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The Speed of Thought: Investigation of a Complex Space-Time Metric to Describe Psychic Phenomena

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"Consciousness is a singular of which the plural is unknown. There *is* only one thing, and that which seems to be a plurality is merely a series of different aspects of this one thing, produced by a deception… as in a gallery of mirrors."

Erwin Schrödinger
What Is Life

Abstract—For more than 100 years scientists have attempted to determine the truth or falsity of claims that some people are able to describe and experience events or information blocked from ordinary perception. For the past 25 years, the authors of this paper—together with researchers in laboratories around the world—have carried out experiments in remote viewing. The evidence for this mode of perception, or direct knowing of distant events and objects, has convinced us of the validity of these claims. It has been widely observed that the accuracy and reliability of this sensory awareness do not diminish with either electromagnetic shielding, or with increases in temporal or spatial separation between the percipient and the target to be described. Modern physics describes such a time and space independent connection between percipient and target as nonlocal.

In this paper we present a geometrical model of space-time, which has already been extensively studied in the technical literature of mathematics and physics. This eight-dimensional metric is known as "complex Minkowski space" and has been shown to be consistent with our present understanding of the equations of Newton, Maxwell, Einstein, and Schrödinger. It also has the interesting property of allowing a connection of zero distance between points in the complex manifold, which appear to be separate from one another in ordinary observation. We propose a model that describes the major elements of experimental parapsychology, and at the same time is consistent with the present highly successful structure of modern physics.

Keywords: parapsychology — ESP — space–time — multi-dimensional

1. Introduction

Scientific research into extrasensory perception (ESP) has made enormous progress since the founding of The Society for Psychical Research in 1882 by a distinguished group of Cambridge University scholars. The society's purpose was to examine allegedly paranormal phenomena in a scientific and unbiased

manner—the first organization of its kind in the world. Now in the twenty-first century, the evidence has become overwhelming that our thoughts and bodies can be directly affected and influenced by the thoughts of another person or by events and activities at a distant location blocked from ordinary perception. Although we do not presently understand the detailed mechanisms underlying psychical abilities, thousands of experiments have been carried out successfully in dozens of laboratories around the world establishing the existence of some form of ESP. We present here a theoretical model to elucidate some of the phenomena underlying the remote perception ability, while remaining consistent with modern physics. For example, our model is in good agreement with the ideas presented in the recent physics book *The Nonlocal Universe,* where we read, "…the universe on a very basic level could be a vast web of particles, which remain in contact with one another over any distance, [and] in no time" (Stapp, 1999).

This paper is about connecting our awareness to the universe and to each other through the use of our psychic abilities. These abilities, known collectively as psi, from the first letter of the Greek word for spirit or soul (psyche), reveal numerous kinds of connections—mind to mind (telepathy), mind to body (distant healing), mind to the world (clairvoyance), precognition of future events, and what some mystics have called one-mindedness. Even though we lack an understanding of ESP, we have learned a great deal about its psychology and about procedures to make this elusive phenomena appear with ever increasing reliability in laboratory experiments. For example, today's remote viewing experiments, in which we can often describe and experience places thousands of miles away, have demonstrated ten times more statistical power, or effect size ($Z/n^{1/2}$), than those of J. B. Rhine's original ESP card-guessing experiments seventy years ago at Duke University (Rhine, 1937). These new perception results have been widely published (Bem & Honorton, 1994; Puthoff & Targ, 1976; Puthoff et al., 1981; Targ & Puthoff, 1974; Utts, 1996). In addition, highly significant double-blind clinical studies in distant healing have been published (Harris et al., 1999; Sicher et al., 1998).

The laboratory evidence from more than one hundred years of parapsychological research makes it clear that we sometimes obtain information about the future, the past, and distant locations, which is not available to us by ordinary means, or through logical inference. This observation of precognition or paranormal foreknowledge has puzzled thinkers since the time of the Oracle at Delphi. However, mystics have known from the earliest Hindu *Vedas* of 2000 BC in India that "separation is an illusion" and that our consciousness transcends our ordinary understanding of both space and time. In *The Sutras of Patanjali (*Patanjali, 1983), from 400 BC, we are given detailed instructions for looking into the distance and the future, in a manner strikingly similar to recent decades of ESP research practice at laboratories such as Stanford Research Institute (SRI International) and Princeton University's Engineering Anomalies Research Laboratory (Jahn, 1982; Targ & Katra, 1998).

The purpose of this investigation is to make use of the remote perception and

precognitive data base in order to deduce the relevant physical principles and laws governing paranormal functioning. One of the most common objections to the existence of psi is that it appears to be in conflict with the laws of physics, because we have not yet found the mechanism for such information transfer. In our investigation we attempt first to demonstrate the compatibility of psi phenomena with the laws and content of physics, and then to develop a theoretical model which is descriptive of the nonlocal properties of psi. In this paper we present a detailed theoretical model describing the properties of psychic phenomena which we have demonstrated to be in agreement with the main body of physics.

Specifically, we have examined a complex eight-dimensional Minkowski space which is consistent with the foundations of quantum mechanics, Maxwell's formalism, and the theory of relativity. This is a purely geometrical model formulated in terms of space and time coordinates, in which each of the familiar three spatial and one temporal coordinates is expanded into its real and imaginary parts—making a total of six spatial and two temporal coordinates. (Kozamah & Newman, 1983; Newman et al., 1978; Rauscher, 1979).

The metric of this complex eight space is a measure of the structure of the space. Within this structure we can define the manner in which one physically or psychically moves along a world line in space-time. This movement can be as mundane as meeting a friend tomorrow at 4:00 PM on the corner of 42nd street and Broadway, or as cosmic as experiencing "oneness with the universe." Essentially, real-time remote viewing demands the ability for the awareness of the individual to be contiguous with a specific target at a distant location. This ability to nonlocally access information blocked from ordinary perception could be described as the result of an apparent zero separation between the subject and the target. Similarly, for precognition one is contiguous in awareness with the future event that is sensed. The complex eight space described here can always provide a path, or world line in space and time, which connects the viewer to a remote target, so that his awareness experiences zero spatial and/or temporal distance in the metric. It appears that for consciousness there may or may not be any separation, depending on one's intention. Although this paper deals principally with the physics underlying psychic abilities, we think it is evident that these abilities are fundamental to our understanding of consciousness itself. In fact, psi functioning may be the means that consciousness uses to make itself known in the internal and external physical world, and to our own awareness.

2. Experimental Foundation

The fact that the future can come into our awareness at an earlier time indicates that we misapprehend both everyday causality and the nature of the very space and time which we take so much for granted. The existence of precognition is a serious problem for contemporary science, as well as those who interpret their experience in terms of linear time, but we consider the data to be overwhelming.

Precognitive dreams are the most common psychic event to appear in the life of the average person (Rhine, 1954). These dreams give us a glimpse of events that we will experience in the future. In fact, it can be said that precognitive dreams are often *caused* by the experience that we actually will have at a later time. If one has a dream of a hearse passing in front of one's window, and then wakes up the next morning and observes a funeral procession led by a hearse going down the street, we could say that last night's dream of a hearse was caused by the experience of seeing the hearse the next morning. This is an example of the future affecting the past. There is an enormous body of evidence for this kind of occurrence, which we cite below.

