

The Search for Spock!

Developing the Theoretical Basis of Psi

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Physical theories and explanations of paranormal phenomena predate the more formal attempts to render the study of such phenomena a legitimate subject for science. The first formal attempt to study paranormal (psi) phenomena within a scientific framework came in the late nineteenth century as a response to the popular movement in 'modern spiritualism.' After 1930, the remnants of this Spartan scientific movement developed into the science of parapsychology, largely through the experimental efforts of J.B. Rhine and his associates.

The word 'psi' is also of a more recent vintage. Before the 1930s, the common phrase used to describe what are now called 'psi phenomena' was 'psychic phenomena,' the supernatural or the occult. Robert Thouless and W.P. Weisner first used the word 'psi' in 1946. They came to the conclusion that ESP and PK phenomena seemed to have many common properties so they assumed the existence of a single underlying principle or active agent at work and they dubbed it psi. Of the various similar terms, the term psychic is the closest to psi, since supernatural refers to anything out-of-the-ordinary and occult includes some of the more superstitious practices that have nothing to do with psi. The phrase 'paranormal phenomena' has also been used as synonymous with psi, but the paranormal includes a much larger group of events than just psi related phenomena. All psi events are paranormal, but not all paranormal events are psi related. Rhine's research in the 1930s and thereafter was substantially different from earlier research, so the word 'psychic' no longer fit the subject being researched. Rhine brought the study of paranormal phenomena into the laboratory and used the generic terms ESP and PK to describe the quantities that he measured experimentally even though psi had been studied under different names for a century or more.

This evolution of the terms by which the phenomena have been known suggests that psi research can be divided into three different historical periods. The first period, from prehistory up to about 1850 can be called the pre-scientific era of psi. The early scientific era lasted from about 1850 to 1930 and was dominated by the modern spiritualism movement. From about 1930 to the present psi research has been dominated by more scientific inquiries including lab experimentation and theoretical development, so these dates mark the scientific period of research. However, with respect to the role of physics in such research, the scientific era can be further divided into two distinct periods. In the first, the mental or psychological aspects of psi dominated research and just theoretical work. This period lasted until about 1970. After that date, physics became more than the lesser partner of parapsychology in psi research that it had been in the past.

A. The pre-scientific period: Psi prior to 1850

By the mid-eighteenth century, Newtonian mechanics was making deep inroads into superstitious beliefs and a great schism was developing between religion and science as each staked out its own domain of influence. A mechanistic worldview had emerged that took the everyday workings of the world out of God's hands. It was difficult for many to believe that the universe and everything in it were no more than mechanisms described by the Newtonian laws of motion, but Newton's science had been so successful that this conclusion seemed self evident. Many believed, rightly or wrongly (this question has still not been answered to anyone's satisfaction), that life was more than a mechanism, so a 'life force' that was not subject to Newton's laws was invented to explain living mechanisms. In many respects, this 'life force,' studied under many different names, was a precursor to psi.

It would be premature to state that there have been physical theories of psi as long as physics has existed and psychic phenomena have been known, since no complete physical theory of psi has ever been proposed. However, physical principles have either been associated with 'psychic phenomena' (to a greater or lesser degree) or used to explain psychic phenomena for as long as these phenomena have been thought to exist. The association of physics and concepts physical to psychic phenomena does not necessarily constitute the development of physical theories of psi. Physics has managed to stay at the forefront of science as a whole and, whether it is advantageous or not, other sciences have followed the lead of physics.

After the success of Newtonian physics and the mechanical worldview, other sciences emulated physics and modeled themselves after physics. So any early attempts to 'physicalize' psychic phenomena would necessarily be influenced by the physics of that particular period of history. But physics is dynamic and progressive. It is constantly moving into new areas and expanding both its scope and the range of phenomena that it explains. This movement of physics into new areas of application has always been preceded by the speculative applications of physical principles to both newly discovered phenomena and previously known phenomena which had as yet been thought outside the scope of physics. In the case of physical explanations of psychic phenomena, the speculations at the advanced edges of physics have more often been used to explain the paranormal than has the normal physics of the period.

