TO BE, OR NOT TO BE?
[Continued]

III. Is Psi a Field or Quantum Effect?

Just as fundamental research in modern theoretical physics follows two different paths, as outlined by the quantum and relativity theories, the development of physical theories of psi follow these same lines of thought. Although serious attempts have been made during the past two decades to find a compromise between these two concepts, no single theory that incorporates both has been successful as yet. Quantum mechanics deals primarily with the sub-microscopic world of elementary particles. It is based upon probabilities of events taking place non-deterministically, rather than a deterministically known state that can be calculated using the classical equations of motion. Here we have an infinite number of possible states that can be solutions within certain boundary conditions. The state vector is the collection of all possible pre-collapse states and represents the system in which the event exists in all states simultaneously. Upon measurement, the system 'collapses' the state vector into a single, probabilistically determined state. Until this 'collapse' occurs, the system is specified collectively by the state vector, which has developed in time deterministically. This interpretation of quantum mechanics is known as the Copenhagen Interpretation and is dominant, with minor changes, in the quantum mechanics used today. It is characterized by a direct break with classical causality.

On the other hand, field theory, of which the general theory of relativity is dominant when considering macroscopic physical systems, is the heir apparent to the classical view of causality and determinism. Classical mechanics deals with continuous distributions that can be solved for specific events when boundary conditions are found. In this case, the equations of motion can be solved when positions and velocities at any one time are given (causal view) or when initial and final conditions are given (teleological view). "The field equation, which replaces the equations of motion, must then be solved as a whole, out of time, as it were." (Whiteman, 1977, p.732) The field then represents a deterministic interrelation of mutually interacting forces between different events (i.e. particles) that can be found by substituting values into the field equations. Both the field and quantum theories have special characteristics which are useful in physical theories of psi while each has detrimental points, both of which become evident when they are developed to a much greater extent than has been evident in the past.

There have been efforts to combine quantum theory and field theory in a common logical system of physics. No such system has yet been devised which can account for all

phenomena, yet quantum field theory has been by far the most successful attempt at this endeavor. Following this trend, it seems that most of the speculation on physical theories of psi deal with quantum or quantum field theory, rather than pure field theory. This has led to such statements as Whiteman's: "It seems therefore that any attempt to unite parapsychology and physics should adhere, substantially at least, to the language of quantum field theory, in terms of 'as if' fields at a level of creative potentiality." (Whiteman, 1977, p.741)

According to Chari, quantum mechanics seems to raise three far reaching issues of possible relevance to parapsychology: (a) Consistent with the postulates of quantum mechanics, it seems possible for the constituents of a composite system to be in an indefinite state even when the system exists in a definite state; (b) The behavior of a quantum mechanical system, so long as it is not interacting with an observer, is controlled by Schrödinger's equation. But during measurement by an observer, the system seems to undergo a sudden and non-determinate transition which is not controlled by Schrödinger's equation...; (c) Von Neumann noted that the quantum-mechanical interaction of the observer with the observed greatly complicates the traditional theories of mind- body dualism." (Chari, 1977, p.813) Quantum theory therefore suggests that randomness is basic in nature in a way that leaves the future open to a large number of possible events or branches. In this way 'measurement,' observation or interaction of some kind with other events decides which of the possibilities will come true and which branch of events will be followed. Since humans make the measurements, the factor that the observer and the observed can no longer be separated must be introduced into any physical theory. Thus, science is no longer objective, but must always be subjective, a fact which challenges the old mind-body dualism. This is an important factor for concern in parapsychology, because it introduces human consciousness by way of 'measurement' into quantum theory and thus physics as a whole.

It is necessary to realize that many problems will arise in quantum mechanics if an attempt is made to apply a particular measurement to a system before the interaction takes place. There must be a distinct physical interaction that leads to the measurement being made. Similarly, in parapsychology there must be an interaction between the agent and some unobservable and probabilistic connecting means, or make a measurement. Schmidt, noting that randomness on the microscopic level is spread throughout nature, has devised mechanical random number generators which work on discrete sources of randomness, for convenience, to derive mathematical concepts for telepathy and precognition. (Schmidt, p.303) He uses the same principle as stated above. However, instead of measuring interactions between events and subjects, or agents and recipients, he has substituted his mechanical devices.

