NEUTRINO THEORY OF PSI PHENOMENA

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The basic element of communication is information. In paranormal communication it is the tenuous, but nonetheless real, product of the neural system—that which we describe generally as thought. Therein lies the whole paradox of parapsychology as a science: Its basic element is undeniably tangible to each of us, yet, unlike the basic elements of any other science, a thought has never been isolated, weighed, measured, seen, tasted, smelled or grasped. It is not surprising that parapsychology has long been regarded as an orphan by the established sciences.

The remarkable irony is that thoughts are the font of the vast knowledge that comprises existing science. Considering man's astounding success in applying the thought process to other phenomena, may we not therefore ask: Can this process be applied to divine its own nature?

Although it is undeniable that we sense our own thoughts, we cannot reliably observe those of others. Despite the bleak outlook for direct measurement, the indisputable reality of thoughts requires that they be a legitimate subject for scientific study. The observability problem merely demands the exercise of caution in formulating testable concepts. To optimize the potential for agreement so necessary for scientific progress, a simple problem-solving technique termed "binary reasoning" is applied here, as follows: *Questions are composed which are answerable from available evidence by only one of two possible choices, such as yes-no, either-or, more-less, etc.*

This is merely a formalization of the essential problem-solving process of the mind as, e.g., tacitly applied by detectives and scientists and employed in games such as the well-known "Twenty Questions." It offers three immediate advantages for scientific theory-building:

(1) Acceptance or rejection of a theory as a whole becomes arbitrary and unrigorous; instead, each binary step is required to be independently evaluated.

(2) A quantitative measure of the validity of a theory is given by 2^n, where n is the number of questions correctly answered. Thus for n = 10 (20), one out of about one thousand (million) theories is affirmed. It is apparent that even a small number of correctly answered questions can provide significant insight into any problem.

(3) Because of the synergistic reinforcement of the answered questions toward a definite solution to a problem, quality of evidence—although always important—is often not critical; in problem solving, a number of little arrows is equivalent to one big arrow for denoting direction.

Binary reasoning is thus a wholistic approach vis-à-vis the usual specialized approach, e.g., of the text-book. In applying binary reasoning to thought and psi phenomena, the main purpose is to delineate the boundary of the forest rather than describe the trees, i.e., to outline a seminal psi theory which is founded on our present knowledge of the universe. Despite the paucity of directly observed data relevant to thought transmissions, a comprehensive psi theory does result. Because of space limitations, the published literature is heavily relied on for details. Although all answers are accorded an above-chance probability by the use of available evidence, direct or indirect, it should be especially borne in mind that no matter how inchoate the discussion or evidence, *further research cannot invalidate the overall theory unless it can change the binary state constituting any answer.* In the theory which follows each question/answer pair is assigned an arabic number.

1. *Is the present body of physical knowledge essential to an understanding of the paranormal?* Yes.

An inviolate tenet of information theory is the association of an energy transfer with every information transfer. Let us apply this to ESP experiments in which above-chance results are obtained indicative of extrasensory information transfer. There are then two extreme interpretations of such experiments:

(a) The skeptic claims there is no perceived energy flow, therefore there is no information transfer; he ascribes the results to hypersensitivity, chance, hoax, error, magic, or some other "normal" explanation.

(b) The believer is prepared to ignore any such theoretical rejection in favor of the elusive, but persistent, findings of psychic research; he stands firm in his faith that some extrasensory process is involved in significant observations.

The net result is an impasse which has long contributed to the general rejection of parapsychology as a veridical science. Yet neither of these interpretations is rigorously justifiable. By denying an energy

transfer, the skeptic presumes he can detect all the possible means of energy transfer in the universe, whereas any believer who indifferently ignores physical theory is trading the solidly based structure of science for a castle in the sky. However, there is a simple solution to this impasse which satisfies both interpretations: We need only explicitly specify that every ESP process is associated with an *unobserved* transfer of energy. Then information theory is not technically violated and the extrasensory interpretation need not be disallowed.

This is more than semantic sophistry, for *no energy* and *unobserved energy* have vastly different connotations. *No energy* is an injunction for all time; *unobserved energy* is only a temporary restriction because it is dependent upon our ability to measure. This ability has been changing rapidly in recent times, for just in the last century several forms of energy have been discovered to which man was oblivious for ages, as radio waves, X-rays, ultrasonics, neutrino radiation and cosmic rays. In light of our still rapidly developing technology it is unreasonable to assume that some form of energy transfer capable of conveying ESP information does not exist. Information theory thereby serves to replace the impasse represented by (a) and (b) and its attendant prolongation of controversy by directing attention to the search for a suitable energy source. In effect, the entire class of psi theories which is in accord with information theory and, concomitantly, with the whole body of present scientific knowledge, is being tacitly selected by a "yes" answer.

2. *Can interaction of a presently unobserved energy source with living things account for the biopsychological properties of psi phenomena?* Yes.

An affirmative answer is provided by the recent theory of Ehrenwald.[1] He initially assumes the excitation of body cells, specifically neurons, by some unknown means and then proceeds to show that given such neural excitation the observed properties of ESP experiments can be accounted for by known biopsychological processes. In brief, he essentially notes that psi-derived information is basically fragmentary, as in subliminal perception and in the perceptions of individuals with damaged left brains, and proposes that all such information is processed via the right brain subject to censorship by the reticular formation, the interest center of the brain. This is substantiated by Dixon's discussion on subliminal perception.[2] By adopting such a theory, we are directed to the nature of the primary unobserved excitation of living cells in the search for the origin of ESP. We may, after Osis and Turner,[3] term this the "ESP channel."

3. *Is there a conventional energy source that is adequate to account for the ESP channel?* No.

Only three of the physical parameters related to ESP information

transfer need be invoked to answer this question: effect of distance, penetrability and required bandwidth. The need for ESP to operate over the largest separation available on earth effectively eliminates all but conventional electromagnetic propagation. The necessity for the ESP channel to penetrate into the body, even when situated in Faraday cages, mines and underwater, further eliminates all but very low frequency electromagnetic radiation. However, this is then eliminated by the need to have available a bandwidth capability of at least 10^{10} Hz, as estimated by Bibbero[4] for telepathic communication. When the extremely low detection efficiency of very low frequency radiation by an antenna the size of the brain is additionally considered, electromagnetic radiation becomes inadequate as a general energy source. Nonetheless, conventional electromagnetic radiation cannot yet be completely excluded as a possible explanation in rare or restricted cases of ESP.

4. *Does physical theory require the existence of forms of energy which are presently unobserved?* Yes.

The zero datum for energy is assigned by convention. In modern physics this is the energy of the vacuum. This question could thus have been alternately posed in the form: Is the vacuum a void of a plenum?

At least three forms of presently unobserved energy which pervade the universe are acknowledged by physical theory to exist: Dirac's infinite energy sea of unobservable electrons,[5] Wheeler's "wormhole" vacuum structure[6] of density $\approx 10^{94}$ g/cm^3 having the characteristic Planck length of 10^{-33} cm, and the neutrino sea. The latter results from neutrinos and antineutrinos which fill the universe from those left over at the formation of the universe, continuously emitted by stellar bodies and radioactive decays, and created in cosmic ray showers. Since 1962, it has been recognized from present observational limits that the energy contained in the neutrino sea may far exceed all the observable energy in the universe.[7] This alone is sufficient to support the vacuum as an energy plenum.

