and of memory storage as in a laptop computer, with the sequential electronic activity that gives rise to the avataric of an ego that is active in most humans between states of sleep, molded by a lifetime of experience and memory. This individual ego is the one explored and dealt with by modern psychology and psychiatry (Jung excepted), not the Ego, the "I" referred to by Steiner. That higher Ego of Steiner, referenced by Jung as the Self, has through the ages been discovered, experienced, and documented by a rare few human beings spanning innumerable cultures.

⁸⁰ Steiner, *How to Know Higher Worlds: A Modern Path of Initiation* (anthroposophic Press, 1994), 35.

Documented participatory experiences reveal descriptions of access to the Ego, true "I," or Self as being one of a state of being replete with higher powers of perceptual cognition, and the ability not only to perceive non-human entities (called variously devils, angels, spirit guides, gods, goddesses, etc.), but also to communicate with these non-ordinary entities in ways not previously foreseen.

Steiner urges us to go into the silence in order for the organs of supersensible perception to become cognizable, but that is for stilling the Etheric (electrical) so that we can experience the mode shift into focus from within the Astral (magnetic), but here he urges us to go even further, much further, beyond both the Etheric and Astral, into and beyond what he strikingly terms "the zero-point of silence":

There would be not only the absolute peace of the zero-point of silence but it would go further and come to the negative of hearing, quieter than quiet, more silent than silence. And this must in fact happen when we are able through enhanced powers to reach this inner peace and silence. When, however, we arrive at this inner negative of audibility, at this peace greater than the zero-point of peace, we are then so deeply in the spiritual world that we not only see it but hear it resounding."⁸¹

4.0 Scientific Vectors to A Psychophysics of Consciousness

*"Every formula
which expresses a law of nature
is a hymn of praise to God."*

Maria Mitchell, Life, Letters, and Journals (1896), 207.

4.1 Mathematical Basis: The Fourier transform

The English mathematical physicist Penrose asks "How 'real' are the objects of the mathematician's world?"⁸² and "Is mathematics invention or discovery?"⁸³ He answers with the following: "I cannot help feeling that, with mathematics, the case for believing in

⁸¹ Steiner, *Evolution of Consciousness*, 30.

⁸² *Ibid.*, 123.

⁸³ *Ibid.*, 126.

some kind of etherial, eternal existence, at least for the more profound mathematical concepts, is a good one.”⁸⁴

The Fourier transform was first derived by Napoleon's appointed Governor of Lower Egypt, Jean Baptiste Joseph Fourier, who had been of exceptional loyalty to Napoleon. Fourier's fascination with mathematics and the flow of the invisible energy called heat led him to investigate a way to use mathematics to model the flow of heat energy, resulting in the discovery of what Lord Kelvin described as "a great mathematical poem," the Fourier transform.⁸⁵

The Fourier transform and inverse Fourier transform are:

$$f(t) = \int_{-\infty}^{+\infty} X(F)e^{j2\pi Ft} dF \qquad f(F) = \int_{-\infty}^{+\infty} x(t)e^{-j2\pi Ft} dt$$

Fourier integral transform of a continuous time function into the frequency domain (f_a).

Fourier integral transform of a continuous frequency function into the time domain.

The preceding two Fourier transform expressions indicate that any arbitrary function in the time-space domain, $f(t)$, can be transformed into and expressed by an infinite series of frequency spectra functions $dF(F)$ in the imaginary frequency domain, and conversely, that any arbitrary function in the frequency domain, $f(F)$, can be transformed into and expressed by an infinite series of time spectra functions $dt(t)$.

Widely used as a fundamental mathematical tool for the encoding, transformation, and transmission of information in electromagnetic energy fields in audio, visual and

⁸⁴ Ibid., 127.

⁸⁵ Nick Herbert, *Quantum Reality*. (New York: Random House, 1985), 79.

network communication engineering, the widespread applicability inherent in the electro-mathematical transforms of the Fourier series cannot be underestimated, bridging and interlinking as they do a spacetime domain (t_d) and a frequency domain (f_d).

The basic concept of the spacetime domain should be familiar to every human. We live and have our history and we move in space and time. It is upon these basic attributes of the spacetime domain that our material science is founded. In physics and engineering one sees the horizontal axis of graphical data displayed as time, the time axis (see Figure 13, *Time Domain Chart with Time Axis and Space Axis*).

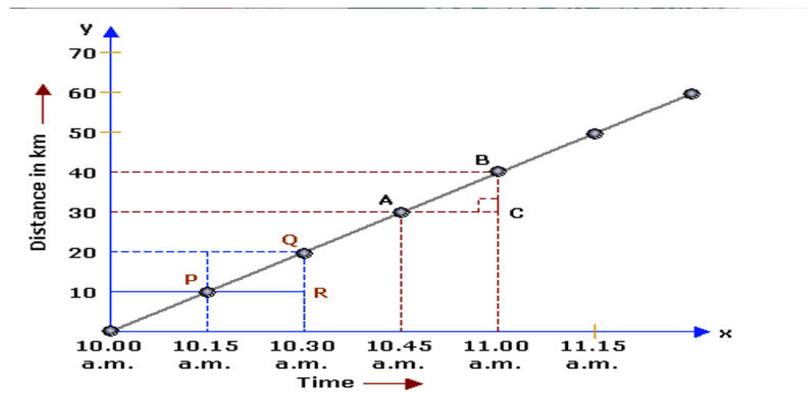


Figure 13. *Time Domain (t_d) Chart with Time Axis and Space Axis*

As you can see in the chart, the horizontal axis measures time and the vertical axis measures distance (space), with the data points (information) marking unique intersections of timespace or the spacetime domain (t_d). But the Fourier transform is used to transform such timespace signals out of the spacetime domain into a conceptually mysterious frequency domain (f_d), in which information is no longer measured by time or distance but by frequency and signal strength (amplitude). Figure 14 below plots an information signal in the frequency domain (f_d). Each discrete frequency value on the horizontal axis indicates a unique pure frequency corresponding one to one (in resonance) with a unique sine wave

within the spacetime domain. The horizontal axis in the frequency domain thus measures frequency and the vertical axis measures the magnitude or power of energy at that specific frequency.

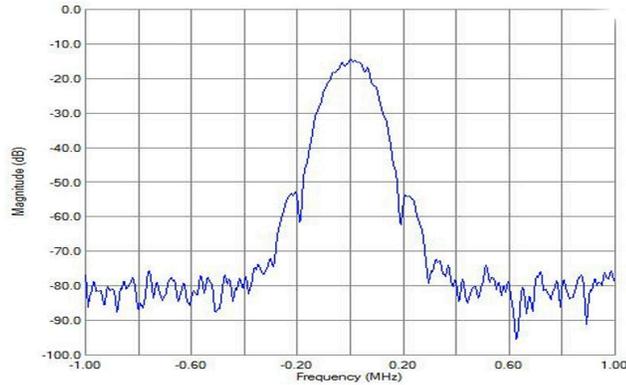


Figure 14. Frequency Domain (f_d) Chart with Frequency Axis and Magnitude Axis

Note that there are infinite frequencies and in fact the full Fourier integral transform operates from minus infinity to plus infinity on the frequency scale, perfectly mirroring a signal in the timespace domain.

It is in the implications of the Fourier transform that we begin to see clear possibilities of mapping a dimension beyond the classical "scientific four," i.e. beyond the three dimensions of space and the additional fourth of time. As we have seen, the widespread acceptance of string theory by physicists (and mathematicians) explicitly implies and requires the existence of ten dimensions, and this would tend to support the conjecture that the Fourier transform's frequency domain is truly a cosmic dimension, a real dimension, one of the "missing dimensions" which is mirrored and modelled by this mathematical of the Fourier transform.

4.1.1 Tangential and Radial Energy Mapped by the Real-Imaginary Plane

Teilhard de Chardin describes energy as having both a tangential component and a radial component, as does the electromagnetic model of wave-frequency propagation with its spacetime domain (tangential) and frequency domain (radial or f_d) components. Likewise the Real-Imaginary axis has been discovered by mathematicians and physicists to map mathematically the dynamic process transformation of the two components.

In the first deep exploration of the Real-Imaginary domain model in the nineteenth century, the Danish mathematician, Caspar Wessel, and the mathematical physicist and astronomer Johann Carl Friedrich Gauss independently discovered that a two dimensional plot could be made of the Real-Imaginary axes, using two dimensional geometry with one axis of Real numbers (traditionally illustrated by a straight horizontal line with values increasing from left to right) and an axis of Imaginary numbers drawn at a ninety degree angle to the Real number axis. Gauss went on to map the invisible planetary magnetism by developing and applying the Fourier transform and in 1835, Gauss's Law, or Gauss's Flux Theorem, which eventually became one of Maxwell's four famous equations published in his 1861 paper "On Physical Lines of Force."

In the 20th century this two dimensional plane has been developed to model, analyze, and solve complex problems dealing with transformations between the spacetime (t_d) and frequency (f_d), domains in electrical and communication engineering and remains the essential core of engineering calculations for transforming energy signals into light, sound, and two and three dimensional images.

Perhaps the most significant modern breakthrough in beginning to grasp this mapping of the Real-Imaginary domain occurred in 1980 when a Polish-American engineer, Benoit

Mandelbrot, made an attempt to plot an actual visual image of a two-dimensional interface of the timespace (t_d) and frequency domain (f_d) by calculating the pattern created by the simple intersection of points on the Real-Imaginary plane close to the origin (defined as the intersecting point where the Real axis equals zero and the Imaginary axis equals zero). His initial impression, upon seeing the first image, was that the computer program had malfunctioned.⁸⁶ Subsequent computer plots assured him that these visual patterns were truly there. Images of this region about the time-frequency origin have gained interest worldwide and the region itself has come to be known as The Mandelbrot Set (Figure 10), of which the English mathematical physicist Sir Roger Penrose wrote:

The Mandelbrot set is not an invention of the human mind: it was a discovery. Like Mount Everest the Mandelbrot set is just *there!*⁸⁷

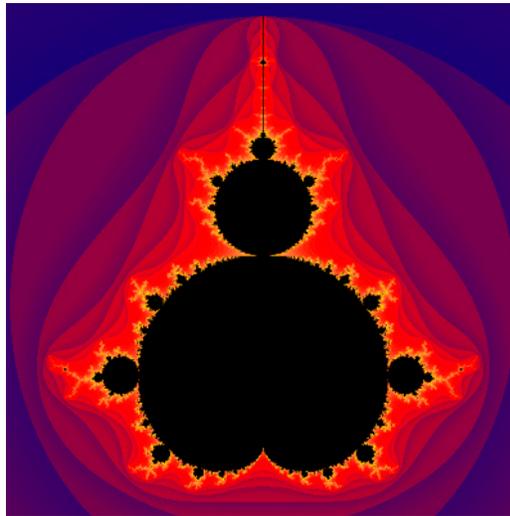


Figure 15. Mandelbrot Set about Real-Imaginary Axis Origin

⁸⁶ Benoit Mandelbrot, “Fractals and the Rebirth of Iteration Theory,” in *The Beauty of Fractals: Images of Complex Dynamical Systems*, (Berlin: Springer-Verlag, 1986), 151.

⁸⁷ Sir Roger Penrose, *The Emperor’s New Mind: Concerning Computers, Minds and the Laws of Physics*, (Oxford: Oxford University Press, 1989), 124.

Aside from the fact that the Mandelbrot image looks rather like a Buddha seated in contemplation, it exhibits some remarkable properties. As calculations are done on ever smaller regions on the time-frequency plane, the images appear similar but never completely repeatable, and the viewer begins to sense some sort of biological shapes emerging from this strange world of purely mathematical being. Penrose goes on to say “..the very system of complex numbers has a profound and timeless reality which goes quite beyond the mental constructions of any particular mathematician.”⁸⁸

If the basic properties of this mysterious Real-Imaginary domain have been used so successfully to model and manipulate the timespace-frequency dimension of electromagnetic energy, is it not conceivable that they might also be seen as parallel models (and perhaps be used to manipulate) some Teilhard's tangential and radial components of energy, and in particular the energy of consciousness? Would shifting energy from the tangential to the radial take us closer to the spiritual source, the Omega Point, the Christic? Mathematics and reality have been found to follow an amazingly parallel path throughout human history.

Mathematical functions mysteriously model the physical world in timespace (t_d). The genius of innumerable mathematicians such as Newton has been in “discovering” such correlations as the coinciding identity of a mathematical equation with the fall of an apple from a tree, and other such intuitive leaps of perception that have contributed to the evolution of our technology.

⁸⁸ Ibid., 127.