Whiteman has stated (Whiteman, 1973, p.347) that an epistemological problem remains in quantum theory, centering on the concept of "reality" and "completeness," and arising from two difficulties. First, we have no way of predicting or knowing where an interaction (i.e. an absorption) will take place and secondly science must deal with the peculiar trait that the wave-function has no specific form while in its infinite possibilities, yet it is posited as a part-cause of the measurement which will later be made. "There is

thus a double hiatus of ignorance or experimental incapacity at the observational level, and, correspondingly, of predicting incapacity at the causal level represented by the formalism." (Whiteman, 1973, pp.347-348) This raises an epistemological parallel between parapsychology and quantum mechanics, both having problems of "reality" and "completeness" at the physical level. There are no lingual concepts to describe that part of quantum mechanics that is beyond normal "reality" just as there is a lack of concepts in common communicating language to describe psi-events.

This brings us to a basic problem in explaining psi which manifests itself in two different ways: (1) We have to find the most fundamental laws which underlie, perhaps at the microscopic level, all psi phenomena, and (2) we have to understand how these laws, which must contain some non-causal principle, can lead globally to a logically consistent world. (Schmidt, p.302) These laws will be of no consequence or use if they cannot be included in the same over-all worldview as other sciences in a complete view of nature. "There is an intimate epistemological relevance of quantum theory, rightly understood, the problem of providing a scientifically acceptable conceptual framework within which parapsychological phenomena makes sense as part of nature and human life in their entirety." (Whiteman, 1973, p.357)

When a 'measurement' is made in a quantum mechanical system, it can be said that the entering of the impression into our consciousness alters or 'collapses' the wave function because it changes our ideas of the probabilities of the future of the event, or rather our consciousness makes a 'choice' of the future event from among an infinite number of possible futures. This point, where consciousness unalterably enters quantum mechanics, has not escaped the notice of those scientists who are trying to derive a physical theory of psi. E.H. Walker's introduction of David Bohm's 'hidden variables' as a quantum mechanical explanation of consciousness and thus of psi is a prime example of a quantum mechanical approach to the convergence of psi and microphysics in order to make the paradoxical transition in measurement by an observer, the notorious 'collapse' of the wave packet,' consciously deterministic. However, the existence of 'hidden variables' still remains speculative at best while the 'hidden variable' theories have never enjoyed a dominant position in the mainstream of quantum physics.

Walker believes that there is no evidence to support the action of a field effect during the course of psi phenomena. (Walker, p.2, 3) He further views 'hidden variables' as an extension of the Copenhagen interpretation of quantum theory, thus seeing his own work as an extension of the purely physical quantum theory as well as a theory of psi. (Walker, p.34) However, his theory has not been presented without criticism. Chari claims that Walker's theory suffers from "logical inadequacy" and fails to meet the paradox of "Wigner's friend." (Chari, pp.258-259) Whiteman is also critical of Walker's theory since the mind seems to be localized in the brain in Walker's model, a fact which Whiteman finds inadequate given "certain experimental work in psychology and physiology." (Oteri, p.46)

On the other hand, Ninian Marshall has proposed a different theory that is somewhat quantum mechanical in nature. He believes that some of the indeterminacies in

quantum physics are resolved by 'resonance' in a completely holistic manner. In this way he also puts consciousness in a position to 'determine' some effects of quantum mechanics, just as Walker did with the 'hidden variables.' Marshall postulates that 'resonances' occur as "action-at-a-distance" in space and time and coordinated action at many points in a structure, depending on the structural complexity of a particular system. Since the human brain is the most complex of systems, the resonances occur more frequently in the human brain, and thus psi and memory are both functions of and occur in accordance with the human brain. This theory "is no more and no less mechanistic than quantum physics." (Marshall, p.269)