What cannot happen, we believe, is a future event *changing* the past. It appears that nothing in the future can cause something that has already happened and is known and agreed upon, to have not occurred. This is the so-called intervention paradox, illustrated by the theoretical example in which one, in the present, kills his grandmother when she was a child, and therefore he ceases to exist. That kind of paradox is interesting to think about, but there is no evidence of its occurrence. The data strongly suggest that, although one can see his grandmother in the past, and obtain information about the past, there is no possibility for physical intervention. Relativity theory calls this a closed time-like loop, and it is strictly forbidden. These issues are discussed at length in Robert Brier's monograph, *Precognition and the Philosophy of Science: An Essay on Backward Causation* (Brier, 1974).

From our research, we have found that in order to know that a dream is precognitive, one has to recognize that it is not caused by the previous day's mental residue, one's wishes, or anxieties. We find, rather, that precognitive dreams have an unusual clarity, but also often contain bizarre and unfamiliar material. Dream experts like to speak of "preternatural clarity." Again, these are not wish fulfillment or anxiety dreams. For example, if one is unprepared for an exam and dreams about failing it, we would not consider this to be precognition. On the other hand, if one has had hundreds of uneventful plane flights, and then has a frightening dream about a crash, one might like to reconsider his travel plans. One might ask, "How can I dream about being in a plane crash, if I don't actually get to experience it?" The answer is that one dreams about the real crash, and then dramatizes the events to include oneself in it.

For example, a government contract monitor of the SRI work had a vivid dream about being in a plane crash, and then after canceling his flight, saw a plane crash at quite close range the next day. Since he was supposed to have been on that very plane, he had no trouble putting himself on the plane in his dream the previous night. We would say that the frightening crash that he experienced in the afternoon was the cause of his earlier dream. This is called retro-causality, and it may be the basis of most precognition. It is evident that precognition occurs, and from the laboratory data we consider it important to note that it is *just as successful and reliable as real-time ESP* (Jahn and Dunne,

1987). These experimental data from Princeton demonstrate that psi performance is not a function of temporal distance.

A well-conducted experiment involving remote viewing over intercontinental distances demonstrated that the quality of psychic functioning is the same across the street or half a world away—independent of spatial distance. In one such series, experienced viewer and anthropologist Marilyn Schlitz planned to replicate the then new SRI remote viewing experiments. She wanted to conduct remote viewing experiments at much greater distances than had been published in any of the SRI papers. To carry out this experiment[1] she enlisted the aid of her friend Elmar Gruber, a European parapsychologist who was traveling in Italy (Schlitz & Gruber, 1980). Each day for ten days in November of 1979, Schlitz, at home in Detroit, Michigan, would attempt to experience and describe the place in Rome where Gruber would be located at 11:00 AM Michigan time. Gruber, for his part, had made a list of 40 different target locations in Rome. These included both indoor and outdoor sites at parks, churches, the airport, museums, the sports arena, the Spanish Steps, etc. Could Schlitz, 3000 miles away, describe each day's target place with enough accuracy to allow a future judge to match each day's description with that day's target? In addition, could she do it without receiving any feedback for each day's target as she attempted this psychic investigation?

An example taken from one of Schlitz's successfully matched remote viewing transcripts is as follows:

> Flight path? Red lights. Strong depth of field. Elmar seems detached, cold....outdoors. See sky dark. Windy and cold. Something shooting upward....Not a private home or anything like that—something—a public facility....He was standing away from the main structure, although he could see it. He might have been in a parking lot or field connected to the structure, that identifies the place. I want to say an airport, but, that just seems too specific. There was activity and people, but no one real close to Elmar. (p. 315)

In fact, the target site was the Rome International Airport, where Gruber had been standing on a hill to the side of the terminal building. Schlitz's transcripts and Gruber's descriptions of his hiding places were sent to Hans Bender, a German researcher who undertook to arrange the judging for the experiment. Five judges examined the material, and their job was to go to each of the ten target sites. At each site they read Gruber's comments about what his activities were at the site. While there, the judges were to decide which of Schlitz's ten transcripts was the best match for that particular site, which one was the second best, etc. The results revealed that out of Schlitz's ten transcripts, six were matched correctly in first place to the target that Gruber visited on the day the transcript was created. The probability of that happening by chance is less than 6 in 10,000.

This experiment was included in K. Ramakrishna Rao's book, *The Basic Experiments in Parapsychology* (Rao, 1984), which is like the "Hall of Fame" for

parapsychology experiments. Since the first publication of the remote viewing protocol (Targ & Puthoff, 1974), there have been at least twenty-three successful replications of this work, including the one cited here (Targ & Harary, 1984).

In a summary of research data from 1935 to 1989, for what we call paranormal foreknowledge, Charles Honorton and Diane Ferari studied 309 precognition experiments that had been carried out by 62 investigators (Honorton & Ferari, 1989). More than 50,000 participants were involved in more than 2 million trials. Thirty percent of these studies were statistically significant in demonstrating that people can describe future events, where only five percent would be expected by chance. This gave overall significance of greater than 10^{20} to one. This body of data offers very strong evidence for confirming the existence of knowledge of the future. A very comprehensive laboratory examination of precognition was conducted by Robert Jahn, Brenda Dunne, and Roger Nelson at Princeton University in the 1980s (Dunne et al., 1983). They conducted 227 formal remote viewing experiments in which a viewer was asked to describe their impressions of where one of the researchers would be hiding at some pre-selected later time. They discovered, much to their surprise, that the accuracy of the description was the same whether the viewer had to look hours, days, or weeks into the future. The overall statistical significance of the combined experiments departed from chance expectation by 1 in 10^{11}! The Princeton group's research findings are among the best evidence for the reality of precognition. Approximately two thirds of these targets were chosen randomly, and one third were chosen at the non-random discretion of the outbound experimenter (Hansen et al., 1992).

In the laboratory, we know if we show a frightening picture to a person, there will be a significant change in his or her physiology. Their blood pressure, heart rate, and skin resistance will all change. This fight or flight reaction is called an "orienting response." At the University of Nevada, researcher Dean Radin has demonstrated that this orienting response is also observed in a person's physiology, a few seconds *before* they directly observe the scary picture. In Radin's comprehensive book *The Conscious Universe*, he describes balanced, double-blind experiments, which show that if one is about to see scenes of violence and mayhem one's body will steel itself against the insult, but if one is about to see a picture of a flower garden, then there is rarely such strong anticipatory reaction (Radin, 1997). Fear is much easier to measure physiologically than bliss. We could say that this is a case in which one's direct physical perception of the picture, when it occurs, causes one to have a unique physical response at an earlier time. Again, in this research protocol, one's future is affecting his past. We are all familiar with the idea of a premonition, in which one has inner knowledge of something that is going to happen in the future—usually something of emotional significance. There is also an experience called presentiment, where one has an inner sensation, a gut feeling that something strange is about to occur. An example would be for one to suddenly stop

on a walk down the street, because he felt "uneasy," only to have a flower pot then fall off a window ledge and land at his feet—instead of on his head. That would be a useful presentiment.

