

The Nature of the Relation Between Psychology and Physics: An Argument for a Central Role of Electromagnetism in Thought and Behavior

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Abstract

This paper hypothesizes key physical principles underlying human psychology fundamental to thought and social behavior. The model supposes when two individuals are involved with each other they are neurologically and therefore physically coupled or “bonded” with each other in a special way. There is an attractive-repulsive connecting force that guides behavior primarily localized in the neurochemistry of the brain. We are attracted to or repelled from objects and stimuli in a fundamentally electromagnetic way, directly correlated with the biochemical/electrochemical storage of charged information driving behavior in the brain. Neurobiological activities, e.g., ion channels, action potentials, and neurotransmitters, are chemical processes in and of themselves; it follows that behavior must be deterministically influenced by them. The model uniquely proposes that physical coupling occurs through space and often in approximately simultaneous time due to the summation of microscopic neuronal events leading to cognition and behavior in the compartmentalized “clockwork” of separate but synchronized brains. This may result in a coherence in thought and behavior through an interdependent physiological “force,” sometimes resulting in what have previously been considered to be unusual coincidental phenomena such as synchronicity or telepathy. Historical origins of the model are traced, and preceding ideas are explained using a new conceptual foundation for synchronistic effects in interactive thought, feeling, and social behavior.

Key Words: neurobiology, electrochemical, electromagnetism, quantum-like, cognition, electrostatic, bioelectric, psychology

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Introduction

There is clearly a human desire and necessity to understand the world in scientific ways.

This natural ideal of scientific inquiry is traditionally most closely approached by the disciplines of physics, chemistry, and biology. These fields are usually considered to be rigorous sciences, enjoying full-fledged scientific status with substantial credibility and legitimacy in their principles and claims, offering impressive explanatory and predictive power. However, the social and behavioral sciences seem to fall short in this respect, and are occasionally accused of being barely sciences at all (Uttal, 2007; Zentall, 2008). It is therefore not surprising

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that behavioral scientists have long wanted psychology to be more like its physical and life science counterparts, particularly the venerated science of physics (Hunt, 2005). While psychology has certainly made some progress toward these aspirations in the past century, especially due to improvements in the rigorosity of its methodologies, it perhaps has yet to attain the highest standard of scientific truth. It can be argued there is a long way to go before it reaches the “gold standard” of a science like physics that has a very high theoretical and mechanistic understanding, offers universal laws and facts, and provides invaluable equations of motion and calculating power.

But there is debate about whether or not this sort of “physics envy” is justifiable (Barnes-Gutteridge, 1985). Even if the experimental methods used by psychologists are now approaching the scientific sophistication of those employed by physicists, the important question remains unanswered as to whether or not a theoretical framework of psychology exists that is comparable to and can be derived from the same laws that govern the behavior of all objects and particles in physics (Kim, 2005). Clearly, psychology deals with a different set and class of phenomena and concepts than does physics and chemistry. Individually considered, the microscopic events of atomic quantum mechanics and electromagnetism are not the same as the complex set of macroscopic biological events and parts that constitute an individual’s human behavior. Conversely, the macroscopic laws of classical mechanics do not necessarily apply to many of the microscopic components (neurons, macromolecules, etc.) and other processes that comprise human brains and minds (Furedy, 2004; Rychlak, 1984).

It is therefore important to carefully address whether or not psychology may be based upon physical and chemical principles like the so-called hard sciences. Indeed, there is a long history of respected psychologists and physicists who labored under the hope and assumption that it is possible to describe the complex behavior of biological organisms with the same forces and constructs used to describe the structure and motions of particles that make up reality

within the physical sciences. These efforts were often attempts to propose distinct physical factors that govern thought and behavior, usually in the form of energetic, resonance, or electromagnetic effects generated and propagated in special and sometimes inexplicable ways. For instance, Freud developed his libido theory with a conservation of energy analogy in mind and treated it as an all-important life-force, although he could not understand how this arose from the biology of neurons (Lashley, 1924). Similarly, Carl Jung developed the idea of synchronicity as an “acausal connecting” principle of the psyche with the outer world and other people using a quantum mechanical-like property, but he too could not provide an adequate physical mechanism (Jung, 1955). Unfortunately, despite all the thinkers who worked on elucidating these physical parameters, none of them were ever able to identify and validate the actual form or mechanism of a real force governing human thought and behavior.

