

The Search for Spock!

[Continued]

C. The scientific era and the rise of Parapsychology: 1930 - 1969.

After 1930, scientists who were concerned with investigating paranormal phenomena dedicated their efforts to proving the existence of psi through lab experimentation and thus they began a program to define psi so that it could be measured. This became an era of definition and distinction between those phenomena that were occult and those that truly exhibited psi. Extra Sensory Perception (ESP) and Psychokinesis (PK) became the two major categories of psi manifestation. Defining the quantities to be measured is an extremely important part of the scientific method. Quantities cannot be measured until they are precisely defined and hypotheses to explain relationships between these quantities cannot be made until measurements are taken. When Rhine first defined psi and brought psi research into the laboratory he was beginning a long process of defining the limits of psi and the conditions under which it could be scientifically investigated.

The number of physicists during this period who were active in parapsychological research on a regular and professional basis is extremely small. Joseph Rush seems to be the only physicist who has consistently maintained a presence within the parapsychological community. A few other physicists entered and departed the field for short periods of time, but only Rush remained active in the area, concentrating his research on investigating psi and its physical characteristics. Therefore, the different physical theories of psi developed during this period came primarily from non-physicists and suffered thereby. The theories of this period also tended to explain one or two of the many facets of psi, with no one theory covering the whole gamut of known ESP and PK phenomena. These theories reflected work done in the main areas of physics research, including electromagnetic theory, quantum theory and relativity (field) theory. Since there is a lag time between the development of new theories in physics and their application in other areas, the theories of psi developed during this period reflect more the physics of the period 1900 to 1930 than they do the fundamental questions and paradoxes that arose in physics during this period. The ground never gets wet until well after the storm clouds begin to form and the growth of plants from the nurturing rain takes still longer. The year 1930 is a convenient choice for the opening of this period, although some of the work considered as part of this period may have begun a few years earlier.

In 1928, Hans Berger succeeded in recording electrical "rhythms," our modern alpha waves, in the human brain for the first time and so invented the electroencephalograph. Earlier research by F. Cazzamali had clearly demonstrated the existence of electrical impulses in the human brain, but Berger's findings were the first to demonstrate a pattern to the electromagnetic impulses in the brain. Cazzamali claimed to have detected brain waves about one centimeter in length after he developed an ultrahigh-

frequency apparatus for testing human telepathy. (Beal, p.429) Based on these observations, he speculated that electromagnetic waves might provide the physical method for the transition of extra-sensorial information such as occurs with telepathy. (Chari, 1977, p.810) However, Cazzamali's claims have been neither substantiated nor confirmed by later observation, including that of both Berger and L.L. Vasiliev.

It would seem that Berger's discovery might imply that the brain could act as a transmitter and receiver of electromagnetic waves of the same frequency as the alpha waves. Indeed, telepathy had been associated by analogy with telegraphic signals since the heyday of modern spiritualism. As radio technology advanced and the use of radios became more commonplace, the concept of a "Mental Radio" also became quite popular, especially when the novelist Upton Sinclair published a book with that title in 1930. In light of the new technologies, such a proposition was "highly plausible to the popular mind." (Burt, p.88) His experimental discoveries, however, did not lead Berger to a wave theory of psi. Instead, he suggested a psychic medium that interacts with physical processes in the brain. Berger noted that electrical changes within the brain were far too weak to explain telepathy as an electromagnetic phenomenon. This led him to postulate a new, as yet unknown energy which is "psychical" in nature yet had the ability to span the greatest distances without attenuation or obstruction by physical objects. The electrical potential in the brain is large enough to allow a transformation to this "psychic energy" which then travels wavelike through space to the subject's brain where it is transformed back to electrical potential, producing neural patterns to complete the telepathic message. It should be noted that Berger considered this energy completely physical and interchangeable with other physical energies. He closely associated this energy with the propagation of electromagnetic waves in his 1940 book *Psyche*. After all, electromagnetic waves are non-material (they have no mass) although they do carry or transmit energy. Berger's theory runs into several problems, the least of which is the fact that there is no evidence of such an energy. Nor is there any way yet known of detecting it.

Physical tests seem to indicate that psi phenomena do not diminish with distance according to the inverse square law, as do electromagnetic waves and gravitational phenomena. Signal strength does not fall off with increasing distance. Nor are they blocked or impeded in any manner by physical objects, as are electromagnetic waves. The Russian scientist Vasiliev between 1927 and 1963 conducted the better known of the experiments testing these characteristics of psi. Vasiliev's research was influenced by the work of V.M. Bechterev earlier in the 1920s. Bechterev believed that "the emanation of electromagnetic waves would provide the best working hypothesis to account for telepathic phenomena." (Quoted in Burt, p.89) Bechterev's conjectural hypothesis formed the basis of Vasiliev's early research on the subject, although Vasiliev also attempted, but failed, to detect Cazzamali's one-centimeter waves during the 1930's. Vasiliev later conducted ESP tests covering great distances as well as tests with subjects in Faraday cages, which effectively block the transmission of electromagnetic waves. In neither case was ESP affected by the adverse conditions of the experiments. Critics have since cited these experiments to prove that ESP cannot be explained by an electromagnetic hypothesis. Vasiliev further pointed out "the brains and nerves are surrounded by fibers

and liquids which possess greater electromagnetic conductivity than the nerve tissues themselves. This makes any meaningful transmission of electrical potentials from brain to brain rather far-fetched." (Rao, p.142) However, the work of John Eccles on "subtle influences" in the brain might eventually render Berger's or similar theories more acceptable and his theory cannot be ruled out completely.