A presentiment study of much longer time-span was carried out by parapsychologist William Cox in the 1950s. He wanted to know whether people used their precognitive abilities to avoid accidents (Cox, 1956). Cox conducted an investigation of twenty-eight documented train wrecks between 1950 and 1955. He found that in every case fewer people rode the trains that crashed or were wrecked than rode similar trains which did not crash. These data were analyzed for weather conditions, and ridership on the previous and following day, week, and month. At odds of greater than 100 to 1, it appears that hundreds of people awakened in the morning and for some reason, known or unknown, decided not to take their usual train. Thus, it would seem that one does not have to experience a future that appears to be unattractive or hazardous, to have it manifest in one's subconscious processes.

It is far more probable to precognize a possible future than to produce a major change in the precognized outcome. Consider an analogy to the river of time: If Huckleberry Finn is drifting down the Mississippi River, he might determine whether he goes to Texas or New Orleans, just by dipping his little finger into the swirling water, *if he is far enough up stream*. What is required here is intention or information—not necessarily energy. If he is already in the delta leading to New Orleans, it would require a miracle for him to wind up in Texas.

It is as though we live in an interconnected spider web of space-time, in which the future is an attractor pulling the present toward itself. Since our awareness is nonlocal, the past may also act as such an attractor. It appears that the universe cannot be causal in the usual sense. That is, the likely future is already determined, to the extent that our precognition is successful. What this may indicate is that we do not lose our free will. But rather, we can use our premonitory information to make even more informed decisions about what we should be doing. We propose that the utilization of our ability to "toggle" our awareness between local four space and nonlocal eight space is what leads to our concept of free will. Additional precognitive and psi information allows us to choose and experience a different world line. The existence of psi creates for us a world of dynamic consequences which depend on our state of awareness, i.e., in either four, or eight space.

3. Some Theoretical Models and Their Shortcomings

In recent years physical models have been proposed to describe psychic abilities, in order to reconcile the psi data base with the current understanding and interpretation of modern physics. Douglas Stokes has summarized and examined more than forty theoretical models of psi phenomena. He categorizes these models and discusses the physics objections and psi inadequacies of each of the models presented (Stokes, 1987). We briefly address here the more compelling ones that have been proposed, such as extremely low-frequency

waves (ELF), advanced electromagnetic waves, and faster than light particles called tachyons.

Beginning in the 1920s there was a prevailing view that psychic abilities were a kind of radio communication between minds. This was stimulated by the widely read book, *Mental Radio*, by the visionary author Upton Sinclair. In his book (which includes a favorable preface by Albert Einstein) Sinclair describes the highly successful experiments in mind-to-mind communication that he carried out in cooperation with his psychic and discerning wife Mary Craig, showing the self-evident strength of hundreds of psychic matches between Sinclair's target pictures and his wife's drawn responses (Sinclair, 1930). The mental radio metaphor is still with us today, more than seventy years after the publication of Sinclair's book, even though it is well understood that radio waves lose their intensity as the square of the distance from the source, and no such fall off is seen in experimental psi data. Furthermore, our data from SRI show clearly that accuracy and reliability of remote viewing are equally significant from inside or outside an electrically shielded Faraday cage.

In the 1960s and 1970s there was intense interest in psi phenomena in the USSR. The distinguished Russian physicist I. M. Kogan put forward the concept that information transmission under conditions of sensory shielding was mediated by extremely low-frequency (ELF) electromagnetic waves in the wavelength region of 300 to 1000 km. The idea is that for separation distances of less than 1000 km, the percipient would still be in the induction field (near field) of the source and would therefore experience less than inverse square fall off in signal strength (Kogan, 1968). Although this model has received repeated investigation—with regard to permissible bit rates and signal propagation—it fails to provide any explanation for precognitive psi, which as we have stated has the same reliability and efficacy as real-time psychic perception.

This apparent time reversal, in which the event of perception seems to precede the cause or stimulus, is often viewed as paradoxical. However, in ordinary electromagnetic theory, one is cautioned not to automatically discard the mathematical solutions that suggest time reversibility. For example, the graduate text in electromagnetic theory written by J. A. Stratton discusses so-called advanced waves and their surprising consequences (Stratton, 1941). Stratton writes:

> The reader has doubtless noticed that the choice of the function $f(t - r/c)$ is highly arbitrary, since the field equation also admits the solution $f(t + r/c)$. This function obviously leads to an advanced time, implying that the field can be detected before it is generated by the source. The familiar chain of cause and effect is thus reversed, and this alternative solution might be discarded as logically inconceivable. However, the application of "logical causality" principles offer a very insecure footing in matters such as these. And we shall do better to restrict to the theory of retarded action, solely on grounds that this solution alone conforms to present physical data.

Such caution is justified, by the example, in the early 1920s, of Dirac's development of a mathematical description of the relativistic electron. That also yielded a pair of solutions, one of which was discarded as inapplicable until the discovery of the positron by Carl Anderson in cloud chamber photographs in 1932.

The advanced wave, like the tachyon particle proposed by Physicist Gerald Feinberg, is an information carrier that appears to travel faster than the speed of light (Feinberg, 1967). This could allow one to experience a distant event before the corresponding light signal reached him, appearing to provide paranormal foreknowledge. However, the gain in temporal advantage would be only one nanosecond per foot of distance, whereas the data for precognition show that events are frequently described and experienced *hours or days* before the occurrence of an event. The advanced wave or tachyon would provide an hour's warning, only for events at a distance of 10^9 miles or greater. All electromagnetic or radio wave descriptions of psi suffer from these same limitations.

Based on the shortcomings of the above models, we have investigated a geometrical model of psi functioning, which is outlined in the following section. The geometric approach is very consistent with physicist John Archibald Wheeler's statement that our understanding of physics will "come from the geometry, and not from the fields."

4. Introduction to the Physics of Nonlocality

The physics of nonlocality is fundamental to quantum theory. The most exciting research in current quantum physics is the investigation of what physicist David Bohm calls quantum-interconnectedness or nonlocal correlations. First proposed by Einstein, Podolsky, and Rosen (EPR) in 1935, as evidence of a defect in quantum theory, and later formulated as a mathematical proof by J. S. Bell, it has now been repeatedly experimentally demonstrated that two quanta of light given off from a single source, and traveling at the speed of light, in opposite directions maintain their connection to one another, so that each photon is affected by what happens to its twin, many kilometers away. (Aspect et al., 1998; Bell, 1966; Einstein et al., 1935; Freedman & Clauser, 1972; Gisin et al., 1998a). John Clauser recently described his impressions of these nonlocality experiments to the authors. He said that quantum experiments have been carried out with photons, electrons, atoms, and even 60-carbon-atom Bucky balls. He said that "it may be impossible to keep *anything* in a box anymore." Bell emphasizes, "no theory of reality compatible with quantum theory can require spatially separate events to be independent." That is to say, the measurement of the polarization of one photon determines the polarization of the other photon at their respective measurement sites. This surprising coherence between distant entities is called nonlocality. In writing on the philosophical implications of nonlocality, physicist Henry Stapp of the University of California at Berkeley states that these quantum connections could

be the "most profound discovery in all of science" (Stapp, 1999). Nonlocality is a property of both time and space. The concept of nonlocality is very reminiscent of the data dealing with identical twins, separated at birth and reared apart, who nonetheless show striking similarities in their tastes, interests, spouses, experiences, and professions, beyond what one could reasonably ascribe to their common DNA.

