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Telepathy as a Process Mediated by Quantum Teleportation Between Remote Neurons

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Abstract: This paper explores the possibility that the quantum state of a given neuron may be teleported to the neuron of a remote brain, thereby initiating normal cognitive activity in that brain and comprising a process known as telepathy, the understanding of which may also help to explain the processing of ordinary sensory stimuli. An attempt is made to relate various aspects of the proposed process to some characteristics of telepathy, such as the apparent ability to transfer information devoid of any discernable movement of mass and/or energy; relating quantum entanglement to the biological similarity of twins and others; and how the introduction of information to neurons ultimately yields cognition within a frame of reference unique to the individual, as reported in cited instances of telepathy.

Keywords: telepathy, quantum teleportation, biological teleportation, neural code, neuronal communication, synchronous firing, psi, phantom limb pain.

INTRODUCTION

“I am not in the least surprised about the mental telepathy; there is much in it and in kindred things which are real and which at present we do not understand.” So wrote American President Theodore Roosevelt (1906 p. 166) in a letter from the White House to his daughter Ethel. A century later, the search for an explanation of telepathy, the apparent transfer of thought from one person to another, devoid of any sensory-based exchange, continues. J. B. Rhine (1937), the pioneer scientist who introduced the phrase “extra-sensory perception” into English, lamented the limitations of science in his day, which failed to adequately account for the phenomena he studied, including telepathy. He did, however, hold the hope that in the future, discoveries would be made to clarify the physical aspects of thought, which would, in turn, shed light on telepathy. Indeed, great strides have been made since then. For example, machines unknown during the time of

Rhine's research, now record brain activity remotely, detecting subtle changes without employing electrodes, implants, or any other invasive apparatus (Harland et al., 2002). The nature of the brain emission measured by this equipment may or may not be that which is responsible for telepathy but, if adequately replicated, a cogent argue can be made that receipt of information emanating from the brain need not require physical contact. Our understanding of how telepathy works may benefit from breakthrough discoveries and theoretical work performed in the cognitive and physical sciences as Rhine had hoped, and is the focus of this discussion. Herein, a theory of telepathy is proposed, beginning with the transfer of information between remote neurons by quantum teleportation and leading to ordinary brain activity, usually described in the context of a sensory-based experience.

SYNCHRONOUS NEURONAL ACTIVITY

How activity in remote areas of the brain is gathered together and transformed into cognition is a central question in the study of neuroscience, giving rise to a wealth of research and theory on what has been called the binding problem. Individual neurons seem to show participation by means of their action potential, also called firing, a term used to describe the release of a measurable electrical charge. In any brain activity such as new learning or memory recall, a large number of neurons across various contiguous and non-contiguous brain regions may fire during a given event. When excited by a stimulus such as information collected by the senses or information presented internally, the neurons associated with specific aspects of that stimulus will fire, no matter where they are located in the brain. They have been shown to fire in a rhythm and in concert with other firing neurons, specific to the event (Finkel et al., 1998). This relatedness is known as synchronized firing. The repeatable pattern of participant neurons and their firing behavior forms what has been termed a synfire chain (Abeles, 1991).

Singer (1999) provided a view of synchronization as a mechanism for binding together what would otherwise be scattered bits of information and posited that such synchronous discharges are related to elaborate neuronal networks. He (Singer, 2003) later reported that discoveries have shown how cortical neurons engage in synchronous oscillatory activity caused by internal interactions and that neurons within and across cortical areas can synchronize their discharges with a precision in the millisecond range. Synchronization thus helps to explain not only the binding of information from remote areas of the brain but also that it forms a cognitive experience for the individual. Bits of information from various regions of the brain are bound together and make it possible for the person to form a cognition related to an experience. This also implies the transfer of specific information between neurons across the brain. According to Sougné (2004), "To achieve binding it is necessary for neurons to communicate with each other because it has been shown that different aspects of a perceived object are not processed in the same cortical areas." Neurons of one cortical area must communicate with other neurons of a different cortical area.

