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The Physiology of Telepathy

By
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Like most people, I became a science fiction enthusiast because I have an innate belief that tomorrow will be better than today, and so far, in 53 years of life, that assessment seems to have been born out spectacularly well. As I look back across the years of my life, I am struck by two things: 1) how much things have changed, and 2) how little I noticed the change as it was happening.

I was put in mind of this fact this past weekend when I spent most of the time on my roof and hanging from a ladder under my eaves. The occasion was my transition from a late-1980s technology, cable television, to its 1990s equivalent, direct broadcast satellite television. Yes, I finally broke down and invested in one of those 18-inch dishes you see on people's houses that deliver a couple of hundred channels of television programming. There are a number of services for this sort of thing, DirecTV being the largest. I went with Dish Network and installed a Dish-500 system. The system is so named because it uses some rather clever technology to allow the customer to receive the signals from two satellites: Echostar at 119 degrees west longitude, and Echostar-4 at 110 degrees west longitude. By pulling in the signals from two satellites simultaneously, the system gives the possibility of 500 channels of television — not that there is that much programming yet. However, being a future-oriented individual, I was a complete sucker when the local retailer told me about the technology. Five hundred channels in the future with no hardware upgrades? Bring it on!

I was up on my roof taking azimuth and elevation sightings to see if there were any trees in the way when I was struck by the feeling that this is the sort of thing that I have been waiting for all of my life. Not DBS television, per se; but the level of technology that DBS television represents. As Arthur C. Clarke put it so succinctly half a century ago, "Any sufficiently advanced technology will look like magic to those who do not possess it." That is his thought, if not an actual direct quote. As I gazed out over my neighborhood from a height of twelve feet, looking for a distant landmark that had a magnetic bearing of exactly 173 degrees, I was put in mind of what a much younger Michael McCollum would have thought of this magic.

In 1949, my family lived in a small silver trailer somewhere on the southwest side of Phoenix. I don't remember it very well, although my mother has told me about the time she blew herself up with the gas oven and singed off a great deal of her beautiful red hair. My father, who was 6 feet 4 inches tall, also used to hit his head a great deal while

entering and leaving the trailer. Because of these collisions, I picked up an extensive vocabulary that was unsuitable for use by a 3-year-old.

The one memory that I do have of that year is exceptionally clear, however. On Christmas day, 1949, I received several memorable presents while still living in the sliver trailer. One of these was a beautiful metal Ferris wheel. The other was a blue-and-white Greyhound Bus that would roll for a short distance if you pressed down on the back and then let go. My third present, the most memorable of all, was a baby brother. My brother, who is now president of his own company, was born on December 22, 1949, and was released from the hospital on Christmas day. Because I was so young, I was not allowed in the hospital itself, so I had to sit on the steps while my parents went upstairs to get the new baby. I still remember a nurse stopping and making a fuss over me as I sat there in my new clothes, wondering which I liked more: the Ferris wheel or the baby brother.

Shortly after that, we moved up in the world. We abandoned our trailer and moved into a prefabricated frame house that sat on concrete blocks on a small plot of land fronted by an irrigation ditch. The house was in one of the less expensive sections of Phoenix. We were only about 200 yards north of the Mohave Road Sewage Disposal Plant. (For those who know Phoenix, the house was located right in the middle of the curve where I-10 turns into I-17.)

The house was a step up for us and we had been there a few weeks when I was introduced to a marvel of technology that became a large part of my life. One Saturday night, we trooped over to the neighbors (along with a dozen other people) and sat around his darkened living room to watch a tiny, round, flickering blue-and-white screen. That was how I was introduced to television. The program that night was *The Lone Ranger*.

In 1952, the year I started school, my parents bought a television set of our own. It was delivered late in the day and installed after I got home from school. The first program I watched was the 6:00 PM news with Jack Murphy on KPHO, Channel 5. If that seems an odd choice for a six-year-old to be watching, the news program had an attraction that was overwhelming. It was the only thing on!

The contrast between that day nearly fifty years ago, when there was a single broadcast channel, and this, when I can continuously scan through 200 active channels with my new satellite TV remote control, is staggering. Yet, all of this technological change has taken place in my lifetime. The future written about by science fiction writers of the 40s and 50s is upon us and, if anything, it is even better than they predicted. While we lack the easy space travel they wrote about, in the fields of communications and computers, we have significantly outstripped the imaginations of the old masters of the field.

Yet, there are other aspects of modern society in which we have totally missed the boat with regard to science fiction predictions. One of the staples of fiction in the Golden Age, especially in John Campbell's *Astounding*, were stories in which psionic powers played a pivotal roll. For those unfamiliar with them, "psionic" was the name given to a wide variety of paranormal abilities in these stories, abilities such as telepathy, far sight, precognition (foreknowledge of the future), and telekinesis. In these stories, the gifted individuals who possess these powers are the objects of envy and discrimination by the poor unfortunate "normal" people who lack them. The "talents" must fight for the respect they so obviously deserve.