5. *Can any of the unobserved forms of energy in the vacuum interact with matter?* Yes.

Of the three unobserved sources, only one has thus far been directly verified to interact with matter—the neutrinos. There are two known types of neutrino interactions: Inverse beta-decay, in which a neutrino is absorbed by an atomic nucleus thereby transmuting it to another element and Compton scattering between neutrinos and elementary particles, in which there is an exchange of energy but no change in structure. The strength of each interaction is measured as a cross-sectional area.

The presently verified scattering effect, known as the Vector-Axial (V-A) interaction, has a cross-sectional area which increases monotonically with neutrino energy.[8] Because of its verification at high energies, the V-A interaction requires that low-energy neutrinos must have a finite interaction with matter.

6. *Is it possible for neutrinos to couple energetically to living cells?* Yes.

Inverse beta-decay is substantially localized within the atomic nucleus, rather than being directly coupled to the electrochemical forces in living cells. This combined with the restrictions on the high-energy neutrino spectrum makes inverse beta-decay an unlikely candidate for an ESP channel.

In scattering phenomena, relative energy transfer is maximum when the interacting particles have similar energies. Because of the high (low) mass of atomic nuclei (electrons), the relative energy transfer from scattering of neutrinos with high (low) energy is significantly greater with nuclei (electrons). Since the high-energy portion of the neutrino sea is severely restricted by observed limits from past experiments, scattering of electrons by the large number of low-energy neutrinos survives as the most significant coupling between the neutrino sea and matter. Because the electrochemical energy levels of electrons within living cells are correspondingly low, neutrino-electron scattering represents the most eligible energy source for the ESP channel.

7. *Do the properties of neutrino-electron scattering match the properties required for the ESP channel?* Yes.

The essential physical properties—distance, penetrability and bandwidth—are satisfied by neutrino-electron scattering. Neutrinos travel with the speed of light and, because of the low scattering cross-section, are highly penetrating. Thus the potential to couple to living cells anywhere on Earth is inherently satisfied. There is no known effective shield for neutrino radiation.

The problem of bandwidth is less obvious. It is dependent on whether there is a selective factor in the scattering between neutrinos and electrons which, in turn, depends on the structures of neutrinos and electrons. Prevalent theory has very little to offer in this respect. Both particles are now regarded as mathematical points and the conventional V-A interaction provides no selective factor in their scattering. However, there is a characteristic frequency known to be associated with each particle given by

$$E_e = hf_e \qquad E_\nu = hf_\nu/2 \tag{1a,b}$$

where E (f) refers to energy (frequency), $h = 6.63 \times 10^{-27}$ erg-sec is

Planck's constant of action and subscripts e (ν) refer to the electron (neutrino). Thus, a neutrino has the same frequency as an electron of twice the neutrino's energy. If the frequencies associated with the two particles mediate neutrino-electron scattering to affect the intensity of scattering, a resonance factor is introduced in the scattering interaction and the frequency range of neutrinos in the neutrino sea determines the maximum available bandwidth of the energy (and hence information) transfer rate obtainable by scattering. For the typical electron binding energies in living molecules of the order of 0.1 electron-volts (1.6×10^{-13} ergs), the frequency of neutrinos of half this energy is by eq. (1b) of the order of 1.2×10^{13} Hz. This is ample to provide via resonant scattering the high information rate required to account for the most elaborate cases of ESP information transfer.

A physical basis for a resonant interaction is provided by the phasor theory of neutrino, photon and electron structures.[9,10] Phasor language derives directly from Maxwell's equations and has long been successfully applied to macroscopic electromagnetic phenomena. The phasor structure of neutrinos is revealed to be a helical form of electromagnetism; the composite photon is demonstrated to be a resonant interaction of a neutrino and antineutrino; and the electron (positron) is shown to be a resonant interaction of two neutrinos (antineutrinos) in accord with the quantum-electrodynamic description of the electron. The resonant interaction of these particles is further shown to result from the complex Poynting vector, a well-known tool employed in macroscopic electromagnetic interactions.

Because the application of phasor language is rigorously in accord with Maxwell's equations and with known properties of the neutrino, photon, and electron, it cannot be denied as a basis for resonant neutrino-electron scattering. Furthermore, phasor theory delineates the reason why quantum theory has persistently failed to provide a composite photon or a physical structure for the electron: The conventional form of the Schrödinger wave equation is incomplete. Phasor theory demonstrates that the Schrödinger equation derives directly from Maxwell's equations and, in so doing, supplies the missing information. Parenthetically, all prior applications of the quantum-mechanical interpretation of the Schrödinger equation to psi theory are rendered incomplete and, therefore, suspect.

The resonant interaction is manifest only when the left-(right-)hand helicity of the neutrino (antineutrino) matches the left-(right-)hand helicity of the electron (positron) components. The interaction cross-section is maximum when the helical wavelengths are identical

and reverts to the V-A value as the wavelengths diverge. Since electrons predominate in the universe of matter, only resonant interactions of the left-hand neutrino are of primary interest. However, it should be noted that the right-hand antineutrino form may be relevant to interaction with right-hand molecules, as DNA and RNA. Unless otherwise indicated, "neutrino" in the rest of this report refers only to the left-hand form.

8. *Is resonant neutrino-electron scattering supported by observation?* Yes.

Present solar theory requires about two percent of the radiated energy of Sun to be in the form of neutrinos emitted from the core of Sun. Detection of solar neutrinos of the highest energies, those from boron-8 (^{8}B) decays, by the Davis solar neutrino experiment has been underway for some time. From the latest data, only ⅓ of the expected number is being detected.[11] The failure to detect the predicted number has been characterized as a major crisis for present physical theory.

One of the many proposals to account for this crisis is the existence of a resonant neutrino-electron scattering.[12] The required resonant cross-section corresponding to the mean energy of the ^{8}B neutrinos is found to be about nine orders higher than the V-A cross-section *within Sun*. Because of the difficulty of detecting individual neutrinos this is still too small to be presently detected in laboratory experiments. However, due to the high electron energies and the large number of interactions within stellar interiors, sufficient energy is transferred to stellar shells to produce observable consequences. It has been shown[10,12] that this is relevant to a number of heretofore unexplained astrophysical phenomena as stellar evolution, stellar oscillation, the origin of flare energy, and nova and supernova events. These further support the existence of resonant scattering.

9. *Is neutrino-electron scattering intrinsically detectable by living tissue?* Yes.

To answer this question it is necessary to know the total power transfer to living tissue. This is the portion of neutrino energy transferred to an electron per mean scattering event multiplied by the total power flux of the neutrino sea. The former is known to be small, but, although the latter is believed to be large, it has never been measured. However, another more precisely known neutrino source—that from Sun—is available for a more accurate assessment of detectability.

