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IMPLICATIONS OF META-PHYSICS FOR PSYCHOENERGETIC SYSTEMS

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The laws of physics, as we know them, are all formulated in terms of the concept of space-time. However, space-time is a concept of limited validity. The general theory of relativity predicts the gravitational collapse of space-time to a "singularity." That is, the concept of space-time as a collection of localized point-like events self-destructs or spontaneously breaks down. The conventional laws of physics are transcended. Professor John A. Wheeler (1974) has called this the "mutability principle." In particular, concepts of energy, momentum and angular momentum are not even definable in a spatially closed universe nor are they even generally conserved in the presence of curvature. Conservation laws are the result of symmetry properties of space-time and curvature generally destroys these symmetries. The conservation of energy is not an ultimate immutable truth of modern theoretical physics.

If space-time is not fundamental but is a derived order from something more fundamental, then what is the primordial "pregeometry" from which space-time is created? It is the *Quantum Principle*. The full meaning of quantum theory is still in the stage of being born. In my opinion, the quantum principle involves *mind* in an essential way along the lines suggested by Parmenedes and Bishop Berkeley, and others. Professor Eugene Wigner (1972) has said that the next revolution in theoretical physics will occur when the properties of mind are explicitly included in the equations of quantum theory. Psycho-energetics will not be properly formulated until the deeper meanings of the quantum principle are further clarified. Wheeler has suggested that the quantum principle can be formulated as a logical calculus of two-valued "yes-no" propositions. Professor Roger Penrose (1969) has made some progress on how the combinatorics of yes-no propositions implies three-dimensional structure of space. A more basic question is who or what is the "participator" formulating the proposition from which matter existing in space-time is derived. Mind appears to be the function of low-entropy, highly organised dissipative structures of matter in space-time that are held far from thermodynamic equilibrium by the negative entropy flow of matter and energy (I. Prigogine, 1972). Mind creates matter and is also a function of matter. This is a self-consistent process or "bootstrap" characteristic of non-linear processes.

The quantum principle transcends local conceptions of space-time and is intrinsically nonlocal in character. Professor David Bohm (1974) has said that *conventional* formulations of quantum mechanics imply that individual quantum particles cannot generally be isolated from the unbroken wholeness of the entire universe. A quantum potential provides a ubiquitous and universal interconnectedness among all parts of the whole:

> Even when the classical potential vanishes (so that in the usual interpretation of the theory it is said that the two particles do not interact) there is still a "quantum interaction" between them which does not approach zero as $(X_1 - X_2)$—the separation between the two particles—approaches macroscopic dimensions and which depends on the quantum state of the whole system (Bohm and Hiley, 1974).

In my view, the Bohm–Hiley (1974) quantum potential proceeds from a self-organising principle which *creates* space-time and is also, at least in part, manifested as a functional order connected with non-equilbrium disspative structures. It is not clear whether this correlation is fundamental or fortuitious. That it is the former is a basic prejudgement of the reductionist metaphysics dominating the mainstream of modern science.

An idea of the utmost significance for the development of psycho-energetic systems that is implicit in the above considerations is that *the structure of matter may not be* [redacted]. The first hint of this is dimly seen in the "Copenhagen interpretation" of quantum measurement as "reduction of the wavepacket." The idea becomes more explicit in the Einstein–Rosen–Podolsky "Paradox" in which two

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widely separated noninteracting particles are correlated by the nonlocal quantum potential.

> It would follow that somehow the measurement of the momentum of the first particle actually "put" this particle into a definite state of momentum p_1 while it "put" the second particle into a correspondingly definite correlated state of momentum $p - p_1$. The paradoxical feature of this experiment is that particle 2 somehow seems to "know" into which state it should go, *without any interaction that could transmit information* (Bohm and Hiley, 1974).

The paradox is explained by the effective long-range instantaneous interaction between the two particles brought about by the quantum potential. However this requires us to ask: can the quantum potential carry a signal?

> The mere fact of interaction does not necessarily give rise to the possibility of carrying a signal. Indeed, a signal has, in general, to be a complex structure, consisting of many events, that are ordered in definite ways (Bohm and Hiley, 1974).