Physical explanations of paranormal phenomena date at least to an earlier era when John Webster first associated 'corporeal beams' with the influencing of objects external to the organism. (Roll, p.38) Henry More theorized that spirits existed within a fourth spatial dimension of our physical world and still later Franz Anton Mesmer dealt with a magnetic medium that he called 'animal magnetism' pervading the universe. More, who was a Neoplatonist philosopher at Cambridge University in England, published his book *Enchiridion Metaphysicum* in 1671. In this book, he proclaimed that our three-dimensional bodies extend into a fourth dimension, beyond our normal senses. This extension gives material bodies a quantity called 'spissitude.'

Although the idea of spirits as 4-D beings had its greatest popularity in the nineteenth century, it had been hinted at some two hundred years before, by the Cambridge Platonist Henry More (1614-1687). Like the scientific spiritualists, More was opposed to the idea that spirits, angels, and Platonic forms could exist as insubstantial abstractions. He felt that if spirits really exist, then they must actually take up space. Yet, if a person's soul takes up space, we have the question of how it can fit into the person's solid physical body. In 1671, More came up with the suggestion that spirits should be four-dimensional. He phrased this in terms of an occult quality he called *spissitude*, meaning something like "denseness of substance." His idea seems to have been that the differences between the physically identical bodies of a dead person and a living person would be that the living body has more spissitude, and that spissitude is physically unobservable because it corresponds to a certain hyperthickness in the direction of the fourth dimension. (Rucker, pp.53-54)

This scheme of More's is all the more interesting because it came a decade before Newton published his *Principia* (1687), the foundation upon which Newtonian mechanics arose, and more than a century before multidimensional geometries began their own long road of development.

About a century later, when the Newtonian worldview held sway over all of European science and culture, Mesmer traveled to Paris where he proclaimed his discovery of a superfine fluid that could penetrate all material bodies and filled all of space. This idea was not new to science, since many scientists and scholars had hypothesized such 'aetheric' fluids to explain various physical phenomena. Such a fluid was thought to carry gravity through the vast emptiness of space between planets because the Newtonians could not accept the action-at-a-distance explanation of universal gravitation. Similar fluids were associated with the mechanical explanations of everything from electricity to heat where the fluid was known as 'caloric.' 'Caloric' was even listed on Antoine Lavoisier's charts as a primary element during the last years of the eighteenth century. Mesmer raised the possibility that an imbalance of his hypothetical fluid in the human body caused illnesses. He further speculated that his fluid was magnetic in nature so manipulations of the fluid in a sickened body, either through massage or by waving magnets over the body, could heal a person's ills and illnesses.

... and he especially extolled its application to medicine. Sickness, he maintained, resulted from an "obstacle" to the flow of the fluid through the body, which was analogous to a magnet. Individuals could control and reinforce the fluid's action by "mesmerizing" or massaging the body's "poles" and thereby overcoming the obstacle, inducing a "crisis," often in the form of convulsions, and restoring health or the "harmony" of man with nature. (Darnton, pp.3-4)

There were also allusions to other psychic phenomena, such as telepathy, within the Mesmerist message. Mesmerism eventually dissociated itself with the use of magnets and developed into a purely mental discipline.

Mesmerism is now associated with an early form of hypnotism in spite of its early marriage with magnetism and physics. The cult that Mesmer founded in pre-revolutionary Paris later evolved and did away with the magnets, the concept of animal magnetism, other physical paraphernalia and physical explanations upon which it had originally been based. This evolutionary track corresponded quite well with scientific

advances in electrical and magnetic theory and the eventual unification of electricity and magnetism into a single branch of science. As science learned more about electricity and magnetism and better explained these and their associated phenomena, there were fewer unknowns for the Mesmerists to utilize for their own ends. So Mesmerism was forced to shed its physical baggage and evolve into a new mental discipline, thus emphasizing other facets of its doctrine such as telepathy and strictly psychic phenomena.

In each of these cases, either the characteristics of known physical phenomena or suspected phenomena were similar to the characteristics of paranormal phenomena. So analogies were drawn between the physical concepts and the paranormal. Such analogies are a powerful tool in theoretical physics, but they must lead to explanatory hypotheses that are testable before they can be elevated to the status of theories. Analogies are only a first step toward theorization and the analogies in themselves do not constitute scientific theories. In many such instances, a public that is interested in science, but has no formal training or education in science, will misinterpret science and its application toward non-scientific ends. This was the case in the original concepts of the Mesmerist movement.