The primary biological effect of solar neutrinos is the random scattering in the brain which produces random noise superimposed on the coherent neural processes. The essential criterion for detectability by living tissue is, then, the noise frequency f in a tissue of active mass

M. This has been determined from existing data to be[13]

$$f/M \approx 3.7 \times 10^{38}\ \sigma\ \text{Hz/g} \tag{2}$$

where σ is the interaction cross-section. For the V-A interaction, f is marginally small, but for the resonant cross-section corresponding to the mean solar neutrino energy of 0.263 Mev from the dominant proton-proton process, $f/M \approx 100$ Hz/g. This is well within the noise detection range of neural systems of reasonable mass. The actual noise power per unit mass is given as

$$P/M \approx 1.5 \times 10^{27}\ \sigma\ \text{erg/g-sec} \tag{3}$$

For resonant scattering, $\sigma \approx 2.8 \times 10^{-37}$ cm^2, so $P/M \approx 4.2 \times 10^{-10}$ erg/g-sec. For a human adult brain of 1300 g, $P \approx 5 \times 10^{-7}$ erg/sec. Such a power is equivalent to the detection, for example, by the eye of $\sim 10^5$ optical photons/sec. This is several orders above the energy detection threshold of living cells, as typified by the sensitivity of the retina. From the standpoint of noise frequency and noise power, it is thus inherently feasible for living things to detect scattering of solar neutrinos with electrons in neural tissue.

10. *Can living things now be applying a solar neutrino detection capability?* Yes.

The study of living things discloses a remarkable ability to utilize all available forms of energy for maximizing survival. Accordingly, the ability of living things to detect solar neutrinos is dependent upon its potential for enhancing the probability of survival.

The detection of random noise in the environment, such as optical, sonic or chemical, is the initial step in the evolution of a corresponding visual, aural or olfactory sense. Since even the most primitive biosystems have such noise-detecting capabilities, the basic processing techniques for detection of neutrino scattering noise already exists. Because solar radiation is directional, electrons scattered by solar neutrinos have a directional anisotropy. Thus, a dual processing system, as employed for the other senses, permits the detection of the instantaneous position of Sun. This is applicable to circadian timing and to navigation, as noted.[13] The primary means by which circadian clocks are synchronized has still not been positively identified. Although numerous cues are used by various species for navigation, the primary reference applied in homing in many species has also not been positively identified. The possibility that detection of solar neutrinos has been applied for such purposes is therefore mandatory.

Scattering of electrons by neutrinos is also demanded in inanimate matter. It has long been observed that associated with electrons is a

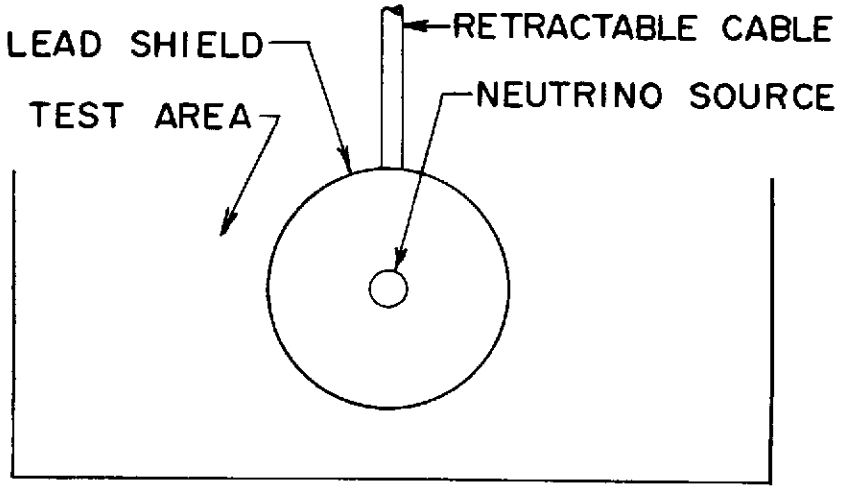

Figure 1. Proposed test for detectability of neutrinos by animate or inanimate matter. The neutrino source is a positron emitting radioactive source capable of producing a neutrino flux just outside the lead shield at least equal to the solar neutrino flux at Earth.

"1/f" electrical noise, wherein, over a considerable range, noise power increases as noise frequency decreases. Such a characteristic is intrinsically required by scattering from the high energy portion of the solar neutrino spectrum, in which the number of neutrinos decreases as energy increases. The existence of a similar 1/f noise characteristic at the Ranvier nodes of frog axons has been measured by Verveen and Derksen.[14] This reinforces the feasibility that biosystems are detecting solar neutrinos.

We are now at a point where the heuristic power of theory asserts itself. By a conceptually simple test it becomes possible to determine whether 1/f noise and/or biological effects are induced by solar neutrinos and, thereby, to affirm all the question/answer sets considered thus far.

The basic design of such a test, as shown in Fig. 1, consists of a source of neutrinos retractably positioned above a test area. The source is an artificially radioactive element of the neutrino/positron emitting type now available from cyclotrons and nuclear reactors. It is encased in a lead shield to reduce the gamma-ray emission associated with such a source. The neutrinos easily pass through the shield producing maximum neutrino flux just outside it. For a source of a few kiloCuries, a neutrino flux is available comparable to that arriving from Sun at Earth's surface—a mean number density of $\sim 10^{11}$ neutrinos/cm^2-sec and a mean power flux of 2.7×10^4 erg/cm^2-sec. The test area may

contain inanimate matter, plants, insects, fish, birds or small mammals to test for 1/f noise, effects on biological rhythm and orientation and any other behavioral reactions. In addition, comparison tests with a second control source producing only gamma rays of intensity equal to that of the neutrino source are also feasible. This allows the diameter of the lead shield to be reduced in some tests to increase sensitivity by increasing the available neutrino flux density closer to the source and measuring the differential effect with and without neutrinos, but with the same gamma-ray background.

The total cost of such a neutrino source is of the order of $500,000. However it is possible to time-share the source, and hence cost, among a number of experiments from different disciplines, e.g., for investigating neutrino scattering with regard to the mystery of the Davis experiment, for which conventional proposals projected to cost millions of dollars are currently being considered.[11] Because living cells are active detectors, they have the added advantage of being able to also test a resonant scattering explanation of the Davis experiment.

Any unusual behavior associable only with the presence of the neutrino flux provides experimental proof of detectability. Such a demonstration, by validating the ten question/answer pairs provides a figure of merit of $2^{10} = 1024$ in support of the theory advanced thus far.

11. *Does use of solar neutrinos also require use of the neutrino sea by living things?* Yes.

The power flux of the neutrino sea differs from the solar flux in three major respects: It is omnidirectional, is projected to be much larger, and has a different energy spectrum.

The neutrino sea flux is unmeasured, but several attempts have been made to estimate it.[15] These have all been based on the *assumption* of Fermi-Dirac statistics only because neutrinos are fermions. However, this assumption has no valid observational or theoretical support: Fermi-Dirac statistics have been verified only for gases of matter, as electrons, and its theoretical application to neutrino gases has been shown to be defective based on Pauli's discussion of the connection between special relativity and statistics.[16] The net result is the admissibility of Bose-Einstein statistics for determining an upper limit to the neutrino sea power flux. Note, especially, that a gravitational limit for massless neutrinos has already been disallowed by general relativity as shown by Davis and Ray.[17]

The total power flux in one direction through a hemisphere with a base of unit area is, from elementary radiation theory,

$$S = c\rho/4 \tag{4}$$

where $c = 3 \times 10^{10}$ cm/sec is the speed of light and ρ is the energy density of the neutrino sea. This also applies in any frequency interval. For the power flux in frequency interval df, the Bose-Einstein upper limit is, as for a photon gas,[18]

$$S_f = \kappa T^4 Z du/df = \kappa T^3 Z h/k \tag{5}$$

where $u = hf/kT$, κ is the Stefan-Boltzmann constant 5.67×10^{-5} erg/cm^2-sec-deg, k is the Boltzmann constant 1.38×10^{-16} erg/deg, T is the temperature in °K, and

$$Z = 15u^3/\pi^4(e^u - 1) \tag{6}$$

The total power flux is the Stefan-Boltzmann law

$$S = \int_0^\infty S_f df = \kappa' T^4 \tag{7}$$

since $Z = 1$ when integrated over all frequencies.