During a given experience, waves of synfire activity are measurable in a laboratory setting. When the repetition of a specific stimulus or behavioral task is presented to the subject, the associated synfire chain will again engage, each appropriate neuron offering its bit of information to the overall functioning of the brain (Baker, 2003). Since the firing neurons need not be arrayed contiguously to act repeatedly in synchrony, the communication occurs via a signal emitted from one or more neurons that triggers a reaction by other neurons. This stimulates their participatory firing and, in turn, causes other needed neurons to fire. It has been postulated that this signal actually consists of a code comprised of the timing, rhythm, and frequency of the firing (Finkle et al., 1998). This firing code is familiar to and hence recognized by other neurons as one which requires their participation. When reacting to external sensory stimuli, according to Jefferys et al. (1996), "individual neurons do not detect their preferred sensory feature in isolation, but form part of neuronal networks whose emergent properties define the feature-detection properties of the cortical column" (p. 202).

Jefferys (2004) further describes the "coherent rhythms" formed by neuronal firing in this way: "One idea is that they provide a timing reference for a neural code that depends on the phase relationship of individual neurons with the reference oscillation." Singer (1999) found that neuronal networks encode information by modulating both the rate and temporal coordination of distributed responses. Steinmetz (2000) tells us that, "A near axiom in neuroscience is the idea that information is conveyed over distances, both in the peripheral and central nervous systems, by the times of occurrence of action potentials." A code is formed which becomes useful to other, similar neurons, but only if the code is presented to a neuron capable of recognizing it. Then that neuron joins in the orchestrated firing of other neurons, becoming part of an induced synfire chain. Thus we may conclude that neurons across the brain share precisely coded information with other, targeted or "interested" neurons, and in doing so elicit responsive activity. That activity may involve what Lin et al. (2006) describes as assemblies of neurons organized into memory coding units called neural cliques. When activated, the neural clique actually recreates an inner version of information previously coded, offering the individual a particular frame of reference for the current experience, as opposed to searching for an exact recording of prior events. If synchronous neural activity occurring in the code-producing brain yields a cognition for person A, then it seems likely do so in the code receiving brain for person B also (Ward, 2003). The second set of reactive neurons would necessarily possess sufficient signal recognition capabilities; close enough to the original to cause native synchronous neuronal assemblies to engage.

In this context, the mechanism of telepathy may involve the neuronal signal stimulating not only a neural clique of the native brain, but that of a remote brain as well; a brain whose organization is similar enough to the original for the information code to trigger cognitive activity. However, though they may be similar, the manifested cognition in both brains may not be identical, or even readily recognizable to the observer, due to differences in the subsequent recreations provided by the neural cliques of the two brains. This would mean that there is a considerable opportunity for distortion in the outcome of telepathy as the information is processed in the brain's peculiar frame of reference, a notion which will also be discussed elsewhere in this paper. Wackermann (2004) describes brains as having continuously varying functional states. The disposition of both the sending and the receiving brains at the moment of code sending and arrival are also possible factors in the outcome. In an experimental observation of brain activity, Kittenis et al. (2004) showed that when a sensory stimulation (light) produced a measurable EEG response in a sending brain, a measurable, but different EEG was also produced in a remote receiving brain. Though extremely close, the timing (both the start and duration) of the remote activity did not correlate exactly with the timing of the stimulation. Due to this difference between the EEG measurements, Kittenis was reluctant to label the remote activity as an ordinary stimulus-response effect. This difference is to be expected, if the stimulated brain actually sent its coded response to the stimulus and not a replication of the stimulus itself. The remote brain interpreted the coded information independently, thus producing a measurable but different EEG. The remote brain activity in the experiment was related to the receipt of information and not to sensory stimulation. It would seem that the introduction of foreign code will likely have an influence, but the strength and fidelity of that influence compared to the original experience is highly variable.