When this occurs, any possibility of obtaining good science from phenomena that are not recognized or accepted as real by the majority of the scientific community, such as psi phenomena, becomes all the more difficult. This was the case at the end of the eighteenth century with Mesmerism. Scientists were only beginning to seriously investigate and understand the nature of electricity and magnetism, but Mesmer and his followers misappropriated the science of magnetism for their own ends, through no fault of their own. Mesmer's magnetic fluid was just a convenient scientific-sounding explanation.

It seems safe, therefore, to draw one conclusion from the pulp literature of the 1780's: the reading public of that era was intoxicated with the power of science, and it was bewildered by the real and imaginary forces with which scientists peopled the universe. Because the public could not distinguish the real from the imaginary, it seized on any invisible fluid, any scientific-sounding hypothesis, that promised to explain the wonders of nature. (Darnton, p.23)

This statement is essentially true, but must be qualified due to the implication that fluid theories were a product of an unknowing public rather than scientists. Even scientists resorted to fluid theories in their earlier attempts to develop physical theories for electricity, magnetism heat and the transport of light. So the 'public' cannot be so hastily judged for accepting Mesmer's semi-scientific explanation. In such cases, the popularity of the subject of psi within the general populace and the non-scientific section of culture can be very harmful to the scientific pursuit of the subject by unnecessarily muddying scientific waters and prejudicing scientists.

The physical explanations offered in these examples reflect both the styles and norms of science or legitimate scientific speculations of that particular era. No more or less could be expected for any phenomenon, whether normal or paranormal. But paranormal phenomena, being that they are beyond the normal, have always been open to the more speculative and imaginative ideas of science during any given period. This is

both a strength and a weakness in the search for a physical theory of psi. Joseph Rush has acknowledged this fact of history in his own discussion of the physical theories of psi.

Theories tend to follow fashions and a theory that works well in one field often is invoked to explain puzzling effects in another. Mesmer and other healers attributed their effects to 'animal magnetism,' trading on the concurrent physical discoveries in magnetism. Relativity theory was mimicked by 'fourth-dimension' hypotheses of psi, and the advent of radio broadcasting evoked an appealing concept of telepathy as 'mental radio.' A few theorists have tried to explain psi effects in terms of gravitation, and plasma physics has found its counterpart in theories of 'bioplasma.' Quantum mechanics has, with more justification, stimulated several quantum-theoretical approaches to paranormal phenomena. (Rush, p.282)

Notwithstanding Rush's error of associating the 'fourth dimension' with the advent of relativity theory, a popular misconception of history, his basic premise still rings true. Attempts to theoretically explain psi phenomena (and their precursors) reflect the theoretical concepts of their day. This was true during the era of the Scientific Revolution, during the centuries that followed and is still true today.

B. The early scientific period: 1850-1930

By the mid-nineteenth century, four new trends in science came to exert a great deal of influence over society, culture and science as a whole, which includes the rise of 'modern spiritualism.' The first trend was the development of non-Euclidean and hyperspace geometries by mathematicians. Although purely mathematical, these theories immediately influenced physical thought. Mathematics had always been bound to physics, it was regarded as the handmaiden of science and God had long been pictured as the Great Mathematician, a view that both complemented and supplemented the mechanical worldview. As quickly as these mathematical theories became known, scientists and scholars began to speculate on the possibility that physical space either contained more than the normal three dimensions and/or it could be non-Euclidean. The second trend was the successful development of a theory of evolution by Charles Darwin. Darwin's explanation of human evolution shook the foundations of society as nothing had before its time, but evolution theory could not account for the development of the human mind. This result, or perhaps the lack of a result in this regard, of evolution theory only added to the previous beliefs that there was more to life than Newtonian mechanisms. Evolution theory thus scientifically reinforced the view that some part of the human being must survive the death of the mechanistic body in the minds of many people.

The last two developments came strictly within the realm of physics. The Newtonian concepts of mechanical energy and heat energy came together in a glorious union called thermodynamics during the 1840s. In similar fashion, the physics of electricity and magnetism came together in a unification called electromagnetic theory between the 1820s and 1860s. One primary outcome of electromagnetic theory was the explanation of light waves and whence the discovery of other types of waves outside the visible spectrum of the rainbow. Even with the powerful new tools of electromagnetic theory, as provided by James Clerk Maxwell, science was still unable to cope with the transmission of waves across the vast distances of empty space, so the concept of an all-

pervading non-detectable 'luminiferous aether' was invented as a medium to carry the electromagnetic waves.