Particle-antiparticle symmetry in the universe demands that S_f be composed of two equal neutrino and antineutrino components. The composite photon required by phasor theory[9] then requires eq. (5) to apply equally to a photon gas and to a neutrino sea obeying particle-antiparticle symmetry. However, the two gases differ in spin properties: Neutrino and antineutrino spins are in the same direction in the photon but are randomly oriented in the neutrino sea. If the latter were not so, the neutrino sea would endow the vacuum with an observable spin contrary to our inability to directly detect any gross property of the vacuum. Thus, it is particle-antiparticle symmetry which effectively determines the appropriate statistics of the neutrino sea. Fermi-Dirac statistics would accurately apply to the neutrino sea only to the extent of its departure from particle-antiparticle symmetry.

Experimental values of S_f are obtained by applying eq. (4) to the upper limits of the observed ρ in the frequency interval Δf, as summarized by Marx[19] and shown in Table 1. These have been doubled to obtain the total value of S_f in accord with the equal neutrino and antineutrino fluxes required by particle-antiparticle symmetry in the universe. Then from eq. (5) the average temperature from the two sets of data is $T = 2.3 \times 10^9$ °K. Application of eqs. (7) and (4) next gives the total values for S and ρ, respectively, as shown in Table 1. The values for the neutrino portion only are $S/2 = 8.0 \times 10^{32}$ erg/cm^2-sec (5.0×10^{38} Mev/cm^2-sec) and $\rho/2 = 1.0 \times 10^{23}$ erg/cm^3 (120 g/cm^3).

Only the negligible portion of ρ and S represented by the high-energy neutrino interactions given by Marx are directly observable. Although ρ may seem high compared to the gross density

TABLE 1

Properties of a Bose-Einstein Neutrino Sea

	Neutrino	Antineutrino	Mean
Observed* neutrino density, g/cm^3	$\lesssim 10^{-25}$	$\lesssim 10^{-24}$	
Energy range of observations,* Mev	0.8 to 3	1.8 to 10	
Δf = frequency range of observations, Hz	5.3×10^{20}	2.0×10^{21}	
ρ_f = total spectral density#, erg/cm^3-Hz	3.4×10^{-25}	9.1×10^{-25}	
Mean of energy range, Mev	1.9	5.9	
S_f from eq. (4), erg/cm^2-sec-Hz	2.5×10^{-15}	6.8×10^{-15}	
T from eq. (5), °K	1.3×10^{9}	3.3×10^{9}	2.3×10^{9}
S from eq. (7), erg/cm^2-sec			1.6×10^{33}
ρ from eq. (4), erg/cm^3			2.1×10^{23}

* Based on data summarized by Marx.[19]

\# Includes doubling of observed values to be in accord with particle-antiparticle symmetry.

of matter in the universe, it is negligible compared, for example, to the unobservable Wheeler-Planck density.

The plot of Z vs. u, which determines the neutrino sea energy spectrum, is shown in Fig. 2. The maximum occurs at $u = 2.80$ corresponding to a neutrino energy $hf/2 = 0.28$ Mev. The mean neutrino energy is $\langle E \rangle \approx kT/2 = 0.10$ Mev. Because these values are so close to the 0.263 Mev mean energy of solar neutrinos, two conclusions follow: (1) The neutrino sea is, or is close to, equilibrium with the neutrino emitting stellar masses distributed throughout the universe so that the Bose-Einstein upper limit becomes an actual estimate. (2) The ability of living things to detect the directional solar neutrino flux demands their ability to also utilize the omnidirectional neutrino sea.

12. *Can the neutrino sea be employed in the chemistry of living things?* Yes.

The neutrino sea power flux obtained from experiment is so high relative to the gross density of matter in the universe that we must regard all matter as embedded in an isotropic neutrino soup that is energetically dense, but dynamically thin. An electron in this neutrino soup slightly interacts simultaneously with a large number flux of mean value $S/2\langle E \rangle = 5.0 \times 10^{39}$ neutrinos/cm^2-sec passing by in all directions. For a perfectly isotropic sea, interactions in opposite directions cancel and there is no net effect on the electron. (This is primarily why a smaller, but directional, solar flux can be detected.) However, to the extent statistical time variations occur, the electron's position fluctuates slightly. In combination with the effect of the directional solar flux, this provides a phenomenal origin of 1/f noise and a physical source of the quantum electrodynamic electron fluctuation measured by the Lamb shift and the anomalous gyromagnetic ratio.

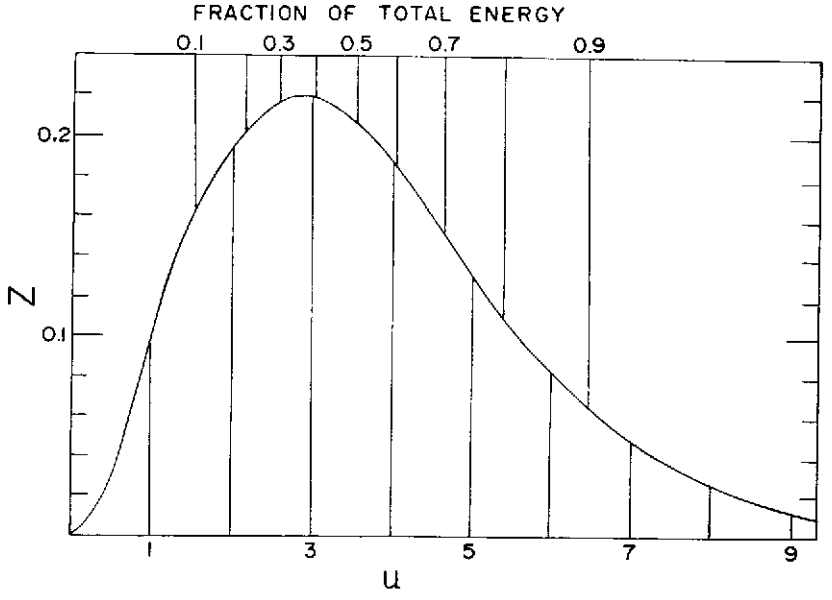

Figure 2. Neutrino sea power spectrum shown in generalized form. The ordinate $Z = 15u^3/\pi^4\ (e^u - 1)$ is proportional to the power flux S_f and density ρ_f per frequency increment. The abscissa $u = hf/kT$ is proportional to neutrino energy and frequency. Absolute values of Z and u are determined by the temperature of the neutrino sea. The upper scale gives the fraction of energy, power, or density remaining in the neutrino sea for all neutrinos with energies less than that of a given u.