Although more recent theories of psi tend away from introducing forces and energies, the older theories of psi sought to postulate transfers of energy in several different manners. One argument against the idea of psi and a physical theory of psi based on energy (or particle) transmission has been that the energies would be far too subtle to be received by the brain. John Eccles has shown that the cerebral cortex acts as a sensitive detector of 'small influences.' (Dobbs, pp.242-244) Using a probabilistic quantum mechanical argument it is possible for the neurons to be fired by these 'subtle influences' within the limits of the Heisenberg uncertainty principle, thus exciting the brain in a normal cascading effect of neurons not unlike the tunneling effect in quantum theory where a particle without sufficient energy can escape a potential well. In this way, the brain may still act as a receptor of 'small influences,' such as might be exhibited by carriers of psi. Among other attempts to unite biological functions with quantum theory, "W. Elsasser has speculated on certain 'biotonic laws' operating exclusively in living beings and drawing upon accumulated quantum-mechanical and information theoretic uncertainties." (Chari, 1972, p.202) These attempts represent a convergence of quantum theory, biology and paraphysics to explain the relations of psi and consciousness.

There are still many other interpretations of quantum theory that may be relevant to psi and parapsychology. Hugh Everett completely eliminated the problem of 'collapse' of the wave function during measurement by proposing that there is no reduction at any stage of the measurement, meaning that all possibilities are real, it being unnecessary to destroy all of the infinite possibilities by measurement or choosing one as opposed to the rest. I.J. Good expanded this idea and proposed, "the universe 'branches' out into myriads of distinct universes in each infinitesimal fraction of a second. After branching, the different universes are not in communication, at any rate not by normal means. To make an ordinary observation is to cut down the possible universes to the one which we personally belong from that instant." (Chari, 1972, p.200) It is then conceivable that by supernormal means some individuals can gain knowledge from these other branches of the universe thus explaining psi. This attempt of hypothesizing may, as Chari puts it, (Chari, 1972, p.201) be more "extravagant than enlightening" in explaining psi. The attempts to relate physics and parapsychology within the framework of quantum theory are not herein exhausted. These attempts, whether proven valid or not in the long run, may still provide important experimental results and clues to further theoretical work.

More recent theories utilize a parallel between the mind-matter dichotomy and the world of the quantum. In particular, the mind-matter question has been reduced to the

interaction of consciousness and physical reality within the auspices of quantum wave mechanics. Walter Von Lucadou and K. Kornwachs have proposed that the Schrödinger wave function representing matter (the state vector) be accompanied by a new wave function representing consciousness. This new wave function actually represents the complexity of the system involved, such as the complexity of the human brain. The complexity of the human brain was also an issue in Marshall's earlier theory. The two functions that Lucadou and Kornwachs describe are mutually dependent, so deriving the proper formulation for the new function will be quite difficult. Meanwhile, Jack Sarfatti pictures this duality in another way. It acts as the "quantum back action" of the collapsed material wave communicating with the observer just as the observer communicated with the wave to cause it to collapse. Sarfatti's psi mechanism is associated with deBroglie's concept of a pilot or guide wave and emphasizes a mutual dependence of action and 'back action' in much the same way as the other theoretical quantities.

On the other hand, Robert Jahn and Brenda Dunne have presented a quantum mechanical model that posits consciousness itself as a wave that resonates with the Schrödinger wave according to the model of reality presented by wave mechanics. Their 'consciousness wave' represents a 'probability of experience' as opposed to the probabilistic interpretation of the Schrödinger wave function. All of these theories are based upon the introduction of a new level of duality in nature in that consciousness has a separate and distinct wave function from that of the normal wave function representing matter and physical reality in quantum theory.

In spite of this theoretical work, not all attempts at developing a physical theory of psi deal with quantum theory and not all scientists feel that quantum theory can completely account for psi. Chari reflects "all attempts to crack the riddles of psychical research by relying on quantum mechanics are, for the present, premature and hazardous." (Chari, 1972, p.203) Whiteman would not agree with this view. Instead, he believes "that there is an intimate epistemological relevance of quantum theory, rightly understood, to the problem of providing a scientifically acceptable conceptual framework within which parapsychological phenomena make sense as part of nature and human life in their entirety. (Whiteman, 1973, p.357) Perhaps further advances in quantum theory may solve this dilemma and provide the final physical theory of psi, but it should not be taken for granted that quantum theory will automatically offer the final solution.

