A Neuronal Model for the Sixth Sense and Extra Sensory Perception

Since the sixth century BC there have existed, roughly speaking, two schools of philosophic thought, one founded by Heraclitus whom one might call the father of the physical sciences and the other founded by Parmenides whom one might call the father of metaphysical philosophy (mysticism). Heraclitus believed that all of human experience is reducible to input (A modern term) from the five senses while Parmenides believed that there is a reality beyond that of the five senses which Plato believed with proper training one can be made to realize. No conception is given as to how this other reality makes itself known to the human brain.

An example of this other reality is pure mathematics, which is envisioned as being of pure truth e.g. the Pythagorean Theorem, which is believed to be true independent of the existence or non-existence of the human brain. Modern Mathematicians disagree as the Pythagorean Theorem has a derivation based on primitive axioms and by changing the axioms one changes the Pythagorean Theorem. Pure mathematics is therefore not pure truth but the result of agreed upon inferential steps from an agreed upon set of axioms which in and of themselves do not represent physical reality. e.g. Plane Geometry is based on the primitive notions of point and line. Points and lines however don't exist; three-dimensional representations of them do exist.

Applied mathematics makes the attempt to derive its theorems from testable postulates using testable inferential steps. In reality applied mathematics is a hodge podge of theorems based on both non-testable axioms and testable postulates using agreed upon non-testable and testable inferential steps. It should be rewritten so that all theorems are based on testable postulates and inferential steps.

The mode of thought first begun by Heraclitus in its modern ramifications (Experimental testability being one of the ramifications) is that used by modern scientists while the mode of human thought founded by Parmenides is far and away the mode of thought most studied by modern philosophy students and professional philosophers.

I believe that the reality beyond the five senses envisioned by Parmenides is what is today called the sixth sense or extra sensory perception, a taboo subject among scientists. My interest is in making it a subject of intellectual interest among scientists. I believe that the sixth sense is a method of communication between human brains and more generally among mammals as well. The following is a neurophysiologically possible physical explanation for the sixth sense.

ESP is a very difficult subject to discuss in a rational way with any one and in particular with a competent scientist. It is the author's belief that it is a major means of communicating information between human beings as well as in general between the higher animals and mammals in particular. I believe it is a very, very deep meaningful mode of human expression and therefore worthy of explanation.

For the layperson who believes in ESP, ESP is confounded with mental superiority or metaphysical experience, or mystical experience, the voice of God, the Holy Ghost . For the professional who uses ESP at work, ESP can be a jealously guarded secret. So secret that the professional denies the existence of ESP and officially labels any one who believes in ESP as either mistaken or deranged.

For many who believe in ESP, ESP is beyond comprehension, has no physical explanation and cannot have a physical explanation. To others, ESP is such an ethereal, beautiful way of communicating with one's fellow man that the experience transcends any possible mere physical explanation.

While sympathetic to this final view, never the less, in so far as ESP produces subjective sensory effects spoken words and visual images, one can rationally ask: What is the cause of these subjective effects?

The modus operandi taken is to treat ESP as a problem in communications engineering, susceptible to the methods of an electrical engineer combined with the methods of a neurophysiologist. Given that ESP transfers information from human brain A to human brain B, what is it that is physically transferred and how is it generated, how does it interact with matter and how is it translated into information by the brain?

ESP is here treated as a communication system that evolved over geologic time subject to natural selection as propounded in the theory of evolution.

It may be possible for predators to detect prey and prey to detect predators using ESP. It is the author's belief that in human's, ESP has intellectual import. e.g. Some physicists believe that in order to understand special relativity theory and quantum mechanics, one must be aware of Extra Sensory Perception (ESP). If one is not aware of ESP then one does not understand either SRT or QM. However, in so far as one does not have a physical understanding of ESP, then one does not have a physical understanding of either SRT or QM.

The following model for ESP makes it clear that if the model is correct, then physical explanations of SRT and QM having nothing what so ever to do with ESP.

The question to be answered is: What is the sixth sense and how does is allow us to communicate with one another?