Consider, now, an electron in a molecule. Whenever the electron changes state it undergoes displacement, during which it scatters asymmetrically with the passing neutrinos. This induces a corresponding perturbation in the isotropy of the neutrino sea which propagates outward with an intensity that varies inversely as the square of distance. Let an electron transition induce a perturbation having amplitude A/s^2 at the equipotential surface of a sphere of radius s closely surrounding the molecule. At a distance $r > s$ the amplitude is A/r^2. Let there now be within the sphere N identical molecules each having an electron making an identical transition. The total perturbation becomes NA/r^2. This is then sufficient to just excite one electron in an identical molecule at distance r when

$$r \approx N^{1/2}s \tag{8}$$

For N large, *a long-range force results which is not available with normal chemical forces.* Such a long-range force is uniquely applicable to living systems where coherent redundancy in active tissue is widespread. The

example above merely represents one way living things may employ redundancy to make use of the neutrino sea.

13. *Can the neutrino sea be employed in the thought process?* Yes.

Consider, next, a synaptic knob containing vesicules each of which contain N similar neurotransmitter molecules. For the more sensitive synapses, an electrical signal at the knob surface of the order of the energy required to excite one molecule suffices to initiate a synaptic event. An essentially simultaneous change of state in the N molecules of discharged vesicules during the event results in a neutrino sea perturbation capable of exciting a similar nearby synapse. Since $N \approx 5 \times 10^3$ and the vesicule radius is typically $s = 1.5 \times 10^{-6}$ cm, like synapses within a range of $r \approx 10^{-4}$ cm may thereby be excited by a single discharged vesicule. When the simultaneous discharge of m vesicules is required to initiate a synaptic event, $r \approx m^{1/2}\ 10^{-4}$ cm.

The total number of synapses in the human brain is now estimated[20] at 10^{13}. More recent and favorable estimates are 10^{14} and 10^{15}. (See *Sci. Amer.*, Sep. 1979. pp. 46, 221.) For the mean brain volume of ~1300 cm^3, the mean spacing between synapses $\approx 3 \times 10^{-4}$ cm. Since this is of the order of r, a "stepping-stone" excitation of similar synapses throughout the brain *which is independent of the neural network* becomes feasible. This is particularly favorable in regions of the brain where the density of synapses is above average and excitation energies are low, as in the dendritic regions of higher brain function. The sensitivity of such synapses is of the order of one light quantum, which corresponds to the energy sufficient to excite one molecule as assumed above; moreover, in these regions coupling is electrotonic and hence is essentially spikeless.[21] Thus, a long-range neutrino force is probable in at least such regions of the brain. This essentially means that the density of synapses is another independent variable that may be exploited in living systems for facilitating brain function. As noted by Schmitt et al.,[22] density of synapses increases with phylogeny and is highest in man.

Such a long-range force is pertinent to a rather remarkable theory of the consciousness proposed by Walker,[23] in which a long-range "stepping-stone" mechanism in the brain was first postulated. The basic innovation of Walker's theory may be characterized as the existence of a supervisory control over the neural system which operates at the speed of light. For this Walker applied the known quantum-mechanical tunneling effect and showed that, with the assumption of closely spaced "propagator" molecules throughout the brain, similar synapses may be coupled in stepping-stone fashion such that excitation of one results in progressive excitation of others with the velocity of light. The essentially instantaneous excitation of numerous

synapses in the brain is identified by Walker with a state of consciousness.

Walker notes that any suitable long-range force may apply in place of quantum tunneling. The substitution of a long-range neutrino sea force for the tunneling effect has two important advantages: (1) Propagator molecules are not required; each nerve transmitter provides this function. Thus, as many separate such systems as there are transmitter types are available without the need and complexity of added components. (2) There is a one-to-one correspondence between the state of the brain and the perturbation induced in the neutrino sea. Since the neutrino perturbation is not confined to the brain whereas tunneling is, a signature of the state of the brain is impressed on the neutrino sea and is propagated throughout space in all directions. This is obviously suited for psi phenomena.

Walker distinguishes between consciousness and thought. The conscious state results from a simultaneous spatial distribution of excited synapses that may last up to ~0.1 sec, the refractory period of neurons. The number of possible conscious states is then given by n!, where n is the total number of neurons ($\sim 10^{10}$ in humans). On the other hand, the thinking process is identifiable with the software program which determines the switching sequence of synapses and hence neurons. Since the neural network feeds back after a time delay to excite other synapses, the interaction of the neural network with a supervisory long-range control mechanism requires Walker's conscious states to perpetually form and change according to the spatio-temporal pattern of synapse excitation. The characteristic frequency is then $\sim 1/0.1 = 10$ Hz, i.e., of the order of the EEG frequencies. A thought may now be defined as the space-time pattern of synaptic excitation. If only ten percent of the synapses are involved in thoughts as opposed to control and other housekeeping functions, the number of different synaptic excitation combinations available for human thinking is then $\sim 10^{12}! = 10^{x}$, where $x = 6 \times 10^{12}$, and the number of possible thoughts vastly exceeds this by the number of time sequences of these combinations that are resolvable. Such a thought mechanism is supported by the high density and sensitivity of synapses in the higher brain centers, divorces thought from brain structure in accord with observation thus far, accounts for the EEG, and ascribes long-term memory to the ability of software to reproduce a particular spatio-temporal synaptic pattern. Since "mind" is the general term we apply to the thinking mechanism, the neutrino sea in combination with Walker's approach to the consciousness provides a feasible mechanism for the brain-mind interaction.

14. *Is the mind wholly contained within the brain?* No.

The software determines the intelligence content of any computer and must, therefore, be associated with the mind in living computers, whereas the hardware of living computers is defined by the neural structure. Whether the mind and its associated software exists inside or outside the brain structure has already been discussed.[24] It is there concluded that the mind exists independently of the brain for these reasons: (1) The widespread view that the mind is wholly included within the brain structure is an assumption that thus far has no direct observational support. (2) A wholly self-programmed computer represents a closed information system which is consequently required by the Second Law of Thermodynamics to degenerate. (3) A wholly self-programmed computer has never been demonstrated. (4) The existence of a *primordial intelligence* within the microcosm in inherently capable of accounting for all psi phenomena. In addition, the ability to "see" in claimed reports of out-of-body and near-death experiences also requires a separate existence of the brain's software. "Seeing" the results of known computer operations, for example, is accomplished by the (human) software, not the computer hardware.

15. *Is a primordial intelligence pervading the vacuum compatible with physical theory?* Yes.

Information theory requires a correlation between energy and information. In physical terms, all energy is structured and all structures contain information. The existence of a vast unobservable sea of energy in the vacuum thus demands the corollary existence of a vast unobserved information source, and hence intelligence, within the microcosm.

The ubiquitous microscopic quantum of action h is known to have the same value throughout the universe. This is attributable to design rather than coincidence and, therefore, suggests h to be a product of a microscopic intelligence.[25] It may not be fortuitous that existence of a macroscopic quantum of action of living things[26, 27] is the only other type of action quantum known to exist in nature.

It has been further shown[27] that the observed mortality of all known macroscopic systems is demanded by the Second Law of Thermodynamics and that the only practical way to attain physical immortality is by application of repair. Repair is a product of intelligence. The apparent mortality of stable elementary particles and the present belief that they are systems of some kind independently requires existence of a primordial intelligence within the microcosm.[28]

In addition to the general support above by the basic tenets of physics, there is no explicit injunction against the existence of a

primordial intelligence within the microcosm. In physics, what is not strictly forbidden is deemed feasible.

16. *Is existence of a primordial intelligence essential to account for psi phenomena?* Yes.