The data from dream research such as J. W. Dunne's *Experiments with Time* (Dunne, 1927), and from the SRI and Princeton remote viewing research, provide evidence that our minds have access to events occurring in distant places—and into the future or past. Immanuel Kant states that space and time are but modes of human perception, and not attributes of the physical world. These modes are powerful filters of our own invention, and often serve to limit our experience.

We know from the experimental data of psi research in our own laboratory at SRI (effect size 0.3–0.6) that a viewer can focus his or her attention at a specific location anywhere on the planet (or off of it) and often describe what is there (Puthoff and Targ, 1976). We know, also, that the viewer is not bound by present time. In contemporary physics we call this ability to focus attention on distant points in space-time nonlocal awareness. From data of the past twenty-five years, we believe that an experienced remote viewer can often answer any question that has an answer about events anywhere in the past, present, or future.

Bohm argues that we greatly misunderstand the illusion of separation in space and time. In his physics text book, *The Undivided Universe* (Bohm & Hiley, 1993), he defuses this illusion as he writes about the quantum-interconnectedness of all things. Bohm says "The essential features of the implicate order are, that the whole universe is in some way enfolded in everything, and that each thing is enfolded in the whole."

This is the fundamental statement of the metaphor of the holographic ordering of the universe. It says that, like a hologram, each region of space-time contains information about every other point in space-time. This model was inspired by the indications of nonlocality in Bell's theorem. And our data indicate that this information is available to our awareness. Bohm continues

> ...all of this implies a thoroughgoing wholeness, in which mental and physical sides participate very closely in each other. Likewise, intellect, emotion, and the whole state of the body are in a similar flux of fundamental participation. Thus, there is no real division between mind and matter, psyche and soma. The common term psychosomatic is in this way seen to be misleading, as it suggests the Cartesian notion of two distinct substances in some kind of interaction. (p. 386)

In the holographic universe of David Bohm, there is a unity of consciousness, a "greater collective mind," with no boundaries of space or time. In the next section of this paper we present a mathematical model that describes such an interconnected universe.

Bohm goes on to describe the famous "Wheeler delayed choice experiment." He writes that experiments "can be designed to show that, according to quantum theory, the choice to measure one or another of a pair of complementary variables at a given time can apparently affect the physical state of things for considerable periods of time *before* such a decision is made." Such complementary variables are typically momentum and distance, or in Wheeler's experiment they refer to the dual wave and particle nature of light, as observed in a two slit interference apparatus.

5. Description of the Eight-Space Metric

The purpose of our investigation is to make use of the current data base of remote perception experiments and to deduce the relevant principles and laws governing paranormal functioning. One of the common objections to the existence of psychic abilities is that they appear to be in conflict with the laws of physics. In what follows, we demonstrate the compatibility of psychic phenomena with the laws and content of physics and develop a model which well describes the properties of psi. In physics, we call this a "correspondence principle," so that in modeling psi we do not create a model which is in conflict with observed physical law. We hypothesize that the data of parapsychology may even usefully inform us about some of the current questions in modern in physics.

We have (1) specifically dealt with the major principles of physics and their relationship to and reconciliation with psychic phenomena, (2) examined higher-dimensional complex coordinate geometries with regard to the resolution of the questions of precognition and causality, and (3) developed a comprehensive physical model of the properties of the nonlocality exhibited in psi functioning. It is determined that the complex eight-space model not only demonstrates the consistency of precognition with causality but also shows a fundamental relationship between Maxwell's equations, quantum theory, and general relativity when expressed in complex eight space (Newman et al., 1978; Rauscher, 1981, 1983). The so-called EPR paradox appears to also be fundamentally related to our space-time picture and is certainly an example of nonlocality in physics. The complete success of Newton's laws and Coulomb's laws occurs only in the case of two body interactions. Three body problems are solved primarily through approximations. Similarly, laws of cause and effect are imprecisely defined except in the simplest cases. It is much more appropriate to describe the *effect* that one event has on another event, independent of which event appeared to come first in time. The rising of the sun has great explanatory power with regard to the increase in traffic across the bridge, but it would be obviously incorrect to say that the sun was the cause of the traffic.

Three major universal principles are used to determine the structure and nature of physical laws and act as constraints on physical phenomena. These are *Poincaré invariance* and its corollary, *Lorentz invariance* (which expresses

the space-time independence of scientific laws in different frames of reference), *analyticity* (which is a general statement of causality conditions in the complex space), and *unitarity* (which can be related to the conservation of physical quantities such as energy or momentum). Since it is not evident that energy occupies any role in the nonlocality of psi phenomena, unitarity is not dealt with in this paper. These principles apply to microscopic as well as to macroscopic phenomena. The quantum description of elementary particles has led to the formulation of the analyticity principle in the complex momentum plane (Chew, 1964). Complex geometries occupy a vital role in many areas of physics and engineering. Analyticity relates to the manner in which events are correlated with each other in the space-time metric (that is, causality). When we apply this critical principle to the complex eight-dimensional space we can reconcile psi (in particular precognition) with physics, without violating causality. It has been mathematically demonstrated that the equations of Newton, Maxwell, Einstein, and Schrödinger are consistent with the eight-dimensional complex space described here (Newman, 1978; Rauscher, 1983). In addition, nondispersive solitary wave solutions are obtained for the complexified eight space Schrödinger equation (Scott, 1970; Rauscher, 1981).

Quantum causality, unlike classical certainty, is limited by the well-known Heisenberg uncertainty principle. Quantum systems must obey linear superposition for *both* actualized and non-actualized states. This probabilistic feature, $\Psi^*\Psi$, leads to the fundamental stochastic or statistical nature of quantum measurement. J. S. Bell asserts that this stochastic nature holds whenever quantum theory applies experimentally and nonlocality must then necessarily exist as expressed in his theorem (Bell, 1964). The universality of this principle is termed the completeness theorem of quantum mechanics and leads to the universality of nonlocality (Einstein et al., 1935). The measure of the success in a psi experiment is also determined in terms of stochastic criteria. Statistical methods are rigorously applied in order to analyze the success rate in any psi research.

The principle of nonlocal connections in quantum theory has been applied over kilometer distances, as we described earlier (Gisin et al., 1998a, 1998b). Eugene Wigner stated that there may be a macroscopic nonlocality that comes out of the complex Minkowski space that could yield a metrical description of the quantum theory, which does not presently have such a description (Wigner, 1981, personal communication). We term this fundamental stochastic nature and universal nonlocality *stochastic causality*. That is, events are statistical aggregates of their many causes, rather than the direct effect of a single cause or linear causal chain. This principle may explain why psi is not always successful and why quantum processes are only predictable statistically. However, in spite of its statistical nature, quantum mechanics is able to successfully predict the optical wavelength of light emitted in spectra of atomic transitions, accurate to eight significant figures.