4.1.2 Information Theory: Signals in the Time and Frequency Domains

Information theory indicates that there is a multi-dimensional connection between radiant energy and information signals "carried" by that energy, and that in a real sense, radiant energy and information are aspects of the same thing. It was Claude Shannon (a cousin of Thomas Edison) who in 1946 first discovered that thermodynamic equations could be used to relate the flow of thermal (radiant heat) energy to the flow of information signals encoded in any medium. Shannon's mathematic discovery that information and electromagnetic energy could be related in precise mathematical relationship, followed by the discovery of the transistor the following year in the same laboratory (AT&T's Bell Labs in New Jersey) while investigating some observed strange properties of germanium crystals, was the evolutionary big bang of the digital information age.

Marshall McLuhan, a Canadian philosopher and communication theorist who coined the term "global village," developed a paradigmatic model that popularized the idea that the hotter the medium, the more information that can be encoded, transmitted, and extracted from the medium. thus information encoded within video images contain much more information encoded than that information carried by radio waves, morse code, or smoke signals. Video is thus seen as a much "hotter" medium than radio. McLuhan was a philosopher however, and Shannon's theory bridging energy and information goes beyond philosophical concepts, connecting information and energy in the powerful yet abstract world of mathematics.

A new branch of mathematical physics pioneered by Shannon and the new science of cybernetics developed by Norbert Weiner at MIT led to methods of modulating information signals in a wide range of radiant energy spectrums from radio waves to visible light waves.

In a parallel way, information theory posits that there is a connection between energy and information, that in a sense they are aspects of the same thing. As previously discussed, it was Claude Shannon (a cousin of Thomas Edison) who applied thermodynamic equations modeling the flow of thermal energy to the flow of information encoded in any medium. This new branch of mathematical physics led to enhanced methods of modulating information signals in many different media, from electromagnetic energy (“radio”) waves to visible and infra-red (“light”) waves.

The two domains, time (t_d) and frequency (f_d), are of essential importance in the field of information theory and signal communication. On the first page of his standard textbook on electronic network information theory, Kuo states:

In describing signals, we use the two universal languages of electrical engineering – *time* and *frequency*. Strictly speaking, a signal is a function of time. However, the signal can be described equally well in terms of *spectral* or *frequency* information. As between any two languages, such as French and German, translation is needed to render information given in one language comprehensible in the other. Between time and frequency, the translation is effected by the *Fourier series* and the *Fourier integral*.⁸⁹

Using Fourier analysis and the Fourier transform, signals can not only be described either in the time domain or the frequency domain (f_d), but they can be converted between the two domains, and it can thus be said that they are two different aspects of one and the same thing, energy signals with information content, but potentially existing in either one, or both, of two very different dimensions, one with a timespace (t_d) component, the other a spaceless atemporal frequency dimension (f_d).

Teilhard de Chardin's description of the relationship of tangential to radial energy in matter can be seen to follow the same pattern, that they are two different modes of one and

⁸⁹ Franklin F. Kuo, *Network Analysis and Synthesis*, (New York: John Wiley & Sons, 1962), 1.

the same thing. The tangential follows the arc of energy in timespace (t_d), while the radial is the pull of energy toward the heart of matter, the ever more centralized centro-complexity of what Teilhard describes as the "infinitesimal psychic centres of the universe. In other words, consciousness is a universal molecular property."⁹⁰

4.1.3 The Fourier transform and Conscious Energy Transformation

"Certainly, no metaphysics can be admissible which does not take count of the standards and undoubted results of Science."

Sri Aurobindo
(*Philosophy of the Upanishads*, 32.)

If we assume that the radial energy of consciousness expresses itself in the human biosystem and as a timespace (t_d) radiant energy phenomena (as Jung speculated) that can be categorized as acting across some sort of arc (as Teilhard has speculated), then the closest mathematical analog for modeling the dynamic transformations of this psychic frequency energy spectrum in moving between the two domains, the timespace dimension (t_d) and the eternal (nontemporal) frequency dimension (f_d) is the Fourier transform.

A digital analog of the Fourier transform is used to transform information between the timespace domain (t_d) and the frequency domain (f_d) repeatedly and reliably in our own hands every time we operate digital devices. Why would not cosmic Nature over billions of years have learned to use or even to have developed directly these very same mathematical transformations to process signals of the psyche and transformations of psychic energy in, around, and between our human bodies and the planetary environment?

And more importantly, why do philosophers, metaphysicians, and mystics continue to look for some as yet undetected energy field variously called chi, prana, mana, orgone

⁹⁰ Teilhard, *Centrology* in [The Activation of Energy](#), 101.

energy, holy spirit, morphogenetic fields, or animal magnetism when our entire existence into which we are born, live, and die is literally filled in every point of the expanding universe with this omnipresent matrix of electromagnetic energy universally acknowledged by materialist science as that which cannot be created nor destroyed. All that must be done is to convince the rational materialist that this field is not a dead thing, but that it is very living stuff of consciousness, the very ground of electromagnetic being they have been taking for granted as a dead lifeless unaware physical "property" unrelated to life or awareness.

On the contrary, the cosmos is not dead, according to pansychism, it is a living being. So too, electromagnetic energy is not a dead "thing," it is consciousness, power, and a truly glorious substrate of the entire universe both in timespace and eternity, the timespace domain and the frequency domain (f_d). It has been gleefully hiding there right in front of (and within) the scientist and psychologist.

As we have observed, in the mathematics of information theory it is the Fourier transform that is the workhorse providing the direct connection interface between the time domain and the frequency domain (f_d). Signal processing chips in cell phones are encoded with what are called Fast Fourier transform algorithms which transform audio voice speech frequency patterns in the time-space domain into frequency spectrum patterns which are then digitized and transmitted to remote receiving devices (antennas with amplifiers) as parallel frequency "packets." On the receiving end, an electronic algorithm called the Fast Fourier transform unpacks the frequency domain spectrum and transforming them into time-space frequency spectrums in low voltage circuits, which then drive the remote speaker allowing the remote human to "hear" the recreated audio time-space spectral energy.

But in addition to audio speech conversion and transmission, the Fourier transform operates on vibrational frequency information of every kind, and so accordingly must be integrally involved in thought communication: human, animal, noospheric, and perhaps on even greater macro scales: the transphysical, between noospheres, intergallactically, intragallactically, possibly trans-multiversally.

We have seen how mathematical functions model the way energy flows between two dimensions, how energy is transformed between the timeless frequency domain of psyche and the material universe of spacetime. The classical school of Indian philosophy, *Samkhya*⁹¹, is founded upon the same hypothesis, that all reality consists of the dance and relationship between the two domains of *prakrtti* and *purusha*, Sanskrit for what have been translated as "matter" and "spirit", but could likely be more accurately translated to correspond with the time domain (t_d) and the frequency domain (f_d).

4.2 Electrical Basis

A fact not commonly understood is that electricity and heat are the same thing. It is a common misconception that heat is some kind of collective "friction" caused by wiggling atoms or molecules bumping into one another or speeding away causing a high "temperature." The words "heat," "friction," and "temperature" conjure up an incorrect paradigm. Heat is actually radiant energy, pure electromagnetic energy in the range of frequencies known as the infrared range or band of frequencies.

⁹¹ One of the six schools of classical Indian philosophy, *Samkhya*, described in Vedic texts as early as 200 C.E., is the basis for the five other major philosophical schools in India, including Yoga.

4.2.1 Thermodynamic and Consciousness: Heat is Not Wiggling Atoms

Paul Nunez, an emeritus professor of biomedical engineering at Tulane, has been studying brain physics for the past two decades, and recently concludes that there is a strong link between thermodynamics and consciousness. Here he mentions this link in his theory of consciousness, the Relativity, Quantum mechanics, Thermodynamics, and Consciousness conjecture (RQTC):

... I label the putative deep connection between relativity, quantum mechanics, thermodynamics, and consciousness, *the RQTC conjecture*, independent of the actual nature of any proposed connection. ... *If consciousness studies lie within the purview of legitimate scientific inquiry, RQTC must be considered seriously if only because classical physics cannot even begin to explain consciousness.*⁹²

Imagine that you have a device that provides a tuneable consciousness, within a given bandwidth of frequencies, similar to a car radio tuner which usually has two or more bands, with individual frequencies that can be preset (to receive your preferred broadcast stations). Tuning past the visible spectrum in nature's transmission system, and continuing to tune a little bit lower in frequency, you soon tune into the infrared frequency band.

4.2.2 Wien's Law, Radiant Energy, and Resonance

Wien's Law states that the maximum electromagnetic wavelength λ generated by a theoretically perfect "black body" at a specific temperature is given by the following equation:

$$\lambda_{\max} = \frac{b}{T}$$

Figure 16. Wien's Law: EMF Wavelength varies directly by Temperature

⁹² Paul L. Nunez, *Brain, Mind, and Structure of Reality*, (New York: Oxford University Press, 2010), 178.

Here "b" in the equation is a constant discovered by Wilhelm Wien in 1893 and is equal to $2.897768551 \times 10^{-3}$ and T is the temperature. Plugging in the core human body temperature we obtain the maximum wavelength to be 9.34 micrometers in what electrical communication engineers call the "10 micron wavelength band," which is found just below the visible light frequency range.

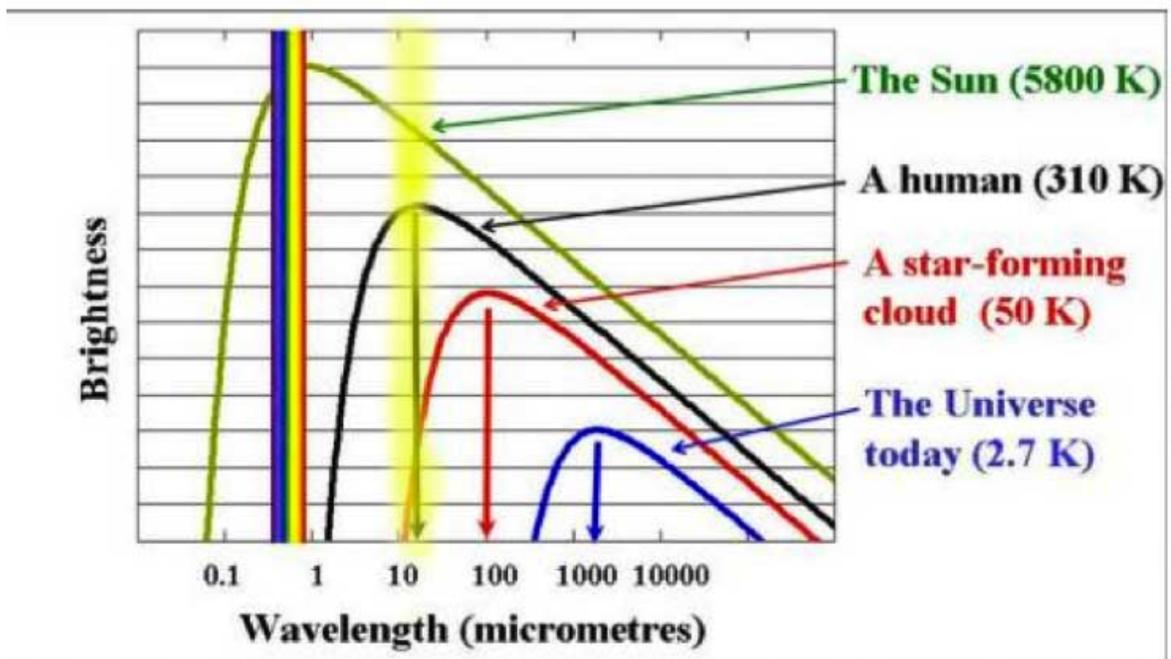


Figure 15. Graph showing human emf radiation wavelength peak at 10 microns

Below to the right in Figure 17 can be seen the direct infrared emf energy radiating from a human being in the 10 micron infrared range. Note that this is directly emitted emf radiation, unlike in the image to the left in Fig. 17, in which is seen emf radiation bouncing off of the human figure at selective frequencies (which we perceive as "color" distinctions).

We humans, slightly warmer than room temperature, glow in the mid infrared and we're brightest at about 10 microns. These days we are all familiar with infrared imaging, which allows us to see in the dark using electronic detectors that record infrared light emitted by warm objects such as people. The pictures below show SPIRE team member Prof. Peter Ade in visible light (wavelength about 0.5 micron) and infrared light (about 10 microns).



Figure 17. Human Image Viewing Visible Light vs Infrared Light

4.2.3 The EMF Field Theory of Consciousness

Most contemporary neurophysiologists are epiphenomenalists, holding the tacit belief that consciousness is nothing but a by-product of neuronal electrical activity. Benjamin Libet's research, resulting in the observation that physiological response to a stimulus can be recorded 300 milliseconds before conscious awareness of such stimulus strengthened the argument of epiphenomenalists, who hold that mental states such as pain, itchiness, jealousy, love, are side-effects or by-products of physical processes within the body. But the fact that neurological circuits spark into activity prior to "our being aware" of something happening can also be explained conversely. It is equally possible that such stimulus-handling sensory and motor subsystem activity has been offloaded into quasi-independent electric circuits, which send their output to the larger (magnetic field) consciousness only after having completed their pre-programmed, offloaded task.