If the signature of the electrical activity of a brain (region of matter) broadcast by the neutrino sea is detected by a remote brain, telepathy (clairvoyance) results. Since the signal is a modulation superimposed on the neutrino sea power flux, the inverse-square decrease in radiation intensity may be obviated by feedback within a receiver to provide signal reception independent of distance up to the maximum range defined by the sensitivity of the receiver. Such a process is equivalent to the essentially constant reception by radio receivers (equipped with automatic gain control) for distances within the maximum transmitter range; its applicability to ESP has already been noted by Hoffmann.[29] Analogous feedback control of ESP reception is provided by the reticular formation, as in Ehrenwald's theory. However, the maximum range of such a telepathic/clairvoyant mechanism is not clearly defined by available neutrino data, so that it must be provisionally regarded as a feasible, but distance-limited, mechanism.

If motor neurons are activated by the perturbations in the neutrino sea, a dowsing capability becomes explicable. If the energy associated with the transmitted perturbations acts directly on nearby matter, psychokinesis (PK) results. In this case it is the energy of the perturbation, not information per se, that produces the PK effect, so this type of PK is required to decrease rapidly with distance. Such a general relation has been reported in one type of poltergeist case,[30] but, unfortunately, estimates of energy transfer to facilitate comparison with theoretical predictions is not possible, since the weights of the moved objects were not given. Forwald[31] obtained energy estimates for dice moved by PK, but these were about an order of magnitude too high due to an incomplete dynamic analysis.[32]

Nevertheless, extension of such a neutrino-ESP mechanism to the more enigmatic forms of psi phenomena that have been reported, such as precognition, hauntings, map dowsing and the more sophisticated poltergeist cases, is not feasible. The basic problem, as expressed long ago by Richet,[33] is that psi phenomena "are marked off from the physical in that they seem due to an unknown intelligence, whether human or nonhuman." It is, consequently, not surprising that the existence of a primordial supereminent intelligence pervading the microcosm has been proposed as the essential ingredient necessary to account for all psi phenomena.[24] This derives from a "vehicle" model

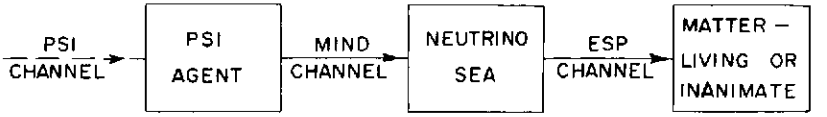

Figure 3. Three stage model of psi phenomena. The psi agent associated with a living thing couples to the neutrino sea via the mind channel and the neutrino sea couples to matter via the ESP channel. Information from external psi agents or sources may couple to the psi agent via the psi channel.

for nonphysical processes in which living things are modeled as systems comprising a physical body and an independent intelligent controller termed the "psi agent," analogous to the combination in our everyday world of a vehicle and driver. The psi agent, which includes the mind, must be regarded as an intelligent system of some kind existing in a microcosmic world in the hierarchy of matter beyond our present observational limits.

This results in a general three-stage model of the paranormal as shown in Fig. 3—a psi agent capable of coupling information and/or energy via the neutrino sea to living systems. The coupling between the psi agent and the neutrino sea is here termed the "mind channel." Although its mode of operation is beyond present observation it must be endowed with the property of an intelligent system to control its environment, such as neutrinos, analogous to the ability of man to control his macroscopic environment. For the primordial intelligence within the microcosm, this is allowed within the constraints of the uncertainty principle at the electromagnetic (elementary particle) hierarchical level. In terms of conventional physics, this may be viewed as a form of a virtual process; there is no violation of energy conservation.

The model in Fig. 3 may be applied in at least three ways:

(1) As a model of the living thing the psi agent is coupled to its associated body analogous to, say, a crew to its ship. The crew (ship) then corresponds to the psi agent (body), the mind channel corresponds to the human software control of the ship by the crew, and the ESP channel corresponds to control of the ship by its electromechanical hardware.

(2) As a model of the limited neutrino-ESP mechanism discussed above, the perturbations broadcast by the neutrino sea from an external source by-pass the body's own psi agent and affect the body directly. This is analogous to control of a space ship from Earth without the intervention of its astronaut crew.

(3) As a general model of psi phenomena in which an external psi source transmits information directly to a psi agent, via the "psi

channel" indicated in Fig. 3, which then couples this information directly via the mind channel to its associated body. This is analogous to the direct communication via radio by the crews of two vehicles, e.g., as in the space meeting accomplished by American and Russian astronauts.

The postulated psi channel between psi agents exists wholly within the primordial energy of the vacuum, so its mode of operation is not directly observable. Since it is not electromagnetic, it is not restricted to the velocity of light. Because it has intelligent properties it is not confined to a form of energy radiation, e.g., as is sound or light propagation. Using our common intelligence based society as a model, we can specify two types of information transfer systems uniquely suited for a psi channel in an energy-rich vacuum pervaded by a microcosmic intelligence.

One model is provided by the common transfer of information via the postal service and telephone. This model is independent of distance—the probability of any human directly contacting any other human anywhere on Earth by these means is independent of location. The existence of an analogous system by which any psi agent may communicate directly with any other, provides a primordial communication means independent of space. Hence an appropriate term for this form of psi channel is the psi "space channel." Since the probability of use of letters or telephone is higher between humans that have some common interest, use of the space channel may be presumed more probable for psi agents that are associated in some way. This is supported by the higher reported occurrence frequency of psi between associated individuals.

A second common source of information in human society is the printed record. By this means all of the conventional wisdom of society is available locally to any individual in libraries. When information on future plans and projections are included in addition to past chronology, this type of information source becomes relatively independent of time. Such a channel must be presumed for a primordial intelligence by which past events and future projections are available locally to all psi agents and hence may be termed the psi "time channel." Coupling of such information via the ESP channel to the biopsychological level provides a feasible model for retrocognition and precognition, as previously discussed.[24, 34]

17. *Can the existence of a primordial psi source and an associated psi channel be tested?* Yes.

Parapsychology deals first and foremost with thought information. Although such information cannot be weighed or otherwise measured as are physical objects, its existence and utility are nonetheless real.

Accordingly, thought information must be evaluated by methods that are suited to such nonphysical entities and, therefore, much different from those of the other sciences. The constant demand for "crucial" psi experiments that must mimic the repeatable measurements of physical objects is an unrealistic imposition that has hampered the development of parapsychology for over a century. Positive proof of the reality of paranormal sources of information may be alternately satisfied simply by a demonstration that information may be obtained when unavailable from any known normal source.

One such type of proof being studied concerns information obtained from out-of-body experiences. These are mostly confined to Earth-bound targets and hence are difficult to render foolproof. To unequivocally satisfy the preclusion of normal acquisition means, extraterrestrial targets are indicated. One class of these is available in astronomical objects within the solar system, wherein psychically derived information may be verifiable by satellites and/or theory. Another class is new information on very remote objects, as quasars, pulsars, and binary systems, that could not possibly be obtained normally in a single lifetime, but which may be amenable to astrophysical verification in various ways.

Another type of remote target is the very small. Besant and Leadbeater,[35] for example, reported results initiated in 1895 of psychic observations within the atom, elementary particles, and beyond. They predicted the existence of isotopes before their discovery and described a composite proton structure which markedly resembles the recent findings of high-energy physics. In particular, they depicted a basic helical structure of the electron which is generally confirmed by the phasor theory of electrons and neutrinos mentioned above.