Bohm and Hiley leave the question unanswered. I suggest the *meta*-physical hypothesis that the quantum mechanical wave function is a property of the self-organising principle which creates space-time. The prefix *meta* here refers to Gödel's ideal reference for the need for reference outside the closed system of physical theory for the existence of proof of propositions in a verifiable way. This leads to new predictions of a psychoenergetic nature that can be tested in the laboratory.

According to conventional interpretations of the quantum principle, if we shoot an electron or photon beam through a double slit and allow the scattered beam to fall on a detecting screen, then the exact place of impact of an individual photon or electron cannot be predicted. Only the probability of a particular place of impact can be predicted. To test this particular prediction requires the use of a good statistical sample involving a large number of photons or electrons. However, according to Dirac, the probability aspect of the quantum principle is not a collective property of the interactions between the several electrons or protons i.e. each photon (electron) "interferes with itself." This is "proved" by observation of double-slit interference patterns even when the incident flux of photons or electrons is so low that on the average only one photon or electron is present in the experimental apparatus at any one time. The existence of Bohm's quantum potential may imply that Dirac's interpretation is not quite correct though it points to a profound truth.

The *explanation* of the quantum phenomenon is outside the scope of the conventional understanding of the quantum principle. That is, the quantum principle as usually interpreted is a *description* of how the world works rather than an *explanation* of *why* it works the way it does. Einstein always maintained that quantum theory was incomplete and that God did not play dice with the universe. Wheeler (1974), in a philosophical application of Gödel's theorem on the decidability of mathematical propositions has said:

> No theory of physics that deals only with physics will ever explain physics.

Therefore, *meta*-physical statements are absolutely vital for the evolution of physics (which like all evolution proceeds as a sequence of instabilities of almost stationary states of dissipative structures that amplify small fluctuations) or indeed of any system of ideas that is still "alive." Einstein also thought it proper to inquire into the space-time "identity" of an individual electron in a discontinuous quantum jump. In Bohr's interpretation of the quantum principle such a question was not meaningful and the quantum jump occurred "out of time." Both men were possibly correct. In a new interpretation of the quantum principle created by Wolf and the author (1974), the distinction between the relativistically invariant proper time and coordinate time is made explicit. Feynman showed how to combine the continuous space-time world-line with the quantum principle. Each continuous world-line or space-time history is assigned a complex probability amplitude. All possible histories of the universe occur and interfere with each other. The regions of constructive interference of the many interpenetrating universes gives the most probable "classical" history of the "universe" as we know it in usual states of consciousness. This is referred to as the Feynman–Dirac Action Principle which is perhaps the most aesthetically satisfying conventional formulation of the quantum principle on the descriptive level. Feynman's space-time path interpretation of the quantum principle shows that an electron can be scattered *backwards* in time by an electromagnetic vacuum fluctuation (Figure 1a).

The electron moving backwards in time is detected as a positron of opposite charge but same mass moving forwards in time. The scattering event is detected as the annihilation of an electron-positron pair. Wolf and the author have added a new process in which the electron is scattered "outside of its light cone" into a tachyonic world