At the very least, these theories demonstrated that there was far more to our world and nature in general than humans could normally sense. Since science had demonstrated that there were vast worlds of phenomena to be found beyond the normal human senses, it was implied that there was still more out there to be discovered. These new theories all seemed to reinforce the idea that there could be more to life and living bodies than just the shell of a Newtonian mechanism. The whole being of the human entity was greater than the sum of its parts. Although this relationship between the hard sciences and modern spiritualism is somewhat vague in most cases, a few scientists more directly applied these four theories to the explanation of psychic phenomena.

In the early 1870s, a German astrophysicist by the name of J.K.F. Zoellner visited England where he met the physicist William Crookes and was influenced by Crooke's work on psychic phenomena. Zoellner had previously applied a four-dimensional geometry to an explanation of comets. He then found parallels between his four-dimensional physics and various psychic phenomena. This led him to propose that psychic phenomena could be explained by the existence of a fourth-dimensional component of our normal space.

Zoellner associated the fourth dimension with the Kantian concept of an 'absolute area.' He further equated Kant's "thing-in-itself" with a four-dimensional material object whereby the three-dimensional part of the object exists in our three-dimensional space as a projection of the complete four-dimensional object. Zoellner clearly considered the spiritualist phenomena as legitimate scientific subjects. (Herrmann, p.82) He felt that his theory was founded upon solid philosophical grounds, and it may have been better if he had left it so, but he extended his work to the experimental arena by studying and interpreting the tricks of the American magician Henry Slade within his theoretical framework. Zoellner saw in Slade's tricks, the untying of complicated knots without apparent human contact or intervention and the appearance of writing on encased and thus inaccessible chalk slates, as evidence of the existence of beings in the fourth dimension and manipulation of three-dimensional objects via the fourth dimension.

In these phenomena, or some of them, Zoellner found experimental confirmation of his hypothesis of a fourth dimension of space, - a dimension which should stand to the known dimensions of cubic space, height, length, and breadth, in the same relation which height now bears to the two dimensions of plane space. Given the fourth dimension, the existence of which is mathematically foreshadowed, Zoellner pointed out that, to a man or a spirit endowed with the capacity of dealing with it, the abstraction of objects from a closed box, the knotting of an endless cord, or the removal into invisibility of a solid object would be tasks of no special difficulty. (Podmore, pp.15-16)

Mathematicians had previously demonstrated that motion into and out of a three-dimensional enclosure could be completed without going through the walls of the enclosure if one traveled through a fourth dimension. Furthermore, three-dimensional knots, no matter how complicated, were not knots when investigated using four-

dimensional geometries. These mathematical findings seemed to support the fact that four-dimensional beings could accomplish the tricks that Slade demonstrated before assembled groups of scientists.

Unfortunately for Zoellner, Slade was eventually exposed as a charlatan and fake, thereby discrediting Zoellner within the scientific community. Evidence of the scientific backlash to Zoellner's research along these lines can be found in Ernst Mach's book, *The Science of Mechanics*. Mach castigated anyone who would believe that the tricks of 'prestidigitateurs' and magicians could represent real scientific phenomena. (Mach, pp.589-591) He stated that religionists would mistakenly find in the fourth dimension a convenient place to put hell while mediums could locate their spirits there. He could not accept the four-dimensional hypothesis himself until objects began to appear out of nowhere, literally pop into and out of space, a possibility that he did not believe would ever occur. But he did not blame the mathematicians who had developed the non-Euclidean geometries and whose work had been usurped by the spiritualists for these purposes. For his own part, Mach refused to believe in the physical reality of non-Euclidean geometry as well as anything else that could not be normally perceived

The breadth of Mach's statements would seem to indicate that there was far more to the use of hyperspaces to explain spiritualistic phenomena than was evident in Zoellner's work alone. His statements on these relationships further raised questions pertinent to the present use of hyperspaces with psi. Should hyperspaces be considered as real or should they only be considered as mathematical constructs of consciousness? In this manner, Mach clearly defined the viewpoint that was later adopted by the positivists who seemed to rule scientific inquiry through the first half of the twentieth century.