Quantum Teleportation

While this has been a discussion regarding the firing of neurons, it is important to note that although electrical discharge is produced as neurons fire, the conveyance of the information-bearing code should not be assumed to travel as electricity *per se*. Indeed, a lighthouse signals to passing ships not by electricity but by the light the electricity helps to produce. The ship's pilot, who presumably understands the meaning of the signal code, captures and perceives the light, not electrical current, developing a cognition as a result of the signalled communication. Therefore, the medium by which the neuronal signal is presented may not follow the mechanics which are believed to govern electricity. What is postulated here is not that electricity travels between brains, but that neuronal information the currency of telepathy, is transferred. It is true that research, such as that by Wackermann et al. (2003), has examined the correlation of separated individuals by recording the electrical activity in their brains. The data does show the positive correlation that one might expect in telepathy. However, no electrical activity specifically entering the brain from the outside has been mentioned, which would be necessary if the code were an electrical charge traveling between systems. Still, it is not the action potentials of the neurons that must reach the neurons of the remote brain, it is the information encoded on the neurons that produced the action potentials (as recorded by Wackermann et al.) that needs to find its way to the receiving neurons. Once the code is in place, the receiving neurons produce their own electrical discharge, as also recorded by Wackermann et al. The code seems not to travel and yet reaches a destination. Therefore, it becomes a question of how incorporeal information from one object can be placed into another object in a remote location.

The solution to this paradox may be found in recent experiments in the field of quantum physics. Placement of the code could be the product of quantum teleportation, proposed by Bennett et al. (1993), and first demonstrated in 1998 in the laboratory of the California Institute of Technology (Furusawa, 1998). While the role of quantum theory to explain the physical underpinnings of telepathy has been discussed in other literature, most notably in the work of Shan (2004), this specific action of nonlocality, satisfying so many of the necessary variables outlined in this paper, has actually been produced and replicated in the laboratory.

Quantum teleportation does not involve the movement of a material object, such as a monkey or a boulder that disappears from one location and reappears suddenly in another, as the term teleport, used copiously in science fiction, would imply. What has actually been shown is the teleportation of information, the measurable attributes of a coherent quantum system, not the receptacle of the attributes. This information refers to the quantum state (Bennet, 1993) of the system: "Teleportation of a quantum state encompasses the complete transfer of information from one particle to another" (Riebe, 2004 p. 734). Specifically, the quantum state of one quantum system is teleported to a remote system, thereby altering the quantum state of the receiving system to include the teleported information. However, to accomplish the teleportation of the quantum state in the laboratory has first required the preparation of both the sending and receiving systems inducing a quantum entanglement of the systems. They are made to share a small amount of information directly from one object to another, and both systems receive half of an entangled EPR beam of light (named for the Einstein/Podolsky/Rosen paper questioning quantum physics because it implied the nonlocal entangling of spatially separated systems). The beams have the effect of entangling the two previously unrelated quantum systems, forging a relationship between them. When a final procedure of measurement is performed on the sending system, the quantum state is instantly teleported to the receiving system. Though the experiment took place in a laboratory in which the systems were separate but not very far apart, theoretically, they could have been separated over a great distance (Furusawa, 1998).

Apparently, teleportation demonstrated *in vitro*, is accomplished under carefully controlled conditions. However, in the case of telepathy, we are considering the possibility of *in vivo*, biological teleportation. The question arises, could a naturally occurring biological structure, such as a neuron, be seen as a coherent quantum system and, if so, is that system capable of achieving entanglement with another system under *in vivo* conditions? Perhaps the answers are found in the role played by microtubules (Hameroff 1998; Mavromatos 2000; 2002), which are proteins present in the cell cytoskeleton of the brain's neurons. The microtubules are seen as quantum mechanically isolated cavities and are noted by Mavromatos as showing properties analogous to the cavities used in quantum optics laboratory experiments. If we accept that characterization, then neuronal microtubules may be capable of entanglement and quantum teleportation.

To further support the notion of *in vivo* biological teleportation, Mavromatos calls on the work of Julsgaard et al. (2001), who experimentally showed that it is possible to maintain entanglement of a large number of atoms, at room temperature. Such a demonstration indicates the possibility of *in vivo* quantum teleportation and the proposition that entangled microtubules may be able to act as mediators for the quantum teleportation of states between neurons. Mavromatos (2002) defines such an instance of biological teleportation as a transfer of the microtubule's coherent state without any direct transfer of mass or energy. The result is that the receiving microtubule possesses an identical state to the sending microtubule. Georgiev (2003), in his work regarding the place in which photons collapse during vision processing, offers further theoretical credence to this scenario, postulating that information in the retina is pre-coded into protein quantum states and then teleported to the neurons in associative areas to eventually become part of a conscious experience. If Georgiev is correct, neuronal teleportation triggers the mental processing that would need to take place for a telepathy experience to ultimately be reported. Though, in these references, entanglement and teleportation has been confined to neurons involved in intrabrain activity, the feasibility of biological teleportation in general and neuronal teleportation in particular, advances the possibility of interbrain neuronal activity.