The other area of physics, which indicates relevance with respect to psi, is field theory as presently represented in its most complete form in the general theory of relativity. As it now stands, field theory is the heir apparent to the deterministic, causal view of nature, but there is sufficient reason to believe that causality also fails in field theory, which may prove significant for psi. In considering the general theory of relativity science usually utilizes a four-dimensional space-time continuum. In classical general relativity, the metrical properties of the continuum are intrinsic to the continuum, but a fifth dimension in which our normally sensed space-time is embedded can also be used to account for the curvature and properties of physical space. In either case, time has a component the same as the spatial directions (by a constant factor), which may result in a paradox concerning causality. Causality reflects a sequence of events one after the other,

but in the space-time continuum one can say that all parts of the four-dimensional world exist simultaneously, in the sense of a mathematical formalism leading to a possible philosophical collapse of causality. This continuum is not claimed to be 'real' in a physical sense, such that physical entities could move back and forth at will in and out of time as easily as changing direction in three-dimensional space. But it does not specifically deny that it is completely impossible for any movement to take place in time. This leaves at least a possibility of explanation for the action of psi as evident in precognition under circumstances yet to be defined.

In relativity theory, time intervals between events are not completely fixed relative to moving systems or frames of reference. This has led to some speculation that there may also be analogies between precognition and anomalies such as the 'twin paradox,' but time dilation, the contraction of time intervals between moving reference frames, is too small to account for precognition and would still require any information transfer to travel at a velocity greater than light. The special theory of relativity does not allow for physical travel backwards in time but relegates this concept to an imaginary mathematical formalism.

When speaking of field theory, it is necessary to differentiate between pure field theory such as gravitation, electrical and magnetic fields, and quantum field theory. G.D. Wasserman has put forward a field theory of psi in which he postulates three types of fields to account for various phenomena in biology, psychology and parapsychology. These are quantum fields and have little in common with electromagnetic fields. (Rao, p.145) The difference is that fields such as electromagnetic fields and gravitational fields are continuous and spatial while quantum fields are quantized, broken into discrete sections of particulate substance.

Both William Roll and Haakon Forwald have proposed field theories to explain psi. Roll's 'psi-field' is analogous to electromagnetic or gravitational fields, and interacts with physical fields as well as with itself. "Roll realizes that a field theory will help to explain psi phenomena only if these in fact obey external objective conditions ... and suggests that the connecting medium is subject to spatio-temporal variables" (Rao, p.145) in the same manner as other physical fields. Forwald bases his theory on a gravitational field. One important factor that lends credence to the use of a gravitational field is the fact that a gravitational field cannot be shielded as can an electromagnetic field. This property of the field corresponds to present evidence regarding psi functioning. Forwald also "suggests that the mind is a non-energetical quality, but it can interact with matter and energy on the microphysical (non-structural) level. ... If gravitation is structural (non-energetic) it might provide the basic element of transition to be considered in connection with psi phenomena." (Forwald, p.1)

The basing of a theory of psi on a gravitational field rests partly on the fact that a distant-force effect such as gravitation is not subject to the maximum velocity of light because it doesn't travel, but is structural. Evidence from Vasiliev and others suggests that psi is also independent of the velocity of light. General relativity has caused the "distance force" to be abandoned placing gravity subject to a maximum velocity, but

Margenau has suggested that general relativity be regarded as a 'formal' principle such as the Pauli Exclusion Principle. Therefore gravitation would be non-energetic and subject to no maximum velocity (Forwald, pp.202-203) and would act as a guiding way to physical phenomena.