However, Zoellner's work and theory did influence many people. C.C. Massey of the Society translated and published an abridgement of his book *Transcendental Physiks* into English for *Psychical Research (the SPR)* in 1880. Between this book and various reports regarding Zoellner's work with Slade, English and American spiritualists had ample opportunities to learn of Zoellner's work. Yet hyperspatial concepts had become far more popular than was evident from Zoellner's notoriety and publications alone. English mathematicians such as William K. Clifford, J.J. Sylvester and scientists such as Sir Robert S. Ball supported the possibility that physical space was non-Euclidean and four-dimensional rather than Euclidean and three-dimensional. (Beichler, "Twist") Although these men did nothing to support nor further the connections between their own scientific research and spiritualism, others could easily misinterpret their work in the light of spiritualism. In the meantime, popular expositions of hypothetical four-dimensional spaces did imply the existence of beings in this new extension of space to anyone not familiar with the scientific method of explanation of a difficult subject by analogy.

In order to explain the physical consequences of a real fourth dimension of space in common terms, popular writers imagined fictional worlds peopled by beings that realized higher dimensional spaces for the first time. The short book *Flatland*, published in 1884 by Edwin Abbott, related the story of two-dimensional beings that came into contact with our three-dimensional space for the first time. This book was a purely

fictional allegory meant to explain a difficult mathematical subject without mathematical language. But spiritualists misinterpret it to imply that such beings could exist could. Even Frank Podmore added a footnote to his brief explanation of Zoellner's theory that referred the reader to *Flatland*. "The idea of space of various dimensions has been well worked out in an amusing little book called *Flatland, ...* ." (Podmore, pp.16) Also during the 1880s, a popular series of articles on the fourth dimension by the geometer Charles H. Hinton appeared as a series of pamphlets under the collective title *Scientific Romances*. The first article to so appear, "What is the fourth dimension?," carried the subtitle, "Ghosts Explained." The publisher added the subtitle even though no mention was made of ghosts, spiritualism or psychic phenomena in the article. But the publisher thought that they were implied. The subtitle helped the article to become a popular hit and the whole series of articles were eventually published as a book under the same title, *Scientific Romances*, again demonstrating the popularity of the subject in late nineteenth century England.

References to connections between ghosts, spirits and psychic phenomena, on the one hand, and the fourth dimension, on the other hand, also appeared throughout the popular scientific and mathematical literature on non-Euclidean geometries throughout this time period. For example, Simon Newcomb, an astronomer and mathematician in America, publicly used the phrase 'fairylane of geometry' to describe the non-Euclidean geometries and hyperspaces during the period of 1890 to 1910. Historians and other scholars have interpreted Newcomb's use of this phrase as implying that the existence of a real four-dimensional space was fictional, the stuff of dreams and fantasies, but Newcomb actually believed that our physical space was non-Euclidean with real curvature in a higher dimension. The word 'fairylane' only referred to the ephemeral nature of physical space itself. It had nothing to do with a connection to psychic studies, but some people may have thought it implied spirits or ghosts. The hypothesis that a fourth dimension could be used to explain psychic phenomena also appeared in several short stories and books published by H.G. Wells during this same period, thus demonstrating the lasting popularity of such hypotheses.

The idea that another world existed parallel to our own, but beyond normal human senses was not limited to the hyperspace theories. In 1875, the book *The Unseen Universe: or Physical Speculations on a Future State* appeared anonymously in England. The book was an immediate success, going into four editions by 1876, forcing the disclosure of its authors Peter G. Tait and Balfour Stewart. The book was not spiritualistic in content, but it did offer a scientific explanation of the continuation of some part of the human entity after the death of the human body. Tait and Stewart utilized a combination of aether theory, thermodynamical concepts and the Principle of Continuity to argue for the possibility of life after death in their 'unseen universe.' Or rather, they argued that the continuation of something, perhaps a 'soul,' did not violate any scientific principles. Their purpose was not to advance spiritualism, but to mend fences between science and Christianity. They specifically dissociated their publication and the ideas they expressed from the modern spiritualist movement. After their own manner, Tait and Stewart reacted to the same attitudes, opinions and concerns that had

influenced the rise of modern spiritualism, without committing themselves to either spiritualist doctrine or psychic phenomena.