In the telepathy process, we may view the laboratory entanglement of the systems which precede teleportation as creating the relationship; perhaps a condition analogous to the affinity existing between certain neurons of people predisposed to produce telepathic experiences with each other. Indeed, it bodes well for the notion that twin to twin, mother to child, and other genetically similar people sharing neuronal properties, or even emotionally allied people sharing like neuronal arrays, already are entangled and “prepared” for the teleportation of their neuronal quantum states. Let us then postulate that the neuronal code so vital to intrabrain processing is part of the quantum state of the neuron. It is, therefore, reasonable to consider that under the right conditions the code (quantum state) of one system can be teleported to a similar yet remote system, also a repository of code. The sending and receiving neurons are information-carriers. Thus, quantum teleportation may provide the mechanism for telepathy, unbound by the usual constraints of moving mass and energy in a conventional physical channel.

ENTANGLEMENT

In Broughton’s (1988) presidential address to the Parapsychological Association, he pondered a basic assumption found in much of psi research, namely, that psi is a human ability; psi being a broad term including, but not limited to telepathy and defined by Wilson et al. (2004) as interaction through means other than the usual sensorimotor systems. Ability, Broughton reasoned, must have a purpose, which may yield clues as to how it works and is, therefore, worthy of investigation. In this context, Broughton referred to Eisenbud’s (1956, cited in Broughton, 1988) concept of psi as serving the goals of survival or psychological need. He also mentioned Stanford (1974a,b, cited in Broughton, 1988), who speculated that while psi is commonplace, the person may be unaware that its influence has been exerted in the accomplishment of a goal. However, Broughton also cited Braude (1986, cited in Broughton, 1988), who cautioned that seeing psi as an ability implies conscious control whereas psi may be more of an involuntary function like digestion. Yet, the two competing ideas of control and function may not necessarily be mutually exclusive. Psi may have once served a vital purpose that placed it at the forefront of satisfying basic needs, but was evolutionarily supplanted by something else, which made survival of the species even more successful. It may have been a consciously controlled ability at one time, now relegated to a different, less conscious status, and making conscious control in modern instances appear more exceptional though still possible. Perhaps modern telepathy is the vestigial remnant of an ancient, purposeful ability, supplanted but not eliminated, and still wielding an influence, though largely out of conscious awareness.[1]

Though telepathic communication may have at one time been an asset, it is possible that, during the course of evolution, personal and/or group survival may have actually depended on the ability to hide brain-stored information from competing individuals and/or groups. Thus, natural selection may have favoured less telepathic people. Playfair (2002) relates the story of a particular set of twins who, throughout their lives had numerous spontaneous telepathic communications between them. Yet, on the momentous occasion of one twin's presumed suicide, the surviving twin failed to experience any telepathy. Since they often shared somatic reactions, this would suggest that blocking a particular telepathy might have been a matter of survival because the receipt of suicidal thinking could have triggered similarly lethal action in the mentally healthy twin. A personality trait, valuing survival, seems responsible for placing controls on the completion of telepathy.

Further discouraging selection for telepathy in human evolution is its likely competition with articulate speech, an arguably more precise form of communication than telepathy. As speech and language developed, telepathy would become less necessary, even less desirable as a means of conveying one's thoughts. More precision, as well as choice, in communication undoubtedly leads to greater survivability and propagation. If telepathy did have its beginnings in group survival, a presumed purpose of any communication, it is likely that genetically similar people, such as members of immediate or extended families, were most proficient in its use with one another. Survival of the family unit and its members would be the obvious benefit.

There is a body of anecdotal and experimental evidence to suggest that spontaneous instances of telepathy occur more often between twins, siblings, parents and children, or amongst other relationships than with unrelated people. It is common for twins to report identical emotions, pain, and even somatic changes, though they may be remotely located from one another (Playfair, 2002), and most often in catastrophic situations such as illness, death, and accident. Ullman, Krippner, with Vaughan (1973)

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[1] Note that these ideas are not new—Freud (1933) also believed that telepathy might be an atavistic attribute in human beings, harking back to an early period in human development.

corroborates this, pointing out that most recorded dream telepathy occurs between close relatives. The notion that genetic similarity corresponds to reported spontaneous telepathy leads to the possibility that the attributes of the organic material of the human body is in some way necessary for telepathy to occur. It is logical, therefore, to look to the primary organ of thought, the brain, for an explanation.