Striking among epiphenomenalists is their incoherence with respect to communication between non-contiguous cells. In a chapter discussing sentience, Terrence Deacon says "...recall that molecules separated by many millimeters in separate Benard cells

within a dish can exhibit highly correlated patterns of movement, despite being nearly completely dynamically isolated from one another."⁹³

In her 2002 publication The Nature of Consciousness: A Hypothesis the New Zealand neurophysiologist Dr. S. Pockett states unequivocally that "... consciousness is identical with certain spatiotemporal patterns in the electromagnetic field."⁹⁴ In a subsequent article, "*Difficulties with the Electromagnetic Field Theory of Consciousness: An Update*", published in 2007, she admits that although spatiotemporal electromagnetic patterns co-varying with consciousness have been identified in rabbits and cats, no analogous patterns have been found in humans likely because the relevant patterns are inaccessible from the scalp without invasive surgery.

The essence of the hypothesis was that conscious experience (a.k.a. sensation) would prove to be identical with certain spatiotemporal patterns in the electromagnetic field. These patterns are at present generated only by living brains, but in principle they could be generated by hardware instead of wetware. The characteristics of the patterns were left largely unspecified, except that they would probably be transiently occurring, brain sized, spatial patterns of electromagnetic intensity or amplitude (i.e. voltage). One of the points which I then thought to be in favor of the theory was that such localized electromagnetic fields are known to be capable of causing neurons to fire, which in principle offers a mechanism by which consciousness could cause behavior. ... Basically, we need access to human electrocorticography (ECoG). Ask me again in another seven years.⁹⁵

A similar idea was put forth by Dr. J. McFadden, a researcher in genetics at the University of Surrey, published in his 2002 article "*The Conscious Electromagnetic Information (Cemi) Field Theory*"^l in which he proposes:

⁹³ Terrence Deacon, *Incomplete Nature: How Mind Emerged from Matter*, (New York: W.W. Norton, 2012), 504.

⁹⁴ Pockett., 7.

⁹⁵ Susan Pockett, *NeuroQuantology*, Sept., Issue 3 (2007):271.

The brain's electromagnetic field is an integrated electromagnetic field representation of distributed neuronal information and has dynamics that closely map to those expected for a correlate of consciousness. *I propose that the brain's electromagnetic information field is the physical substrate of conscious awareness.*⁹⁶ (italics added)

Notice that both McFadden and Pocket display a common assumption that any electromagnetic component of consciousness must be an epiphenomenon, a byproduct arising from the firing of neurons in the brain or quantum resonance occurring in microtubules.

Many philosophers would take the converse view, i.e. that consciousness predates (and has always been the underlying driving cause of) the emergence of matter, meat, and neuronal activity. Perhaps it is in the electromagnetic energy matrix of consciousness of the cosmos in general and within the bioelectromagnetic field matrix of the Earth itself specifically that we should seek the evolutionary driver and precursor to subsequent evolution in the biosphere and psychosphere, and that it is out of this cosmic energy field that life, the neuron, and brain structures subsequently arise and are energized. According to this perspective, it is the "electromagnetic frequency field (EFF)" that is the "horse before the cart" in the evolutionary sequence, first came radiant energy and only subsequently emerged neuronal structures.

While McFadden and Pockett approach consciousness as being an epiphenomenon consisting of the electromagnetic field generated by neuronal firing caused by the brain, recent studies indicate the converse. In a 2012 issue of the *Journal of Consciousness Studies*, M.B. Majorek, in his article "Does the Brain Cause Conscious Experience?", attacks the current tautology that "the brain produces (causes) conscious experience,

⁹⁶ McFadden, *Journal of Consciousness Studies*, vol. 9, no. 4 (2002): 23.

conscious states, or more broadly consciousness."⁹⁷ Majorek produces a number of clinical pictures of massive ventricular enlargements (Figure 18) and hemispherectomies in numerous individuals in France, and relates clinical verification of their otherwise completely normal mental/social functioning:

In 2007, a brief account of another fascinating case was published. It was the story of a 44-year-old French civil servant and father of two who led an apparently fairly normal life, but when examined on account of a persistent weakness of the left leg turned out to have a massive enlargement of the ventricles which reduced his brain to a thin mantle squashed against the skull.⁹⁸

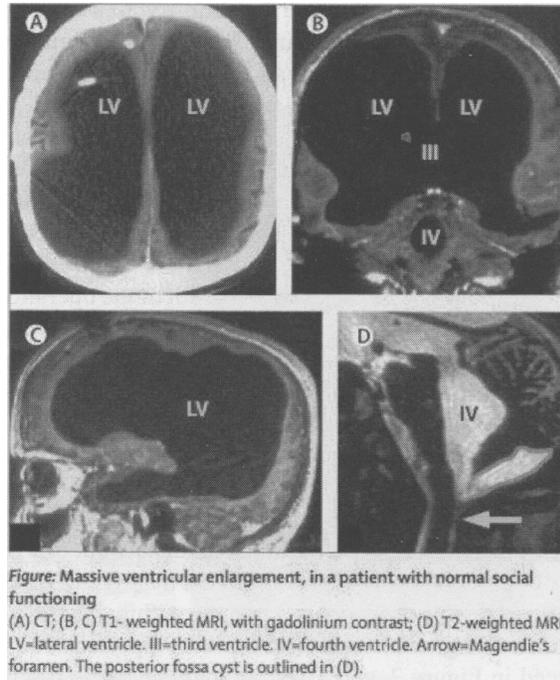


Figure 18. Massive ventricular enlargement, in a patient with normal social functioning

Ultimately Majorek concludes:

Taking the weight of the preceeding considerations in its entirety it seems fair to say that they amount to *a radical challenge to the currently dominant view of the origin of consciousness*. In view of these considerations it appears that the theory that electrical impulses recorded in the brain are

⁹⁷ M.B. Majorek, *Journal of Consciousness Studies*, vol. 19, no. 304 (2012):121.

⁹⁸ Majorek., 125.

traces of information processing taking place within individual neurons and/or in neuronal assemblies, and ultimately leading to the emergence of consciousness in its varied and rich facets, is a fairy tale.⁹⁹ (italics added)

4.3 Magnetic Basis

Many cultures have religious traditions that stress the importance of understanding that consciousness is somehow represented in human blood, often by the heart itself. Quantum physics corroborates this tradition. In recent years researchers in the field of quantum brain dynamics (QBD) have concluded that consciousness is to be found, not exclusively within the neuronal system of nerves and organs such as the brain, but within a powerful magnetic field that is sustained by the hot ionic liquid that continuously courses through the human circulatory system.

4.3.1 Quantum Brain Dynamics (QBD)

Modern quantum physics corroborates Rudolf Steiner's observations on the importance of understanding the consciousness represented by the blood system. In recent years researchers in the field of quantum brain dynamics have concluded that consciousness is to be found, not necessarily within the neuronal system of nerves and organs such as the brain, but within the liquid that fills the human circulatory system, the hydrogen ionized bloodstream.¹⁰⁰

Contemporary neuroscience tacitly assume that consciousness can be associated only with the nervous system and the brain. Over a century ago Gustav Fechner fought against

⁹⁹ Majorek., 141.

¹⁰⁰ Mari Jibu and Kunio Yasue, *Quantum Brain Dynamics and Consciousness: An Introduction*, (Philadelphia: John Benjamins, 1995).

this same assumption, which he called the "nerve issue." Fechner countered this assumption with the following amusing nonsensical analogies:

Since violins need strings to sound, then flutes also need strings; but since flutes have no strings, they cannot sound; candles and petroleum lamps need wicks in order to burn, so gas lamps also need wicks, but they have none; thus they cannot burn. yet flutes sound without strings and gas lamps burn without wicks. ... If fish and worms can breathe without having lungs, while mammals and birds can breathe only if they have lungs, why cannot plants without nerves experience perception, while animals can only perceive when they do have nerves?¹⁰¹

In 1995 the Japanese neurophysiologists Jibu and Yasue described the creation and annihilation dynamics of units of conerescing consciousness which they characterize as quanta of consciousness and link these quanta to the physical properties of water stating that they are "energy quanta of the water rotational field" extending to the whole assembly of brain cells, and photons, that is, energy quanta of the electromagnetic field.¹⁰²

Jibu and Yasue go on to describe a theory in which the polarization of water molecules plays an exceptional part, and on the macro level produces a single resonant water "macromolecule" in bodies of living, water based creatures. Within this non-local quantum field that is generated within the human circulatory system is embedded an electromagnetic field in the form of an ionized blood plasma¹⁰³ vortex. That our blood acts as a plasma should not be surprising as the first line in a textbook on plasma physics reads:

¹⁰¹ Gustav Fechner, *Religion of a Scientist: Selections from Gustav Theodor Fechner*, (New York: Pantheon, 1946), 309.

¹⁰² Jibu and Yasue, *Quantum Brain Dynamics*, 164.

¹⁰³ *Plasma*: "A plasma is a state of matter in which a significant portion of the particles are ionized. Plasmas are by far the most common phase of matter in the universe, both by mass and by volume. All stars are made of plasma, and interstellar space is filled with plasma. Common forms of plasma include lightning, St. Elmo's fire, the polar aurorae, the solar wind, neon signs, and plasma displays in modern home television." Francis F. Chen, *Introduction to Plasma Physics and Controlled Fusion, vol 1. Plasma Physics*, 2nd ed. (New York: Springer, 2006), 56.

"It has often been said that 99% of the matter in the universe is in the plasma state."¹⁰⁴ Jibu and Yasue go even further by explaining how Quantum Brain Mechanics explain how life itself can be seen to be equivalent to "the unity of water" in the human body, or as "a single molecule" in the human blood system:

There are two basic fields in quantum brain dynamics (QBD): the water rotational field and the electromagnetic field. The two must be described simultaneously by quantum field theory because they interact with each other. ... All H₂O molecules bound together in a QBD vacuum domain form a single, extensive molecule of water in a macroscopic domain. That is, water throughout the entire region of the cerebral cortex is thought to be composed of many macroscopic water molecules whose sizes are all comparable to the coherence length of the QBD vacuum, that is, about 50 microns. This remarkable feature of water in living matter might provide us with quantum field theoretical support for the idea that life is nothing but the unity of water as a single molecule in living matter.¹⁰⁵

4.3.2 QBD and the Cardiac Bioelectromagnetic Self

This observation from quantum brain dynamics (QBD) supports Steiner's model of an Astral body of consciousness beyond the Etheric body of the nervous system and brain. The supporting pattern can be seen in the QBD manifestation of a "single extensive molecule of water," dipolar in geometry like an antenna, generating a complex magnetic field through the circulation of the hot hydrogen ions of blood plasma.

Thus we find existing within the blood system of the human body an extensively polarized "super cell" of magnetic energy which can be identified as Steiner's¹⁰⁶ Astral body of consciousness, as differentiated from the Etheric body of consciousness which itself is generated by electrical activity in the nervous system.

¹⁰⁴ Chen, *Introduction to Plasma Physics*, 1.

¹⁰⁵ *Ibid.*, 83.

¹⁰⁶ And also the same "Astral body" we have seen identified by Plato, Proclus, and Patañjali.

This Astral Body, magnetic component of the blood, is in the human being largely outside of the range of the consciousness of the Etheric activity in the electrical neuronal system during waking states of human consciousness. But as we have seen, Steiner tells us that "it is possible purely through processes of inner concentration, to separate the blood-system from the nerve-system ..."¹⁰⁷

Thus there is system of dual consciousness in the human being, one operating largely within the electrical activity of the nervous system and brain, and the second mode of consciousness operational in the dipolar magnetic blood plasma:

... as human beings, we actually stand in the world as a duality, a duality in the first place which has, in the nervous system of the brain and the spinal cord, instruments that bring external impressions to the blood.¹⁰⁸

Additional recent support for this view can be found in the research conclusions of Dr. Rollin McCraty of HeartMath Institute in California, who summarizes an essay describing his research findings with the following:

In conclusion, I believe that the electromagnetic energy generated by the heart is an untapped resource within the human system awaiting further exploration and application. Acting as a synchronizing force within the body, a key carrier of emotional information, and an apparent mediator of a type of subtle electromagnetic communication between people, the cardiac bioelectromagnetic field may have much to teach us about the inner dynamics of health and disease as well as our interactions with others.¹⁰⁹

4.4 Geomagnetic Basis: Wien's Law and the Noosphere

Like the invisible water in which all fish swim, we emerge into and throughout our lives exist within the geomagnetic field of the earth. Constantly bathed by this swirling

¹⁰⁷ Steiner, *An Occult Physiology*, 41.

¹⁰⁸ Steiner, *An Occult Physiology*, 120.