The attraction these stories held for science fiction enthusiasts is obvious. I hope no one is offended by the observation that our field has more than its fair share of people whose social development was either late or stunted, people who have been called "geeks" and "nerds" at some point in their life. I became a science fiction reader because I lacked the skills necessary to play football; and thus, gravitated to the library for my entertainment. My story is hardly unique in that respect.

For those judged social outcasts by the "popular" adolescent social cliques in school, there is something seductive about the thought that they are different because they are better. Such people identify instinctively with the poor, misunderstood mind readers that one finds in psionic-power stories. It seems to me that the popularity of these stories has declined in recent years, although this may only be an impression caused by changes in my own taste in reading. If it exists, much of the decline can be attributed to the death of John W. Campbell, who was an enthusiast on the subject of the paranormal and who taught a generation of writers that their chances of being published increased dramatically if they threw a little *psi* into their stories.

Another possible reason for loss of popularity of such stories in science fiction is the fact that the ideas have largely been adopted by the New Age movement. A quick search of the INTERNET, for instance, reveals any number of sites devoted to spirit channeling, telepathy, and other subjects that were once the exclusive domain of science fiction writers. Police dramas have a standard plot in which the bumbling gendarmerie is assisted in finding the killer by someone who has psychic powers and can dimly see the death scene through the eyes of the killer. Still, you would think that the science of *psi*, or parapsychology, or whatever you want to call it, would have advanced more than it has these past fifty years.

What possible explanation is there to the fact that the miraculous powers of the human brain have remained largely untapped? Perhaps the lack of progress is only apparent, and due to a vast network of telepaths living among us, people who read our every thought and channel our inquisitiveness into pathways that will keep their existence hidden. On the other extreme, perhaps we have made zero progress because there is no progress to be made. Perhaps telepathy is just plain impossible, and any opinions to the contrary are mere wishful thinking.

That, then, will be our subject for this month. If telepathy is possible, what are its physical parameters and principles? How does it work? More importantly, how *well* does it work?

Psionic Powers – Definitions

In science, any study begins with classification of the subject. In biology, this is called taxonomy, the classification of organisms based on their genetic similarities. In our case, a psionic power can be classified as any unusual ability of the human brain. Among the more common are:

1. Telepathy

Telepathy is the ability to read other people's minds, to sense their thoughts, or to sense images or emotions. In other words, a telepath perceives what is going on in the

minds of other people through some direct interaction between the two brains. Sometimes telepaths have the ability to read actual thoughts, while other times they only receive impressions, images or emotions. A telepath sensitive to emotions is given the special label of *empath*. On *Star Trek, the Next Generation*, Deanna Troi is an empath. That is why she is seated beside the Captain on the bridge of the *Enterprise* all the time. She can sense when the various aliens and humans that appear on the viewscreen are up to no good and warn Picard in time for him to raise the shields.

2. Far Sight

Far sight is the ability to perceive scenes in one's brain at distances greater than the human eye can see. In effect, it is the ability for the mind's eye to roam where it will at the speed of thought, poking into things that are normally hidden. It could also be called tele-vision, but of course, that would be confusing. Actually, like most of the paranormal abilities ascribed to the human brain, tele-vision has a technological counterpart, television. We can see at ranges far beyond the ability of our naked eyes. All that is required is to have a video camera at one end, a 25-inch screen at the other, and a whole mess of electronic gadgetry in between.

3. Precognition

Cognition is the perception of things as they occur. Precognition is the perception of things BEFORE they occur. Precognition would be extremely useful in modern life, especially on a trip to Las Vegas. As many a science fiction story has explored, it would be an evolutionary advance that would dwarf just about any other. Even the ability to see a couple of seconds into the future would dramatically increase an organism's probability of survival (allowing that individual organism a couple of seconds head start on a hungry lion, for instance). It would be such an advantage, in fact, that you would expect the gene for precognition to quickly sweep through a species.

4. Telekinesis

Telekinesis is the ability to exert a force at a distance merely by willing it into existence. The most common report of people with telekinesis involves the bending of spoons with brainpower alone.

<u>Psionics in Fiction</u>

Most science fiction writers have dabbled in *psi* in their writing. They have done so because they really believe that psi powers exist, or because they needed them for reasons of plot, or as noted above, to increase the probability that their stuff would sell to the editors of the time.