The quantum entanglement of two whole brains has been considered by Shan (2004) in a proposed experiment meant to artificially induce telepathy between subjects. In Shan's design, the entire brain is seen as the quantum system and it is the quantum state of the entire brain that would be sent. In actual reports of telepathy, however, descriptions of the telepathy experience seem confined to a particular feeling, or a visual impression, or even a certain storyline, as in a dream. This may indicate that an instance of telepathy involves a particular set of neurons, not the totality of a personality together with all memory and experience as might be expected if every neuron in the entire brain were involved. Even if we took the quantum state of the brain to mean the momentary focus of attention, this would still argue for neuronally mediated telepathy and not of the whole brain because only the neurons participating in the momentary focus would be involved. Therefore, we must consider the information in the code of individual neurons to be the operative quantum state, teleported from a local neuron to a remote counterpart neuron. The individual neurons or perhaps specific neuronal cliques, on either side of the transaction would need to be entangled as well as serving similar functions within their respective brains in order to offer up the teleported information for a somewhat reconstructed mental process and hence producing a chance for a meaningful cognition, recognizable as related to the original cognition. The entanglement and other preparation which makes laboratory orchestrated quantum teleportation possible may actually be a perfectly natural, everyday process.[2]

DISTORTION IN TELEPATHY

The neuronal view of telepathy not only helps to explain its mechanics, but also its imperfection as a method of communication. Finkle

[2] During the preparation of this paper, an anonymous reviewer commented, "Normal communication across neurons in the brain may take place by a mechanism akin to apprehension of information or events that we see in extrasensory perception . . . this may not be the only mechanism of such information transfer but . . . this is suggestive."

et al. (1998) relates a perceptual experiment devised by Johansson and colleagues at Uppsala University:

> Johansson attached small lights to a subject's joints (elbow, knee, etc.) and viewed the resulting point motions as the subject walked or ran in a dark room. Johansson found that, despite the sparse information provided, it was possible to recognize a human body walking or running, and, in fact, all observers immediately perceived the moving dots as a moving human form. (p. 3).

The correct recognition of just what the lights depicted was largely dependent on previously encoded information (knowledge of what a moving human being looks like) already present in the brain, providing a contextual meaning to the disembodied lights. If we take the lights as a metaphor for the information passed in the quantum teleportation of neuronal code, we can see that it is up to the receiving brain to derive meaning from the teleported code.

Much of the data about telepathy is based on the verbal responses or self reporting of the experimental and anecdotal participants. This information is used to discern the success or failure of the telepathy. However, telepathy seems to obey a variety of normal constraints of personality such as confidence, stress, fatigue, the effects of drugs, etc. (Rhine, 1937). Therefore, constraints which govern more ordinary means of communication should likewise be applied to telepathy. In everyday intercourse verbal miscommunications are prevalent. Conversations often consist of repetition, corrections, qualifications, and other explanations of the intended original message. There is no such opportunity in telepathy. Further, the work of the code-producing brain is imperfect in that the bound neurons undoubtedly approximate the original experience and fill in the rest with related assumptions from prior learning. This may be one reason why human recall represents such an individual version of the experience, differing from the perception of other persons present during the same experience. Thus, the very information to be mediated, the neuronal quantum state, is likely to arrive in a degraded form as compared to the original experience that fostered it.

The accuracy of the teleportation, too, presents the possibility of further degradation inasmuch as the resonating synfire patterns will almost certainly be different to some degree from person to person. Radin (2000) has shown that individuals possess brain signatures that identify them as unique compared to others. This uniqueness is also reflected in the excitation of pertinent neural clique assemblies, a product of experience. The search for meaning of the received code as it is processed, what we might call the conceptual binding, will be molded by the frame of reference of the recipient, who appears to "translate" the retrieved information. Evidently, there are a great many obstacles to overcome before the complete success of a telepathy instance is declared. Even when genuine, *in vivo* telepathy has occurred, it may actually elude recognition and the cognition attributed to something else.