Rather coincidentally, Tait was a severe critic of Zoellner's work as presented in the first volume of Zoellner's *Abhandlunglung* (his *Transcendental Physik* came in the second volume) as well as an expert in the mathematical theory of knots. A 'Gordian' knot even appeared as a symbol of the mystery surrounding their subject on the cover of the *Unseen Universe*, marking a very strange connection to Zoellner's work. Stewart, although not a dedicated spiritualist, did have formal relations with the SPR, eventually rising to its presidency. While he did not believe in spirits, Stewart did find the evidence for telepathy "increasingly persuasive." (Oppenheim, p.337)

The SPR was founded in 1882. In part, it was formed to act as a counterpoint to the misinterpretation of science that had been an endemic part of the spiritualism movement, in part to investigate the reported phenomena within a purely scientific context, and finally to offer a scientific forum for the publication of scientific papers on spiritualistic and psychic phenomena during a time when other avenues of publishing scientific papers on the subject were closed. Several physicists became members of the new society. Some were confirmed skeptics who were still willing to consider the possibility of psychic phenomena, such as J.J. Thomson and Lord Rayleigh, while some supported either the spiritualist cause, the related psychic phenomena or both. Of these members, William Crookes, William Barrett and Sir Oliver Lodge were all well known and highly respected physicists.

As early as 1871, Crookes informed William Barrett of his belief that these "obscure phenomena" demonstrated by the spiritualists were "objectively true," while later that same year he informed another scientist that "There is a new force, or a new form of a known force" in order to explain the phenomena. (Quoted in Oppenheim, p.348) So, well before the SPR was formed, Crookes had come to the conclusion that 'normal physics' could not account for the observed "obscure" phenomena associated with spiritualism. More than two decades later, he still held this opinion, but he had become even more resolute that the force could not be accounted for within the framework of physics, as he understood the subject. This situation did not come from a lack of trying to explain the phenomena in terms of the known concepts of physics, since he had earlier turned spiritualistic phenomena into a branch of experimental physics. He had used the famous medium D.D. Home as a subject of scientific investigation.

He never ceased believing that psychical research was revealing the operations of a new force, but he was no longer certain that scientists could assign it a place on the map of modern physics. He had attempted to locate psychic force on that map during his tests with Home: He had placed the medium 'in a helix of insulated wire through which electric currents of different intensities were passed'; he had brought strong magnets near to Home and to the objects that moved in Home's presence; he had illuminated the experiments with different colored lights - all to see what effect the known agencies of physics might have on the medium's manifestations. Crookes had noticed no effect whatsoever. (Oppenheim, p.349)

Later in his career he turned to the purely mental (psychic) phenomenon of telepathy. Assured of the existence of telepathy, he even called on the newly discovered x-rays as a possible conveyance of telepathy in his 1897 presidential address to the SPR.

That in these rays we may have a possible mode of transmitting intelligence, which with a few reasonable postulates, may supply a key to much that is obscure in psychical research. Let it be assumed that these rays, or rays even of higher frequency, can pass into the brain and act on some nervous centre there. Let it be conceived that the brain contains a centre which uses these rays as the vocal chords use sound vibrations (both being under the command of intelligence), and sends them out, with the velocity of light, to impinge on the receiving ganglion of another brain. In this way some, at least, of the phenomena of telepathy, and the transmission of intelligence from one sensitive to another through long distances, seem to come into the domain of law, and can be grasped. (Quoted in Oppenheim, pp.349-350)

But he still came no closer to a theory than these simple analogies. Still later, in a 1909 letter to Lodge, he wondered if spiritual beings might not reside in a four-dimensional space. (Quoted in Oppenheim, p.351).

William F. Barrett's approach to the "obscure" phenomena of modern spiritualism was somewhat different. From the very beginning, he was more interested in the phenomena of clairvoyance and thought transference displayed by some mediums while in a state of trance. By 1876, he worked on developing a theory of thought transference.

Barrett was working toward a theory of thought transference, "the action of one mind upon another, across space, without the intervention of the senses." He was certain that much more was involved than the normal processes of suggestion between two people - more even than heightened sensitivity and abnormally acute perceptive powers on the part of his subjects. What was involved he did not pretend to know, but he proposed a tentative hypothesis based on the model of electrical induction, or influence, across space. Defining thought as a form of nervous action, Barrett inquired at Glasgow: "May not nerve energy, whatever be its nature, also act by influence as well as conduction?" If the nerve force were a radiant energy of some kind, "might it not be capable of throwing the nerve tissue of passive, receptive individuals into states of activity corresponding to the states existing in an active adjoining mind?" (Oppenheim, p.357)

Several years later, he still spoke of "nervous induction" and made analogies between electrical and magnetic induction and telepathy, but he only suggested a connection without deriving any specific explanatory hypotheses. Like Crookes, Barrett would never go beyond analogies and suggested courses of action, but fully believed in the reality of the mental psychic phenomena while hoping that they would eventually be explained within the context of physics.