One of the first novels I read that included telepathy, for instance, was Robert Heinlein's *Time for the Stars*. Published in 1956, *Time for the Stars* is the story of two identical twins, Tom and Pat, who find themselves in a research project to determine if they are telepathic. It turns out that they do communicate with one another telepathically,

and that this communication is instantaneous and unlimited in range. "To what use could such an ability be put?" you ask. Obviously, if you have sufficient pairs of telepathic twins (and in at least one case, triplets), you can build an instantaneous communications system to link a fleet of interstellar starships to Earth and to each other.

In the story, Tom is assigned to the starship *Lewis and Clark*, while Pat stays home. Tom is the viewpoint character and we follow his adventures as the ship first accelerates to nearly the speed of light, and then decelerates when it reaches a nearby star to explore. Because the ship is not a faster-than-light craft, it undergoes time dilation effect when it is traveling "over the hump," that is, when it is going very close to light speed in mid-journey. At these times, the twins lose contact with one another, regaining contact when the ship slows to intrasystem velocity. When this happens, a few weeks have passed for Tom aboard ship, but back on Earth, years go by. After a few star systems, Tom has aged only a couple of years from his initial age of 18, but Pat is an old man approaching the century mark. At the end of the book, Tom returns home and is reunited with his twin, who is now a doddering old man. At the end, we are treated not only to the chronological age differences, but also to the difference in outlook of the two men who began life mere minutes apart.

Despite its use of telepathy in the plot, the twins' telepathic ability is not the subject of the book. Indeed, it is a minor adjunct to what is basically a novel written to illustrate the strange things that happen to anyone traveling near the speed of light. Nor is the genesis of the novel difficult to determine since the primary method for explaining the time dilation effect is to use the example of two twins, one of whom goes to the stars while the other stays home. The usual explanation is even dubbed the "twin paradox."

So why the telepathy? Obviously, if nothing can exceed the speed of light and you need an instantaneous communications system, AND you are dramatizing the twin paradox, the choice of telepathic twins as the protagonists in the novel would seem obvious. Besides, as we shall see later in this article, there is something seductive about assuming that such a paranormal ability would be more likely to occur in two brains with identical origins than it would it two without. Besides, it gives one of the twins a reason for going along on a voyage from which an 18-year-old with no special training would normally be barred. It is their special ability that overrides all other considerations, which explains the "brat" twin, Dusty, who bedevils Tom's life aboard ship.

This is but one of hundreds of short stories I have read about telepaths over the years. Poul Anderson has telepathic aliens in his *Dominic Flandry* series, including Aycharaych, a master villain whose name seems suspiciously close to HRH. There is also an old *Analog* story in which Earth is invited to join the Galactic Federation, only to discover that the tax burden is unbearable. The two human diplomats are approached by a telepathic alien who bemoans the fact that his species is discriminated against by the non-telepaths. The humans are sympathetic until he starts spouting the two diplomats' most personal secrets that he has gleaned from their minds. The alien has just finished blurting out the fact that one of the diplomats had taken a cruise with a young lady not his wife when the two terrestrials beat a hasty retreat, from both the telepath and the Galactic Federation, hoping that the aliens will not stumble across Earth anytime soon.

I remember one especially memorable short story about telepaths where a man with telepathic abilities is seated on a train when another train passes them in the opposite direction. All his life the telepath had thought he was unique in being able to tap into

other people's thoughts, but in the few moments the other train is passing on a parallel track, he senses a woman telepath aboard. The two are out of range of each other before they can get over their surprise, and though fleeting, the contact leaves the man desperate to find his soul mate on the other train. He spends the rest of the story searching for her. She, too, is anxious to make contact and they eventually find one another again. Their reunion is that of long, lost lovers. They embrace, and kiss, and are in love for thirty seconds, at which time they silently thrust each other away, each screaming a common silent command: "GET THE HELL OUT OF MY MIND!" The story was memorable (even though I can't remember either the title or author) because telepathy is generally portrayed as being a useful ability to have. Seldom do authors explore the possibility that the loss of privacy would be unbearable.

There have been numerous other uses of telepathy in fiction, most notably Deanna Troi and the poor frightened psychics of slasher movies, both of which we touched on in the introduction. What of other psionic powers?

Precognition is a common theme in fiction and usually explores the possibilities and problems that arise from knowing the future. These stories are essentially the same genre as time travel fiction in which the time traveler goes back into the past to save Abraham Lincoln from John Wilkes Booth. Despite having knowledge of what is about to befall the sixteenth president, the time traveler is always thwarted by fate. And so, too, are those with the gift of precognition. They can sense the fact that a loved one is about to be killed, but try as they will, they cannot prevent it. This theme was well done in an *X-Files* episode last year about an ageless photographer who can sense when someone is about to die. The photographer stalks the soon-to-be-deceased and photographs their demise in the hope of getting a picture of their spirit leaving the body. The difficulty of having such an ability is brought home to us when it becomes obvious that Dana Scully (the heroine) is to be the next to die.