Implied by the ability to obtain such types of information by psychic means unlimited by space or time is the capability of greatly extending the range of our instrumental capabilities. Although such information does not usually satisfy normal standards of scientific precision, its heuristic value may be inestimable. With experience, statistical and other means may evolve to better evaluate the relevance of such information.

The primary source of the ideas which are the font of man's progress represents another fertile field for investigation. Dreams represent one area in which the existence of telepathy, clairvoyance and precognition has long been recognized by parapsychologists. The history of science is replete with examples of new ideas originating in dreams, such as the process of making lead shot by James Watt;[36–38] discovery of the Bedheilac cave paintings by Joseph Mandemant;[39] an intricate

dissection of a fossil fish by Louis Agassiz;[33,40–42] translation of "Nebuchadnezzer" and the breaking of the Assyrian cuneiform code by Herman Hilprecht;[42–44] discovery of the benzene ring by August Kekulé;[37,45] discovery of the coordination theory of molecular structure by Alfred Werner;[46] discovery of nerve transmitters by Otto Loewi;[37,47] elucidation of atomic structure by Niels Bohr;[37] and invention of the sewing machine by Elias Howe.[37] To assume such previously unknown ideas derive from a brain state where conscious thought processes are suppressed is an unverified extrapolation from known brain research; an alternate source that must be admitted is an outside intelligence.

This is further supported by the appearance of new information in trance and hypnotic states and even in the normal waking state. The widely known use of psychics by police, the Edgar Cayce data, and the recent use of psychics to locate promising archeological sites attest a pervasive nonhuman information source. Reincarnation research and spirit communication are further sources of new potential information not normally obtainable, as on lost languages and customs and verifiable historical facts.

It may not be premature to venture that the present total record already overwhelmingly supports the existence of a primordial intelligence capable of coupling to animate and inanimate matter.

Conclusion

A road has been mapped by which a seminal comprehensive explanation of psi phenomena may be reached which is in general accord with physical theory. This road contains 17 forks. Choice of a direction has been determined by the above-chance probability afforded by experience. Although some of the paths between forks may portray rocky trails, the paramount consideration is that all are sufficiently passable to permit attainment of the destination. The total number of possible directions given by the 17 forks is $2^{17} = 131{,}072$. The actual road mapped represents the selection of just one of these.

No scientific theory answers all the questions we want answered. The value of any theory lies in the questions it *does* answer and in its heuristic value for new tests. It is, therefore, hoped that the theory herein will be useful in further exploring what is undoubtedly the most important unsolved problem in the world today—the nature of the mind of man.

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DISCUSSION

RUDOLPH: I must take exception to your statement that "An inviolate tenet of information theory is the association of an energy transfer with every information transfer." This is something that has crept into the literature of parapsychology and it's rather disturbing to me as an information theorist. Now when someone says "information theory," I'm assuming that they're referring to the mathematical theory of communication proposed by Claude Shannon of Bell Laboratories in the late 1940s, in which there is no discussion of energy. I would refer you to one of the best text books on information theory today, Robert Gallagher's, *Information Theory and Reliable Communication*, in which there is no discussion of energy, and also to Shannon's original paper. Information theory is a strictly mathematical theory based on probabilities.

RUDERFER: I think what we're talking about is a difference in semantics as to what we mean by information theory. Shannon's theory was the original spur for modern information theory, but it's gone much further. It's been extended by a number of authors and includes the actual communication process, which is a physical process. Also, we have the fact that when we're talking about communication, we're talking about a physical process and all communication that we are aware of takes place with a transfer of energy. What we are doing is selecting a "yes" answer to Question 1 for a very practical reason; that is, we are assuming that the present laws of science apply and are sticking to that for a very practical reason. We first have to explore what's nearest at hand. If we can't find an answer with that, then we have to look elsewhere.

MORRIS: You mention the fact that certain procedures eliminate "all but very low frequency electromagnetic radiation." And then you say, according to an estimation by Bibbero, you'd need to have a bandwidth capability of at least 10^{10} Hertz, I was wondering if you would comment further on why he estimated that. What was his line of reasoning?

RUDERFER: Bibbero presented that in a series of letters in the *Proceedings of IRE* between 1951 and 1953, discussing telepathic

communication, which unfortunately has been pretty well ignored by parapsychologists. What he stated there was that people, when they see a telepathic image, may very often see in three dimensions and in color. To reproduce such a picture requires a certain number of bits and that's where 10^{10} Hertz comes from. For a 2-D black and white picture, we have an estimate from a television channel of a few megacycles. This is the number that he has given on that basis. He again multiplied by 10^{10} to give each person in the universe his own channel, but this is a questionable added assumption. In any case, for spontaneous occurrences of ESP, some of which are very elaborate, you do require a high information rate and you can't get around that.

BYERS: I'd like to compliment you on that and the most appropriate comment I can think of to make is "Wow!" It seems to me, if I heard you right, we no longer separate man from his cosmic environment.

RUDERFER: I don't think I'm the first one to say that.

BYERS: No, but you're the first one I've heard to give such an elaborate and precise mode of explanation of how that might work. I felt, as you were talking, that the last point I made yesterday from my abstract is that further research will require the recognition of some, perhaps, infinite regressive invisible information bearing contexts. It seems to me that's what you have outlined. Do you agree?

RUDERFER: Yes. I was disturbed by your use of *extrasensory*, but it's a matter of semantics. Extrasensory, as used now, is extra because right now we can't see how it can occur, but if some means is eventually found, which is quite possible due to our developing technology, at that time it would become sensory, so that's the difference. It's a matter of semantics there.

STORM: If information exchange requires expenditure of energy, that means in principle there are going to be unbounded amounts of energy needed for information exchange.

RUDERFER: That's right, because the energy of the universe is infinite.

STORM: Does everyone agree to that? I didn't realize it.

RUDERFER: Well, the observable energy is finite. I don't know if every physicist will agree that it is or is not and I don't think if you take a vote you can decide the issue on that. But most physicists will agree, for example, with Dirac's infinite energy sea of electrons, so there is a basis right there in physics for an infinite energy. It's just that the energy is

not observable. Another thing, energy is a scaler. It has no absolute zero and no absolute maximum. We set the zero energy arbitrarily by fiat, and in physics today they set the zero energy as the energy of the vacuum where there is no observable energy. But if an unobservable energy does exist in the vacuum, it becomes "negative energy," because it's below zero, and that's the only difference. It's just that it's not observable at this time. Then, of course, there's also the Wheeler-Planck density, which is a tremendous density. It's not observable, and, therefore, it doesn't affect the processes that occur in our world as far as we can presently ascertain. It's just a constant amount of energy that underlies the observable energy of our world.

STORM: What specific aspect of the description you just laid out would you identify with my personal conscious experience?

RUDERFER: Well, I use Walker's approach, which is that consciousness is a simultaneous state of a finite number of synapses, a large number of synapses. They are all firing together and they innervate the neurons for a whole tenth of a second so Walker identifies that with a conscious state, and you can't have any other activity for that activated set until the next tenth of a second. And that's what he calls a conscious state. I guess it's a matter of semantics again if you want to call it consciousness or not, but it's a state of the brain that occurs with this type of mechanism, so it's nautral for him to identify it with a physical state, an actual state.