¹⁰⁹ Rollin McCraty, *The Energetic Heart: Bioelectromagnetic Interactions Within and Between People*, (Boulder Creek, California: Institute of HeartMath, 2003), 17.

vortex of geomagnetic radiation, we never see, nor seldom think of the fact that directly below us, occupying half of the diameter of the planet, is a glowing vibrating source of geomagnetic radiant flux emanating from an enormous crystalline iron-nickel¹¹⁰ core of glowing energy. Yet we have all seen magnetic compass needles line up with the magnetosphere and for centuries have relied upon that field to chart the course on land, sea, and air. And this is far from a static field as we can see in the sworling glow of the aurora borealis when the geomagnetic fields are lit up with ionized gasses in far latitudes.

What is less commonly realized is that what we call "heat" is an epiphenomenon of radiant energy in the infrared band of the electromagnetic energy spectrum of the cosmos. What we call "light" is the same kind of energy though of a higher frequency, a smaller wavelength.

And what is even less commonly realized is that the human body generates a spectrum of electromagnetic radiation with maximum peak frequency right in the infrared band. In section 4.2.2 we used Wien's Law to calculate this wavelength and arrived at approximately 10 microns (see Figure 18 - What's so special about 10 microns?).

There are about 25 kilometers of 10-micrometer-wide capillaries carrying blood throughout the brain, which would provide an excellent wave-guide for electromagnetic infrared energy at 10 microns. Coincidentally, perhaps, our planet Earth itself radiates

¹¹⁰ "On August 30 2011, Professor Kei Hirose, professor of high-pressure mineral physics and petrology at the Tokyo Institute of Technology, became the first person to recreate conditions found at the earth's core under laboratory conditions, subjecting a sample of iron nickel alloy to the same type of pressure by gripping it in a vice between 2 diamond tips, and then heating the sample to approximately 4000 Kelvins with a laser. The sample was observed with x-rays, and strongly supported the theory that the earth's inner core was made of giant crystals running north to south." from webpage "Structure of the Earth", http://en.wikipedia.org/wiki/Structure_of_the_Earth, accessed 10/27/2011.

energy most strongly at the 10 microns wavelength. Ten microns is also the diameter of the prokaryote, considered to be perhaps the first form of life on Earth, as early as 3 billion years ago.

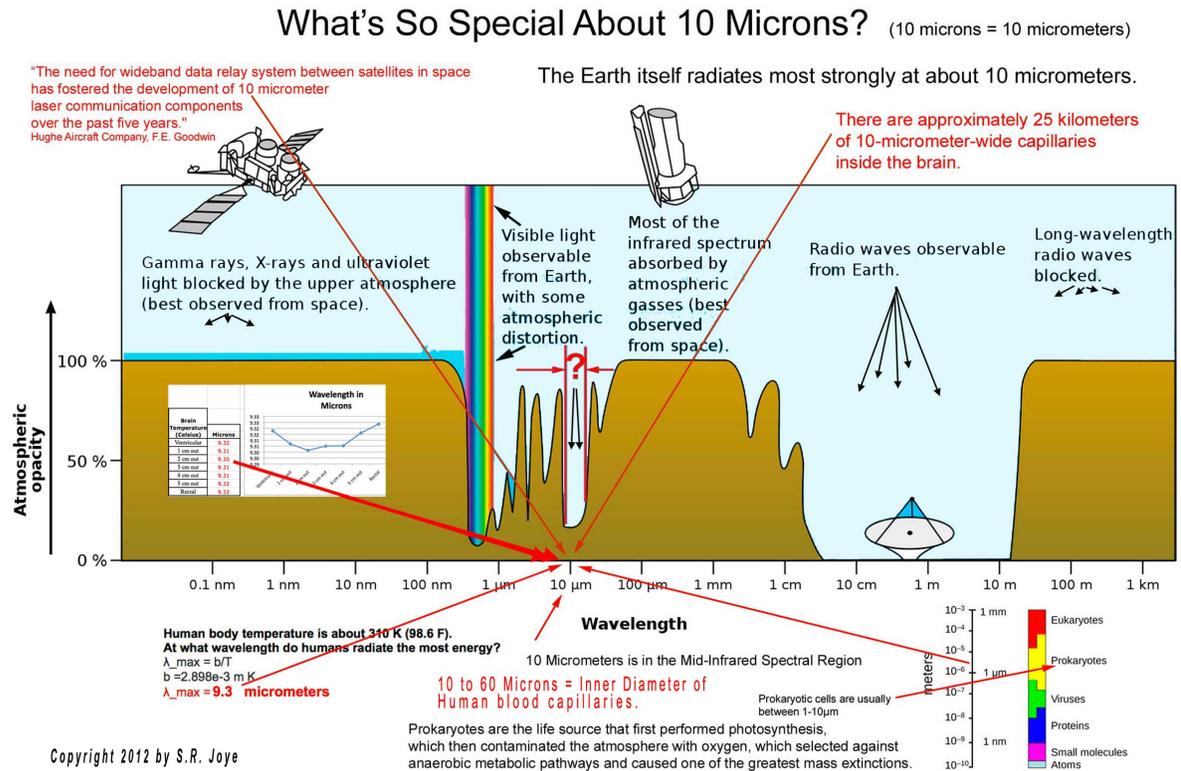


Figure 19. What's So Special About 10 Microns?

Moving from macrocosm to microcosm within this broader context of the electromagnetic energy field that is our planet, if we focus on the possible location of the electromagnetic field component of consciousness described by Pockett and McFadden in the living matrix of consciousness resonating within the cavities of the human body, it is our human body temperature that tells us where this electromagnetic flux field is located in the ranges of the electromagnetic frequency spectrum, and it is there that we should look. And perhaps understanding this will give us some indication of the location of Teilhard's noosphere on or within our planet.

4.4.1 Wien's Law and Human Body Heat

If we look at the previous figure and at the chart of atmospheric opacity (Fig. 19 below), there is a distinct "opening" or what communication engineers call a "passband" in the opacity of the atmosphere in this range of the infrared in the 10 micron range.

Nothing in nature is arbitrary and accordingly might we speculate that this is evolutionary nature's opening passband for the human component of radiant consciousness? If our human consciousness system has been designed to broadcast and receive in this frequency range, then it would be a very convenient thing indeed that the atmosphere of our planet is transparent in this range, i.e. that the atmosphere with its gasses does not absorb our radiant energy but allows it to pass unrestricted and unattenuated. Certainly this fact has been used by military engineers in the development of "sniper scopes" used to locate a single human body in the dark thousands of yards in the distance. We glow like the stars.

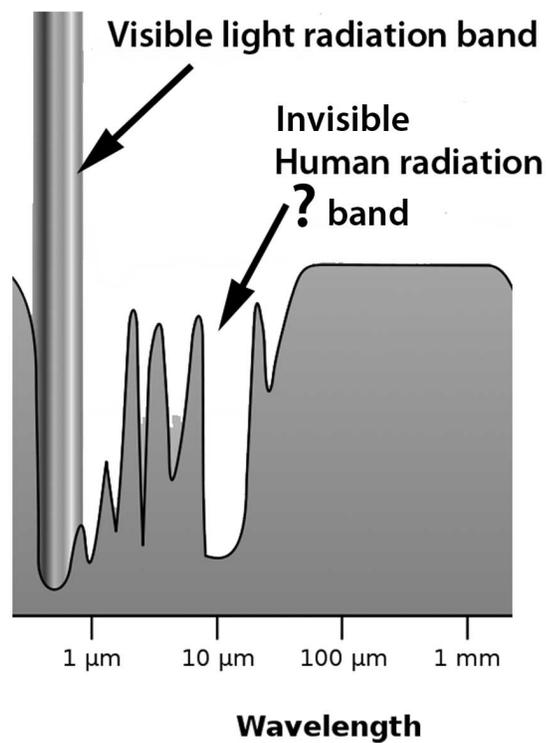


Figure 20. Human Radiation Passband of Atmosphere

4.4.2 Where is the Noosphere?

To find the noosphere let us try a thought experiment to build a likely image of the noosphere. Picture in your mind the geometry of the planet Earth. Imagine the heat, approximately 7200° C. in the central core. Place your consciousness at the absolute geometric-gravitational central point of the planet's core. Now begin to move (or to rise) along a radial line slowly outward, toward the cold of space, noting the temperature drop as you move along the line away from the center of the planet, and stop at the moment you arrive at the temperature 98.2° F. which is the average normal human core temperature.

Repeating the above procedure multiple times, with many different radii moving away at different angular separation from the core, a three dimensional surface mapping, like a mathematical brane¹¹¹, or Teilhard's isosphere, will begin to emerge, an infrared energy isosphere to which each human being is linked through an identical resonance frequency.

The shape of this isosphere will likely be highly organic and fractal in appearance, sometimes hovering above the ground on thermoclines where the "ambient temperature" reaches 98.2° F., while in arctic regions and below the oceans it will be located hundreds of feet the surface of ice or water.

But the noosphere is more than simply a dynamic location on the surface of an isosphere at or above or below the rocky surface of the earth. It is energy at the same frequency band as the human body, which generates with each heartbeat approximately

¹¹¹ A brane is a geometrical boundary of higher dimensional dimensions spaces. This concept is used in contemporary superstring theory and M-theory.

1.3 watts of power.¹¹² While we normally think of each heartbeat as simply a pushing of blood through the arteries, it is also radiantly generating infrared electromagnetic energy (the infrared being a range of the spectrum that we often hear dismissively described as "heat").

How might this information be used to substantiate Teilhard's vision by providing a source of power for the emerging noosphere using human energy? Simply looking at a chart of global population growth (Figure 20 - Population of the Earth since 1800) and multiplying the current 7 billion humans by the average of 1.3 watts per human gives the

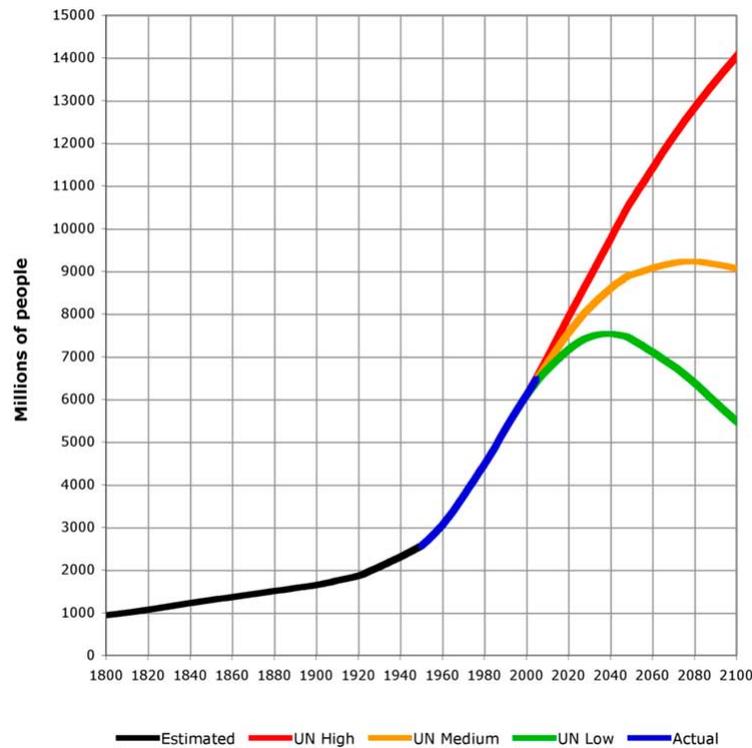


Figure 21. Population of Earth since 1800

¹¹² Tadeusz Malinski, *Chemistry of the Heart*, (Ohio: Biochemistry Research Laboratory, 1960), 72.

current amount of electromagnetic energy generated by all human hearts as having currently risen to 7 Gigawatts (7,000,000,000 watts) which dwarfs the output power of the most powerful radio transmitter in the world at only 1,500,000 watts, and the Three Mile Island nuclear power plant generated 873,000,000 watts during maximum operation.

	Power Output
Most powerful radio frequency transmitter on planet	1,500,000 watts
Max. output of Three Mile Island nuclear reactor	873,000,000 watts
Combined instantaneous electromagnetic output of human heartbeats (1.3 watts per heartbeat).	7,000,000,000 watts

With all of this energy being generated it is likely that we may, individually and collectively, mostly unwittingly, be taking part in a vastly energetic resonance communication within and feeding of the frequency domain (f_d) of the noosphere as expressed in the 98.2° F. radiation band and planetary isosphere, collapsing into and out of the spacetime domain, riding the waves of Fourier fractal shapes of that part of the geomagnetosphere that is us, the noosphere.

At this point a relevant statement by Teilhard in the 1953 essay "A Sequel to the Problem of Human Origins" follows:

... our minds cannot resist the inevitable conclusion that were we, by chance, to possess plates that were sensitive to the specific radiation of the 'noospheres' scattered throughout space, it would be *practically certain* that what we saw registered on them would be a cloud of thinking stars.¹¹³

¹¹³ Teilhard. *Christianity and Evolution: Reflections on Science and Religion*, (New York: Harcourt, Inc., 1969), 231.