The point of most of these stories is that knowing the future is not necessarily a benefit if you find that there is nothing you can do to change it. A movie that deals with this theme through the time travel venue rather than precognition is *The Army of the Twelve Monkeys* (lately truncated to *Twelve Monkeys*). I sat in misery for the first half hour because the plot seemed to be a mishmash. Then the clues started to make sense and I muttered, "Uh oh," under my breath. Having caught on to what was going on, I could tell that the movie would not have a happy ending — at least, not when viewed from the viewpoint of the modern-day audience. When viewed by future society, the ending was not only happy, but inevitable.

It seems to me that of all the psionic powers, the least useful would be telekinesis, the ability to move objects and otherwise exert a force at a distance through force of mind. That is because we already possess numerous mechanical ways of performing this same stunt. True, a telekinetic can bend spoons with his mind, but then again, so can everyone else with their hands. If you need the spoon bent at a distance, you can do wonders with a Colt .45 automatic pistol, if you can just hit the spoon.

Larry Niven wrote a series of stories about Gil, the Arm, which highlight the telekinetic ability. Gil is an ex-asteroid miner who loses his right arm in an accident. Because of the loss of the arm, he gains a prosthetic and trains as a member of the United Nations' police force, the ARM. Even though he has lost his arm, however, he can still feel his amputated fingers whenever stray electrical impulses travel up the severed

nerves. This is a common problem with amputees, who often feel the need to scratch the fingers that are no longer there. Slowly, because he imagines that his arm is still there, Gil develops a telekinetic ability. He can hold small objects such as cigarettes with his "imaginary third arm."

The stories are typical science fiction detective stories, but with climaxes that tend to revolve around the psychic arm. For instance, in one of the stories, Gil is being choked by a suspect when he reaches into that man's chest with his psychic arm and squeezes his assailant's heart. Having an invisible hand around your heart is a good way to make you lose interest in choking someone.

The Science of Paranormal Abilities

The thought that the human brain has a vast untapped potential is a common one in both science fiction and myth. There have long been stories about people who could do impossible things merely by thinking about them. There is something very enticing about the thought that we are more than the sum of our mechanical parts. So, if telepathy really exists, how exactly does it work? If people can foretell the future, what is the mechanism that lets them see into a time that has not yet happened? Indeed, does the future exist somewhere in the space-time continuum? How about the past? Does that version of you that had the bad day at work yesterday still exist somewhere in the universe, or is that past "you" as dead as the future "you" will inevitably be someday? As for bending spoons with thought, exactly how does a brain get hold of a spoon at both ends and how much mechanical torque can it apply in the process?

These are all questions for which advocates of the paranormal never seem to have adequate answers. In researching this article, I called up a number of New Age and paranormal web sites, looking for a scientific explanation. The closest I got is listed below from Lisa Development Pty. Ltd. in Australia. Their particular version of telepathy is known as mind networks:

> "The concept which has made the mind networks a reality is the theory of dimensional energy. It can be explained in this way: telepathy is possible because in some situations a biological organism like the human brain can give birth to a unique mind energy which does not recognize a spatial distance (not psychic energy or mystical energy, just ordinary energy which the brain continually produces but in a different way). This is referred to as 'dimensional energy' and that energy can be used to create 'a dimensional space' (which are our 'mind networks'). Explained another way: the thoughts of person A in say Brazil and person B in say Budapest can entwine together as one providing a bundle of dimensional energy formed in the brain of both people is sufficiently similar. These thoughts are usually (in advanced telepathy) mental imagery - these are the easiest to correctly introduce into a dimensional space (hence both would be aware of the

> imagery inside this particular dimensional space). Imagery alone is one aspect, but the flows of feelings and sensations which can accompany these can make telepathy personally special and rewarding. It is possible for some words, (and with advanced skills a speech like effect by enhancing the signals using the imagination), to be used and its language independent because each person's own thoughts equate what is being conveyed in the way that it is understood by the receiver."

Like most explanations of telepathic or telekinetic phenomena, this explanation postulates "a unique mind energy which does not recognize a spatial distance." A perfectly lucid explanation, but one that begs the question, "What sort of energy is that?" To answer that question, let us take a short detour into the realm of physics and discuss the rather limited choices we have in answering the question.