In 1953, Eccles proposed a theory to explain how an individual's "will" could affect a single neuron in the cerebral cortex to trigger far more changes in brain activity than could normally be triggered. If a group of neurons are critically poised in a state of unstable equilibrium, even a single neuron can initiate or trigger their response. That single neuron need not have had enough energy to trigger a nerve impulse under normal conditions, but the firing of one neuron just below the discharge threshold could trigger a larger number of firings. While this theory did not refer to any psi phenomena, or explain any psi action, as it was first proposed in Eccles' book *Psyche*, he did relate the theory to ESP and PK in the concluding sections of the book. Since a "subtle influence" of some type is needed to initiate this cascading process, even weak electromagnetic waves might trigger a spontaneous psi event in the human mind. Eccles' theory says nothing of either the mode of information transfer or the medium of transmission of psi, only how the signal can affect the human brain to come into conscious thought. Eccles' theory is physiological rather than physical, but the energies involved can easily be accounted for using a quantum model. Eccles' concepts are susceptible to quantum analysis.

It is interesting to note that the electromagnetic theories of psi are also field theories. Up until 1930, quantum theory was fairly incomplete and wide open to changes. So it could contribute little to a theory of psi. Relativity theory was a theory of extremes, extremely dense masses in the case of general relativity and extremely high speeds in the case of special relativity, so psi theories were seldom based on either relativity or the quantum theory early in this era. They were instead based on Newtonian and classical principles. Technically speaking, any theory associated with electromagnetic waves should be considered a field theory. Electromagnetic waves are actually high frequency variations in electromagnetic fields spreading out from a source. But these electromagnetic theories of psi utilized a more classical description of waves and are thus distinct from field theories of psi, as they are grouped by Rush (Rush, p.285). On the other hand, C.W.K. Mundle has termed Berger's hypothesis an "unorthodox physicalist theory" (Mundle, p.201) since it was based on the concept of a "psychic energy." However, there are other problems inherent in Berger's theory no matter how it is classified. First of all, Berger's theory is only a theory of telepathy. His hypothesis cannot account for either precognition or PK. Since this "psychic energy" is converted by a brain's electrical potential and passes through physical objects unobstructed, it could not interact energetically with physical objects to produce PK.

Ninian Marshall put another "unorthodox physicalist" theory forward in 1960. This theory deals with "resonances" between complex systems such as human brains. The "resonances" are functions of the complexity of systems and account for "the highly selective and well-nigh incredible ranges in which ESP information operates" (Chari, 1977, p.813) In general practice, physics experiments are performed on structures that

have been made as simple as possible, whereas ESP phenomena seem inherent within the human brain, which is highly structured and complex to an extreme. This fact led Marshall to develop "The Hypothesis of Eidopoic Influences" such that "the change produced by an eidopoic influence increases with its strength, and with the quantum mechanically defined probability of change." This hypothesis, analogous to Newton's Law of Force, leads to two deviations from current physics: "(i) Complex structures must be involved, and (ii) These structures must have 'indeterminate' features in their observable behavior." (Marshall, p.267) Two conditions such as these, complexity and indeterminacy, have thus far only been fulfilled in the neural matter of living organisms.

The eidopoic influence creates a resonance between different complex systems, thus allowing something very faint to be made available as a signal regardless of the spatio-temporal distances. The degree of resonance within the complex structures tends to make them become more alike, the strength increasing with the product of their complexities and decreasing with the difference between their patterns. When the human brain is the complex structure under consideration, telepathy occurs as a resonance between brain patterns. The greater the similarity between two structures (brains) or patterns within the structures, the greater the eidopoic influence and thus the greater the chance of resonance. This structure could explain why greater probabilities of telepathy occur between family members (with inherited similarities in brain complexity), people familiar with each other, or those having similar ideas. Even memory can be explained as a repetition of resonance with past events or patterns of knowledge.

The eidopoic influence is a determining factor in the world in much the same manner as physical causes have been regarded in the past. The differences between the two arise from the properties of physical causes: "(i) A transmission of energy or moments is involved; (ii) the cause acts before the effect; and (iii) there is a continuing chain of intervening events from cause to effect." (Marshall, p.269) Since the Eidopoic influence acts like a physical cause without exhibiting the properties of a physical cause, the whole concept, besides being quite revolutionary, is difficult to accept. The theory's basic strength lies in the fact that it introduces no new structures to explain telepathy, although it does lead to testable predictions. For example, Marshall "predicts that telepathic interaction will be detectable between computing machines if or when these can be made sufficiently complex in nature." (Mundle, p.202) However, there are also difficulties inherent in the theory. As with other physical theories of psi, Marshall has been led to postulate a causal interaction that does not require a spatio-temporal continuity. (Rao, p.143) So, his theory would seem to be more a fact of nature like Pauli's Exclusion Principle or the General Theory of Relativity (which are formal principles as Margenau describes them). Other problems arise because his theory is only qualitative (Marshall claims the mathematical machinery needed does not yet exist) and it also fails to adequately explain psi phenomena other than telepathy such as clairvoyance and PK. "As is easily seen Marshall's theory explains practically nothing about telepathy nor takes into account the interrelation of telepathy, clairvoyance and precognition." (Rogo, p.289) In other words, it does not address the question of how signals travel between two minds in the case of telepathy or between mind and objects to produce psychokinesis. Rush considers Marshall's "resonance" theory a "quasi-physical" theory while he considers

Berger's a field theory. He further categorizes all field theories as "quasi-physical." The theories of H.A.C. Dobbs, G.D. Wasserman and William G. Roll also fall within these categories according to Rush.