In summary, and envisioning the future exploration of human energy, in particular of that universally acknowledged phenomenon of electricity, taken so for granted and thought to be fully "understood" by so many engineers and physicists, who view the universe as a collection of non-living particles inhabited only by biological life, and who regard electricity merely as a dead phenomena to be manipulated (like so much of the ecosphere), it is appropriate here to recall the story told in a letter by Nikola Tesla of his cat, Macak.

One day, at the age of three, I felt impelled to stroke my Macak's back. What I saw was a miracle which made me speechless. Macak's back was a sheet of light, and my hand produced a shower of crackling sparks loud enough to be heard all over the place. My father told me this was caused by electricity. My mother said to stop playing with the cat lest we start a fire, but I was thinking abstractly, "Is nature a gigantic cat? If so who strokes its back? It can only be God," I concluded.

Later, as darkness filled the room, Macak shook his paws as though he were walking on wet ground, and the I distinctly saw the furry body surrounded by a halo like the aura of saints. Day after day I asked myself what electricity could be, and found no answer. At the time of writing this letter, eighty years have gone by, and I still have no answer.¹¹⁴

4.5 Cosmological Basis

The ninety degree relationship of the electric field to the magnetic field is also reflected in the recent cosmological discovery (NASA) that our Milky Way galaxy is similarly structured, and that a central black hole not only pulls the starstuff inward toward

¹¹⁴ Margaret Cheney, *Tesla, Man Out of Time*, (New York: Dorset Press, 1981), 226.

itself in a giant planar whirlpool, but also emits surging Gamma-ray and X-ray frequencies of energy beams perpendicularly to the galactic plane (see Fig. 22).¹¹⁵

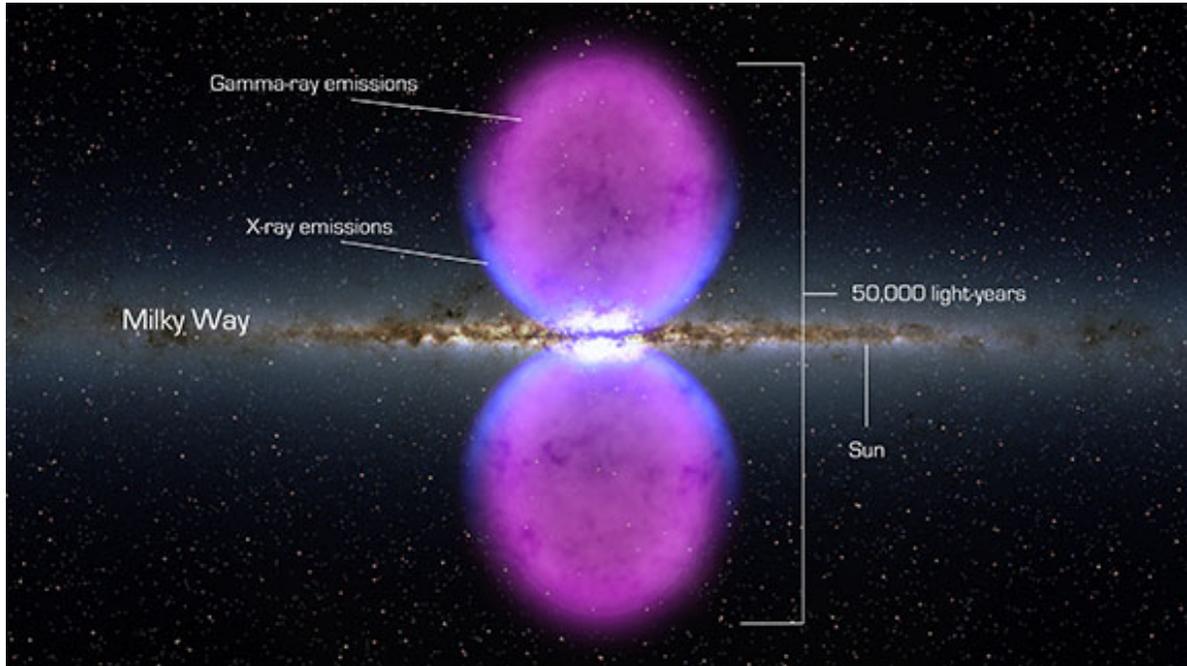


Figure 22. Gamma Ray Bursts from Milky Way: e_a and m_a emerging from f_d

This perpendicular relationship of a disc of stars spinning in a horizontal galactic plane, with a powerful magnetic polar axis running perpendicular through the center, finds symmetry with the fundamental geometry of the emf energy field, as well as the models of energy and consciousness developed both by Teilhard and Steiner. Incredibly enough, water appears to be generated as part of this process:

Two teams of astronomers have discovered the largest and farthest reservoir of water ever detected in the universe. The water, equivalent to 140 trillion times all the water in the world's ocean, surrounds a huge, feeding black hole, called a quasar, more than 12 billion light-years away. A quasar is powered by an enormous black hole that steadily consumes a surrounding disk of gas and

¹¹⁵ Image retrieved from North American Space Administration website:
http://www.nasa.gov/images/content/498884main_DF3_Fermi_bubble_art_labels.jpg.

dust. As it eats, the quasar spews out huge amounts of energy. Two groups of astronomers studied this particular quasar called APM 08279+5255, which harbors a black hole 20 billion times more massive than the sun and produces as much energy as a thousand trillion suns. Astronomers expected water vapor to be present even in the early, distant universe, but had not detected it this far away before.¹¹⁶

5.0 Eastern Metaphysical Vectors to a Psychophysics of Consciousness

5.1 Tantra Yoga and Psychophysics: Mantra, Yantra, and Samadhi

Of the three component domains of consciousness (electric, magnetic, frequency) it is in the frequency domain, devoid of spacetime separation, in which we would expect to discover the basis for the often reported experience of transpersonal, universal connectivity that has been reported by so many mystics, saints, and shamans in all cultures throughout history. As the experimental psychiatrist Staislav Grof states:

If the mind is actually part of a continuum, a labyrinth that is connected to every other mind that exists or has existed, but to every atom, organism, and region in the vastness of space and time itself, the fact that it is able to occasionally make forays into the labyrinth and have transpersonal experiences no longer seems so strange.¹¹⁷

Assuming that human beings have the capacity to somehow enter and tune conscious awareness within this transcendent dimension, the frequency domain, a domain which transcends the separation limitations of time and space, where

M.P. Pandit, a close associate of the Indian philosopher and contemplative sage Sri Aurobindo, as well as the Secretary of the Sri Aurobindo Ashram, describes Tantra as follows:

The *Tantra* provides for a graded system of sadhana according to the competence of the seeker. *Puja*, external worship with flowers, incense,

¹¹⁶ Retrieved from NASA website:

<http://www.nasa.gov/topics/universe/features/universe20110722.html>

¹¹⁷ Stanislav Grof, quoted in Mohsen Kermanshahi, *Universal Theory: A Model for the Theory of Everything*, (Boca Raton: Universal Publishers, 2007), 106

offerings, etc., is a first stage; next comes *Japa*, repetition of *Mantra* according to prescribed procedure; then *Dhyana*, mental contemplation, adoration; the last and highest is the Brahmbhava or Brahmasadhana, attainment of the knowledge and feeling that one *is* Brahman and All is pervaded by Brahman.¹¹⁸

5.1.1 Mantra and Audible Resonance

Mantra can be seen as much more than words, even sacred words, though all prayer can be mantra. Even single words or sounds, repeated over and over, are mantra when practiced with as continuous a focus of awareness as possible, and of course, the mantra, the repetition, does not have to be audible, it can be a silent repetition, which is internally audible. The audible resonance is consciousness itself, and internal repetition leads to contact with the source of the vibrations in the frequency domain of consciousness, allowing supersensuous perception to arise.

Mantra are considered, not products of discursive thought, human wisdom or poetic phantasy, but flash-lights of the eternal truth, seen by those eminent men who have come into a supersensuous contact with the Unseen.¹¹⁹

As the scientist and Indian philosopher I.K. Taimni (who obtained his PhD in Inorganic Chemistry from London University in 1928, and later became the President of the Theosophical Society in Adyar) writes:

The aim of all mantra, in short, is to purify and harmonise the vehicles of the seeker so that they become increasingly sensitive to the subtler layers of his own spiritual consciousness. As he comes into contact with these he becomes increasingly aware of that Reality of which his own consciousness is a partial expression.¹²⁰

¹¹⁸ M.P. Pandit, *Studies in the Tantras and the Veda*, (Madras: Ganesh & Company, 1973), 6-7.

¹¹⁹ J. Gonda, *History of Ancient Indian Religion*, Vol. IV, *SELECTED STUDIES*. (Leiden: E.J. Brill, 1975), 251.

¹²⁰ I.K. Taimni, *Gayatri*. (Allahabad: Ananda Publishing House, 1946), 24.

Rephrasing this statement in psychophysical terms we would say that the aim of mantra is to tune into, to resonate with a particular bandwidth of energy frequencies, a spectrum of energy accessible to our own consciousness which can be contacted through mantric vibration resonating in a bandwidth of atemporal conscious energy .

Within this bandwidth or region of atemporal consciousness (which cannot even really be called a region as it is both atemporal and aspatial, i.e. outside of time and space), or what is called the frequency domain in the emf field theory of consciousness, can be found all of the vibrations that have ever been generated, interpenetrating in all of their complexities. This is called, in many Indian schools of thought, the Ākāśa, or Alaya-vijñana, the "storehouse of all consciousness;" and it is this domain that is 'touched' by the contemplative Tantric yogi during sessions reaching *asamprajñata samādhi*, when the various separate cognitive systems of thought and perception have been attenuated and the deepest silence has been entered.

It is ironic that in order to reach this state of *asamprajñata samādhi* and touch the akashic records even short term and long term memory must be "silenced," detached, attenuated or deactivated. Hence the difficulty (back in the world of time and space) of communicating the "experience" or of describing this state, and thus the resulting myriad metaphors and symbols throughout cultures and religions serving as substitute for the authentic experience.

5.1.2 Yantra and Visual Resonance

The Sanskrit word *yantra* derives etymologically from the root *yam* which is translated 'to sustain, hold or support.' In common usage it can be used to refer to any physical structure which may be used to support exercises for the health, growth, and

evolutionary transformation of consciousness. The scholar Madhu Khanna characterizes yantras as "aids to and the chief instruments of meditative discipline ... a yantra used in this context and for this purpose is an abstract geometrical design intended as a 'tool' for meditation and increased awareness."¹²¹

Among Yantras the Sri Yantra is highly revered as an advanced contemplative instrument. Below is the image of a Sri Yantra created by the author out of wood, gold, and ground mineral pigments tempered in egg yolk. The mantra of the yantra (which resonates with the yantra when recited, and invokes the energy deities associated with the yantra) can be seen in Devanagari script in a circle just within the inner surrounding row of petals in the yantra.

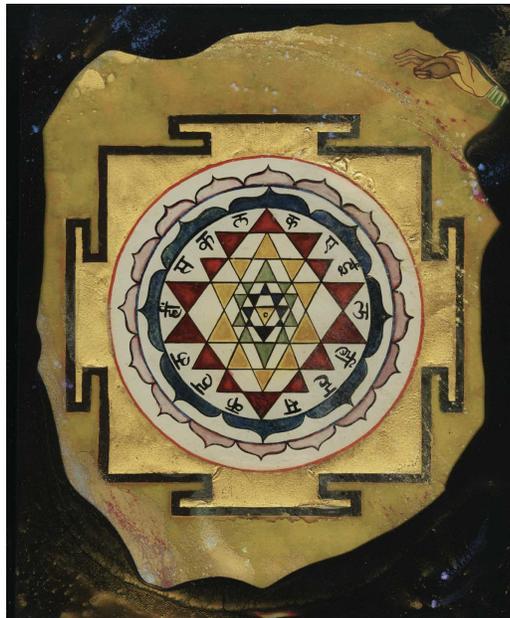


Figure 23. Sri Yantra for Contemplation¹²²

¹²¹ Madhu Khanna, *Yantra: The Tantric Symbol of Cosmic Unity*. (London: Thames & Hudson, 1979), 11.

¹²² Sri Yantra in 24 k gold with ground minerals tempered in egg yolk, on wood; by author, completed October 2012.

The Yantra is also used as mnemonic tool which helps the practitioner recall a variety of attributes and issues which should be made consciously explicit in the psychophysical practices leading to the transformative experiential dimensions associated with the Yantra.