While Crookes was by far the better known of these two physicists, the same cannot be said of Sir Oliver Lodge who was very well known and respected within the scientific community. Lodge was an early experimenter with radio waves, their transmission and reception. He is credited with the development of the basic tuning circuit for sending and receiving specific frequencies of radio waves. His philosophical

disposition made Lodge a lifelong believer in the existence of a 'luminiferous aether' as the medium of propagation for electromagnetic waves. Even after the development of the theories of special and general relativity, which rendered the aether superfluous, Lodge held that the aether was still necessary for electromagnetic propagation across the vastness of space.

The other pillar upon which his philosophical attitudes toward the study of nature rested was the principle of continuity. Continuity was essential for his concept of the aether, since the aether was continuous across space contrary to the discrete particles of matter from which material bodies were composed, a fact necessary for the transmission of electromagnetic waves. But continuity also had spiritual connotations for Lodge, who, unlike other physicists, fully accepted the possibility of the existence of spirits. Lodge reasoned that the essence of an individual human did not exist wholly in the physical body, but formed an "aetheric body," through which psychic powers acted. He explained that

"What we have learnt physically is that the ether can act on matter through electric and magnetic properties: we also know that mind can somehow act on matter, though probably indirectly. Our assumption is that we possess an ether body or animated structure of modified ether here and now, that life or mind is closely in touch with the ether body, and that through its action on this at present imperceptible body it is able to exert an action on the familiar material body. To assume that mind acts on ether and that ether acts on matter, is I hope an assumption in the direction of truth: and it appears to be justified by psychical facts, which show that the action of mind can be independent of matter." (Lodge quoted in Oppenheim, pp.384-385)

The 'aetheric body' was the intermediary between spirit and the physical body. Lodge held this view and fully supported his theory of the 'aetheric body' as late as 1930, in spite of the new advances in physics of the twentieth century.

The investigation of these phenomena by physicists and physical scientists was not limited to Britain alone, nor was it limited to Britain and Germany. The French astronomer Camille Flammarion investigated similar phenomena and tried to place psychic research on a scientific basis while the astronomer Giovanni Schiaparelli carried out observations on the medium Eusapia Palladino in the company of Giuseppe Geroso, a professor of physics, and other scientists in Milan, Italy. In his 1907 book *Mysterious Psychic Forces*, Flammarion argued for the existence of a "magic substance" which could explain the phenomena that he had witnessed. This "magic substance" was

unknowable in its essence. We see and touch only its condensations, its aggregations, its arrangements; that is to say, forms produced by movement. Matter, force, life, thought, are all one. In reality, there is only one principle in the universe and it is at once intelligence, force and matter, embracing all that is and all that possibly can be. That which we call matter is only a form of motion. At the basis of all is force, dynamism, and universal mind, or spirit. (Flammarion quoted in Inglis, p.440)

Flammarion's conclusion was similar to that of other scientists in that he could not explain the phenomena in terms of the physics of his era, so he resorted to some

imaginary medium or substance. In the meantime, physics itself had run into serious problems and was facing drastic changes. Flammarion's explanation coincided with the opening phase of the new revolution in science.

Although there was no 'shot heard round the world' to precisely date its birth, the Second Scientific Revolution is generally agreed to have begun in the year 1900. As far as physics is concerned, the revolutionary period lasted until 1927 and during that period a number of fundamental concepts were developed. To name the most important, we have the first paper on quantum theory (1900), special relativity (1905), experimental verification of the atom (1909), Rutherford's planetary model of the atom (1912), the Bohr model of the atom (1913), general relativity (1915), deBroglie's wave theory of matter (1922), quantum mechanics (1922-1923), other advances in quantum theory coming together in the Solvay Conference of 1927, and numerous advances in the theory of radiation and radioactivity. However, the revolution went far beyond just changes in physics with seminal advances in psychology, genetics, psychiatry and many other sciences. Society and culture also reacted to these changes while the political landscape changed drastically, especially during and after World War I.