The Four Forces

As far as we are able to determine, there are only four forces in the whole universe. These are:

1. Electromagnetism
2. Gravity
3. Strong nuclear force
4. Weak nuclear force

The following, semi-technical discussion from the Particle Adventure (www.particleadventure.org) is intended to enlighten you to the current level of understanding regarding the nature of the universe. If you find it tough going, just plow through to the next section and we will put the knowledge to work:

> "Now we know the building blocks of matter, but we must also ask: What holds it together? All forces are due to the underlying interactions of the particles. Interactions come in four types: gravitational, electromagnetic, strong, and weak. Gravity is perhaps the most familiar force to us, but it is not included in the Standard Model because its effects are tiny in particle processes and, furthermore, physicists have not yet figured out how to include it.
>
> Electromagnetic forces are also familiar; they are responsible for binding the electrons to the nucleus to form electrically-neutral atoms. Atoms combine to form molecules or crystals because of electromagnetic effects due to their charged substructure. Most everyday forces, such as the support of the floor or friction, are due to the electromagnetic forces in matter that resist displacement of atoms or electrons from their equilibrium positions in the material.
>
> In particle processes the forces are described as due to the exchange of particles; for each type of force there is an associated carrier particle. The carrier particle of the electromagnetic force is the photon; gamma ray is the name given a photon from a nuclear transition.
>
> For distances much larger than the size of an atomic nucleus, the remaining two forces have only tiny effects -- so we never notice them in

everyday life. But we depend on them for the existence of all the stuff from which the world is made, and for the decay processes that make some types of matter unstable.

The strong force holds quarks together to form hadrons; its carrier particles are whimsically called gluons because they so successfully "glue" the quarks together. The binding of protons and neutrons to form nuclei is a residual strong interaction effect due to their strongly-interacting quark and gluon constituents. Leptons have no strong interactions.

Weak interactions are the only processes in which a quark can change to another type of quark, or a lepton to another lepton. They are responsible for the fact that all the more massive quarks and leptons decay to produce lighter quarks and leptons. That is why stable matter around us contains only electrons and the lightest two quark types (up and down). The carrier particles of weak interactions are the W and Z bosons. Beta decay of nuclei was the first observed weak process: in a nucleus where there is sufficient energy a neutron becomes a proton and gives off an electron and an antielectron neutrino. This decay changes the atomic number of the nucleus. Beta ray is the name given to the emerging electron.

So now we have explained beta and gamma rays; what about the alpha? The alpha particle is a helium nucleus - one of the products of a nuclear fission. Fission is the breakup of a massive nucleus into smaller nuclei; this occurs when the sum of the masses of the smaller nuclei is less than the mass of the parent nucleus. This is a residual strong interaction effect.

What has particle physics to do with telepathy?

My apologies for subjecting you to the above physics primer, but when discussing paranormal abilities, it is all too easy to drift into the intellectually lazy explanation of "unique mind energy." In reality, we know quite a lot about how the universe works, and to explain telepathy, we must rely on the physical principles that we know, or else come up with some new physical principles that we can prove actually exist. That our minds are marvelous devices, there is no question. The French philosopher Rene Descartes had it correct when he said, "Cognito, Ergo Sum," ("I think; therefore, I am"). The nature of intelligence and self-awareness is one of the great mysteries of life.

Unfortunately, one of the things we understand fairly well is how the brain works on a mechanical basis. The brain is a fifty-watt electro-biochemical computer. It operates by sending electrical impulses through a series of synapses, firing cascades of small electrical sparks that somehow coalesce into thought. How a mere electrical machine can generate that pattern of thought and energy known as "me" is a mystery. The means by which it performs this miracle, however, are well understood. In fact, they are surprisingly mundane. We have reached the point in computer science that someday in the lifetimes of those reading this article; we may find ourselves with a self-aware silicon computer on our hands. Think of all the interesting ethical dilemmas that will entail.

How do we know that the brain is primarily electrical in nature? We have studied it quite extensively, and though it is a marvelously complex computer, it is still only a computer. We can tap into it at various spots and observe the operation of the synapses. We have a rudimentary understanding of speech and vision and memory, all of which are electrically activated phenomena. And while we learn marvelous things about this marvelous machine, at no time have we ever encountered anything that resembles

"unique mind energy." In fact, physics leaves no room for such energy. If it is not gravitational, electromagnetic, strong nuclear, or weak nuclear, there does not seem to be another option.

But wait a minute. We may understand the operation of the brain, but we certainly do not understand the operation of the mind. True enough. The mind (as opposed to the mechanical instrument that generates it) would appear to be related to a large, but finite, quantity of information arranged in a particular pattern. That the mind is dependent on, but separate from, the brain is intuitively obvious. After all, shut down my electrical synapses for just a short time and I am no longer here. My body is here, my undamaged brain is here, but the essence that is "me" is gone. Where, exactly, did I go?

This is analogous to something that has happened to everyone who has worked with personal computers. You are typing on a long report that you haven't saved in four hours, there is a sudden flickering of the overhead lights, the computer screen flashes, and the document is gone. Gone where? Surely something with that much work in it could not have merely disappeared. Perhaps it went to the Great Bit-Bucket in the Sky, and all we have to do is to ask nicely and it will again appear on the screen.