The 1965 theory of Dobbs is based upon quantum mechanical lines. He suggested that Eccles' "subtle influences," as perceived in the brain, could have the form of mathematically "imaginary" energies. These, he argues, are not without precedent since physicists use the concept of virtual particles, which carry mathematically imaginary energy and moments, to describe the fields around real particles. These virtual particles are only inferred from experimental results and not observable in their own right. Dobbs hypothesizes a two-dimensional theory of time. The first is the normal time dimension of physics and psychology and is represented as the real axis in a complex number system while the second time dimension, "in which the objective probabilities of different possible outcomes of events are ordered," (Dobbs, p.250) is represented by the imaginary axis. Different probabilities in this second virtual time dimension can be co-present and may be interpreted as Karl Popper's objective dispositions or "propensities." These are related to "precasts" of events that are highly probable but not certain to happen in the future and are spread out in a quasi-temporal order around actual events. When the mind perceives these "precasts," precognition takes place. The "precasts" are analogous to the virtual particles of quantum theory. Dobbs then postulates the existence of particles called psi-trons, which are the carriers of psi information. Psi-trons "register the probabilities in the second time dimension and contribute to the EEG alpha rhythms of the brain." (Chari, 1977, p.814)

A precedent for Dobbs' second time dimension can be found in the *Fundamental Theory* of Sir Arthur Eddington. Edmund Whittaker published Eddington's theory in 1946, after Eddington's death. Eddington's theory was a type of unified field theory, based on a space of three dimensions with two time dimensions from which a five-dimensional continuum was constructed. Since his five-dimensional model was an extension of Einstein's four-dimensional space-time continuum as postulated in general relativity, all physical aspects of general relativity were automatically incorporated into the theory while the extra dimension of time allowed the incorporation of quantum theory. (Dobbs, p.251) Eddington's theory more-or-less provided the physical model for Dobbs' theory of psi and may or may not lend some credence to Dobbs' theory. So Dobbs' theory is doomed to suffer the same criticisms as Eddington's fundamental theory as well as its criticisms based upon its own merits. The same arguments made against the physical theories of virtual particles, two-dimensional time and "propensities," can be made against Dobbs' theory also occur. Although an important part of quantum theory, virtual particles are completely undetectable. Dobbs' psi-trons are also undetectable, as would be expected, since they have only mathematical and not physical significance. They are imaginary in the mathematical sense of the term. Perhaps this is why Chari claims "The 'psi-tron' theory of the late H.A.C. Dobbs can claim no unequivocal support from the logic of quantum mechanics or from the mathematics of EEG rhythms." (Chari, 1974, p.3)

Dobb's quantum mechanical theory of complex time and energy can also be used to explain general ESP. The theory allows physically real events that are caused by particles of mathematically imaginary mass to be cognized without friction or energy loss across space. The physical basis for ESP then becomes a matter of interaction between particles of real mass and particles of imaginary mass. Dobbs' theory is thus extended to a more general case, so it cannot be argued that his theory is unable to explain all the different aspects of psi. By assuming that psi-trons are a general characteristic of the universe, Dobbs' theory does open itself to the challenge that "the mind could not possibly have the ability to identify and isolate which one psi-tron or mass of psi-trons it needed for a particular bit of information, or how it could decode it. (Rogo, p.289) Unfortunately, Dobbs' theory suffers from the fact that it "offers no good experiments, nor does it provide for clairvoyance or psychokinesis." (Rush, p.284)

Wasserman (1956) has gone a good deal further and postulated four different fields; the M-fields, B-fields, P-fields and psi-fields. P-fields are associated with matter alone. The M-fields, or morphogenetic fields, are physical fields of the same class as other energy fields. They conform to Lagrangians and are Lorentz invariant, thus they have the same properties as other physical fields. "An M-field may act as a slight perturbation field which changes the transition probabilities of the molecular fields and also changes their energies slightly through active transitions." (Wasserman, p.57) Like electromagnetic fields, M-Fields can only be observed through the changes they cause in matter fields. Matter fields of an organism co-exist in mutually bound states with molecules and M-fields can only go into bound states when a certain specific molecular complexity has arisen. M-fields can also exist in states whereby they cannot exchange energy with matter fields. These states are analogous to electronic transition states that are not allowed according to the quantum theory. On a biological level these M-fields seem to correspond to the functions of an organism such as fertilization, before which an egg's molecular system will not allow energy transitions with the M-field but after which the sperm triggers fertilization.

The M-fields act to "steer" the organism's development. Similarly, there are fields of the M-field type, which "steer" the organism on the molecular level after the embryonic stage. These fields give rise to animal behavior and are called B-fields. The B-fields are the structural "steering" fields of the nervous system and interact with neural matter the same as M-fields interact with molecular matter. Behavior is a consequence of mutual interaction between B-fields and mental matter. Learning happens when new B-fields become bound to already existing B-fields and memory results from the formation of systems of mutually bound B-fields, which can exist in stable bound stationary states. Since B-fields are specialized M-fields, they must obey quantum mechanical transition laws and quantum field theory can then be used to produce the selectivity and permanence of memory and learning. Psi is related to the interaction of these fields with psi-fields.

The psi-fields can interact only with neighboring fields and then only within a very narrow band of energy levels. Thus, psi-fields could radiate their energy over long distances without absorption by matter fields and attenuation. In telepathy, a B-field

selects a specific psi-field, which excites a corresponding B-field of the receiving recipient. The psi-field can only make transitions with a percipient's B-field depending on the overall state of the B-fields or the attitude of the percipient. Clairvoyance depends on a one-to-one correspondence between an object's associated P-fields and the percipient's B-fields via intermediate psi-fields. The P-fields are inherent in all matter while B-fields and M-fields are special cases of P-fields. Finally, precognition occurs when fields of other kinds are duplicated, the copies make faster transitions than the originals, and thus there exists a potential for the reception of advanced information when the appropriate psi-fields meet the conditions for appropriate interactions with B-fields.