A formidable example of this distortion principal is recorded in the work of Upton and Mary Sinclair (1930). In their experiments, Mrs. Sinclair would attempt to telepathically perceive drawings made remotely by Mr. Sinclair and others. A book showing many of the drawings, both original and received, displays her remarkable ability. However, Mrs. Sinclair would often reproduce the drawings of the senders containing strikingly similar lines and shapes but with changed meaning, according to her own background. Conversely, she also was able to show a substantial portion of the original meaning in some of the drawings, yet distort the lines and shapes. In both instances, the drawings are undeniably recognizable as having originated remotely when compared with the originals.

Dreams show a similar process of formation, beginning with bits of information and resulting in personally referenced cognition. The absence of complex segmentation activity as in sleep or trance may provide a greater opportunity for neurons to be receptive to remote signals. Indeed, if neuronal activity is not occupied with the huge volume of sensory input characteristic of the awake state, it stands to reason that sleep makes more brain resources available to attune to distant neuronal signals. Storm's (2006) review of the dream-psi literature suggests that the sleep state provides conditions favorable for detecting psi and points out that a reduction of sensory noise during sleep is a factor in this. This finding seems to support the notion that telepathy involves those structures and activities of the brain closely associated with processing sensory information, such as the neurons, even though the input is not from a sensory source. When occupied with the immediacy of waking state necessities demanding attention, the psi signal is perhaps placed in the focal background, last in line to be addressed. The dream state, putting those sensory needs on hold, may allow the signal more ample access to brain functioning. Storm's (2006) meta-analysis examined the statistical results of various psi experiments. Illustrating the possibly superior outcome of dream psi compared to waking psi, the collected dream psi studies (telepathy and clairvoyance combined), produced a mean z score of 1.08, while the waking psi studies of general ESP and remote viewing had a z score of .68, and waking clairvoyance a z score of .60. These scores also tend to support Freud's (1922) earlier, anecdotal observations, from which he concluded that it is an ". . . incontestable fact that sleep creates favorable conditions for telepathy" (p. 86).

Some years later, Freud (1933) again spoke of the telepathic messages contained in some dreams, as actually being hidden from first view, but subsequently understood through psychoanalysis. Once the dream work had been analyzed and the meaning of the dream was brought to light, the dream's telepathic origins were revealed. To illustrate, Freud offered several examples from his own psychoanalytic practice. Each is an illustration of how the telepathically received material not only translated into the person's frame of reference, but interacted with and incorporated into the person's innermost thinking, all outside of the awareness of the unwitting participant. Only upon analysis was the person made aware of the telepathic nature of the dream. We may surmise, therefore, that telepathy could occur on a completely nonconscious level, perhaps, but not necessarily because it was received during the dream state. It should be noted that elsewhere, Freud (1900/1965) states that the formation of dreams may begin during the awake state, even long before the actual dream is manifested. Pederson-Craig (1947), the prominent psychoanalyst, found that some of the dreams of her patients included accurate depictions of recent events in her personal life. The events were never described to the patients. She was, therefore, convinced that the information had been conveyed between analyst and patient telepathically, ultimately affecting the patients' dreams.

Spontaneous telepathy seems most successful when there is an element of emotional intensity in the information. Early records of telepathic dreams reveal that the vast majority dealt with extremely emotional topics such as death, illness, or an emergency situation (Ullman et al., 1973). It may be easier for a telepathy percipient to bind coherently a strong emotion than to process an exact set of personally meaningless data with precision. Dalkvist and Westerlund (1998) obtained good results in an experiment that elicited the telepathic communication of emotions between subjects. The overall impression of the emotion resides, perhaps, in a more primitive, more universal realm of brain function, closer to an earlier stage of evolution. Neural cliques associated with common human emotional experiences may develop similarly across cultures as a normal part of human personality development. The neurons involved may be more universally placed and of a higher sensitivity to the telepathic process because of survival considerations. The relative universality of emotionally linked neuronal activity probably is likely to be a more successful topic for telepathy than topics with little or no meaning or extremely specific to experience and culture.