World War I also brought technological advances to society, especially in radio communications, which would later affect the attitudes of common society toward psychic phenomena. But more importantly, the war hastened the end to the scientific investigation of medium phenomena. According to Brian Inglis,

The first world war did not entirely disrupt psychical research; one of the most carefully organised and illuminating of all the investigations into the physical phenomena was to be carried out during it by a lecturer in engineering in Belfast, W. J. Crawford. But in Britain, and on the Continent, little could be done; and the massive upsurge of demand for mediums who could console the bereaved by bringing them in contact again with loved ones killed in the trenches tended to concentrate attention on this aspect of the phenomena - and all too often on the frauds, or alleged frauds, associated with it. By the time peace returned, all prospect of psychical research establishing itself as an academic discipline had vanished. (Inglis, p.450)

But scientific research into psychic phenomena did continue after the war, although in an altered form, when science again had time to return to such frivolous pursuits. Before the war began, the emphasis had already passed from the study of mediums and the associated spirit phenomena to the purely mental varieties of psychic phenomena and this trend continued after the war.

With respect to physics, the years 1900 to 1927 marked the period of revolution, the effects of which did not come to bear on psychic research until after 1927. And this, coupled with the trend toward the study of purely mental psychic phenomena rather than spirit phenomena marked the emergence of a new age in scientific paranormal research. Until the new ideas in physics had trickled down to the study of psychic phenomena, the older 'Victorian' views dominated the study. In other words, the scientific revolution in parapsychology did not come until 1930. This revolution is generally attributed to the work of Rhine, but the date also fits the influence of physics and basic

changes in overall scientific attitudes resulting from the revolution in physics. Since the study of psychic phenomena remained fairly constant until the late 1920's when the new concepts of physics began to trickle down and affect other areas of academic study and culture in general. Frank Podmore's 1897 assessment of the state of psychic research remains valid for all of the work between 1850 and 1929.

Podmore was neither a physicist nor a scientist by training, but rather an astute and scholarly investigator of psychic phenomena as well as an official of the SPR. He came to the conclusion that various spiritualistic phenomena had no scientific foundation, but he could find no fault in the various forms of telepathic communication, which were purely psychic phenomena and had nothing to do with spirits.

From this brief review of the evidence - experimental and spontaneous - for telepathic communication, many topics of interest have necessarily been excluded. In the present chapter the examples have been selected mainly from the class of visual hallucinations, because these phenomena are in themselves more impressive, and explanation by chance coincidence is more obviously precluded. But the narratives here quoted, though they represent the evidence, either as regards its amount or its variety, very imperfectly, are sufficient to afford some idea of the character and importance of the problems to be solved. First amongst these problems is the nature of the agency by which the re-suits are brought about. On this question there has been speculation enough, from the first crude analogy of two tuning-forks sounding in unison, to elaborate theories, with experimental demonstration, of radiant neuric force, or a comfortable belief in the omnipotence of the ether. But in truth we know neither the medium by which the telepathic impulse is conveyed, nor the organ by which the impulse is originated or received. By some, indeed, it is held that telepathy is but one of a group of transcendent faculties, which point to a world beyond the world of sight and touch: the germ of powers which cannot reach their full growth until man has ceased to be man. Such a view is perhaps little more than the expression of the difficulties involved in any physical explanation. That mind should reach to mind over miles of intervening space without discoverable apparatus may, indeed, appear to call for supernatural means. But so to the peasant might appear the discovery of rayless stars, the analysis of the sun's photosphere, or the familiar miracles of the electric current. The properties of the ether and the mechanism and functions of the nervous system, it may be suggested, are still imperfectly explored; and it would be rash to assert that the nerve-changes which are the presumed accompaniment of thought could not be conveyed by ethereal undulations to a kindred brain over distances at least as great as those which are indicated by some of our thought-transference experiments. Even the greatest distance vouched for in the spontaneous cases of death-apparitions - even the whole diameter of the earth - would be an insignificant fraction of the distance traversed by the waves of ether which strike upon our retina the image of a star. (Podmore, pp.266-267)

Podmore's summary offers a fair look at the attitudes held by scientists of the era who had fifty years of spiritual and psychic phenomena on which to draw conclusions. The attitudes of those open-minded scientists who accepted at least the possibility of paranormal abilities tended to dismiss the spiritualistic phenomena to center on the related psychic phenomena after most of the mediums were exposed as fakes. The rest of the mediums were assumed to be fakes. But spontaneous telepathy and other psychic phenomena could not be so easily discredited or discounted. So, this assessment of the

phenomena essentially formed the basis upon which scientific investigation of the paranormal was to continue during the next period of scientific development.

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