Here, we present a brief description of our eight-space model. The complex

metrical space includes the three real dimensions of space and the usual dimension of time; it also includes three imaginary dimensions of space and one imaginary dimension of time. These imaginary components of space and time are real quantities multiplied by the imaginary number $i = (-1)^{1/2}$. The interesting property of i is that $i^2 = -1$, a real number. Thus in a complex space, the square of an *imaginary* distance becomes a negative distance squared. In the eight space, the real components comprise the elements of the space defined by Einstein and Minkowski. This is actually a four-dimensional representation of what we have been taught about right triangles in high school, which is the well-known Pythagorean theorem. That is, the square of the distance between the corners of the right triangle opposite the ninety degree angle (the hypotenuse) is equal to the sum of the squares of the other two sides. This distance when measured in the complex Minkowski space is still represented by the squares of the sides of the now complex hyper-dimensional triangle. This expanded space is constructed so that each real dimension is paired with its imaginary counterpart. In the complex space, for any hypotenuse defining the space-time distance between two points we can always find an apex angle of the triangle such that the sum of the squares of the sides, $x^2 + (iy)^2$ can be zero. That is, in the complex Minkowski space-time, *there can always be found a path of zero distance connecting any two points.*

The standard Minkowski metrical space is constructed so that all spatial components are real. But, the square of the temporal component differs by a $-c^2$, which is formulated from ict_{Re}, yielding a component $-c^2t_{Re}^2$. In constructing the "mirror" imaginary four space, each spatial component has an ix_{Im} component, yielding the square component $-x_{Im}^2$. The corresponding temporal component is $+c^2t_{Im}^2$. This is the basis upon which the eight space allows apparent zero spatial and temporal separation.

The lowest number of dimensions that has the property of nonlocality and that is consistent with Poincaré invariance or Lorentz invariance is eight dimensions. In this space, each physical *spatial* distance has an imaginary *temporal* counterpart, such that there is a zero spatial separation in the higher dimensional space. We hypothesize that this path is what awareness accesses in real-time remote viewing. Likewise for every real physically *temporal* separation, there is a counterpart imaginary *spatial* separation that subtracts to zero on the metric, allowing awareness to access precognitive information.

Obviously nonlocality does not require the sun and the earth to be congruent or coincident with each other. This is because physical space has the attribute of force fields and the impenetrability of matter, which dominates most physical processes. This property yields the locality aspect of the physical world with which we are familiar. But, as we have described above, not all aspects of the physical world obey this locality, such as in the case of Bell's theorem nonlocality experiment. Hence, both nonlocality and locality are coexisting properties of the physical world. The physical universe is neither completely local or nonlocal, but has attributes of both, depending on the phenomena being ob-

served. This is a manifestation of four logic, which we describe in the next section.

How does consciousness access this higher dimensional space? We believe it does so through the process of intentionality, which is fundamental to any goal-oriented process, including retrieval of memory. In fact, the universality of nonlocality is *just there,* filling all of space and time. That is, it is available to be accessed at will. With regard to causality, events that appear to be determined in ordinary four space may be more amenable to the operation of our free will in the complex eight space. In the complex space, the causal chain is multi-valued rather than linear, offering us access to a greater number of possibilities.

6. Four Logic and Nonlocality

Certain apparent paradoxes may not be solvable within the framework of Aristotelian two-valued logic. This logic system is basic to western analytical thought. Other logic systems have been suggested in Buddhist writings such as *The Prajnaparamita* (Hixon, 1993). In the second century AD, the Buddhist master teacher Nagarjuna introduced a four-logic system (Garfield, 1995; Hayes, 1994) in which statements about the world can be (1) true, (2) not true, (3) both true and not true, and (4) neither true nor not true (which Nagarjuna believed was the usual case). The four-logic system appears quite outside western consideration and thought. A seeming paradox in physics that may well find its resolution in four logic, or at least an expansion of the restrictions of two logic, is the so-called wave/particle paradox. This may be resolved or better understand in the context of four-logic principles. It is well known that, under the conditions of various experimental arrangements, light displays either wave-like or particle-like properties. But what, then, is the essential nature of light? This question may not be amenable to the usual two logic and may be better addressed by four logic or some form of expanded logic system. We might say, for example, that light is (1) a wave, (2) not a wave, (3) both a wave and not a wave, or most correctly, (4) neither a wave nor not a wave.

Another example that is very interesting to consider is the famous "Schrödinger cat paradox." The key to this paradox is linear superposition in quantum mechanics, which states that the unobserved cat in the box is the sum of two wave functions ($\Psi_{alive} + \Psi_{dead}$), which represent both alive and dead conditions. Clearly this statement is not consistent with two logic, but appears formulated in terms of the third and fourth of four logic.

We hypothesize that higher dimensional spaces, such as complex eight space, may *require* four logic at least for certain circumstances. Specifically, in treating causality conditions, we find that certain cause and effect relations may be amenable to Aristotelian logic in ordinary four space, but phenomena such as precognition might appear paradoxical when they occur in eight space. For example, it appears that one's future is neither determined nor not determined, depending on whether or not one's awareness has access to eight space.

We could state that a possible future, which has been precognized, is neither true nor not true in the four logic of eight space. In ordinary four space, the precognized event must be either true or false, as described in two logic, creating a seeming paradox. Time passage determines the truth or falsity of a future precognized event, and this appears as standard statistical analysis that weights the possible future outcomes. What we termed "stochastic causality" is observed as such in the two logic in ordinary four space. In his 1997 book *The End of Certainty*, Ilya Prigogine seems to be thirsting for the freedom of four logic when he writes: "What is now emerging is an 'intermediate' description that lies somewhere between the two alienating images of a deterministic world and an arbitrary world of pure chance. Physical laws lead to a new form of intelligibility as expressed by irreducible probabilistic representations."

The eight-space model, which involves greater degrees of freedom than four space, may allow for what is usually termed "free will" in this space, which may appear as "deterministic" accurate precognition in ordinary four space. The additional perceived information acquired through the sense's awareness of eight space allows greater degrees of freedom of choice, so that what may appear deterministic because of precognitive phenomena may not be deterministic in the higher dimensional eight space. Additional "degrees of freedom" may allow for a broader or more global concept of free will; one in which greater information and awareness allows greater choice (Cox, 1956).

That is to say, what appears to be deterministic as an either/or condition may have greater "degrees of freedom" or choices in eight space. Precognitive awareness may allow additional choices so that either and/or conditions can exist for temporal periods in eight space before they become fixed as either this or that in four space, i.e., appeared determined in this space. If one has access to psi through the existence of a higher dimensional spaces, one has greater opportunities to increase awareness and increase one's options and hence more free will choices. Metaphysically, instead of crawling along the four-space time line at 1 sec/sec, one can expand one's awareness and learn to reside off this timeline.