M.P. Pandit writes:

There are in the being of man certain nodii which are so to say centres connecting him with other universal planes of existence; and when properly tapped they open up in one's being their respective planes and the powers that are characteristic of the principles governing those planes. Within the Indian Yogic system, these are called "chakras" or "Centers."¹²³

The chakra is experienced as a psychophysical matrix with a definite spatial location within the human body. Diagrams of charkas are used as mnemonic tools to assist the practitioner recall the various locations within which to focus consciousness during periods of contemplative practice.

For example the *ajña-chakra*, located behind the forehead in the cranium, is described.

This *chakra* is the naso-ciliary extension of the cavernous plexus of the sympathetic through the ophthalmic division of the fifth cranial nerve, ending in the ciliary muscles of the iris and at the root of the nose, through the supra-orbital foramen. It has two petals or branches and is situated between the eye-brows. It is the spot which is contemplated while undergoing the process of *prānāyāma*.¹²⁴

5.1.3 Samadhi: Psychophysical Tuning of Human Consciousness

In Patañjali's *Yoga Sūtra*, dating back to the second-third century CE,¹²⁵ we find an elaborate map of human consciousness and explicit methods for traveling among the various

¹²³ M.P. Pandit, *Lights on the Tantra*. (Madras: Ganesh & Co, 1957), 15.

¹²⁴ Rele, 29.

¹²⁵ Whicher., 5.

regions described in that map. In the *Yoga Sutra* are gathered the collective experiential wisdom distilled over the lifetimes of generations of Indian sages, and that what has been compiled with a stamp of authenticity. That there is a great deal of real, enduring, and practical validity to Patañjali's map can be inferred by the many translations and written commentaries that have sprung up beginning with *Vyāsa's* as early as the seventh century CE.

In a series of terse *sutras* (mnemonic threads, from the root *siv*, to sew, root of our medical use of the word 'suture') Patañjali constructs a pragmatic model for human access to states of awareness rarely found in human experience. The descriptions of these states and dimensions of consciousness, and the instruction given for maneuvering among them are the outgrowth of direct observation contributed from age to age through a long lineage of contemplative seekers in India (and of course in virtually all other cultures), and obviously of significant interest to Patañjali .

The key word *yoga* is written in the *Devanāgarī* script as follows:

योग

This word often translated "yoke, to link, to unite."¹²⁶ The word *yoga* is understood numerous ways in the West, typically as a form of exercise consisting of extreme body stretching poses. But a contemporary yoga scholar says that when the word "is used by itself without any qualification, it refers to the path of meditation, particularly as outlined in the

¹²⁶ Salvatore Zambito, *The Unadorned Thread of Yoga: The Yoga-Sutra of Patanjali in English - A compilation of English Translations*, (Washington: The Yoga-Sutras Institute Press, 1992), 10.

Yoga Sutras - the Aphorisms on Yoga - and the term yogi, a practitioner of this type of meditational yoga."¹²⁷

But the word yoga is also synonymous with *samādhi* in the *Yoga Sūtra*, in which is give detailed instruction on an experiential, introspective approach to navigating the flow of sentient energy within the human psycho-cognitive mental subsystem, and numerous ways of controlling, redirecting, and modifying mental activities to establish transcendent¹²⁸ links, unions, and communions with alternate states of conscious awareness.

The *Yoga Sutra* assumes that the material in the previous chapters has been mastered. In the third chapter Patañjali focuses first specifically upon instructions for entering into *samādhi*, which is followed by an enumeration of various powers that may be experienced. Here again, the first *Sūtra* of the chapter is the most important, describing a key skill required to be exercised in learning to manipulate consciousness in order to move into *samādhi*, that of *dhāraṇa*, the practice of holding the "stuff" of consciousness steadily within one place, within a fixed set of multi-dimensional boundaries:

YS III.1., *Deśa-bandhaḥ cittasya dhāraṇā*

"Focusing *citta* consciousness within a specific place is called *dhāraṇā*."

देशबन्धश्चित्तस्य धारणा

¹²⁷ Edwin F. Bryant, *The Yoga Sūtras of Patañjali: A new edition, translation, and commentary with insights from the traditional commentators*, (New York: North Point Press, 2009), xvii.

¹²⁸ Author's note: "Transcendent" as used in this paper is to be contrasted with "ordinary everyday waking" consciousness: a state or condition of awareness beyond verbal-emotional ego boundaries; numinous; sublime; inexpressible; elaborated by Patanjali in his descriptive injunctions defining the various stages and states of *samadhi* and *kaivalya*.

Dhāranā is already highly developed in the Western educational systems. It is the skill of being able to concentrate the attention of consciousness in one place (*deśa*), the more focused the better. Accordingly one would think that adepts at electronic gaming might have this skill in a highly developed form. However it is not enough to be able to gather consciousness to focus within a bounded area momentarily, the next step is to "hold" that focus steadily without being diverted by distractions, and to learn to be able to sustain this laser-like focus unwaveringly for a protracted period of time, which is the subject of the next important *sūtra*, *YS III.2.*, defining the fundamental practice of contemplation with the word *dhyāna*, a word that has been translated into Chinese as *Chán* (禪) and in Japanese as Zen.

Sūtra III.2., Tatra pratyaya-ikatānatā dhyānam

"Here the content of awareness held in a single stream is called *dhyāna*."

तत्र प्रत्ययैकतानता ध्यानम्

The skill and practice of holding the *citta consciousness* steadily and continuously in the same place is here defined as *dhyāna*. The focus of the sequence *dhāranā dhyāna* can be various: a *mantra* (voiced or internally audible sutra or prayer), a *yantra* (usually a visual, painted diagram), a concept, an inner sensation, etc. In advanced practice the object is actually not an object at all and the adept learns to focus on "consciousness-without-an-object", a sort of void of objects.

The key here is to be able to sustain this bounded focus of consciousness within such a particular region for a sufficient length of time and intensity of focus so as to ignite transition into the state called *samādhi*, which is the subject of the next sutra. An analogy might be seen in using a magnifying glass lens to focus the rays of the sun on an object in order to ignite the

object into flame. In focusing with the glass lens, the object is usually a leaf or a twig, whereas in focusing consciousness the object is a repeated prayer (*mantra*), image (*yantra*), concept (such as love, death, detachment), external point (candle flame, cloud), or internal bodily location or sensation.

Success in this *dhāranā dhyāna* sequence is obtained with a shift or threshold crossing of consciousness into a state of *samādhi*, as described in the third *sūtra* of this chapter:

Sūtra III.3., *Tadeva-artha-mātra-nirbhāsam svarūpa-sūnyam-iva-samādhiḥ* or

"Samadhi is when that same dhyāna shines forth as the object alone and [the mind] is devoid of its own [reflective] nature."¹²⁹

तदेवार्थमात्रनिर्भासं स्वरूपशून्यमिव समाधिः

The rest of the third chapter describes numerous *siddhis* or "powers" that have been found possible to exercise and observed by contemplatives in exploring the domains of consciousness opened up through entry into the ocean *purusa* through achieving *samādhi*, including such things as communication with other centers of consciousness (telepathy), becoming invisible to others, remote seeing, inner light and various powers (*siddhis*).

5.2 The Chakras: Loci of Psychophysical Resonance

Within the human body, there are to be found areas of particular psychophysical significance. In the practices of *samādhi*, contemplatives have discovered loci which are particularly sensitive for tuning into simultaneous resonance the electrical domain, the

¹²⁹ Edwin F. Bryant, *The Yoga Sūtras of Patañjali: A new edition, translation, and commentary with insights from traditional commentators*, (New York: North Point Press, 2009), 306.

magnetic domain, and the frequency domain. From the Aurobindian point of view of M.P.

Pandit:

There are in the being of man certain nodii which are so to say centres connecting him with other universal planes of existence; and when properly tapped they open up in one's being their respective planes and the powers that are characteristic of the principles governing those planes. Within the Indian Yogic system, these are called "chakras" or "Centers."¹³⁰

A more Western, medical description of these areas was presented in 1926, before the Bombay Medical Union, by Dr. V.G. Rele, who read a paper for those interested in "the science of Yoga." Rele presented a theoretical psychophysical explanation for some of the experiential changes in consciousness described by Yogis as a result of Tantric practices, and in particular, the activation of the Kundalini, the "Serpent Power." Dr. Rele also happened to be a close friend and associate of the Chief Justice (1915) of the Supreme Court in India, Sir John Woodroffe, known also by his pen name "Sir Arthur Avalon," with which he himself had published numerous books and translations of Tantric material.

The chakra is experienced as a psychophysical matrix with a definite spatial location within the human body. Diagrams of charkas are used as mnemonic tools to assist the practitioner recall the various locations within which to focus consciousness during periods of contemplative practice.

Here for example is the *ajña-chakra*, located behind the forehead in the cranium:

This *chakra* is the naso-ciliary extension of the cavernous plexus of the sympathetic through the ophthalmic division of the fifth cranial nerve, ending in the ciliary muscles of the iris and at the root of the nose, through the supra-orbital foramen. It has two petals or branches

¹³⁰ M.P. Pandit, *Lights on the Tantra*. (Madras: Ganesh & Co, 1957), 15.

and is situated between the eye-brows. It is the spot which is contemplated while undergoing the process of *prānāyāma*.¹³¹



Figure 24. Chakra Figure Diagram - Nepal, 16th century CE

Dr. Rele, whose lecture series was later published as *The Mysterious Kundalini: The Physical Basis of the "Kundalini Yoga"*¹³² asserts that the *kundalini* corresponds to energy flowing in the right vagus nerve. He says that a yogi, through the vagus nerve, "establishes a complete control over the unconscious automatic action of the involuntary muscular fibres."¹³³ This accords well with the *Hatha-Yoga-Pradipika*, in which the Kundalini is said "to be lying dormant guarding the opening of the passage that leads to the seat of Brahma." Rele goes on to describe the very physiological substrate of yogic processes when he states:

This seat is said to be *Brahma-randhra* (cave of Brahma), that is, the ventricular cavity in the brain. ... Unless she (*Kundalini*) is awakened, or made consciously active, one cannot send one's embodied soul (*Jivātma*), which is supposed to reside in the heart (*Hridaya*), along the *Sushumnā nādi* to the *Brahma-randhra* nor is he able to assist the soul captured in the *Randhra*, to be freed to join the Universal Soul (*Paramātmā*) outside."¹³⁴

¹³¹ Rele, 29.

¹³² Rele, Vasant G. *The Mysterious Kundalini: The Physical Basis of the "Kundalini Yoga"*. (Bombay: D.B. Taraporevala Sons & Co., 1927).

¹³³ Rele, 50.

¹³⁴ Rele, 34.

Here Rele is careful to explain that his understanding of the English translation of the Sanskrit word *Randhra* is definitely 'cavity,' and should not be translated as 'hole' as found in numerous other English translations. He states that this *Randhra* is "the inter-communicating cavity of the four ventricles of the brain and is continuous with the central canal (*Chitra*) of the spinal cord (*Sushumnā nādi*). Below is a physiologically accurate sketch of the contiguous ventricular cavity within the brain.

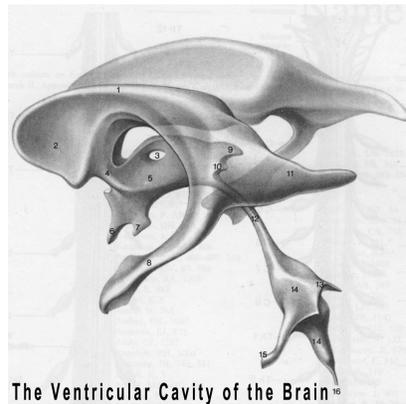


Figure 25. Sketch of Ventricular Cavity: Oblique view from behind and above.¹³⁵

Thus the experience called by yogis the movement or flow of "Kundalini" energy might also be seen understood as the phenomena of a magnetic plasma field being being tuned and resonating within the ventricular "Cave of Brahma."

Microwave cavities, also known as electromagnetic cavity radiators, are to the invisible frequency energy spectrum what lenses are to visible light energy. During my senior year of electrical engineering we were given the project to design resonant waveguide cavity horn antennas (Figure 24) for amplification and modulation of microwave energy.

¹³⁵ George Adelman, ed., *Encyclopedia of Neuroscience*, Vol. I. (Boston: Birkhäuser Boston, 1987), Appendix I: A-11.

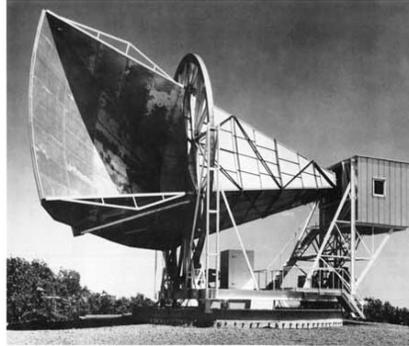


Figure 26. Horn antenna.