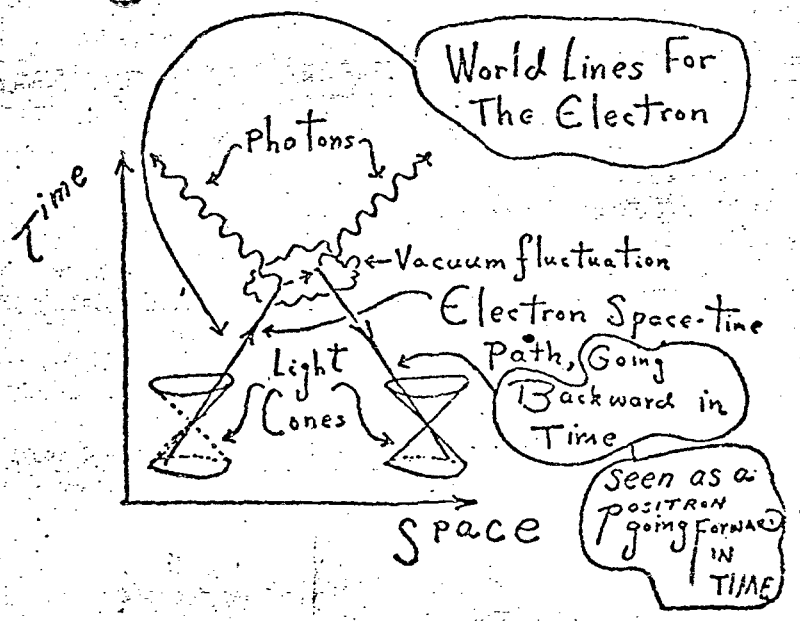

FIGURE 1a.

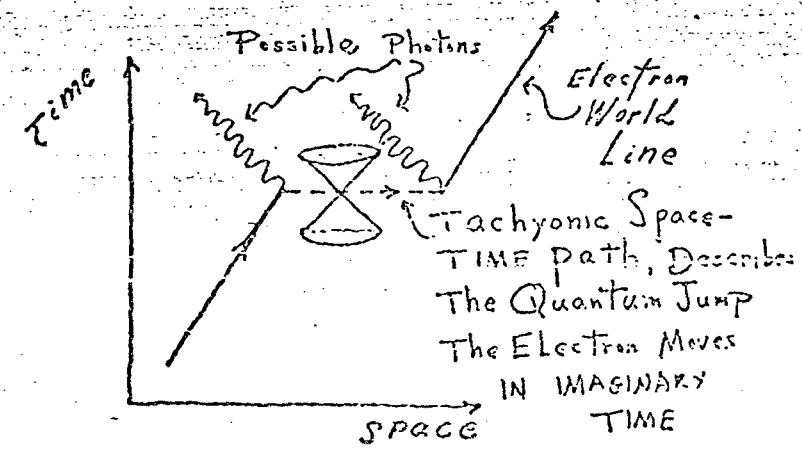

FIGURE 1b.

line in which the electron velocity (v) is greater than (c) the speed of light c. (See Figure 1b). The tachyonic segment of the electron's world line is detected as an *instantaneous discrete quantum jump* which can take zero *real* coordinate time as measured in the laboratory. The electron has a *continuous* space-time identity in the quantum jump. ~~Both~~ The proper time ~~and the coordinate time~~ becomes imaginary along the tachyonic piece of world line, ~~which is very small for ordinary [illegible]~~. Furthermore, the dynamical Action which determines the phase of the probability amplitude of the electron's world-line or history is proportional to the proper time. Therefore, the quantum jump or tachyonic piece of the world line introduces an exponental decay or growth of the probability amplitude. The tachyonic contribution to the action defines a quantum irreversible *entropy* for each quantum jump.

Exponential

Quantum particles do not radiate photons when moving with speed v less than c "inside their light cones." Photons are created in a Cerenkov process on the tachyonic path of the world-line outside the light-cone where v is greater than c. This is a new

+ The gravitational analog to tachyon loss in fact that the metric tensor (and therefore the curvature) has two kinds of contributions from the source stress tensor. One is on or inside light cone ($V \leq C$) the other is outside the light cone ($V > C$) (see D.W. Sciama IC/74/. Gravitational waves and Mach's Principle" for details) the views of IC/74/9/ by J. Sarfatti) there may be a connection between the quantum potential and the curvature.

interpretation of Bohr's frequency condition of 1913 in which electrons in bound atomic orbits (stationary states) do not radiate. Radiation and absorption only occur in the quantum jumps between orbits. But what about Maxwell's electromagnetic theory which predicts that an accelerating electron with v ~~greater~~ than c radiates. This is simply the classical limit of for closely spaced "continuum" states. The seemingly smooth time-like (i.e. v less than c) accelerated world line of the radiating free electron upon closer inspection is composed of a jagged curve of time-like and tachyonic pieces. (See Figure 2). Photons only appear along the tachyonic segments.