Unfortunately, as we have all discovered the hard way, once that screen flashes, the information no longer exists. The arrangement of information into which we have poured so much work, sweat, and tears is no more. It is the same with the human mind. Our brains are the computers and our minds are the programs stored in their data banks.

Unfortunately, immaterial though it may be, the mind is dependent on the brain's mechanical plumbing to produce thoughts, and if it is to contact another mind, or bend a spoon at a distance, or see into the future, it must do so by generating some form of energy. Because of the nature of the brain, that energy must be electromagnetic in nature — gravity and the two nuclear forces being ineffective on the scale of human beings.

So, if telepathy exists, it must be based on some form of electromagnetic radiation. Actually, a version of telepathy does exist — sort of. We have long been able to deliver a message from one mind to another over nearly unlimited distances. To do so, however, the two minds must generate ordered electromagnetic radiation that is transmitted between the two. We have a variety of names for this successful form of "telepathic" communication. We call it radio, television, and telephone.

If you think about it, radio is just as good a communications device as telepathy. Not only does it get your thoughts into the other person's brain over great distance, it does so through the mechanism of speech. Verbal communication, the transmission of words, is much more precise and controllable than is the transmission of mental images or emotions. Does Commander Ryker emote to Deanna Troi when he is thirsty, or does he merely ask her for a drink of water? I rest my case.

So why can't we detect minute radio waves emanating from the brain of someone who claims to be telepathic, and those same radio waves showing up in the brain of someone who claims to be receiving their thoughts? And if not radio waves, what other mechanism can possibly be the carrier of thoughts involved in telepathy?

So, the current state of physics would tend to rule out direct mind-to-mind contact strictly because the human mind is not a good transmitter/receiver of radio waves — not unless you have your Walkman on, of course. Moreover, even if we could come up with an energy source and carrier for telepathic waves, we would still face a problem in

postulating practical telepathy. That problem has to do with the basic nature of the human brain.

Random Thoughts

When I was in grade school in the 1950s, Bell Telephone produced a series of 90-minute documentaries for school children. The most popular of these were *Our Mr. Sun* and *The Magnificent Mr. Hemo*. However, the one that made the biggest impression on me was called *The Five Senses*. In this documentary, a narrator took us through the senses of vision, hearing, smell, taste, and touch. To demonstrate vision, they did an experiment I have never heard of being repeated.

The narrator of the film began wearing a pair of spectacles that looked like twin telescopes mounted to eyeglass frames. The function of these optical devices was to invert his vision. So long as he wore them, everything appeared upside down. He wore the glasses every waking moment for six weeks, causing himself severe psychological distress in the process. Then one morning after he woke up and donned his inverting spectacles, he discovered that everything appeared normal.

What happened was that his brain became tired of viewing the world inverted, so it reinterpreted the signals coming down the optic nerve and flipped the scene over so that it made sense. Nor did we have to take the narrator's word for it. To demonstrate that his vision had been swapped while wearing the inverting glasses, he rode a motorcycle, something one cannot do with upside-down vision. Then, to make it perfectly clear, he took off in an airplane, circled the field, and landed (with a naval aviator in the co-pilot's seat, just in case). I was a private pilot in my earlier years and I can tell you that it is impossible to land an airplane with inverted vision. There is too much going on for your brain to unscramble everything in time to make the proper control movements during landing.

Finally, the narrator cautioned us not to try the experiment ourselves because when he removed the spectacles, his unaided vision was once again inverted. In fact, it took another six weeks before his brain once again unscrambled the signals from his eyes such that he could see properly again.

The point of this demonstration is that unlike the scanning electron beam that generates a picture on a television screen, the signals carried into our brains arrive in random order. This is why newborn babies cannot see. It is not that there is anything wrong with their eyes or optic nerves. Rather, their brains need time to sort out the random signals and to learn the order in which the "pixels" must be arranged in order for the scene to make sense. Only when their brains have had time to perform this sorting operation do babies begin to recognize things.

What this has to do with telepathy is simple. Even if we were able to somehow sense what was going on in other people's brains, it would make no sense to us. That is because all of the random inputs in our own brains are different from the random inputs in everyone else's. If you could hear what was going on in my brain, it would sound like white noise to you — and vice versa. Thus, it is hard to see how telepathy could work even if there were some mechanism for sending thoughts directly between brains. We would tune out each other's thoughts merely because we could not stand the din! We would be screaming, "Get the hell out of my mind!" at each other.

Conclusion

Therefore, when judged logically, it appears that there is no such thing as telepathy. Indeed, there cannot be. Each of our brains is individually wired. Of course, if we ever successfully develop a direct brain-to-computer interface, things will change. Once we train the computer to recognize our own particular brand of thoughts, then there is no reason why we will not be able to transmit those same thoughts to someone else with a brain-to-computer interface. It will not be telepathy, exactly; but it will be direct brain-to-brain communication.