The horn antenna at Bell Labs, Holmdel, NJ that Penzias and Wilson used to discover the 3 K cosmic microwave background radiation in 1965. The simplest aperture antenna is such a waveguide horn. Radiation is guided by a tapered waveguide horn.
<http://www.cv.nrao.edu/course/ast534/RadioTelescopes.html>

In a course on the electrophysiology of the nervous system I noticed the striking similarities between the waveguide horn antennas we were designing in the communication lab and the images of the ventricular cavities within the human skull (Figure 8 below). I mentioned this in class and was told by my professor that the ventricular system only dealt with thermal equilibrium of the brain and secondarily to absorb shock trauma to the head.

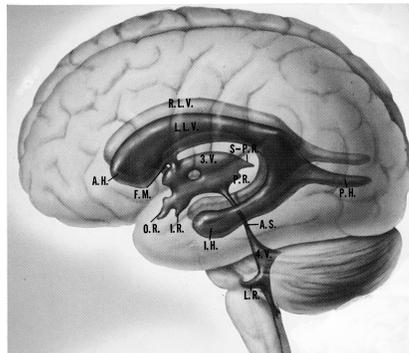


Figure 27. Lateral view of the ventricular cavities within the human brain¹³⁶

If the human nexus does indeed have an electromagnetic frequency energy component, then the horn shaped ventricular cavities within the cranial cavity indicate the

¹³⁶ Netter. p. 46.

possibility that nature might very well have already designed and implemented its own energy frequency signal communication system.

Rele states that a perfect adept in *Kundalini Yoga* should be able to move the focus of consciousness out from the captivity of the *Brahma-randhra* and out of the brain into the "bigger cavity surrounding the brain and the spinal-cord, known as *ākāsha*." In this state there will arise awareness of a much wider field of perception and the yogi "becomes absorbed in the Infinite Intelligence from which it emanated."¹³⁷

The benefits, Rele goes on to say, include that he "begins to function through his Astral body, even at points in space far removed from his physical body."¹³⁸ In all of this, he says that Kundalini itself does not take part directly, but that "it does prepare the ground for the soul to vibrate through another channel than the nerves."

6.0 Participatory Vectors to a Psychophysics of Consciousness

The following sections describe a sequence of my own participatory experiences, first-person noetic revelations which catalyzed the eventual development of this paper through impassioning a lifelong exploration of consciousness. None of these three visions occurred in a cave, but the first on a remote Big Sur beach at midnight, the second at midnight by an ancient volcanic pool in Austin, Texas, and the third in a windowless inner room in my quiet fifth floor walkup at night in New York's Lower East Side.

¹³⁷ Rele, 79.

¹³⁸ Rele, 83.

6.1 Midnight Experience On the Beach at Big Sur, California

At the age of twelve, I obtained a pamphlet with the title "How to Hypnotize Your Friends." One chapter advised the hypnotist-in-training to sit in a darkened room at night while gazing steadily at a single candle flame in order to develop an "empty mind", an important power of the psyche required (or so said the book) on the way to becoming a competent hypnotist. For many months I pursued this exercise; in retrospect, it was the beginning of a lifetime of contemplative practice and participatory exploration of consciousness.

Several years later, I entered college on a physics scholarship. However it was the late '60s and during the summer of my third year of science I found myself on a California beach south of Big Sur, where Little Sur Creek meets the Pacific Ocean, under a clear, starry, moonless sky, having taken for the first time a strong dose of LSD. That night of ocean, star, and energy experiences opened my eyes to the vastness of regions far beyond my recently forged scientific perspectives. This led directly to a lifelong yearning to re-enter those worlds and to explore those ranges of consciousness and high peaks of sheer experience into which I had been briefly thrust by psychedelics.

Almost all that I could remember afterwards of this intense episode were the physical effects that had occurred at onset of "rupture of plane", a feeling of electrical currents flowing in the area of my teeth and electrical snapping somewhere on a horizontal plane inside my head and through the back of my neck. Trying to remember the ensuing experiences was as impossible as recalling a vastly complex dream sequence, but I took away a deep conviction that "there", wherever I had been, and however I had arrived "there", be it somewhere or perhaps somewhen, was an ocean of experience that could be

tuned into, but that normally was so filtered out from awareness as to be completely concealed from everyday waking consciousness.

6.2 Midnight Experience at Hamilton's Pool, Austin, Texas

The next summer, my worldview again experienced a major paradigm shift. It came with the appearance of a strange light that I saw in the Texas hill country near Austin. This occurred near Hamilton's Pool, a small grotto fed by a creek along an ancient crack in the earth called the Balcones Fault. Fed by a small waterfall, and about 300 yards across, the pool was deep and dark, almost a perfect circle. It was around midnight, and we had come to rest and swim after a week of final exams. The night was quiet except for the chirping of insects and bullfrogs. A thick pale covering of moon-backlit clouds concealed the stars. We arrived around 11:00 pm from Austin, having succumbed to a late evening urge to go swimming in the countryside to celebrate the end of the semester. For more than an hour we sat at the edge of the pool, leaning against a large sun-warmed boulder, talking quietly, often lapsing into silence.

The first sign of something out of the ordinary came with an abrupt cessation of the crickets' chirping, replaced by the quieter sound of a small waterfall, splashing into the pool from an overhanging rim directly across from where we sat. Soon even the intermittent bullfrog croaking stopped, amplifying the night silence broken only by the regular sound of the waterfall.

After an interminable time even our thoughts faded away. A barely perceptible glow seemed to flicker far down the creek which drained Hamilton's Pool into the Pedernales River. The light seemed to be growing and fading in a slow pulsating rhythm. The glowing moved closer, sometimes fading, but then growing brighter in a slow pulsating rhythm,

continually moving toward us, into our view, yet obscured in the distance by the intervening trees of the forest. The glowing light at last moved out from the greater darkness of the night foliage, following the bed of the stream from the pool. Slowly, almost majestically, the flickering sphere circled the rim of the overhanging cliff which surrounded two-thirds of the grotto. When the glowing sphere reached the falls, it slowly dipped toward the falls, bobbing and weaving in a strange, almost rhythmical pattern near the falling water, as if it were some gigantic moth in the night. Eventually it resumed its circuitous path along the sheltering rim, moving along the shore toward our side of the pool.

At last it came to the rock by the shore, against which we rested in suspended judgment. It paused in its movement, and, hovering twenty to thirty feet over the rock, above our heads, it appeared as if a galaxy of stars had coalesced within a spherical space the size of a beach ball, with thousands of points of light tracing straight-line paths in seemingly random patterns, circumscribed within a spherical boundary about a meter in diameter.

For what seemed an eternity it remained above us, until at last it resumed its circumnavigation of the grotto, moving once again toward the creek draining the pool, then following the creek, bobbing and weaving on its way back into the forest and the swamps from which it had apparently come.

What I felt and perceived during that time in the presence of, and then beneath, this apparition I can only attribute as being "angelic", I can scarcely remember, let alone begin to describe. I heard peculiar sounds, and feelings arose that I had never before imagined, all overshadowed with astonishment, awe, amazement, and fear. I knew it had radically changed my view of our planet and my life. Here, thirty miles or more from the nearest

"civilization", in the silence of a simple Texas countryside, the unknown had revealed itself in all innocence. That this apparition, this light being, was aware, that it saw us and paused awhile above us, there was no doubt.

For days we discussed the apparition at length. We wondered if it should be reported, and if so, to whom. I realized, in the light of this experience, my entire view of the world had gone through an upheaval. Having been freshly trained as a scientist and engineer, an empirical materialist of the age of physics and machine theories, my paradigms of the world were too newly molded to have settled into inflexibility. I remember my most vivid impressions of physics centered around a book by Feynman¹, in which he challenged his students to visualize the electromagnetic energies passing through the very lecture hall, the colors and forms swirling, merging and patterning one another as they passed through our bodies and minds, linking us to other galaxies and to each other. As remarkable as this book was, it still maintained the sterile vision of a dead universe, a matrix of beautiful yet non-living energies. The light in the forest had kindled my awareness of these energies as living, aware, conscious in ways my previously limited, filtered awareness did not allow.

I returned to my studies of electricity, electronics and physics with a new perspective and found that I was seeing things in ways that I could not easily share with my classmates who all seemed to be mindlessly adopting the "Universe is (mostly) dead matter and random motion" paradigm. I began to experience a growing awareness that the very electricity flowing within the building walls must be alive in some real way, that the light energy flowing from light bulbs, the frequencies carrying radio and television signals, the entire electromagnetic spectrum surrounding all of us must consist of living fields, in some dimension of consciousness, and that electrophysics itself could, and perhaps should, be a

subfield of biology. Most significant of all was the growing awareness of the complex centralized flows of radiant energy emanating from and coursing throughout my physical body.

As a result of my experiences at Little Sur Creek, I began practicing silent meditation with renewed focus. Later that summer I acquired a book on contemplation, *The Psychedelic Experience: A Manual Based on the Tibetan Book of the Dead*¹ compiled by Leary, Metzner, and Alpert. I was intrigued to learn of the various states of experiential states that could be reached during death transition, or through taking psychedelic drugs, or through various forms of contemplative practices. It was the idea of contemplative practice leading to altered states that most intrigued me. I soon discovered a wealth of relevant knowledge and instruction in the writings of Swami Vivekananda and Sri Aurobindo, further catalyzed by practicing *hatha yoga* and studying with Swami Satchidananda, who had recently arrived from India.

6.3 Midnight Experience in the Lower East Side, New York City

The experiences of Little Sur Creek in 1967 and the encounter at Hamilton's Pool in 1968 greatly spurred on my regular practice of meditation, *hatha yoga*, and fasting exercises. I stopped eating meat entirely, and went on frequent water fasts, losing thirty pounds during the spring of 1969. Initially, I would first do physical exercises and *hatha yoga*, followed by what seemed to be a long 10 minutes trying to meditate, watching my breathing and trying to quiet my mind, to free it from memory impulses, interior verbalization, and other impulsive mental distractions. While at the beginning the ten minutes was an arduous exercise, over the next few months was I able to increase the time well beyond this.

In 1971 I was living in a two room flat on the fifth floor of a five story "walk-up" in the Lower East Side in New York (Avenue 'A' and E. 6th Street). While the neighborhood was full of Indian vegetarian restaurants and other businesses, being above most of the commotion of the city kept my environment quiet at night. One late evening in my flat, during a shoulder stand posture (*sarvāṅgāsana*) as part of my *hatha yoga* meditation I heard a singular loud, high pitched sound in my head. To my surprised, I found that as I focused conscious attention on this sound it substantially increased in volume! Amazingly, I found I was able to repeat this sequence, making the sound grow louder or software simply by choosing to focus upon or to ignore the sound-point, which seemed to be located in the upper left-hand region of my brain.

After the initial "bright" sound discovery, additional "points" of sound of distinctly different pitch began to arise in other locations in my cranium. That entire night I could not sleep; while listening to the sounds they would variously increase in volume according to the degree that I would be able to direct my attention toward them. I noticed, however, that as soon as I would begin consciously thinking "about them" or "thinking in words" or "let my attention stray" they would subside, vanish, or be obscured and I would "lose touch" with these sounds. But by quickly searching for them again (I noticed myself struggling to regain an inner silence), they could be coaxed out of the silence and their beacon-like tones could be located, focused upon, and thereby would increase in volume once more in what was clearly a feedback loop effect, a sort of reverberation. To my amazement, the tones were not unlike the cricket sounds heard in the Austin hill country at night that had seemed to become audible only as we became silent.

I could scarcely believe what was happening. I found that by trying to ignore a

particularly dominant bright sound and trying to focus on a fainter, more obscure sound ("further away from" or "behind" the first) the second sound would immediately grow louder in volume and become easier to focus upon using this inner focal-sense mechanism. Here was direct cause and effect, albeit in an internal domain, of consciousness among some kind of living experiential fields of energy dynamics. All that night I lay awake in the dark, moving from sound to sound within my head, as they rose and fell almost with a volition of their own. I experienced strong emotional oscillations between exaltation verging on disbelief, and terror at visions of creating a brain damaging hemorrhage.

In engineering school, I had come to understand vibration as a single vibration or tone, yet this was not a single tone, a single frequency as I had come to understand, but a myriad sea of tones faintly making up the background of the perceived, sensed audio range, like those aforementioned "peepers" in the forest at night. As I stated earlier, it was at specific points in space within my cranium, that from time to time a tone would arise with exponential sharpness high above the background level, and become a bright tone of pure frequency, like a beacon, upon which if I were able to focus for any sustained few moments, would become markedly louder with an accompanying intense tactile sensation.

During the course of what seemed a very long night my body grew hot and sweated profusely, soaking the sheets in what must have been a fever of some kind. I went through what seemed to be a long period of deep fear, suspecting that I had somehow damaged my nervous system, though since then I never experienced a headache or discomfort of any kind in within my cranium. Sometime in the early morning hours I fell asleep and when I awoke, to my relief, my mind was back to "normal" in its inner cognition, thinking, verbalizing, chatting away merrily once more, though it now lived with a memory and realization that

something singularly strange had occurred, something I had never been prepared for and which I had never encountered in books nor in life experiences.