For us to have access to nonlocal events in the eight-space manifold, the familiar world line of four space becomes a point for awareness, by utilizing the additional imaginary components. Therefore, we can see that causality will manifest through the apparent past and the apparent future, which are both pulling on the apparent present. Living in eight space guarantees that our awareness is governed by four logic—the two appear to be inseparable. Four logic would say that we are neither free nor not free. Intentionality and purpose allow us to manifest our free will and overcome the apparent deterministic limitations of four space. We will experience free will or determinism in our lives, depending on our intentions and awareness. Our orientation and perspective in eight space always allows us to find a path of zero distance and often informs us usefully of the future.

7. Formalism of the Complex Eight Space

We will now present our formalism, which follows along lines of the detailed formalism of Hansen and Newman (1975) expressed in general relativistic terms, but we express our generalized complex eight-dimensional metric primarily in special relativistic terms because gravity appears not to occupy a role in psi phenomena. The general relativistic formalism is relevant in astrophysics and where strong gravitational fields are present. In that case, we must utilize Reimannian (curved) geometry. For our purposes here, we will utilize the line invariant element expressed in Einstein's special relativity theory. Hansen and Newman (1975) demonstrate, in their extensive paper, that the complex eight-space metric yields the proper solutions to Einstein's field equations only in the condition of asymmetrically flat Euclidean geometries for the case of low gravitational fields. Thus, this formalism approximates, in very general terms, the conditions described by special relativity.

Einstein used a three-dimensional geometric figure termed the light cone to represent the usual four-space metric or Minkowski metric in a two-dimensional plane, based on the conic section diagrams developed by the ancient Greeks. This geometric picture is formed from a figure with two axes, the ordinate is time, t and the abscissa is formed from the three dimensions of space as one axis $X = x, y, z$. The speed of light forms the sides of the two cones apex to apex (which represents "now" time) with the t axis in the vertical direction. The purpose of this picture is to define the relationship between events in four space. For events connected by signals of $v < c$, where c is the velocity of light, events occur within the top of the light cone (forward time) or bottom (past time). These are termed time-like signals. Event connections outside the light cone surface, $v = c$, are connected by $v > c$ and are called space-like signals and are not addressed in standard physics. As we demonstrated before, even this "elsewhere" does not give us precognition (Ramon & Rausher, 1980).

In defining the conditions for causality in the usual four space, distance ds^2 is invariant and given as $ds^2 = g_{ab}dx^a dx^b$ where the indices a and b run 1 to 4. We use the metrical signature $(+, +, +, -)$ for the three spatial and one temporal component in the metric g_{ab}. This metric is expressed as a sixteen element four by four matrix which represents a measure of the form and shape of space. This is the metric defined on (within) the light cone, connecting time-like events. This is to insure Einstein's postulate that any given velocity of event connection occurs for $v < c$. It is clear that precognition demands more that the relaxation of the time-like event connection for $v > c$, that is, no space-like signal will yield the observed precognitive advantage in any four space.

Rauscher (1979) and Newman (1976) construct a second intersecting light cone identifiable with the four imaginary dimensions. We express the complex eight-space metric as M_4 because it represents the complexification of four space-time dimensions. The complex space is expressed in terms of the complex eight-space variable Z^{α}, where $Z^{\mu} = X^{\mu}_{\mathrm{Re}} + iX^{\mu}_{\mathrm{Im}}$, and $Z^{*\nu}$ is the complex conjugate of Z^{α} so that $Z^{*\nu} = X^{\nu}_{\mathrm{Re}} - iX^{\nu}_{\mathrm{Im}}$. We now form the complex eight-

space differential line element $dS^2 = \eta_{\mu\nu} dZ^\mu dZ^{*\nu}$ where the indices run 1 to 4, and $\eta_{\mu\nu}$ is the complex metric of eight space. The generalized complex metric in the previous equation is analogous to the usual Einsteinian four-space metric in the above paragraph. In our formalism, we proceed by extending the usual four-dimensional Minkowski space into a four complex dimensional space-time. This new manifold (or space-time structure) is analytically expressed in the complexified eight space.

Here X_{Re} is represented by x_{Re}, y_{Re}, z_{Re} and t_{Re}, i.e., the dimensions of our usual four space. Likewise, X_{Im} represent the four additional imaginary dimensions of x_{Im}, y_{Im}, z_{Im}, and t_{Im}. Hence, we represent the dimensions of our complex space as or x_{Re}, y_{Re}, z_{Re}, t_{Re}, x_{Im}, y_{Im}, z_{Im}, and t_{Im}. These are all real quantities. It is the i before the x_{Im}, etc. that complexifies the space.

Now we write the expression showing the separation of the real and imaginary parts of the differential form of the metric: $dZ^\mu dZ^{*\mu} = (dX^\mu_{\mathrm{Re}})^2 + (dX^\mu_{\mathrm{Im}})^2$. We can write in general for real and imaginary space and time components in the special relativistic formalism

$$ds^2 = \left(dx^2_{\mathrm{Re}} + dx^2_{\mathrm{Im}}\right) + \left(dy^2_{\mathrm{Re}} + dy^2_{\mathrm{Im}}\right) + \left(dz^2_{\mathrm{Re}} + dz^2_{\mathrm{Im}}\right) - c^2\left(dt^2_{\mathrm{Re}} + dt^2_{\mathrm{Im}}\right). \tag{1}$$

Note from now on we use lower case x and t for the three dimensions of space and one of time. Now let us represent the three real spatial components dx_{Re}, dy_{Re}, dz_{Re} as dx_{Re} and the three imaginary spatial components dx_{Im}, dy_{Im}, dz_{Im} as dx_{Im} and similarly for the real-time component $dt_{\mathrm{Re}} = dt$, the ordinary time and imaginary time component dt_{Im} remains dt_{Im}. We then introduce complex space-time coordinates as a space-like part x_{Im} and time-like part t_{Im} as imaginary parts of x and t. Now we have the invariant line elements as,

$$s^2 = |x'|^2 - c^2|t'|^2 = |x'|^2 - |t'|^2 \tag{2}$$

again where we choose units where $c^2 = c = 1$ which is usually made for convenience

$$x' = x_{\mathrm{Re}} + \mathrm{i}x_{\mathrm{Im}}$$

and

$$t' = t_{\mathrm{Re}} + \mathrm{i}t_{\mathrm{Im}} \tag{3}$$

as our complex dimensional components (Feinberg, private communication, 1976). Then

$$x'^2 = |x'|^2 = x^2_{\mathrm{Re}} + x^2_{\mathrm{Im}}$$

and

$$t^2 = |t|^2 = t^2_{\mathrm{Re}} + t^2_{\mathrm{Im}}. \tag{4}$$

Recall that the square of a complex number is given as

$$|x'|^2 = x'x'^* = (x_{\mathrm{Re}} + \mathrm{i}x_{\mathrm{Im}})(x_{\mathrm{Re}} - \mathrm{i}x_{\mathrm{Im}}) \tag{5}$$

where the modulus of a complex is a complex number, $|x'|^2 = x_{\mathrm{Re}}^2 + x_{\mathrm{Im}}^2$, so that x_{Re} and x_{Im} are real numbers. This is a very important point, as we can only measure events described in terms of real numbers. Therefore, we have the eight-space line element where spatial and temporal distances are taken from the origin.