I use the term sixth sense as:

1. The ability to see objects at time t when no light from the seen object is directly observed as determined by using a camera juxtaposed with the observers eyes. The independent existence of the object at time t is confirmed by taking a picture of the object juxtaposed with a clock at time t.
2. The ability to hear voices and sounds when there is no sound to be heard as recorded by a nearby tape recorder.
3. The ability to sense smells when there are no molecules in one's nasal passages other than the usual atmospheric gases as determined by chemical analysis.
4. The ability to feel pain when there are no solids, liquids or gasses causing pain as recorded by a camera or determined by chemical analysis.
5a. The ability to feel hot or cold when the air temperature and one's body temperature are normal as measured by a thermometer.
5b. The ability to feel objects touching one's skin when there are no objects touching one's skin as recorded by a camera.
Assuming such a sense exists, a neurophysiological explanation is sought. As each of the five ordinary senses requires the sensory, peripheral, and central nervous system for their existence, a biological organ system is looked for to be responsible for the sixth sense; Said organ system arising from biological evolutionary processes in much the same way as the mammalian eye and sight arose from biological evolutionary processes.

On an October day in 1972, the author was sitting in an auditorium on the Berkeley Campus waiting for the start of a neurobiological lecture. Musing to myself I gradually became aware that a Professor X, standing some 4m from me in a doorway, was word for word speaking out loud the words I was thinking to myself as I was thinking them. I was immediately struck by the fact that:
1. It could not be mere coincidence.
2. There must be a neurophysiological explanation for the event. If there were not, it would be an instance of a neuro physical effect with no neurophysical cause. The coincidence of Professor X, standing some 4m from me in a doorway, word for word speaking out loud the words I was thinking to myself as I was thinking them and the fact that I was currently studying neurobiology and at that instant waiting to hear a talk on a neurobiological subject, drove me to seek a neurophysiological explanation.
3. It was the first instance that I can remember of which I was aware of the sixth sense.
Several months later I was in the biology library and on the cover of that week's issue of the journal "Nature", was a picture of a South Vietnamese fire fly tree. A small tree covered by several thousand fireflies all simultaneously lit. It is

thought that there is a leader who lights up and stimulates all the others to simultaneously light up.
The firefly provides the model system to be analyzed for it has on its abdomen photo luminescent cells, which have the ability to emit a pulse of light when stimulated by an f.m. electrical signal generated by the firefly's brain. The firefly sends out a series of "Dots and Dashes" in a Morse like Code which transmit to other fire flies its sex and species over a distance of say 100m.
If the human organism had a similar biological system, it is hypothesized that it would be possible to transmit information from one human brain to another and, by hypothesis, transmit one's thoughts to another human being, using the sixth sense,. The receiver human being would then be able to experience the ongoing life of another human being.

Imagine now that humans have somewhere on their bodies:
1. A similar set of luminescent cells which emit electromagnetic energy. These hypothesized cells are here called transmitter cells.
2. A set of receiving cells able to transform the electromagnetic energy emitted by the transmitter cells of other humans, into a f.m. electric signal that is then routed to ones' brain. These hypothesized cells are here called receiver cells.
At what frequency do the transmitter cells emit and where are they located? Subjectively I have experienced the sixth sense in a fog and as visible and infrared radiation are readily adsorbed by water vapor, the transmitter cells probably do not transmit at either of those frequencies. X-rays take more than ten thousand volts to generate and as the brain operates at voltages of ~ 0.1V, transmitter do not transmit in the X-ray region.
The hypothesis made here is that the sixth sense evolved as a communication system and as such would be more efficient if the output radiation were focused. As will be shown below, because of the low output power it is probably necessary that the output be focused. It is difficult to conceive of a body organ or body structure that would be able to focus radio waves and thus the transmitter cells probably do not transmit at that frequency.
By process of elimination this leaves ultra violet light as the leading contender for the output generated by the transmitter cells. The lens of the eye could focus u.v. if the hypothesized transmitter cells were located in the retina and it is hypothesized that both the transmitter cells and the receiver cells are located there. (I remain open to the suggestion of an electrical engineer that the relevant wavelength might be in the 1cm range not in the ultra violet).
The role of the transmitter cells is to transform an input neuronal signal from the optic nerve into an output u.v. signal; Much the same neurophysiological role that photo luminescent cells serve the fire fly but at a different frequency.