I continued to practice *hatha yoga* but spent increasingly long periods in simple quiet meditation, contacting these resonant inner sounds in my dark room late at night, and often while falling asleep. My earlier studies in physics and electrical engineering led me to notice how these perceived/felt sounds seemed to be highly specific sinusoidal tones, focused, it seemed, on various single frequencies, fundamental tones, and few weaker harmonic frequencies.

For a time, I conjectured that they were merely mechanical resonances within the physical structures of my inner ear, and I did some research on tinnitus. In my engineering office in the World Trade Center (I worked on the 64th floor as a lighting designer for the Port Authority), sometimes, and often with great surprise, I would experience one of the sounds flare up in my cranium when I approached certain electronic equipment, computer screens, or even certain vending machines, and I found myself internally verbalizing, with some humor, "incoming".

During meditation periods I noticed that by concentrating awareness within different physical/spatial locations within my body, such as the heart or the throat, different sounds would arise in different locations and patterns, though the sounds were most clear and pronounced in the cranial area. I conjectured that they might be of an electromagnetic nature, possibly the resonance of a neuronal plexus within my nervous system with electromagnetic modulations of our Earth's electromagnetic energy fields, or in the case of vending machines, some internal electrical radiation from their circuitry.

At the same time I became interested in anatomy, especially the anatomical

structures of the brain and central nervous system, as well as the endocrine system. Living in New York City, I had access to medical bookstores where I was able to obtain excellent medical books with technical illustrations and x-ray photographs which I used to visualize as specifically as possible those internal areas, usually corresponding with the Indian chakra system, while meditating in the dark.

Over several years this process, concentrating and visualizing within areas of my body and focusing on the sound tones as they would arise, became a main source of meditative practice for me, and the inner sounds tones grew ever more richly complex and sometimes louder in volume, and began to produce distinct tactile sensations of flow, unlike the sensations felt in the external senses of touch, vision and hearing.

On weekends I would also search for books for guidance in silent meditation, and in the process discovered Patañjali's *Yoga Sūtras*. My first copy was a translation with commentaries by Professor Ernest E. Wood (b.1883),¹ and I was impressed that his education had been in the "hard" sciences - chemistry, physics and geology - and only later had he become interested in yoga and meditation. Wood's translations of the Sūtras seemed to me to be the perfect manual for the type of meditative exploration that had become my passion, but after several months I found a different translation of Yoga Sūtras by I.K. Taimni (b. 1898), a professor of chemistry.¹ To my surprise, many of the translations and commentaries differed markedly between the two books. This led me to attempt an understanding of each word in the context of my own experiences and practices.

During subsequent years I continued trying to understand the Patañjali *Yoga Sūtra*, but have also spent a great deal of time searching religious and mystical literature, both Christian as well as Far Eastern, for the slightest reference to inner sounds and externally

perceived balls of light. The most specific references I have found are in the Northern Indian school of "Nada Yoga", the yoga of the "Inner Sounds", as well as in a Sikh school of contemplation called "Naam". I also found references to these phenomena in the writings of various Christian mystics.

I left New York for San Francisco to study at the California Institute of Asian Studies, which had the unique reputation of valuing experiential knowledge equally with academic knowledge among both faculty and students. This allowed me to develop a broader understanding of the connections between various traditional practices of contemplative technique and modern attempts to map the interior worlds of the experience using metaphysics and language of science.

6.4 Midnight Experience of Ayahuasca in Northern California

After several decades without using entheogens other than cannabis, decades in which my contemplative practice had grown substantially in regularity and richer in experience, I was afforded the opportunity to participate in a small group working with a shaman from Ecuador to use the plant vine ayahuasca in a "healing-meditation". The session was held at night with a dozen other participants in the dark in a large room in the middle of a redwood forest.

After about an hour and a half I suddenly noticed that a large fan hanging from the ceiling above was writhing and as I looked up I saw what had been blades were a huge black snake, writhing. At that point I had to urinate very intensely and got up to move toward the bathroom, but when I looked down I saw the floor covered with a sea of smaller writhing black snakes and I stepped on one and slipped backwards. The next thing I recall is lying

down on my back with the shaman fanning me with several large tobacco leaves and blowing tobacco over my face, after which I was able to stand up.

After returning from the bathroom I found a place to lie down and closed my eyes. Many things were felt and it seemed several 'stages' passed through, and I will relate only the most intense experience that I have been able to recall. At some point I felt that I was literally being taken apart. In fact I was being so thoroughly analyzed, tested, tasted, and probed that I had a sudden fear that I might lose my "personality" or ego, that I would never be able to be the person I thought I was again. I felt as if I were being subjected to cosmic plasma-magnetic entity rape, and for a brief time felt outrage and fear and panic but that quickly passed (much of the time during the ayahuasca experience I found my years of practicing various mantras both in Latin, Sanskrit, and English, helped immensely as I was able to fall back to focusing on a mantra in a specific location of the body-mind as if it were an old friend).

The outrage passed as I felt the "invasion" to be of a benign character, almost a caring quality. I was not being violated after all, but I was being "tuned" somehow at a very fundamental level, what seemed to be a molecular, organic level, or perhaps even lower at a genetic or electronic level. At about the time I became calm and felt the sense of benevolent "tuning", I felt a sense of knowing what people talk about when they say the plants are "medicine", though I've always been exceptionally blessed with health and seldom needed healing in the ordinary sense. But this healing or tuning had a different, deeper, psychophysical or neurophysical sense to it.

Visually what I was observing at that time was stunning. I was floating somewhere off to the side of and looking across (or down) at an enormous slab rising up from below

and continuing upward to beyond my perception, looking like some behemoth intergalactic cruiser/city from a Battlestar Gallactica or Star Wars set. It consisted visually of a myriad of complex linear/angular components that continued to dissolve and reform like hyper-active transforming robot component assemblies, changing as if modifying themselves participatorily through resonance with my own interactive process of observing and being observed.

The lines were of sharp laser-like iridescent energy, thinner than a hair, and the flickering color of bright candle flames. I was floating alongside viewing the phenomenon as a bird might view an enormous sky scraper flying fifty feet away from the building, the structure itself continuously forming and transforming with ultra thin bright lines that seemed antenna-like and angular, creating an enormous behemoth of a slab entity composed of what can only be described as nanobot-like plasmoidally shifting components.

They were definitely responding to my own presence and indeed they seemed to be the source of the "probe" and "tuning" that was simultaneously going on so intimately within my own being that at first I had thought it to be a violation, a rape. This went on for what seemed like a very long time, during the latter part of which I found myself completely calm and receptive and somehow grateful. In fact I felt in some way that I was trading something with these plasma-magnetic entities or electrobiological nanobots, that they were imparting to me a fine tuning in many ways while receiving something in return.

For a long time it felt as if these spiritual nanobots were performing a kind of vehicle recall analysis or 100,000 mile checkup and tuning of my many energy dimensions, physical and psychophysical systems, and prescribing and applying immediately the compensatory radiation-resonance tweaking treatments required in my resonating energy systems, perhaps

at the quantum level, the DNA level, the molecular level, the cellular level, the neuronal level, the electromagnetic plasmoid level, and as yet unknown "levels" of being. Six hours later however, to my surprise, and all of the next day and week my sense of well being, alertness, sense of feeling centered, and happiness, were all seemingly enhanced, amplified, operating at higher levels than normal, and these feelings have lasted in the intervening weeks.

This experience has given me a new respect for the characterization of ayahuasca and other 'healing plants' through their imparting in me a new understanding of the meaning of the concept of healing, which now implies a new urgency, a healing not only of me as an individual but of the entire ecology, the planet. I think something the vine energy-nanobot-plasma-magnetic entities did for me was strengthen what had been weak or broken links with the ecosphere. I feel even greater concern for the planet and the animals and plants around me and I feel a new enthusiasm for the study of consciousness in all its mysterious ramifications.

6.5 Consequences of These Participatory Experiences

As a direct consequence of these experiences, my interests and motivations have been recurrently nudged into a trajectory atypical for an engineer. Five years after having received my B.S. in electrical engineering, I found myself in a graduate program, studying Sanskrit for an M.A. in Indian Philosophy, which led to several trips to India, and twenty years in Saudi Arabia. I have, over the years, been drawn into ever deeper studies in psychology, philosophy, metaphysics, and into an ever deeper practice of meditation and the contemplative arts. Concurrently, over the years, I have continued to embrace entheogenic

exploration as a corroborative extension to an emerging theory of psychophysics, while exploring sentience in the cosmos.

I have been blessed with many numinous experiences, which certainly would be classified by Maslow as belonging to the class of peak experiences. These have only added to my motivation to go further in explore this vast ocean of consciousness into which sail contemplatives and "psychonauts,"¹ of all times and cultures. In this paper I have tried to map this experiential dimension in the languages of the mathematical physics, communications engineering, and Patanjali's *Yoga Sutra*, all models that I absorbed early in my life. But also, and perhaps above all, I have tried to approach and develop this theory in a manner which can be readily assimilated into an understandable model by anyone with sufficient interest, motivation, and with a broad, even non-specialist, education.

7.0 Summary and Implications

In this paper we have presented a hypothesis that there exist three distinct modes of consciousness operational within each human being: a mode of consciousness in the electric domain, a mode of consciousness in the magnetic domain, and a mode of consciousness in the frequency domain. On the technical side we have discussed elements of physics, mathematics, physiology, and electrical engineering in support of this hypothesis. We have also examined several major twentieth century thinkers whose ideas provide additional support to the hypothesis that consciousness is electromagnetic radiant energy manifesting in multiple dimensions or domains.

In exploring the participatory domain, we examined traditional contemplative practices, a wealth of highly lucid descriptions and practical, effective exercises, maps, and guidelines left by generations of psychophysical explorers in their efforts to tune the full range of consciousness, including nontemporal and nondual dimensions.

It is our hope that the development of a renewed interest and growth in Fechner's psychophysics, beginning with the assumption that consciousness is to be found associated in multi-dimensional transformational modes of the electromagnetic energy field, that may help catalyze this transformation. But science must stop self-limiting its scope of inquiry and begin to search for evidence of electromagnetic consciousness in other ranges of physical manifestation, beyond current simplistic assumptions as to the nature of electricity, consciousness, and neuronal brain wave rhythms.

EEG studies have reached their limits of return in trying to detect signals of consciousness. Focus should now be turned toward study of the infrared emf radiation spectral emissions generated in real time by a human being in various modes of

consciousness, to include sleep states, waking states, contemplative states, and entheogenetically induced states. An understanding of the true underlying physics of consciousness will open up vast new possibilities for practical application, and if so, it is likely that Fechner's psychophysics will branch into fields of "psychophysical engineering," or perhaps even "psychonautical engineering," or "psychonoospheric engineering" may emerge.

Experiments with traditional plant entheogens (fungi, weed, and vine) should include monitoring and perhaps recording of both infrared radiation spectral response as well as magnetic field distribution patterns and configuration changes. Experiments with transcranial electromagnetic stimulation devices such as Persinger's "God Helmet"¹³⁹ should be conducted in conjunction with monitoring changes in the infrared and magnetic fields surrounding the subject, and if possible within the bloodstream.

Finally, an acceptance of components of the human psyche existing as a high frequency toroidal energy nexus extending fifteen feet from the human body can be seen as providing a physical basis for validating the traditional South Asian belief in "*darshan*", whereby proximity to a living human body can result in a resonance of energy that can be experienced. In support of this conjecture and in closing, I would like to quote the following experience of a strongly felt *darshan* with Sri Aurobindo, as described in the dissertation of Rhoda Le Cocq, one of my previous professors and a former student of Dr. Chaudhuri's:

As I stepped into a radius of about four feet, there was the sensation of moving into some kind of a force field. Intuitively, I knew it was the force of Love, but not what ordinary humans usually mean by the term. These two were "geared straight up"; they were not paying attention to me as ordinary parents might have done; yet, this

¹³⁹ Michael Persinger, *God Helmet*, from from http://en.wikipedia.org/wiki/God_helmet

unattachment seemed just the thing that healed. Suddenly, I loved them both, as spiritual “parents.”

Then, all thought ceased, I was perfectly aware of where I was; it was not “hypnotism” as one Stanford friend later suggested. It was simply that during those few minutes, my mind became utterly still. It seemed that I stood there a very long, an uncounted time, for there *was* no time. Only many years later did I describe this experience as my having experienced the Timeless *in* Time. When there at the *darshan*, there was not the least doubt in my mind that I had met two people who had experienced what they claimed. They *were* Gnostic Beings. They had realized this new consciousness which Sri Aurobindo called the Supramental.¹⁴⁰

¹⁴⁰ Le Cocq., *The Radical Thinkers: Heidegger and Sri Aurobindo*, 108.

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