Other experimental evidence also suggests a field theory for psi. "If one reviews Croiset's precognition chair tests, it is apparent that, although some of his impressions did not apply to the target person, they did directly concern persons in close physical proximity to that person." (Rogo, p.288) This suggests a spatial dependence similar to that of fields. Still other experiments confirm that mass ESP may be spatially dependent and in the case of poltergeist activity, there seems to be a vortex shaped spatial field of activity around the subject of the poltergeist activity. Perhaps the most startling evidence is Watkins' experiments with a compass needle. A psychic was able, under Watkins supervision, to deflect a compass needle using PK, but when the compass was moved to a different part of the room the needle returned to normal suggesting a field effect centered at the original position of the compass. (Rogo, p.223)

One common form of field theories relies upon an extra dimension that is added to the normal four dimensions of the space-time continuum. This fifth dimension, in which the four-dimensional space-time continuum is embedded, is fully compatible with special and general relativity and was suggested in the form of a combined electromagnetic and gravitational field by Theodor Kaluza. The same duality of mutual dependence, as in the case of the quantum theories, is also evident in the hyperspatial theories. The mutual dependence itself is a very common feature of all field theories. For instance, Elizabeth Rauscher proposed an eight-dimensional theory in which each of the normal four dimensions of space-time had a separate imaginary component. A similar theory was later proposed by Puthoff, Targ and May in consultation with Rauscher. Within these new dimensions, as represented by a complex number system, psi functioning could take place as the exchange of information without being hampered by the physical limits of our normal space-time continuum. Although they pictured this new realm as an eight-dimensional continuum, with four new imaginary components, only a single imaginary component is necessary to complete their model, rendering space-time five-dimensional.

Saul Paul Sirag has developed his own unique hyperspatial model of consciousness. In his model, two separate mathematical methods, Mackay groups and Lie groups can analyze a complex space-time of higher dimensions. These separate analyses underlie the basic duality of the mind-matter paradox with the intersection of the two representing a 'universal consciousness' in which psi can function. Each of these hyperspatial models evokes its own answer to the inherent duality of mind and matter, and in this regard they are similar to each other as well as to the quantum theories. Each of these hyperspatial theories also stresses the important relationship between modern physics and consciousness on the one hand, and consciousness and psi on the other hand.

These theories are only representative of the various hyperspatial field theories that have been used to explain psi. Such theories, in general, are not as popular or well

regarded as their quantum theoretical counterparts, but their popularity among physicists has been growing. While speaking of the "compatibility of physics and parapsychology," Carl Becker has used such 'hyperspace' theories to illustrate his own point of view.

> **Such phenomena have led some physicists to suggest that there exists a 'hyperspace," which has explanatory value in both physics and parapsychology. Parapsychologists also have taken up the suggestion; either as a literal or allegorical construct, to further demonstrate their compatibility with the worldviews of leading physicists. The appropriateness of such explanatory models is debatable, but this is ultimately a question for resolution by further empirical experimentation rather than by philosophical debate.**
>
> **The important point here is that physical scientists of the highest caliber are open to the possibility of other forms of matter and other dimensions. They believe that such hypotheses would have explanatory value in their own fields as well as in parapsychology. While the subject matter of parapsychology and physics is significantly different, their fundamental insights curiously coincide.**

Becker makes the specific point that scientists are now open to suggestions that there are other forms of matter and other dimensions rather than those with which they have traditionally studied in physics. The opening of science to such radical ideas, especially in pure physics, bears directly on the scientific questions raised by the possibility of the existence of psi. Becker's own parapsychological studies are in the area of survival of death, not in the area of physical theories of psi, yet he must have detected some correspondences between "NDEs," "OBEs" and other related parapsychological phenomena on the one hand and hyperspatial theories in physics on the other, or he would not have exemplified the extra-dimensional theories in his brief discussion of the compatibility between the two sciences. Since he is not especially interested in physical theories, he has not developed his own theory along these lines. While the hyperspatial or hyperdimensional theories mentioned above are purely field theories of psi or consciousness, they do not exhaust the possibilities for these types of theories. At least one combined quantum mechanical-field model of physics already exists and is extensible enough that it can be applied as a physical theory of psi.