The output u.v. is focused by the lens resulting in two parallel beams of u.v. leaving the individual.
The role of the receiver cells is to transform an input u.v. signal, focused by the lens of the eye onto the retina, into an output f.m. neuronal signal that is fed to the optic nerve. From the optic nerve the action potentials are fed to the parts of the brain responsible for transducing action potentials into sight (Visual Cortex), hearing (Auditory Cortex), smell (Frontal Lobe), pain (Thalamus), heat, cold and touch (Postcentral Gyrus).
These hypotheses are testable. Either the transmitter cells and the receiver cells exist with the functions described above or they don't. If they don't, then the described model for the sixth sense is wrong.
One can set limits on the amount of power radiated by the eyes. The glucose and oxygen concentration of the arterial blood entering the brain and the glucose and oxygen concentration of the venous blood leaving the brain have been experimentally measured. The volume of blood entering the brain (Which equals the volume of blood leaving the brain) per second is also measured. These measurements enable one to determine the number of glucose molecules oxidized by the brain per second and by experimentally determining how much energy is liberated by the oxidation of one glucose molecule enables one to determine the power (Watts) consumed by the brain. The answer is the brain consumes ~25 Watts. Dividing 25 Watts by the number of nerve cells in the brain, about 10^{11}, yields ~10^{-11} W per nerve cell. From dimensional considerations assuming each transmitter cell has a cross sectional area of one square micron and that the functional retina has an area of $1cm^2$yields ~10^8 retinal cells per retina. Assuming that the transmitter cells comprise 10% of the retinal cells, there are 10^7 transmitting cells per retina. Consequently the eyes could conceivably transmit
$(10^{-11})(10^7)=10^{-4}$ W assuming all the input energy is converted into u.v. The input energy however is also used to keep all of the cells of the retina alive, consequently the figure 10^{-5} W is used here.
What is the conceivable range of the sixth sense? Radio stations broadcast at 10^4 W and light bulbs are typically 10^2 W. The dark-adapted eye can see 10^{-16}W per retina in the optical and it is assumed here that the transmitting cells in the retina can detect 10^{-17}W per retina in the u.v. If the transmitted u.v. beam diverges by 1.0 degree then by direct computation the power density at 100km is 10^{-17} W per retina and if the transmitted u.v. beam diverges by 10 degrees, then by direct computation the power density at 10km is 10^{-17} W per

retina. This means that if the beam divergence is 1.0 degree, it is conceivable that the sixth sense operates at an order of magnitude range of 100km and if the beam divergence is 10 degrees, it is conceivable that the sixth sense operates at an order of magnitude range of 10km.
It is possible that one human could use the receiver and transmitter cells of another human as step up transformers. The u.v. from a transmitting man's transmitter cells are intercepted by the receiver cells of another man and if the two men are within ~10km of one another, the second man re radiates the u.v. using his transmitter cells. In a process similar to that used by the fire flies on the South Vietnamese fire fly tree, 10^n men used as step up transformers would broadcast at 10^{n-5} W.
Electromagnetic radiation travels in straight lines and unless it reflects from something in the atmosphere will travel from the source to the ground and reflect into outer space. Transmission in the optical is thus line of sight and at most good only to the horizon. Radio waves can be detected beyond the horizon because they are reflected by the ionosphere. u.v. however is not reflected by the ionosphere. There is a permanent thermal inversion layer at 40,000 ft and u.v. might reflect between it and the ground for round the world transmission.
It is conjectured that this biological transmission-reception system developed under the same evolutionary pressures as affects the development of all organ systems. It probably developed at the same time and in conjunction with the development of the eye as a means of detecting predator/prey under low light conditions e.g. Lions pursuing zebra at night by emitting u.v. and detecting the u.v. reflected by the zebra. Or dragon flies pursuing mosquitoes in low light conditions by emitting u.v. and detecting the u.v. reflected by the mosquitoes. It might have developed first in the insects as far back as the Ordovician 500 million years ago. It occurs today in fireflies: However the receiving cells in fire flies are located in the eyes and the transmitting cells are located on the abdomen and fire flies transmit and receive in the optical, not in the u.v. unlike the hypothesized transmitting receiving system in man. One may now categorize, in a rough and ready way, the several ways in which the human brain creates new ideas.
1.
The following a,b,c do not use the sixth sense.
a. By reading material from several different sources and integrating the read material with internalized (Memorized) information so as to generate a solution to an old problem or to generate a new problem.

b. By performing an experiment and integrating the new results with internalized information so as to generate a solution to an old problem or to generate a new problem.
c. By directly talking to someone and integrating the conversation with internalized information so as to generate a solution to an old problem or to generate a new problem.
None of these ways of generating new ideas or problems uses the sixth sense.