We need a third idea in order to explain the mystery of the quantum principle since, as Einstein realised, the quantum theory is incomplete. We must formulate a principle which tells us *why* an individual quantum particle makes a quantum jump into the tachyonic world line at any particular coordinate time and place. Thus we introduce the *Participator meta*-principle: the determining factor for an individual quantum jump is associated with the volition of the participator. Generally the collective will of the participators is unfocused and incoherent, giving the seemingly random character of quantum probability. The implication here is that there are states of consciousness which can

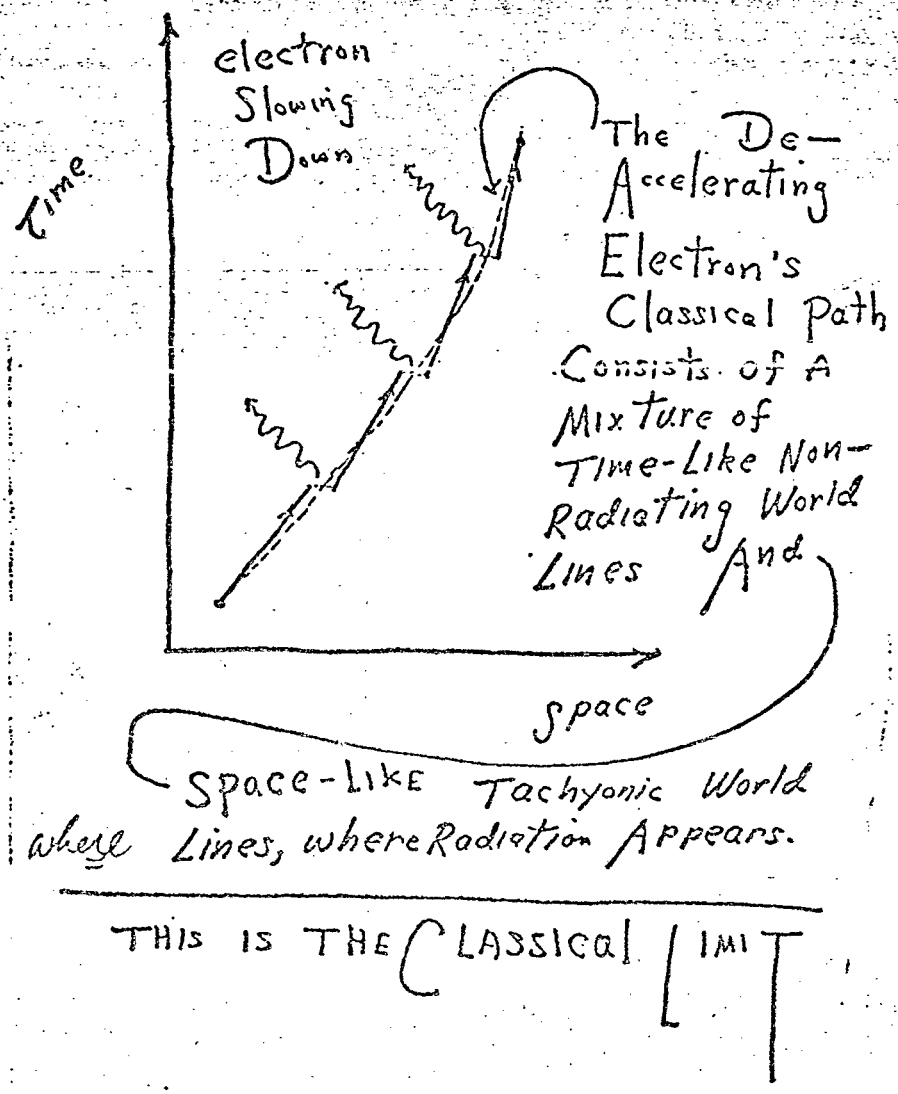

FIGURE 2.

+ In a spatially closed universe all states have discrete energy eigenvalues. Therefore, this kind of cosmology dictates the universality of Bohr's frequency condition on the microscale.