Perhaps we will call it "brainio."

#

The End

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Moreover, if you like space art, you can visit our Art Gallery, where we feature the works of Don Dixon, one of the best astronomical and science fiction artists at work today. Don is the Art Director of the Griffith Observatory. Pick up one or more of his spacescapes for computer wallpaper, or order a high quality print direct from the artist.

We have book length versions of both Writers' Workshop series, "The Art of Writing, Volumes I and II" and "The Art of Science Fiction, Volumes I and II" in both electronic and hard copy formats.

So if you are looking for a fondly remembered novel, or facing six hours strapped into an airplane seat with nothing to read, check out our offerings. We think you will like what you find.

NOVELS

1. Life Probe - ^{US}$7.50

The Makers searched for the secret to faster-than-light travel for 100,000 years. Their chosen instruments were the Life Probes, which they launched in every direction to seek out advanced civilizations among the stars. One such machine searching for intelligent life encounters 21st century Earth. It isn't sure that it has found any...

2. Procyon's Promise - ^{US}$7.50

Three hundred years after humanity made its deal with the Life Probe to search out the secret of faster-than-light travel, the descendants of the original expedition return to Earth in a starship. They find a world that has forgotten the ancient contract. No matter. The colonists have overcome far greater obstacles in their single-minded drive to redeem a promise made before any of them were born...

3. Antares Dawn - US$6.00

When the super giant star Antares exploded in 2512, the human colony on Alta found their pathway to the stars gone, isolating them from the rest of human space for more than a century. Then one day, a powerful warship materialized in the system without warning. Alarmed by the sudden appearance of such a behemoth, the commanders of the Altan Space Navy dispatched one of their most powerful ships to investigate. What ASNS Discovery finds when they finally catch the intruder is a battered hulk manned by a dead crew.

That is disturbing news for the Altans. For the dead battleship could easily have defeated the whole of the Altan navy. If it could find Alta, then so could whomever it was that beat it. Something must be done…

4. Antares Passage - US$7.50

After more than a century of isolation, the paths between stars are again open and the people of Alta in contact with their sister colony on Sandar. The opening of the foldlines has not been the unmixed blessing the Altans had supposed, however.

For the reestablishment of interstellar travel has brought with it news of the Ryall, an alien race whose goal is the extermination of humanity. If they are to avoid defeat at the hands of the aliens, Alta must seek out the military might of Earth. However, to reach Earth requires them to dive into the heart of a supernova.

5. Antares Victory – First Time in Print – US$7.50

After a century of warfare, humanity finally discovered the Achilles heel of the Ryall, their xenophobic reptilian foe. Spica – Alpha Virginis – is the key star system in enemy space. It is the hub through which all Ryall starships must pass, and if humanity can only capture and hold it, they will strangle the Ryall war machine and end their threat to humankind forever.

It all seemed so simple in the computer simulations: Advance by stealth, attack without warning, strike swiftly with overwhelming power. Unfortunately, conquering the Ryall proves the easy part. With the key to victory in hand, Richard and Bethany Drake discover that they must also conquer human nature if they are to bring down the alien foe …

6. Thunderstrike! - US$7.50

The new comet found near Jupiter was an incredible treasure trove of water ice and rock. Immediately, the water-starved Luna Republic and the Sierra Corporation, a leader in asteroid mining, were squabbling over rights to the new resource. However, all thoughts of profit and fame were abandoned when a scientific expedition discovered that the comet's trajectory placed it on a collision course with Earth!

As scientists struggled to find a way to alter the comet's course, world leaders tried desperately to restrain mass panic, and two lovers quarreled over the direction the comet was to take, all Earth waited to see if humanity had any future at all…

7. The Clouds of Saturn - US$7.50

When the sun flared out of control and boiled Earth's oceans, humanity took refuge in a place that few would have predicted. In the greatest migration in history, the entire human race took up residence among the towering clouds and deep clear-air canyons of Saturn's upper atmosphere. Having survived the traitor star, they returned to the all-too-human tradition of internecine strife. The new city-states of Saturn began to resemble those of ancient Greece, with one group of cities taking on the role of militaristic Sparta...

8. The Sails of Tau Ceti – US$7.50

Starhopper was humanity's first interstellar probe. It was designed to search for intelligent life beyond the solar system. Before it could be launched, however, intelligent life found Earth. The discovery of an alien light sail inbound at the edge of the solar system generated considerable excitement in scientific circles. With the interstellar probe nearing completion, it gave scientists the opportunity to launch an expedition to meet the aliens while they were still in space. The second surprise came when *Starhopper's* crew boarded the alien craft. They found beings that, despite their alien physiques, were surprisingly compatible with humans. That two species so similar could have evolved a mere twelve light years from one another seemed too coincidental to be true.