Wasserman has been very careful to show the analogies between his postulated fields and quantum mechanical transitions, giving his theory what he feels is a sound physical base. However, this proliferation of fields is purely 'ad hoc' (Chari, 1977, p.816) and Wasserman "ignores the almost intractable difficulties which arise in relativistic quantum mechanics from the interaction of fields, ..." These fields are gratuitous when regarded as explanatory devices and fail to have any analytic or predictive value. Nor can the existence of these fields be proven without deducing testable implications, so Wasserman's theory remains an interesting speculation and no more. (Rao, p.169)

Yet the utilization of the field concept occurs elsewhere. Before embarking on his own theory of the psi-field in 1966, Roll wisely stated that he was "not a physicist either by education or aptitude. As (he) looked through some of the older material in parapsychology, however, several hypotheses suggested themselves" (Roll, 1966, pp.46-47) There is ample evidence indicating that a field effect best describes psi phenomena. Acting on this evidence, Roll admittedly borrowed freely from both Gardner Murphy's and Wasserman's field theories (among others) to develop his own field theory and claims that his psi-field occupies a theoretical position between Wasserman's P-field and psi-field. Roll's psi-field is defined as "The region in space in which psi phenomena are detectable." (Roll, 1966, p.47) Assuming that all objects or systems, animate or inanimate, have their own psi-fields, Roll was able to break down ESP, PK, precognition and clairvoyance into a single communication system between two or more psi-fields through a channel. Any contact between two individuals' psi-fields, or a physical field and a psi-field, will leave an impression or copy called a "psi-trace" which is communicated via some channel to the percipient. The following 'ad hoc' postulates have been set down to describe Roll's psi-fields:

- I. Psi-fields exist in bound states with physical fields or objects or in free states.**
- II. Physical and mental events produce isomorphic representations of themselves in the psi-fields of the animate or inanimate objects in which the events occur. The isomorphic representations persist after the events that formed them have terminated.**
- III. Psi-fields produce isomorphic representations of themselves in other psi-fields.**
- IV. Psi-fields produce isomorphic representations of themselves in physical fields.**
- V. The transition probability between psi-fields is higher than the transition probability from psi-fields to physical fields. (Roll, 1966, p.50)**

The value of these postulates depends upon the empirical deductions that can be inferred from them and to this end Roll lists four general interaction hypotheses and five more

conditions dealing with the channels between psi-fields. Experiments can be designed to test these hypotheses, which lends more weight to Roll's work.

Other important consequences can be deduced from this theory. A psi-field is able to store information and thus it acts like a memory record. This has an immediate impact on telepathy and ESP since a person must be able to "express" the telepathic message or must have a previous memory of the information relative to the message (memory traces) to draw on. The more memory traces that are available, the better the chances of telepathic success. This also relates the 'laws of learning' (dealing with recency, frequency and vividness) to the reception and transmission of ESP. Roll also questions the hypothesis of attenuation at a distance, but doesn't draw any substantial conclusions there from. Roll further postulates the permanence of the psi-fields and deduces that a "person" is not limited by his physical body but encompasses the objects in his psi-field. This conjecture leaves the door open to further speculation regarding the different phenomena associated with survival after death, but makes no statement regarding the extent to which consciousness is associated with the psi-field.

These theories do not exhaust the attempts to derive a theory of psi based upon a field model. There have been several other attempts to explain psi in terms of its own generalized psi fields. Along with Wasserman's theory there are also the theories of Gardner Murphy, Cyril Burt, W.G. Rolland and Campbell Garnett. Burt's theory (1961) utilizes "informational fields" that deal with clairvoyant or precognitive ESP (Whiteman, 1977, p.748), or rather psychical fields (Roll, 1966, p.41). In these fields, specific mental properties assume the places of physical "forces" and "potentials." Just as an electrostatic field exists in the space surrounding a point charge, "mind" is a field existing about the human brain. These mental fields can interact with and/or copy one another. They can also interact with the existing physical fields. The probability of interaction between these various fields then becomes dependent on the particular conditions that determine the "transition probabilities." (Roll, 1966, p.41) Telepathy occurs when two or more mental fields copy one another and clairvoyance is a result of a physical field being copied by a mental one. Burt accounts for the purported non-attenuation of psi by supposing that ESP is concentrated in a beam directed toward the receiver's brain and not spread out as an electromagnetic wave is, rather like a laser beam. (Roll, 1966, p.44) There is no need to postulate a "particle" which influences the field just as there is no need to have a graviton for a gravitational field. (Roll, 1966, pp.47-48) Burt's theory has the advantage that it explains psi without going beyond present knowledge even though he postulates fields that have not yet been detected.

Although it is not strictly a physical theory, Murphy's "paranormal metric" does deserve some small mention in that it is related to Roll's psi-field. Murphy noticed that psi phenomena seem interpersonal rather than completely isolated and individual. They also seem to be blocked by one's personal psychological isolation. To account for these facts, he developed a theory of an interpersonal entity or field of psychic forces, which is devoid of any material existence. This field or entity is purely mental. "Every psychological activity which takes place in a world where time and space are real takes place leaves a 'trace' in the world to which psi belongs - a world to which time-space

concepts are not applicable. When the present psychological activity makes a contact with the reality directly, we have telepathic or clairvoyant experiences." (Rao, p.147) The universe thus coexists with a "cosmic system of psychic laws and psychical entities" making up a "paranormal matrix" with ordinary psychological activity. Since the theory deals with purely mental concepts it is psychological rather than physical. But by Roll's own admission, his psi-field, which is physical, draws on both this non-physical "paranormal matrix" and Wasserman's P-fields.

It should be noted that these field theories were developed at a much later date in the history of parapsychology. They all came in the late 1950s through the decade of the 1960s. There may well be some fundamental and underlying reason for this shift in attitude. Einstein's general theory of relativity, the ultimate example of a field theory in physics, was accepted rather rapidly by the scientific community, given Eddington's 1919 verification of the bending of starlight as predicted by Einstein. But there were very few applications of general relativity in the ensuing years, so it was overshadowed by the quantum theory, which seemed to explain a great deal about the atom and its nucleus. Political and cultural forces pushed the development of nuclear theory at a much greater pace than might otherwise have been the case while there was no such incentive for the development of the relativity theories. This turn of events emphasized the development of quantum theory at the expense of the relativity theories. So physics simply turned away from relativity and field theories toward quantum theory. In other words, the vast majority of physicists concentrated their efforts on developing quantum theory during the four decades after Einstein first developed general relativity.