Brownian movement of the quantum particles. Thus the electron or photon is buffeted about in a random Brownian motion probably created by the subconscious mental functioning of living systems. So, if Wheeler's substitution of the idea of the "participator" for that of the "observer" is to be taken seriously, then some component of the quantum probability involves the turbulent creative sublayer of ideas in the mind of the "participator." The participator in a particular quantum experiment in a physics laboratory can be the experimenter himself, though on the deeper level of quantum interconnectedness it must also include the general range of all living systems. All conscious systems, independantly of their *spatio-temporal* locations relative to the experimental apparatus, make incoherent contributions to the total nonlocal quantum potential felt by the individual photons or electrons.

The subquantum Brownian movement of the hidden variable theory of Bohm and Vigier in the nonlocal version is "mental" in origin, proceeding from the uncoordinated and incoherent mental activity of the participators everywhere and everywhen. The random character of quantum events is not transmitted by *signals* propagating in space-time in the usual sense but is a gestalt property of the unbroken wholeness of the universe, which transcends the conservation of energy and other generators of flat space-time symmetries. The "hidden variables" of Bohm and Vigier and the hidden "heat reservoir" of De Broglie are found in the nonlocal functional order of the participator. As Bohm and Hiley point out:

> Any attempt to assert the independent existence of a part would deny this unbroken wholeness. . . . This does *not* necessarily mean that the subsystems are always spatially smaller (localised) than the system as a whole. Rather, what characterizes a subsystem is only its relative stability and the possibility of its independence of behaviour in the limited context under discussion.

Stapp (1971) has reached similar conclusions in a study of Bell's inequalities within an *S*-matrix formulation of the Quantum Principle. The combined implication of these ideas is that: the quantum mechanics of individual quantum particles is the generally incoherent field of consciousness of all the "participators" who themselves "interconnect" to generate the unbroken wholeness of the universe. Combining the ideas of both Wheeler and Bohm would suggest that this unbroken wholeness must be not only *self-organizing* but also *self-creating*.

whose volitional control is such that they can impress a coherent structure on the usually incoherent Brownian motion felt by single quantum particles. On a superficial level of analysis, such demonstrations appear to "violate" the "laws" of a physics which are defined in terms of limitations that we are only beginning to understand. Such are the problems presented by the scientific observations of Uri Geller to date. If the explanation of Geller's abilities lies in the direction outlined, he should be capable, by an act of will, and at a distance be able to repeatedly control the precise place of impact of single electrons of photons in the above-mentioned double-slit experiment of quantum mechanics. This is a crucial test and could easily be conducted as a laboratory experiment. Indeed it may be that many seemingly "miraculous" phenomena, such as those that have been reported frequently throughout history, can in principle be related to the framework of the quantum principle when properly understood. Further research along these lines could conceivably begin to demonstrate the *how* of such phenomena since Wheeler's "mutability" principle carried to its logical conclusion suggests the transcending of biological laws in so far as they can be *reduced* to physical laws. Therefore, if mutability is right there is an inherent flexibility in a wide range of both physical and biological phenomena e.g. stability of metal structure, aging etc.

The quantum potential is universal, affecting all quantum particles in the same way. The universality of the quantum potential is closely connected with the universality of gravitation and the curvature of space-time. Indeed, the incoherent structure of the quantum interconnectedness can be identified with the "zero point" quantum mechanical vacuum fluctuations of the geometry of space-time. The volition of a particularly strong "participator" impresses a coherent pattern on the vacuum fluctuations which is then detected as a "particle" of matter. It was originally thought that quantum vacuum fluctuations in the geometry of space-time were only important on the practically inaccessible scale of 10^{-33} cms. The finite ranged strong gravity theory of Abdus Salam and co-workers shows that these vacuum fluctuations are possibly important on a scale of 10^{-13} cms. due to the Yukawa exchange of a meson with two units of quantum spin having a mass of about 10^{-24} grs. However, the principle works for spin 2 particles of lower mass. For example, the Yukawa exchange of a