One human being soon discovered that coincidence had nothing to do with it...

9. Gibraltar Earth – First Time in Print — $7.50

It is the 24th Century and humanity is just gaining a toehold out among the stars. Stellar Survey Starship *Magellan* is exploring the New Eden system when they encounter two alien spacecraft. When the encounter is over, the score is one human scout ship and one alien aggressor destroyed. In exploring the wreck of the second alien ship, spacers discover a survivor with a fantastic story.

The alien comes from a million-star Galactic Empire ruled over by a mysterious race known as the Broa. These overlords are the masters of this region of the galaxy and they allow no competitors. This news presents Earth's rulers with a problem. As yet, the Broa are ignorant of humanity's existence. Does the human race retreat to its one small world, quaking in fear that the Broa will eventually discover Earth? Or do they take a more aggressive approach?

Whatever they do, they must do it quickly! Time is running out for the human race…

10. Gibraltar Sun – First Time in Print — $7.50

The expedition to the Crab Nebula has returned to Earth and the news is not good. Out among the stars, a million systems have fallen under Broan domination, the fate awaiting Earth should the Broa ever learn of its existence. The problem would seem to allow but three responses: submit meekly to slavery, fight and risk extermination, or hide and pray the Broa remain ignorant of humankind for at least a few more generations. Are the hairless apes of Sol III finally faced with a problem for which there is no acceptable solution?

While politicians argue, Mark Rykand and Lisa Arden risk everything to spy on the all-powerful enemy that is beginning to wonder at the appearance of mysterious bipeds in their midst…

11. Gibraltar Stars – First Time in Print — [US]$7.50

The great debate is over. The human race has rejected the idea of pulling back from the stars and hiding on Earth in the hope the Broa will overlook us for a few more generations. Instead, the World Parliament, by a vote of 60-40, has decided to throw the dice and go for a win. Parliament Hall resounds with brave words as members declare victory inevitable.

With the balance of forces a million to one against *Homo sapiens Terra*, those who must turn patriotic speeches into hard-won reality have their work cut out for them. They must expand humanity's foothold in Broan space while contending with a supply line that is 7000 light-years long.

If the sheer magnitude of the task isn't enough, Mark and Lisa Rykand discover they are in a race against two very different antagonists. The Broa are beginning to wonder at the strange two-legged interlopers in their domain; while back on Earth, those who lost the great debate are eager to try again.

Whoever wins the race will determine the future of the human species… or, indeed, whether it has one.

12. Gridlock and Other Stories - US$6.00

Where would you visit if you invented a time machine, but could not steer it? What if you went out for a six-pack of beer and never came back? If you think nuclear power is dangerous, you should try black holes as an energy source — or even scarier, solar energy! Visit the many worlds of Michael McCollum. I guarantee that you will be surprised!

Non-Fiction Books

13. The Art of Writing, Volume I - US$10.00

Have you missed any of the articles in the Art of Writing Series? No problem. The first sixteen articles (October, 1996-December, 1997) have been collected into a book-length work of more than 72,000 words. Now you can learn about character, conflict, plot, pacing, dialogue, and the business of writing, all in one document.

14. The Art of Writing, Volume II - US$10.00

This collection covers the Art of Writing articles published during 1998. The book is 62,000 words in length and builds on the foundation of knowledge provided by Volume I of this popular series.

15. The Art of Science Fiction, Volume I - US$10.00

Have you missed any of the articles in the Art of Science Fiction Series? No problem. The first sixteen articles (October, 1996-December, 1997) have been collected into a book-length work of more than 70,000 words. Learn about science fiction techniques and technologies, including starships, time machines, and rocket propulsion. Tour the Solar System and learn astronomy from the science fiction writer's viewpoint. We don't care where the stars appear in the terrestrial sky. We want to know their true positions in space. If you are planning to write an interstellar romance, brushing up on your astronomy may be just what you need.

16. The Art of Science Fiction, Volume II - US$10.00

This collection covers the *Art of Science Fiction* articles published during 1998. The book is 67,000 words in length and builds on the foundation of knowledge provided by Volume I of this popular series.

17. The Astrogator's Handbook – Expanded Edition and Deluxe Editions

The Astrogator's Handbook has been very popular on Sci Fi – Arizona. The handbook has star maps that show science fiction writers where the stars are located in space rather than where they are located in Earth's sky. Because of the popularity, we are expanding the handbook to show nine times as much space and more than ten times as many stars. The expanded handbook includes the positions of 3500 stars as viewed from Polaris on 63 maps. This handbook is a useful resource for every science fiction writer and will appeal to anyone with an interest in astronomy.