On the other hand, Einstein spent the last three decades of his life searching for a unified field theory and thus ostracized himself from most of a scientific community that considered his search both futile and eccentric. It was not until after technological advances allowing better measurements and observations were made as well as the beginning of the space age, within a few years after Einstein's death in 1955, that general relativity and thus the field approach to physics again became popular. This popularity undoubtedly influenced the development of field theories of psi in the late 1950s and thereafter. While these historical influences are merely conjectural in that they cannot be easily proven, it should be quite evident that far more advances were made in the application of general relativity in the three decades following Einstein's death than the three decades before his death. Another of the many factors that could have influenced this shift in strategy was the failure of the quantum theorists to incorporate gravitational theory, and thus general relativity, within their own worldview. There were certainly some successes in developing a quantum field theory, but an explanation of gravitation within the quantum perspective was not among the successes. Einstein took the opposite point of view and thought that his unified field theory approach would eventually lead to an explanation of the quantum. This trend began to slowly change with field theory reversing its stature within the scientific community and vindicating Einstein's point of view. More scientists began to study field theory in the 1950s and thereafter.

There is yet another classification of psi theories which is related to the field theories. These are the hyperspatial theories. Rush classifies them as fully "physical

theories." (Rush, p. ...) However, technically speaking the hyperspatial theories are field theories since they are modeled upon relativity theory. Instead of emphasizing the field aspects of relativity, these theories make use of the extra-dimensional features of relativity. While the different field theories of psi discussed so far are physical to one degree or another, depending on the extent to which specialized fields were invented to explain psi, these hyperspatial theories of psi adhere more closely to the tenets of contemporary physics. J.W. Dunne's theory of 1927 is based on the conception of a fourth-dimensional time. Our consciousness travels in a temporal dimension in such a manner that we seem to experience a motion in time in our three-dimensional world. "Real" time is then the fifth dimension in which second consciousness moves and this process continues in still higher dimensions. While Dunne's theory provides a two-dimensional time, his theory is not specifically related to Dobbs' theory. Precognition becomes possible when the second consciousness moves about in our waking conscious time of four dimensions. (Rao, pp.166-167)

C.D. Broad proposed a similar theory in 1967. It is also based on a second dimension of time, but lacks Dunne's infinite regress of higher time dimensions. In Broad's theory, precognition is explained in approximately the same manner as Dunne's explanation with a secondary consciousness associated with a second time dimension. Precognition in our awareness occurs in the past of the second time dimension since the second time dimension precedes normal time. (Rao, pp.167-168) Both of these ideas seem quite fantastic, indeed "A topological generalization of these theories seems to be possible, but no coherent interpretation of the amended theory can be provided without the most sweeping changes in all our causal conceptions of the passage of events." (Chari, 1977, p.816) Both these theories are based upon the relativistic view of a four-dimensional space-time continuum. While they are decidedly five-dimensional, incorporating a second time dimension, they are loosely based upon the five-dimensional theory of Theodor Kaluza.

In 1921, Kaluza developed a unified field theory in which a fifth spatial dimension was used to account for electromagnetic phenomena. The fifth dimension, or rather the fifth component in the metrical field, had no physical significance in that Kaluza merely used it as a mathematical artifice. A few years later, Oskar Klein extended Kaluza's theory to include quantum effects, while Einstein and other scientists continued to develop variations of the theory throughout the 1930s and 1940s. Einstein gave up the pursuit of a five-dimensional theory in 1943 declaring that the five-dimensional approach could not be considered valid until a proper explanation of why the extra dimension could not be sensed was given. Since Kaluza attached no special physical significance to his fifth coordinate or dimension, it could be considered legitimate to use it as an extra time dimension. At the very least, Kaluza's theory set a precedent for developing a five-dimensional theory of psi.

Carroll B. Nash makes use of the four-dimensional space of Hermann Minkowski and Einstein in yet another way. When a particle is represented as a point in three dimensions it prescribes a 'world-line' in the four-dimensional space-time continuum, a line that stretches from past to future. Nash has given Minkowski's world-line a physical

reality which it does not have within ordinary relativity theory. In physics, the world-line has no more physical presence than a dotted line representing the parabolic trajectory of a thrown ball on a student's homework paper. But according to Nash, these world-lines act connections between our brains and remote events in time and space. The world-lines themselves react with our brains within the limits of the uncertainty principle. This interaction gives rise to ESP, precognition and PK. (Roll, 1966, p.39) While science recognizes the concept of world-lines in Minkowskian space-time diagrams, they are not physically real strands which stretch through space and time. Nash's ideas may be mentally appealing, but too much is left to the imagination for his theory to hold any merit. At the very least, a more precise mechanism is needed to explain how his version of the world-lines can interact with the human brain, if not a better explanation of how these world-lines can have a real physical existence..

Still other multi-dimensional theories of psi have been proposed. In 1965 H.N. Hart postulated a theory similar to Nash's. In his theory, our material universe is only a four-dimensional cross section of a five-dimensional manifold. (Hart, pp.16-22) Events take place by moving along a four-dimensional time-line with each observer "reading his past, but sometimes looking ahead non-inferentially into the future." (Chari, 1977, p.815) Precognition thus becomes a valid consequence of the space-time geometry. In 1967, J.R. Smythies' thoughts ranged toward a three-dimensional physical space and a three-n-dimensional psychic space in which ESP and PK are exchanges between the two spaces. His theory was based upon the concept of a non-Cartesian dualism. In other words "Non-Cartesian dualism suggests that the world consists of the physical universe extended in physical space and a number of substantive minds extended each in a space of its own." (Smythies, p.6)

In the case of Smythies theory, there is a constant flow of information between the individual's mind in its own space and the individual's brain in physical space. This interaction can be envisioned if "the total human organism is extended in an n -dimensional space." (Smythies, p.7) This model allows the mind-brain interaction to be treated as a part of normal science and offers "possibilities for deductive development by topologists, geometers and physicists." (Smythies, p.9) Some unspecified type of signal coming from another individual's mind-space can interrupt the normal connection between one individual's mind and brain. This interruption explains ESP. Since the signal is outside of the normal physical space-time continuum of the brain, the normal laws of physics, such as the attenuation of waves with distance, do not apply.