+ The quantum potential can be expressed in terms of the Riemann curvature tensor provided that the quantum wave function is primarily a physical field in the sense of De Broglie's double solution or Bohm's 1952 version of hidden variables in quantum theory. The Born interpretation of the wave function as a probability wave is secondary applying for a thermal equilibrium distribution of the hidden variables (see IC/74/9 T. Sarfatti) Q.M. as a consequence of thermal fluctuations.

spin 2 state of a bound electron-position pair would give a super strong ~~isotonic~~ leptonic gravity of range 10^{-11} cm. with a high frequency cut-off of about 1 Mev. which is consistent with the observed Lamb shift of the *S*-level of atomic hydrogen predicted by quantum electrodynamics. One can envision an effective biogravitational field due to the Yukawa exchange of very low energy (order of 1 ev.) collective elementary excitations in biological materials which would give a massive gravitational range of about 10^{-4} cm. which is of the same scale as functional biological units.

Wheeler's consideration of quantum geometrodynamics and the "spread of the wave-packet in super space" that show the usual ideas of causality and simple time order breakdown on the scale of the Planck length for quantum fluctuations in the geometry. However, the exchange of massive spin 2 "gravitons" in the particular case of the conjectured biogravitational field imply that this breakdown in time ordering could occur on the scale of 10^{-4} cms. which puts it within the range of human perceptive and conscious mechanisms. The quantum principle even suggests a mechanism for holographic information storage in the human nervous system. The storage may be in the frequency modulation of the phase of a room-temperature organic super-conductor. The coding and decoding of the information would occur by means of the Josephson effects. Such a model has many implications for areas of research such as Kirlian photography, healing and the "laying on of hands" etc. These matters will be taken up in a future publication.

In summary, it may well be that classical definitions of energy and its conservation will shortly have to be either expanded or superseded in ways that allow physics to handle a much richer kind of universe. This revision would appear to be one that is fundamentally linked with an understanding of biological systems and further, a deep appreciation of the role of the "participator" and his consciousness. As Wheeler recently remarked:

"We will understand how simple the universe is when we recognize how strange it is."

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(n.p.) [Uri Geller demonstrated the bending of metal and the triggering of a geiger counter tube by psycho-energetic means in a series of controlled and repeatable tests conducted by Prof John Hasted at Birkbeck College, University of London on 21 and 22 June, 1974. Participants and witnesses to these tests included Professor David Bohm, Dr. Jack Sarfatt, Dr. Ted Bastin, Dr. Keith Birkinshaw, Dr. Arthur Ellison, Arthur Koestler, and Arthur C. Clarke. Hasted and Bohm are preparing a detailed report for publication.

(n.p.) [Acknowledgements: I wish to thank Dr. Fred A. Wolf and Brendan O'Regan for their assistance in preparing this paper for publication.

A Comment

BRENDAN O'REGAN

The debate regarding the "true" nature of progress in science seems to have gained considerable momentum in recent decades. It is not without interest that this should be occurring at about the same time that science is having to confront a number of extremely difficult problems. Whether one chooses the framework of Kuhn's (1962) paradigms or Holton's (1973) themata, for example, it would seem that one of the most useful things such debates could provide might be some guidance for science (and scientists) when they find themselves faced with a build-up of anomalies or other unexpected phenomena. As Kuhn so aptly phrases it:

> One of the things that a scientific community acquires with a paradigm is a criterion for choosing problems that, while the paradigm is taken for granted, can be assumed to have solutions. To a great extent these are the only problems that the community will admit as scientific or encourage its members to undertake. Other problems, including many that had previously been standard, are rejected as metaphysical, as the concern of another discipline, or sometimes as just too problematic to be worth the time.

For example, the problems suggested by the anomalies of psychic research have the dubious distinction of having been rejected, at one time or another, on all three grounds suggested by Kuhn above. However, as Kuhn also points out, perhaps we should not be too surprised at this since:

> Discovering a new sort of phenomenon is necessarily a complex event, one which involves recognizing both *that* something is and *what* it is. . . . Only when the relevant conceptual categories are prepared in advance, in which case the phenomenon would not be of a new sort, can discovering *what* occur effortlessly, together, and in an instant.