$$s^2 = x_{\mathrm{Re}}^2 - c^2t_{\mathrm{Re}}^2 + x_{\mathrm{Im}}^2 - c^2t_{\mathrm{Im}}^2 \tag{6a}$$

$$s^2 = x_{\mathrm{Re}}^2 - t_{\mathrm{Re}}^2 + x_{\mathrm{Im}}^2 - t_{\mathrm{Im}}^2 \tag{6b}$$

Causality is defined by remaining on the light cone, in real space-time as,

$$s^2 = x_{\mathrm{Re}}^2 - c^2t_{\mathrm{Re}}^2 = x_{\mathrm{Re}}^2 - t_{\mathrm{Re}}^2 \tag{7}$$

using the condition $c = 1$. Then generalized causality in complex space-time is defined by

$$s^2 = x_{\mathrm{Re}}^2 - t_{\mathrm{Re}}^2 + x_{\mathrm{Im}}^2 - t_{\mathrm{Im}}^2, \tag{8a}$$

where the coordinates in complex eight space can be represented by x_{Re}, t_{Re}, x_{Im}, t_{Im} on two generalized light cones eight-dimensional space (Newman, 1976; Rauscher, 1979).

Let us calculate the interval separation between two events or occurrences, Z_1 and Z_2, with real separation $\Delta x_{\mathrm{Re}} = x_{\mathrm{Re},2} - x_{\mathrm{Re},1}$ and imaginary separation $\Delta x_{\mathrm{Im}} = x_{\mathrm{Im},2} - x_{\mathrm{Im},1}$. Then the distance along the line element is

$$\Delta s^2 = \Delta\left(x_{\mathrm{Re}}^2 + x_{\mathrm{Im}}^2 - t_{\mathrm{Re}}^2 - t_{\mathrm{Im}}^2\right) \tag{8b}$$

and it must be true that the line interval is a real separation. We now consider spatial and temporal distances that are generalized, that is, are not taken only from the origin, but from any two points in space and time. Then,

$$\Delta s^2 = (x_{\mathrm{Re},2} - x_{\mathrm{Re},1})^2 + (x_{\mathrm{Im},2} - x_{\mathrm{Im},1})^2 - (t_{\mathrm{Re},2} - t_{\mathrm{Re},1})^2 - (t_{\mathrm{Im},2} - t_{\mathrm{Im},1})^2. \tag{9a}$$

Or we can rewrite Equation 9a as

$$\Delta s^2 = (x_{\mathrm{Re},2} - x_{\mathrm{Re},1})^2 + (x_{\mathrm{Im},2} - x_{\mathrm{Im},1})^2 - (t_{\mathrm{Re},2} - t_{\mathrm{Re},1})^2 - (t_{\mathrm{Im},2} - t_{\mathrm{Im},1})^2. \tag{9b}$$

In Equation 9b, the upper left diagonal term $(x_{\mathrm{Re},2} - x_{\mathrm{Re},1})^2$ is can be offset or

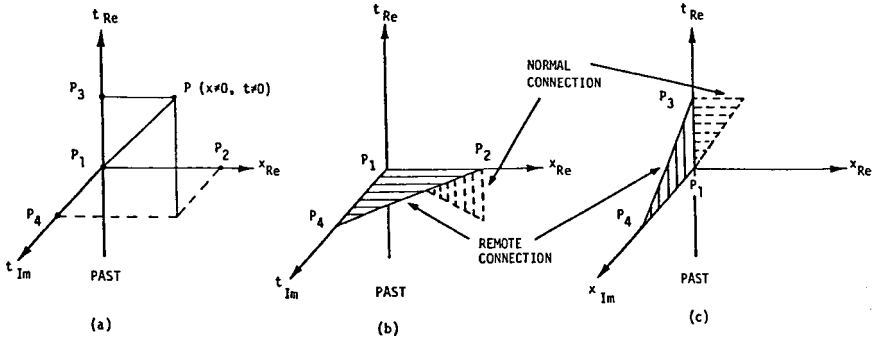

Fig. 1. Showing the location of four points in the complex manifold. In Figure 1a, point P_1 is the origin, and P is a generalized point which is spatially and temporally separated from P_1. In Figure 1b, the Points P_1 and P_2 are separated in space but synchronous in time. This could be a representation of real-time remote viewing. In Figure 1c, points P_1 and P_3 are separated temporally and spatially contiguous. This represents a precognitive perception.

"cancelled" by the lower right diagonal term $-(t_{\mathrm{Im},2} - t_{\mathrm{Im},1})^2$, and the lower left diagonal term $-(t_{\mathrm{Re},1} - t_{\mathrm{Re},1})^2$ is offset by the upper right diagonal term $(x_{\mathrm{Im},2} - x_{\mathrm{Im},1})^2$.

Because of the relative signs of the real and imaginary space and time components and in order to achieve the causality connectedness condition between the two events, or $\Delta s^2 = 0$, we must "mix" space and time. That is, we use the imaginary time component to effect a zero space separation. We identify $(x_{\mathrm{Re},1}, t_{\mathrm{Re},1})$ with a subject receiver remotely perceiving information from an even target $(x_{\mathrm{Re},2}, t_{\mathrm{Re},1})$.

The remote perception experiments consist of a subject receiver in a laboratory room with an experimenter monitor who elicits a response about an outbound experimenter's location which can be a few thousand kilometers distant from the laboratory. Correlation of the subject's response is made of the outbound experimenter's activities at the remote site and the nature of that geographical location. The experiment involves a real physical separation $\Delta x_{\mathrm{Re}} = x_{\mathrm{Re},2} - x_{\mathrm{Re},1} \neq 0$ and can either involve a current time observation such that $\Delta t_{\mathrm{Re}} = t_{\mathrm{Re},2} - t_{\mathrm{Re},1} = 0$ or a precognitive time interval $\Delta t_{\mathrm{Re}} = t_{\mathrm{Re},2} - t_{\mathrm{Re},1} > 0$. The case where there is no precognitive time element $\Delta t_{\mathrm{Re}} = 0$. The simplest causal connection then is one in which $\Delta x_{\mathrm{Im}} = 0$, and we have

$$\Delta s^2 = 0 = (x_{\mathrm{Re},2} - x_{\mathrm{Re},1})^2 - (t_{\mathrm{Im},2} - t_{\mathrm{Im},1})^2. \tag{10}$$