Therefore, if the desire for a physical sciences model of psychology is not to be abandoned merely as a pipe dream of intellectuals or a heuristic metaphor (Gholson and Barker, 1986), it would be helpful to consider the history of this subject and to evaluate some promising possibilities. In the light and context of the most up-to-date interdisciplinary scientific knowledge, it may be possible to arrive at some new conclusions about certain physical characteristics of the psyche and its interactions. This includes the true origin and mechanistic nature of these physical properties, their psychological and ecological validity, and empirical verifiability. Other theories of physical human bodily parameters and sensory capabilities were successfully established using principles from physics in appropriate ways. The field of psychophysics began during the nineteenth century and continues through recent times (Fechner, 1860; Stevens, 1957). It seems only logical that a viable and pragmatic version of a cognitive and behavioral physics will eventually be developed and accepted as well.

A New Hypothesis: Electromagnetic Psychology

My approach begins with the belief, like other researchers, that a physical scientific and reductionistically built model of psychology may in fact be developed beginning from the principles of physics (Budenholzer, 2003; Churchland, 1982). This may be considered analogous, as in the progress and development of science in general, to the way many of the rules of chemistry and biology were built from the foundation of preceding physical principles. For instance, the properties of the periodic table and of most chemical substances may be completely theoretically understood from the principles of quantum mechanics. New features, including rules of bonding and molecular structure, were successfully explained this way (Pauling, 1939). Similarly, behaviors dependent primarily on quantum mechanical and electrostatic principles are now routinely calculated and experimentally measured for the biological macromolecules that do most of the work in organisms (*e.g.*, see Moser *et al.*, 1992; Nicholls *et al.*, 1991). This yields useful quantifiable parameters that can explain and predict the behavior of many enzymes; for example to calculate and anticipate desired effects such as an enzyme's kinetic turnover rate or a drug binding affinity. Accordingly, observable macroscopic effects in organismic biology and psychology may also be feasibly deduced to be guided by these currently "invisible" but ultimately calculable physical and chemical forces. So it is very important to begin to clarify what they might be.

It is clear that during the long history of research attempting to uncover the suspected physical factors behind psychological effects, the mysterious forces were frequently believed to be energetic or electromagnetic-like in nature. The evolution of this view is recounted in the following section of this paper, where the most important insights toward an electromagnetic hypothesis are highlighted. Highly respected thinkers often began by seeking their own favorite variations of an electromagnetic force or energetic resonance effect, a trend that can probably be considered to have formally begun as early as Franz Mesmer's ideas of a kind of "animal magnetism" in humans. Following the

mesmerism movement and the development of Maxwell's equations about a century later, a more focused approach emerged in Oliver Lodge's pursuit to explain telepathy as an electromagnetic transmission of thoughts through the ether. Freud himself shortly thereafter sought his own particular version in a thermodynamic kind of life-force driven by the libido.

It was perhaps Jung's subsequent idea of synchronicity that most dramatically suggested the possible connection of perceptible psychological events in everyday life, experienced as meaningful coincidences, to a potential quantum-like physical origin. His idea was that seemingly chance encounters and coincidences include a psychological but rationally unknowable or imperceptibly hidden physical explanation, which suggested that many social and psychological events, including thoughts themselves, might have a physically supported connection or pattern. In the end, Jung ultimately resigned to describing the paired events as unrelated through any directly mediated physics, treating them only analogously similar to newly discovered indeterminate quantum mechanical phenomena (Main, 2007). But it was this type of effect that exemplified the real possibility for the existence of a general kind of physical linking to others and the universe through cognition and behavior. A thoughtful examination of the history of this subject begins to reveal the possibility that individuals may be both emotionally as well as physically compelled to seek out objects or avoid them at specific times. This is to say, extraordinary coincidences and patterns may emerge for both psychological and physical-chemical reasons.