Thus for some of us, it has always seemed more potentially productive to examine the progress of research on paradoxes that have emerged *within* the framework of conventional physics, for example, especially if those paradoxes share some fundamental characteristics with the phenomena that have been rejected. In this connection, it should be obvious that many of the questions raised by psychic research have much in common with problems in the areas of conventional measurement theory and modern research into both quantum theory and relativity research. Yet at the same time, it has also been clear that an essential component would be being ignored by such an approach since it would take no account of the fact that highly complex biological *living* systems are involved in psychic phenomena. The special problems posed by living systems, which are open and nonequilibrium systems, are now being given consideration in the work of Prigogine (1972) as well as in Eigen's (1971) work on the "self-organization" of matter in biological systems. It has also been obvious for some time that somehow, developments in these different areas would have to be combined in such a way that the consciousness of the observer-participator is indeed part of the resulting theory in a way that constitutes a genuine response to Wigner's (1972) complaint that from the point of view of quantum mechanics, consciousness is completely unexplained. (In this connection, it is interesting to note that Wigner expressed the view that one of the only ways of solving this was to find phenomena "in which the consciousness modifies the laws of physics.") Given the diversity of the kinds of information needing integration, it is perhaps not surprising that the field of contendors is not exactly crowded.

In the preceding paper, Sarfatt has presented the beginning outlines for just how this integration may yet be achieved. At the heart of his thesis lies an interpretation of the nature of random events. In particular he is suggesting that the cause of the random behaviour of particles in Brownian motion is directly linked with the volitional activity of the sum of observer-participators. Recent research into biofeedback has generated the distinction between what has been termed "active" and "passive" volition. Green (1972) has described this notion and the implication in the present context is that via the techniques of biofeedback training, which seem to deal specifically with the training and direction of passive volition, it may be possible to set up an experimental situation which could

directly test the possibility of at least linking up specific subjective states with changes in the pattern of events in the physical world. The research to date has clearly indicated that certain sets of subjective states *can* be linked up with changes in the pattern of behavior of the body, though there has yet to be a systematic exploration of the idea that passive volitional states may reach "outside" the body in a manner at least analagous to the way active volitional states do so—neither of which we can explain.

The other aspect of Sarfatt's paper which may spark some controversy is the suggestion that the discontinuity inherent in quantum theory involves the electron undergoing its transition between energy levels via a path involving a tachyonic world line. Tachyons have yet to be actually detected but their existence is a logical extension of existing physical theory. Even if they are detected, it is not yet clear how they will relate to psychoenergetic theory, though strictly speaking, detection is the wrong word since it implies that tachyons should be "detectable" in the manner of a signal. The concept of a signal does not necessarily apply at speeds greater than that of light (Feinberg, 1967). Since psychic phenomena seem to involve the need for revision of our concepts of time, it may be that the connection will be via some relationship between the "time sense" of certain subjective states and the complex time of the tachyonic world line, though this has to be regarded as a completely speculative notion for the moment.

It would appear that it is also essential that some model for the exertion of force by biological systems is necessary for the further development of psychoenergetic theory. This, of course, must be in terms outside the normal active volitional extensions via the action of the body. Research in this direction seems to have been a part of the Russian effort to explain psychic phenomena for some time. In this direction Sarfatt has suggested the possibility of some form of biogravitational field which may be correlated with ~~becomes~~ ~~parallels if~~ organic room-temperature superconductors ~~may~~ be found in biological systems. Some work in this area is already going on and further development of this notion could provide explicit suggestions for further research.

However, the kinds of research needed here are all both highly involved and requiring the attention of the very best minds. Perhaps when the scientific community at large realizes that the problems posed by psychic research are *already* part of the very fabric of science, rather than being some exotic pseudo-scientific intrusion, the necessary research effort can begin in earnest. In fact, it now seems clear that if Wheeler's concept of the role of the "participator" is to be fully explored, then physics might have to invent psychic research, if it did not already exist. Though clearly controversial in many aspects, it is to be hoped that the challenges and research suggestions in this paper will serve to spark off scientific debate in the constructive direction in which it should always have been moving.

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