The consciousness of an individual is located in the individual's private mind-space. The consciousness is combined of the individual's ego and a sense-field. The consciousness is projected onto the brain to yield conscious thought. This projection may include a 'penumbra,' or shadow extending beyond the spatial limits of the brain, allowing an individual to be influenced indirectly by a pack of Zener cards, explaining clairvoyance. The 'penumbra' of the mind's focus on the brain could also extend beyond the brain in the temporal direction of physical space-time and thus precognition could be explained. Smythies also claims that his theory is simple, extensible and testable, in that deductions from the theory could lead to experimental verification. This flexibility of his

theory would go some distance to allay the criticisms against all such theories, but the theory still has a serious drawback. There is no explanation of signal that can pass between two or more individual's mind-spaces and that signal or transmission would be the part of the theory that would be of interest to physicists. Physicists have not taken Smythies theory, like all of these other theories, seriously.

The non-Euclidean geometries upon which all of these theories are ultimately based were first developed in the 1820s. But the most damaging refutation to Euclidean (three-dimensional) physical space came as a result of Bernhard Riemann's geometry of a generalized n -dimensional manifold in the 1850s. After he developed his general theory of relativity, Einstein credited Riemann's original mathematical concept of non-Euclidean geometry as a precursor to his own work. But Einstein did not refer to the research of other scientists and mathematicians regarding their own prior use of non-Euclidean geometries and hyperspaces in physics. There was no need for Einstein to cite previous physical theories of hyperspace since the mathematics used by Einstein had evolved along a different path than the form of non-Euclidean geometry used by Zoellner and the English mathematicians.

In the 1860s, Hermann Helmholtz independently developed a more generalized hyperspatial geometry similar to Riemann's, but founded upon the concepts of congruence and invariance upon motion to another location in the physical space represented by the geometry. After Helmholtz learned of Riemann's previous geometrical theory of space, his ideas were grafted to Riemann's geometry to further its applicability. In 1882, E.B. Christoffel gave the algebraic forms of these invariants and thus developed the concept of curvature tensors while Tulio Levi-Civita and G. Ricci developed a full tensor calculus upon this basis in 1901. Einstein used this tensor calculus in his analysis of space curvature in the general theory of relativity. On the other hand, Zoellner and the other nineteenth century scientists and scholars who tried to apply non-Euclidean geometries and hyperspaces to physical space used a topological variety of the Riemannian geometries. This analytical model of space curvature had not yet been developed when Zoellner and others first applied a four-dimensional space to psychic and spiritual phenomena.

Helmholtz had been a contemporary as well as a critic of Zoellner's work while Zoellner was well aware of Helmholtz' work on non-Euclidean geometries. But Zoellner never applied Helmholtz' concepts to his theoretical work. Fifty years later, Einstein must have had some idea of the controversy regarding the use of hyperspaces to explain spiritualistic and other phenomena since he had read Mach's *Science of Mechanics* early in his career and often referred to Mach. But this knowledge would not have affected Einstein's development of relativity. The other ideas and concepts expressed in Mach's book were a primary inspiration for Einstein's own theoretical research, not Mach's comments on non-Euclidean geometries.

So both modern field theories and hyper-dimensional theories of psi have been dissociated from Zoellner's and similar concepts in their past by Einstein's omission. We could say that the scientific revolution wiped the slate clean and left the field unbiased

toward non-Euclidean applications in physics. Although Einstein used Riemannian geometry to explain gravitation, it has never been decided whether a fifth dimension was needed to explain gravitational forces. In mathematical language, general relativity utilizes 'intrinsic' space-time curvature so a higher dimensional embedding space is not necessary. The use of the analytical methods of Riemannian geometry render this intrinsic model plausible without the need to embed the four-dimensional space-time continuum in a fifth dimension. On the other hand, 'extrinsic' geometry whereby a fifth dimension is needed for curvature has never been ruled out. This fact allowed Kaluza to develop his five-dimensional unification of gravity and electromagnetism.

In applications to psi, any theory of hyperspace would assume the higher dimensions to be real. This idea makes any theory of psi based on hyperspaces untenable with normal perception, a fact that also forms the main argument against unified field theories based on a five-dimensional hypothesis. Before Einstein's development of relativity theory, mathematicians and scholars discussed the possibility of four-dimensional physical spaces with a separate time, but after Einstein these concepts evolved into a four-dimensional space-time continuum embedded or curved in an external fifth dimension. After development of special relativity in 1905, the background for nature became a four-dimensional space-time continuum and the previous work on four-dimensional spaces was either forgotten or purged from science.

In 1922, Robert Browne published the book *The Mystery of Space*. The book is relatively unknown, but still expresses the sentiments regarding higher-dimensioned space-times that are evident in the hyperspatial theories of psi. Browne considered mathematics to be a true "biometer of intellectual evolution." He contended that human awareness of a higher dimension is a further step in mental evolution and this view might someday prove true. There is some evidence that psychics actually perceive the other dimensions of a hyperspace. For example, the mathematician H.S.M. Coxeter "has documented several cases of persons possessing the ability to express lucidly and mathematically the experience of hyperspace. Fuller appears to operate quite freely quite freely in this domain." (O'Regan, p.463) The mathematician Musès also hints at a possible structure for a consciousness-matter continuum.