It was David Bohm's goal to unify quantum and field within a single physical model of nature and toward this end he developed what is basically a field theory that underlies the quantum. The application of Bohm's theory of the 'implicate order' to the question of psi has gained a small following in the scientific community. Bohm argued that the inherent dualities of quantum physics would disappear and a 'complete' description of reality could be accomplished if a 'potential field' was assumed as the underlying reality to the limits set by the Heisenberg uncertainty principle. Within this 'potential field,' all of true reality as well as all of space and time remains in an enfolded and thus implicate order or state. At the implicate level, both consciousness and implicate matter coexist. The moment of that perceived reality, the instant that is our present time or the explicate order, is the moment that the implicate becomes materially real as represented by the quantum collapse of the state vector, or an unfolding of the implicate. In the implicate order, where consciousness and implicate matter coexist, the exchange of information that we know as psi functioning could easily occur. This model bears a

strong resemblance to the various hyperspatial models as well as a direct relationship to the various quantum models of psi discussed above. But Bohm's theory is a theory of physics, not a theory of psi.

The fact that Bohm's theory is so easily adaptable to psi is only incidental. Or perhaps this fact is an indication that psi is either a fundamental concept in its own right laying at the most basic levels of physical reality or it is dependent upon consciousness at the most basic levels of physical reality. Karl Pribram has developed a 'holographic' theory of memory which corresponds to Bohm's physical theory of the implicate order and thus we have the 'holographic universe.' Yet this combined theory is not without its own problems. Becker has criticized this "holographic reality" and claimed that Pribram has not shown "in what sense the brain could resemble a hologram" and "it is unclear how the brain relates to this reality." (Becker, p.172) He further feels that if the 'holographic' model could be made workable, it would more closely resemble a field theory than a quantum theory. It is clear that Becker prefers the hyperspatial theories (Becker p.174) to the quantum theories of psi, and he may well be correct in pointing out that the physical model presented by Bohm is more field than quantum.

It would seem from these various physical theories or models of psi that the quantum and field theories are slowly merging into a single theory of physics. Bohm's theory is a result of this trend in science, but it is not the only modern theory that attempts to unify physics. The present trend in physics is toward such a unification whether that unification includes psi and the paranormal or not. However, it is well understood in the scientific community that any new advance in fundamental physics must necessarily account for the role of consciousness in physics and whenever consciousness acts 'non-locally,' the existence of psi is implied. When consciousness acts locally the normal rules of quantum mechanics describe reality, but the non-local action of consciousness, which seems to already have been verified experimentally, demonstrates that normal model of quantum mechanics and physics in general is incomplete. So physics is already heading toward a new paradigm independent of the theoretical work in psi.

Like quantum theory, field theory can be used to explain some of the characteristics of psi, but has not yet been used to successfully explain all of the observed psi phenomena. Rao believes that "the field theories, as they are developed in parapsychology, seem to indicate a greater possibility for reducing empirically verifiable consequences than others," (Rao, p.170) but it is not immediately evident whether he is speaking of quantum fields or pure fields (electromagnetic, gravitational, etc.). Rao's comments were made more than two decades ago and physics theories as well as the general attitude of the scientific community has changed during that interval of time. No matter which area of physics finally explains psi, if indeed any ever do, it must be noted that the theories of physics, no matter what they are, are not 'reality' itself, but are only ways of perceiving and categorizing 'reality.' They may come so close to describing reality that it may be hard to distinguish between reality and our theoretical model of reality, but still the model and the reality must remain separate no matter how accurate the model. However, we may take it as a matter of faith that science progresses and thus comes closer to reality with its theories.

Perhaps psi lays on a level of reality that is far subtler than either our present conceptions of quantum theory or field theory can accommodate. It is certainly beginning to seem that this is the case. If this is the case, the present theories of physics can only offer approximations of a 'psi-reality.' As long as physics is itself divided by two different fundamental concepts, it cannot be expected to supply a complete theory of psi. How can any discipline offer a complete picture of what is partially known (such as psi) when it cannot offer a complete picture of what is already known (such as our physical world)? But the theoretical models that we know as field theory and quantum theory have definitely displayed a common dynamism within the last several decades that is bringing them closer to a point of merging while the emerging synthesis of the two seems to hold hope for the evolution of a physical theory of psi as a consequence of physics, rather than as an extra add-on feature to theories of physics that already exist independent of the concept.

Return to PART II
Go to the BIBLIOGRAPHY

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Top of Page
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