2.
Using the sixth sense mind C: "Reads A's mind" and/or "Reads B's mind" as pertains to a specific problem and integrates the read results so as to generate a new solution to an old problem or to generate a new problem. In this instance neither mind A or mind B have solved the old problem or generated the new problem and may not be even thinking about the old problem or generating the new problem. However mind A and/or mind B have internalized information vital to the creation of the new solution of the old problem or to the generation of the new problem. There are recorded instances of infants (Children under the age of 5) who have written down new mathematical proofs (Proofs never seen by the mathematical community) without ever having studied mathematics. The method outlined in 2 may be how it is done. A-priori the child presumably has no internalized information pertinent to the solution of the proof and in this instance the child may be integrating many minds at once in real time. In this instance the "Many minds" may be determining what is a productive tract without however completing the theorem that is solely the domain of the child. If so, one can see the problems that arise in correctly determining the author of said proofs.
The following are lesser uses of the sixth sense.

3.
Mind A has proved a new theorem but shown it to no one. Mind C: "Reads A's mind" and writes down the proof using essentially no internalized information of his own.

4.
Mind A using the sixth sense, directly tells trained mind C in a master slave relationship to: "Go to the house on the S.E. corner of Sixth and Main, reach into the large flower pot by the front steps, find a pistol there and..." . C does as he is told. Mind A may direct C's mind and body in either in real time or not in real time.

A misguided use of the sixth sense occurs when mind A tells mind B to commit murder using the sixth sense. Person B does so, is arrested and pleads before a judge that "Voices" were telling him to do so. Person B is judged to be psychotic and as there is no evidence linking person A to the crime, person A literally gets away with murder. There is the possibility that persons privy to the extra sensory relation between A and B, will take the law into their own hands and meet out justice to A as they see fit.

5.
Mind A belonging to a pilot directly feels from the vibration of the plane during warm up that one of the Wright Cyclone aircraft engines is misfiring. He tunes in the mind of the planes mechanic and determines that the mechanic has purposely placed a faulty spark plug in cylinder #17 in the #2 port engine. Spark plug #17 is inspected and indeed found to be faulty. The spark plug is replaced and the flight proceeds as scheduled.

6.
6a. Mind A simply for sport, "Tunes in on" mind B to discover what person B is doing.
6b. Mind A, belonging to a counter spy, tunes in on mind B, belonging to a spy, in an effort to thwart espionage.
6c. Mind A, belonging to one seeking sexual gratification, tunes in on mind B, belonging to a willing co conspirator, for the purposes of setting up a sexual liaison.
One can imagine the anguish that ensues if person B is a reluctant sycophant and person A is aggressively seeking sexual gratification.
6d. Person A will not allow 6th sense access to his mind by Person B seeking access, unless Person B sexually satisfies Person A.
6e. It is the author's experience that a group of people (variously called a ring, a head group, a circle etc.) acting in unison perform as step up transformers to broadcast messages to one another and to people outside the ring. The ring may or may not require persons outside the ring to sexually satisfy person or persons in the ring in order to become a member of the ring and use the ESP services of the ring.
6f. It is the author's experience that many people of his acquaintance believe that in order to use ESP either as a sender or a receiver, one must sexually satisfy one or more members of a ring. From personal experience this is not necessarily true. It is possible to use the ESP services of a ring by attaining one or more of the following: A solid intellectual reputation, high athletic ability,

high military awards, high political office etc. without sexually satisfying a person or persons in a ring.

7. A person blind in the visible range of the spectrum might still have functional ESP if he/she has a functional retina in the relevant range of the U.V. spectrum.

End of Model for ESP.

The model is testable.
1. The radiation emitted by the transmitting cells should be capable of being detected with a receiver tuned to the emitted frequency and sensitive to 10^(-4)W.
2. If photon-transmitting cells exist in the retina, they presumably would not resemble rods or cones and might resemble the photo luminescent cells of fireflies. At any rate they should be found and identified.
The fear at this point is that a communications engineer will design a transmitter that will enable the sender to broadcast propaganda, advertisements, general instructions, etc. to the general populace, and the unwary may well be induced into a schizophrenic or psychotic state.

Addendum: Transcendental Arguments

As I understand it, a transcendental argument is one for which (A) implies (B) and (~B) does not imply (~A) where (A) "Concerns someone's experience". For example statements (A) and (B) might be:
A. I can attribute sense-datum experiences to myself.
B. I have experience of objects.
Assuming the sixth sense exists, one can interpret (A) as attributing sense-datum experiences to one's self, using one or more of the six senses. One can interpret (B) as having experience of objects using one or more of the five ordinary senses. Thus if one does not experience an object using one or more of the five ordinary senses, one can still experience the object using the sixth sense. i.e. (~B) does not imply (~A).

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