NASH: Is the neutrino sea unobservable because neutrinos and antineutrinos are in balance, and why don't they annihilate each other?

RUDERFER: Well, I'll take the last part first. Neutrinos are left-handed and they're like a left-handed screw and they advance left-handed through the universe. Anti-neutrinos are right-handed, so they don't match, and they can't annihilate. The physicist will say that free neutrinos and antineutrinos do not interact with each other. Now, the first part of your question—is it completely unobservable? No. There is a portion which is observable, which is the high energy portion. This occurs when a neutrino may hit, let's say, a chlorine atom and convert it to argon, which is what is being used in the Davis experiment to detect solar neutrinos. They do detect them, and the anti-neutrino from nuclear reactors was detected in 1956, by Reines and Cowan. So they are detectable when above a certain energy. Now, below that energy we have no means right now of detecting them, but, from the theory, most of the neutrinos are below that energy, so there's a tremendous volume of low energy neutrinos floating around which we can't detect, but they're there.

IRWIN: You describe clairvoyance as "the electrical activity of the region of matter broadcast by the neutrino sea and detected by a remote brain." What is the nature of this electrical activity and how does it encode information such as shape, color, intensity, etc.?

RUDERFER: The neutrinos, as they go through matter, will occasionally interact with an electron or electrons, the electrons that are in a transition of some kind that can disturb the isotropy. It's the resulting anisotropy that's detectable. An isotropic field is not, so as the electrons in a piece of matter vary in their motion, in acceleration, they will induce perturbations which are detectable. Now, to the extent that we can recognize this signature and identify it with some physical object is how we can say what it is. It's very analogous to, say, sound when we hear certain sounds; we know what they mean because of our past learning, so if the brain can detect these perturbations and identify them with some physical objects, that would be the way in which we would be able to use that information. It's a learning process, the same as for the other senses.

IRWIN: Is there any evidence for example, that the electrical activity associated with a square in the ESP cards is different from the electrical activity associated with a circle?

RUDERFER: Well, that's in the processing portion of the brain, and that comes under the heading of Ehrenwald's theory. I am dealing only basically with the input of Ehrenwald's theory, which is the energy channel required. Let me give you a very simple analogy to the whole thing. The whole theory can be described as a telephone conversation. If you're at the receiver end, the noise made by the receiver sound is transferred by your brain into neuron activity which you understand, and that's the portion that Ehrenwald would practically cover in all psi experiments thus far. The sound is created by a physical mechanism—the telephone wire, receiver and transmitter and the neutrino sea would correspond to that. It's just a transmission mechanism. The telephone wires and circuitry do not originate the message. To originate the message you have to have another person or source of information at the other end, and that's the third part of the model which is a psi source and which I call a psi agent. It's a source of psi information, and it's an intelligent source in general. So what you have is a psi source conversing with another psi source or psi agent through the communication medium afforded by neutrinos. It's analogous to a telephone conversation.

MORRIS: I was just wondering about the kinds of predictions you might make to test your theory, especially what kinds of circumstances would be likely to enhance the psi effect?

RUDERFER: I did have two in the report and one is strictly a physical experiment which would be very useful, because it would tell us definitely that we do have a cerebral information-transferring medium. Now, the second one was identifying information that was or is not obtainable elsewhere and this is something that parapsychologists have been trying to do for a long time. Maybe not explicitly for that reason, but that is a basic goal of parapsychology, to identify new information that came from paranormal sources, and if that can be unambiguously demonstrated, then you have proof of psi phenomena. And my personal opinion is that if you take all the experiments and observations of all types and put them together, you find that it's overwhelmingly in favor of the existence of psi phenomena statistically. But we're always looking for the definitive experiment and there you have to get targets that are foolproof. In this respect, parapsychologists haven't gone very far in dealing with the normal, such as out-of-body experiences, which are not really foolproof. I think that there are new sources of information that are foolproof. There is new information that we never knew before and that includes inventions and scientific ideas. This is really an area which demands to be exploited by parapsychologists. Just to investigate the history of where ideas come from would be very relevant. Unfortunately, scientists and the history books don't record that. It is the most interesting aspect, because it's the source of where the ideas come from, and if we're talking about ideas, we're talking about the mind. So, how this kind of new information arises is an excellent area for parapsychologists to investigate.

MORRIS: What would you do next, though? I mean, given the two examples you have there, how would you follow up to really try to assess the very specific ideas you put forth here? Would you have any predictions about factors that would increase or decrease psi success?

RUDERFER: I wouldn't be able to go into it right now because of time, for one thing. But, secondly, it is often difficult for a theorist to do this, because it is the experimentalist who knows what tools he has available; and if he understands the theory he can fit his tools into the theory and find out how he can best verify it. If I were to tell you what to do, I would be designating certain kinds of tools and apparatus you might

not have, and you could discount the whole thing. But, in general, the theory does lead to certain things. For example, this neutrino sea is being perturbed in the vicinity of the body and it's streaming out all the time, so you have a direct possible connection with the aura. We have healing phenomena, where between the hands there is some kind of flow of energy. Could it be a neutrino form of energy? What is the effect of different frequencies of neutrinos on the human body? We don't have a way of detecting low energy neutrinos, but, if we did, then we could directly induce that kind of effects. Potentially, there is a vast area for communications and new energy sources in the neutrino sea if we could ever find a way of utilizing it.

ULLMAN: Of course, many creative scientists pay tribute to intuition as the source of some of their novel ways of looking at the world, and Einstein was perhaps a good example. But are you implying, when a shockingly new insight comes into being, that it's coming from some external source rather than as I've always looked at it, as being in the nature of genius or the nature of creativity to take a look at something that's there for everyone to see, but to see it differently because it's being looked at in a new way, i.e., old facts being rearranged in such a way as to give a different result?

RUDERFER: My view is that intelligence is controlled by the neural system, but creativity is controlled by the external source.

ULLMAN: An external source outside the individual, independent of his personality?

RUDERFER: When you talk about an individual, you're not talking about a physical body, you're talking about a combination of a body and a controller. When you talk about a parked car, you're talking about a physical object. If you're talking about a car moving along the street, you're not talking about a physical thing, you're talking about a combination of a physical thing and an intelligent controller. That moving car has a driver in it, always. When you're talking about an individual, you're talking about a body, but also you're talking about a mind. It appears to me that there's no way that the mind could be just part of the brain itself, a biological thing. It's more than that.

So if there is a controller, an intelligence source, then that is the source of ideas. I don't know what you mean by intuition. I don't think any scientist can define intuition very reliably, but it does show, from some of the history of science, that some of these ideas must come from the outside. At least, you have to entertain that possibility, and that possibility has been pretty well ignored up to now. Now, I guess mainly

it's the arrogance of man; he thinks he himself is the king and that *he* gets the ideas and hence infers that they originate in him. Usually, when people come up against this idea that maybe their ideas come from outside themselves, it shocks them at first. But that doesn't mean it's correct or incorrect. The proper way to find out is scientifically, which is by testing, and what you have to do is, first of all, acknowledge what are the various possibilities. And then test for them. And one possibility is that the brain is the origin for all ideas and the other is that it's not. And you have to first list these without prejudice and then proceed to test them. But this is not done now. One is preferred over the other, unknowingly.