These experiences would tend to support the field concepts of psi rather than a quantum mechanical approach. However, even if they eventually shed some light on the question of the reality of hyperspaces, they do not prove the reality of a fifth dimension. The existence of a fifth or higher dimensions must be proven through physics if the concept is to have any scientific validity. Despite Browne's attempt to define dimension in a way different from length, width, and height, the term dimension still remains an unsophisticated concept when spoken of in terms of mathematics and physics as opposed to psi. There is also a possibility that "unorthodox exchanges in multidimensional space may well disrupt the physical continuity of ordinary space, and they may even prevent the extinction of an ordinary candle in our familiar three-space. No cogent definition of causality in the many-space universe has been offered." (Chari, 1977, p.816)

The hyperspatial theories of psi suffer from many problems, the least of which is the inability to consciously sense the extra dimension or dimensions. Among these problems can be included the concepts of free will and consciousness traveling in other time dimensions. If world-lines and time dimensions are accepted as pre-existent, such that human consciousness travels along a trajectory in the time dimension, then the concept of free will fails. The psychological sense of time would be reduced to the consciousness moving along a pre-existent world-line and the idea that individuals choose their own future from moment to moment would disappear. So the possibility exists that acceptance of a hyperspace theory of psi might result in the abandonment of our present concept of free will. This possibility seems to be the only way that precognition can be explained using an extra dimension of time. However, this problem is a general problem of physics, not just parapsychology. From the first moment that philosophers began discussing the consequences of the physics of a four-dimensional space-time continuum, they have been discussing its affect on the concept of 'free will,' and in most cases this discussion has had nothing to do with ESP, precognition or psi phenomena.

One other theory, which is rather unique as well as complete in its outlay, was outlined by Andrija Puharich in his book *Beyond Telepathy*, published in 1962. He proposed both a biological and a physical connection to the psi plasma that he has postulated. (Only the physical aspects are herein discussed) The main physical property of the psi plasma is that it has form and form "is perhaps the only level at which we have any idea as to the nature of the psi plasma." (Puharich, p.72) In normal physics, plasma is the fourth state of matter. The three normal states of matter are solid, liquid and gas. They are defined by their properties. However, several decades ago superheated gases were found to have specific properties that marked them as different from normal gases. So plasma physics, the study of matter under these special characteristics, was born. Different gases reach their plasma states at different temperatures. By analogy, a psi plasma would be a special state of matter which is characterized by the ability to interact psychically with other bodies of matter.

The psi plasma is characterized by a pilot wave and must therefore always have a velocity greater than that of light. Here, Puharich recognizes the problem of an interaction between things happening on opposite sides of the light barrier. To solve this he postulates four domains: (1) The positive energy state of the material world; (2) The negative energy state according to Dirac's equation; (3) The vortex motion of the plasma state; and, (4) A cosmic fluid or aether that is the plasma. From these four domains there comes a complicated structure of pseudospheres of plasma, with parallel pseudospheres spinning in opposite directions. As these pseudospheres spin in vortical motion they will draw the other pseudospheres into them, creating spherical bubbles, which will spin at right angles to the axis of the pseudospheres.

The four upper spheres are the electron, proton, neutron and neutrino. Opposite spheres spin in opposite directions, thus giving rise to positive and negative electrical charges. There are also four spheres on the underside of the rim of the pseudosphere. These are the positron, anti-proton, anti-neutron and anti-neutrino. The upper four

spheres or particles represent the first domain or positive energy and the lower ones represent the negative energy of the second domain. The pseudosphere itself is made up of the psi-plasma, the fourth domain. From the interactions within this structure which depend on spin energy being given up or absorbed as quanta by the various particles, Puharich shows that "all exchanges of energy in the physical world are governed by the psi plasma properties ... and ... the psi-plasma records and in a sense remembers every such transaction." (Puharich, p.179) He also derives other physical effects (i.e. gamma radiation) and further theorizes that both the psi-plasma and physical fields are coupled by a gravitational force.

The task then remains to relate this structure to ESP. Any event, physical or mental, causes a perturbation in the psi-plasma field due to changes of state in the particles involved. This perturbation travels as a pilot wave, at a velocity greater than light, to the observers brain where a similar particle is set in motion by the wave. Thus a standing wave is set up which can act as a channel for ESP while the observer's brain is stimulated and the ESP message is cognized.

In order to present this theory, Puharich has not only had to introduce a new entity, the psi-plasma, as other psi theorists have had to do, but he has also introduced a very complicated structure of space and matter which may be quite untenable with modern physics. He also leaves too many questions unanswered. For example, is this structure universal such that even the region of empty space between galaxies also consists of the same structure? A theory such as the one Puharich puts forward seems to call for a complete new worldview on almost no evidence. Perhaps that is why there seems to be no mention of his theory in any works rather than his own. Such a re-ordering of the universe cannot be made and accepted without reason and either observational or experimental evidence. The scope of Puharich's theory just goes too far beyond that of explaining psi. It would be too far-fetched to think that all of physics should be rewritten to accommodate a theory of psi. However, the opposite is highly possible. If physicists were to develop new physical theories, in essence rewrite physics, to incorporate new advances in science, then it might be possible to incorporate psi into the overall structure of nature.

One other mode of presenting an acceptable theory of psi is through biophysical speculation. Newton once suggested that one form of the all-pervading 'aether,' of the same form as involved in gravitation, "also pervades 'animal juices' and controls the movement and even procreation of living things." (Roll, 1966, p.37) Such speculation as this has led to other theories concerning biogravitation, bioplasmas, various other biophysical fields and entities. Mead made early attempts with 'animal gravitation' and Mesmer with 'animal magnetism.' Biological organisms do, of course, exhibit electrical and magnetic properties, and this has led field theories into the realm of biology. This movement has been enhanced when the patterns that guide biological functions such as organization, growth and development were not found to be part of any single part of an organism.

In 1935, Burt and Northrop proposed that bioelectric fields could influence the pattern and development of organisms, however no proof has come forward to substantiate such claims despite the known presence of electrical fields within organisms. W. Elsasser has postulated 'biotonic laws' inherent in living beings "and drawing upon accumulated quantum-mechanical and information-theoretic uncertainties." (Chari, 1972, p.203) As recently as 1968, Inyushin and his colleagues have worked with a 'bioplasmic interaction' to explain psi. They consider the 'bioplasm' to be a 'fourth state of matter' and claim it to be the phenomena responsible for Kirlian photography. Their basic claim is that "All living things - plants, animals and human - not only have a physical body made of atoms and molecules, but also a counterpart body of energy." (Schroeder and Ostrander, p.217) Chari criticizes such speculation and states, "A 'bioplasm' or 'psychoplasm' with totally unknown properties cannot claim to be a rightful link between physics and psi phenomena." (Chari, 1977, p.812) Yet the issue of a link between physics, biology and psi is of growing concern and, as many scientists believe, it may be an inevitable outcome of future research.