These conditions are illustrated in Figure 1. In Figure 1a we represent a generalized point $\mathrm{P}(x_{\mathrm{Re}}, t_{\mathrm{Re}}, t_{\mathrm{Im}})$, displaced from the origin which is denoted as P_1. This point can be projected on each dimension x_{Re}, t_{Re}, and t_{Im} as points P_2, P_3, and P_4 respectively. In Figure 1b, we denote the case where a real-time *spatial*

separation exists between points P_1 and P_2 on the x_{Re} axis, so that $\Delta x_{Re} \neq 0$, and there is no precognition, so that $t_{Re} = 0$. Because our awareness has access to imaginary time t_{Im}, it can access the P_1 to P_4 interval, so that $\Delta t_{Im} \neq 0$. Then, our metric gives us $\Delta s^2 = 0$, where awareness experiences contiguity between P_1 and P_2 by its ability to access the path to P_4. By using this complex path, the physical spatial separation between P_1 and P_2 becomes equal to zero, allowing direct awareness of distant spatial locations, as we observe in remote viewing of distant locations. Figure 1c represents the case where precognition occurs between P_1 and a future perceived event, P_3, on the t_{Re} axis. In this case, no physical spatial separation between observer and event is represented in the figure. Often such separation on the x_{Re} exists. In the case where $x_{Re} = 0$, then access to precognitive information along t_{Re} can be achieved by access to the imaginary temporal component, t_{Im}.

The light cone metric representation may imply superluminal signal propagation between subject and event in the real four space, but the event-receiver connection will not appear superluminal in some eight-space representations. We can consider that our ordinary four-dimensional Minkowski space is derived as a four-dimensional cut through the complex eight space (Newman et al., 1978).

We have examined causality conditions in four space with superluminal signals and the problem of closed time loops posed by G. Feinberg's classic "Tachyon" paper (Feinberg, 1967). These problems appear to be resolved by considering a space of higher than four dimensions such as we describe in this paper.

We believe that remote perception and awareness are manifestations of a non-energetic phenomenon, and arise from our nonlocal nature, rather than as information "sent" from one location to another.

8. Additional Considerations of the Complex Eight-Space Picture

The complex eight-dimensional Minkowski (M_4) space metrical formalism is relevant and fundamental to a number of branches of physics. Hundreds of papers on complex eight space by a number of researchers have been published in refereed journals, some of which are cited in this article. Some of this research has demonstrated the compatibility of M_4 space and standard modern physics; others have utilized complex Minkowski to better describe the foundations of physics. Some of these theoretical research papers describe the role of M_4 space in unifying the various branches of physics. Some researchers have expressed the opinion that this M_4 space may yield great contributions in unifying field theory models. We will briefly describe the utility of several approaches, utilizing complex eight-space models, in various branches of physics.

Using general relativistic formations of Maxwell's equation, Newman (1973) has formulated Maxwell's equations in complex eight space. He demonstrates that the principle of Poincaré invariance holds and that the use-

ful Kerr metric comes out of this formalism and is basic to the Einstein-Maxwell field equations. Solving the nonrelativistic and relativistic forms Maxwell's equations in complex eight space yields some new and testable predictions. These predictions are detailed in Rauscher (1983, 2001).

Some of the predictions of the complexification of Maxwell's equation are (1) the need for modified gauge invariant conditions, (2) short range non-Abelian force as well as the usual Abelian long range forces, (3) finite but very small rest mass of the photon, (4) a magnetic monopole-like term, and (5) longitudinal as well as transverse magnetic and electromagnetic field components.

It should be mentioned that the complex eight space and classical mechanics are self consistent. The form (invariance) of Newton's law of universal gravitation and Newton's laws of motion is not modified by the conditions of the complex eight space. Essentially, as is usual in Lorentz transformation, a linear shift in axis may occur just as, for example, for time. Introducing a –t yields an axis shift but no changes of the form of the equations. For t real, $+t$ or $-t$ both yield t^2 which produces no changes in t^2 in the metric, leaving the metric unchanged and Newton's laws unchanged. The formalism of the complex eight space is incorporated into the current Grand Unification Theories (GUT) theories, supersymmetry models, and string theory that describe particle physics and the current models of the universe.

9. Conclusions

It appears then that there is a human perceptual modality in which distant space-time events can be accessed. The remote perception phenomena may imply, in a certain sense, that space and time are not primary physical constructs. In the words of Albert Einstein, 1941, "time and space are modes by which we think and not conditions in which we live." In a similar vain, in 1923 A. S. Eddington said, "time is a mental construct of our private consciousness … physicists construct the concept of a world wide time from a string of subjective instances" (qtd. in Batten, 1995).

The fundamental nature of nonlocality is expressed in the universe through quantum physics, as well as psi phenomena, and in the universality of consciousness. We have developed and presented a theoretical model, the complex Minkowski space, which expresses the nonlocal aspect of our observed reality. Not only does this model describe the data for psi, but it is also reasonably consistent with the main body of modern physics, as we describe in previous sections. As the data for psi become stronger and more coherent, we have the opportunity to construct physical models which can increasingly well describe these observations.

The psi data base, and the fundamental properties of nonlocality in physics, lead us inexorably to the conclusion that the speed of thought is transcendent of any finite velocity. Because precognition occurs with the event experienced prior to its apparent cause, the speed of thought appears to be instantaneous, or

any other velocity one chooses. The speed of thought is therefore undefined in meters per second. Since consciousness can access the complex eight space as though it is contiguous, space-time distances are non-existent for mind-to-mind, or mind-to-target awareness—separation of consciousness is an illusion. The compelling data for precognition make it appear that the future is unalterably determined. This fatalist point of view maintains that our awareness moves inexorably along the time line at a rate of one second per second. But, this seeming limitation of our free will is only a four-space perception. We believe that the higher dimensional space described here gives additional degrees of freedom, which are available to our awareness, allowing us to have greater access to possible futures.

We recognize that every ontology is perishable and that one day it may be found that complex Minkowski space is not the best model for psi. However, we are confident that two factors will remain: namely that these phenomena are *not a result of an energetic transmission, but rather they are an interaction of our awareness with a nonlocal hyper-dimensional space-time in which we live.* Although we have demonstrated that physics in not contradicted by this model, we cannot explain why these phenomena manifest in consciousness and apparently not in the rest of physics. Nor can we presently describe the mechanism by which consciousness has access to the complex space.

Certainly, the nature of psi is about our mental access and our awareness of the truth. Ethical issues about truth also arise from the experimental and theoretical research presented here, and in many other teachings. If there is, in fact, only one of us here in awareness, we should always choose compassion over "justice", since we can always recognize compassion, but it is often difficult to discern justice from injustice. This is why the practice of compassion and the teaching that separation is an illusion (nonlocality) are always found together in Buddhist writings. Compassion follows logically from life in a nonlocal universe.

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Note

[1] This experiment received a great deal of examination by the critical community. It was suggested that because Schlitz and Gruber were friends, they may have been similarly affected by world events, even though they did not communicate during the experiment. It was proposed that Gruber's comments about each place he visited might contain words or ideas similar to those which might have contaminated Schlitz's transcripts. As a result of this far-fetched but not totally invalid criticism, the entire judging process was repeated, omit-

ting Elmar's comments about what he had done at each site. The overall significance of the experiment was calculated, and the significance from this approach was 16 in 10,000, which is still remarkable for an experiment with only ten trials.

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