It is also reasonable to conclude that receipt of remotely originating neuronal code may often be hidden from the person's awareness in much the same way that other types of brain activity fail to fully reach consciousness. Playfair (2002) reports having designed an experiment in which a pair of adult twins was separated, out of sight and out of earshot. One was exposed to a shocking surprise in the form of a loud, colourful explosion, while the remote twin was monitored for galvanic skin response, brain wave, and heart rate. When questioned, the remote twin calmly answered that she thought her sister may have been somewhat anxious. However, the measurements taken at the moment of the explosion showed an extreme nervous reaction. The brain activity of the remote twin barely made it to her awareness and only under direct questioning. This illustrates the possibility of nonconscious neuronal firing due to remote signalling. Indeed, there is a common reference in the neuroscience literature to so-called random, unexplained neuronal firing in the context of what has been termed a generally "noisy" neural system. It may be that remote neuronal code is received on a fairly constant basis, most of it incapable of inspiring a meaningful synfire reaction, thus never having the opportunity to make its way to awareness.

CONCLUSION

The theory presented is an attempt to synthesize the remarkable work of scientists the world over, to whom this author is exceeding grateful. To summarize the model, the following thread is proposed that:

1. telepathy is brain centered;
2. information is passed between neurons via a code;
3. cognition is the result of synchronous neuronal activity;
4. the quantum state of a neuron contains the information code;
5. a biological quantum state may be teleported;
6. the information code of a neuron may be teleported to a neuron of a remote brain;
7. remote neuronal quantum teleportation and the resulting neural processing is known as telepathy.

As with any fledgling theory, initial research may seek to either prove or disprove its validity. It would be helpful if future experiments observing instances of telepathy, such as those concerned with electrical activity in the brain (Wackermann et al., 2003; Kittenis et al., 2004) perhaps can include a method of also ascertaining the quantum states of participating neurons at various stages of the experiment. Perfecting such a method for gathering that information may be the first order of business. In a two-brain experiment, for example, this would present the opportunity to compare the electrical data with the quantum data from neurons in a single brain, and then compare the same data to the data of neurons in the other brain. The resulting correlations could yield an indication of the theory's validity because evidence of neural code teleportation would show the occurrence of telepathy, more clearly than relying on the report of the percipient. Another test of validity is to measure the natural entanglement of the neurons of experimental subjects, using it as a predictor for the degree of telepathic success.

With the notable exception of the brain electricity studies many, perhaps most telepathy experiments have measured success and failure on the basis of exact or nearly exact content replication from agent to percipient. If the neuronal theory of telepathy is accurate, this type of experiment would probably yield a fairly unreliable assessment of whether telepathic communication has actually occurred. The excitation of receiving neurons would necessarily call up information previously encoded, dependent on the personal experience and other factors influencing learning. In fact, for the percipient to report absolutely correct information would be extremely unusual, to say the least. A success in such a case would probably indicate that either the content is so universal as to require virtually no interpretation, or that the neuronal structures of the subjects are nearly identical. Perhaps the most appropriate measure of telepathy based on subject reporting would somehow account for individuality on a neuronal level. Two markedly successful experiments with such an individualistic approach, the Maimonides telepathic dream study (Ullman et al., 1973) and the Sinclair (1930) drawings both used art as the telepathic content. In doing so, they allowed for the idiosyncratic differences between individuals when judging the results.

Another experimental venue which may make the behavior of neurons and their quantum properties more accessible is the use of cultured neurons, even if the donors are of non-human origin. Cultured neurons have been shown to thrive and fire synchronously (Stepanova et al. 2003), self-organizing into arrays. In an experiment to test the validity of some aspects of the current theory, neurons from a cultured array demonstrating synchronous firing could be physically separated from the original array. One may predict that the separated neurons are likely to continue some synchronous or other reactive activity with the original culture, even after physical separation. In other scenarios, observing cultured neurons from different donors could yield valuable data about remote neuronal interactivity, and examining individual neurons from a cultured environment may also lead to a method of determining entanglement.

A medical phenomenon that may offer promise in the research of how remote neurons interact is the occurrence of phantom limb pain following amputation in as many as 60-80% of patients (Nikolajsen et al., 2001). In light of the current theory, it is possible that a residual entanglement between the neurons of the separated limb and the neurons of the amputee's brain enable the teleportation of some information such as that which triggers the cognition of pain.

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