In contrast, Haakon Forwald has proposed a theory of psi that shares neither of these characteristics with the other theories. Forwald's theory hypothesizes no new structures nor does it tend to be anything but physical. Forwald's theory is derived directly from the experimental results of mental influence on rolling cubes. His experimental findings seem to indicate that the PK results observed are of a gravitational kind resulting from a mental influence on the atomic nuclei of the material making up the cubes. The energy which causes the displacement seems to come from the transformation of some of the cube's mass to energy according to the formula $E=mc^2$. The energy is derived from the nucleus in the form of gravitational potential differences by an as yet unknown process. Assuming that a physical force acts on the cubes, Forwald used instruments to test for all types of forces (electrostatic, magnetic, nuclear, and etc) but could find no forces acting on the rolling cubes. Thus by a process of elimination he arrived at a gravitational theory of PK. He justifies the choice of gravitation in various ways including "what seems a highly dubious argument from his position effect, the parabolic U-curve." (Rush, p.225) The position effect is a graphical representation of the probability and change of position, which assumes a figure that closely approximates a parabola. Taking into account that other psi phenomena also seem to tend to parabolic functions, he compares this to the fact that an object thrown in a gravitational field travels along a parabolic curve. This argument is tenuous at most, the analogy is not completely valid and "correspondence between the position effect in those experiments and the gravitational trajectory of a moving mass seems purely formal." (Rush, p.22)

There are, however, other arguments that could be made to support a gravitational theory. Forwald points out that "it would be more correct to use the expression 'psi is non-energetic' instead of 'psi is non-physical'," (Forwald, p.66) and the psyche also seems to be structural (non-energetic) rather than energetic, giving a correlation between mind and gravity on a formal level. Psi phenomena have been shown to be unshieldable and they seem to present no measurable energy loss (attenuation). Gravity also meets the same requirements whereas other physical forces do not. Gravitational effects are transferred non-energetically and gravity cannot be shielded. Forwald's hypothesis can

also be proven. "The loss in mass is far too small to be measured as the difference in the weight of a cube before and after an experimental series. But it should in principle be possible to determine by mass-spectrometry whether the isotope composition of the cube material changed during the experiment. A possible result in such an investigation might give a direct proof of the existence of psychokinesis." (Forwald, p.6)

As in other attempts to derive a physical theory of psi, Forwald's hypothesis only covers one type of phenomena from among the many different kinds that seem to be exhibited by psi. He does make an attempt, albeit indirectly, to apply his theory to other psi phenomena when he says that "the gravitational field ... should have had a guiding influence on the psyche. This would mean that the field should to a certain extent have limited the freedom of the psyche to act deliberately." (Forwald, p.19) To assert that gravity affects the psyche and 'thinking' is a bold assumption and will be tested when space research reaches a higher level. Of course, if this would be proven true, then it must also have a real affect for all psi processes.

The year of 1969 was propitious for the science of parapsychology. A new air of respectability dawned when the Parapsychological Association joined the American Association for the Advancement of Science, but parapsychology was still a long way from being accepted by a large number of scientists and scholars. The existence of psi was nearly as far from acceptance by the scientific community as a whole as it had been a few decades earlier. The admission of the Parapsychological Association was more a sign of the recognition of the work that researchers had completed over the last four decades than an admission of a belief in psi. If anything, the critics of parapsychology were becoming more vocal and organized. The acceptance of the Parapsychological Association only marked a modicum of completion for the growing community of parapsychologists, but many other historical factors, which would soon affect research on the paranormal, were being played out at the time.

A small cultural revolution, which would indirectly affect the overall perception of society on paranormal phenomena, was taking place in the 1960s. The changes in attitude were the strongest in America, but it was far more wide spread than just this one country. One consequence of this mini-revolution was a greater tolerance toward other cultural ideas as well as a deep-rooted interest in Eastern philosophy, mysticism and religion. This trend manifested itself in everything from an upsurge in Buddhism, to the use of acupuncture and the study of martial arts. Another factor was an increasing awareness that the Soviet Union had long been conducting basic research into the paranormal. This revelation was already beginning to become evident through scientific contacts when the book *Psychic Discoveries Behind the Iron Curtain*, by Sheila Ostrander and Lynn Schroeder, was first published in 1970. It had long been believed that the communist governments of the Soviet Union and the other Eastern Block nations were vehemently against parapsychological research, but the release of this book offered proof that the Soviet government not only supported psychic research but might even be attempting to harness psychic powers for their own use. And finally, many people were beginning to look outward from this tiny planet with a more cosmic attitude, putting astronauts in space and on the moon.

Both the direct and indirect influences of the space program cannot be underestimated. Rosalind Heywood noted their direct affect in an article on the "changing mental climate" toward psi research during the mid 1960s.

In the 1950's then, the situation looked like a stalemate. ESP still could not be harnessed to order, and merely to demonstrate its overwhelming probability did not satisfy critics who hated and subconsciously feared its heretical implications and past association with the supernatural. But now, in the sixties, a softer wind is beginning to blow. One reason for this is practical: the idea that telepathy might be a means of communication in space flight. (Heywood, p.57)

While she directly attributed the space program as an influence on the changes in attitude, the indirect influences could not have been known until after the decade was completed. In her article, Heywood also confirmed the influence of iron curtain scientists on psi research a few years before Ostrander and Schroeder's book was published. From these and other factors a more generally accepted attitude of holism with a more global view emerged. This new attitude was far more tolerant of the view that there was more to life than had been apparent in science at any previous time in history and this translated to an increased interest in the scientific pursuit of psi.

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