These mysterious "forces" long sought by scientists differed from the more superstitious ideas of spiritual and psychic forces in mind-matter interactions that were, and perhaps still are, the most common throughout history (Alvarado, 2006). Empirical clinical observations of discrete coincidences and ordered synchronous events that are psychologically driven was leading to relatively scientifically enlightened attempts to explain them with a similar class of mechanisms, and these seemed to be converging on a new conception. There was

increasing evidence that could lead to the plausible deduction that human thoughts and actions may actually follow a kind of electromagnetic property involving energy, charge, and the idea of attraction and repulsion. This would be a concept of attraction and repulsion that could be derived from Coulomb's laws and other new principles of physics regarding charge movement and electromagnetic waves that were being discovered at about the same time as the electrical explanations of psychology began to appear. The difficulty may have always resided in how to properly incorporate new concepts from an ostensibly unrelated branch of natural science to the incipient and far less developed discipline of psychology at the time. The possible connection between psychology and actual electrodynamic charge-like effects in the brain was perhaps never properly made.

It is arguably already a fact that the concept of an electric-like attraction and repulsion is currently used within psychology, and increasingly in everyday conversation. Nearly the same physical effect is implied when speaking in terms of "positive" or "negative" reinforcement toward certain stimuli, or positive and negative experiences. In behaviorism, objects are sought or moved away from according to present and prior experiences and perceptions of them, with negative reinforcement being a reward when an object is avoided and positive reinforcement when it is sought and gained. For those versed primarily in the physical sciences, it is challenging not to think of the idea of electrodynamic charge when speaking of conditioning in this manner. The physicist and chemist cannot help but to think this way because the particles of their interest, most often electrons and protons, are attracted to each other and assigned a charge to account for their properties and to help keep track of and calculate their behavior. It is therefore not surprising that psychologists would begin to attempt to do the same thing by using their terminology in an analogous manner.

Probably the strongest supporting evidence for a new electromagnetic argument would come from the fact that it is now well understood that many enzymes and

other macromolecules operate using an electrical molecular basis. Ion channels and signal transducing cascades in neurons, required for storing and transmitting information in the brain and memory (Kandel, 2006), are undoubtedly electric-like in their operations. The molecules involved in neuronal processes are often modified and change their states by the addition or removal of small molecules with a formal charge. Bonds may be made and broken on enzymes to control their action as ionic gates and charge switches, and these events may not always be net neutral. For example, in the process of phosphorylation used in memory storage processes, inorganic phosphate is added or removed to modify the state of a protein and to alter its chemical activity (Wood *et al.*, 2006), effectively turning it on or off and controlling its global activities. But inorganic phosphate is net negatively charged, so the effect is enacted primarily by adding or subtracting charges. The result may be small net partial charge increases or decreases in positive/negative potential.

Of course neural action itself is greatly dependent on the flow of charge during action potentials as controlled by activated or inactivated enzymes, and action potentials in many ways resemble electromagnetic waves and pulses. It is therefore not difficult to conceive that psychological experiences and behavioral conditioning, undoubtedly directly connected with and dependent upon the biochemical/electrochemical processes of the brain, are electrochemically and electromagnetically founded. This important line of reasoning, briefly introduced here, strongly suggests that perception, thought, and human actions can and perhaps must be treated much like charged quantities in their mental origins. The physiological events may eventually be demonstrated to be distinctly correlated with actual cognitive and behavioral states (Haas, 2011b).

If consciously active organisms are hypothesized to be affected on a neurobiological level in such an electromagnetic way when they interact, then they may also be considered physically coupled or "bonded" in a special way to the objects they participate with. This would

represent a materialist perspective that proposes the matter and attractive binding forces guiding and regulating behavior are primarily localized in the neurochemistry of brains. Mental and bodily actions arise from the drives of charge and energy states based upon explicit motivations and cognitions, and these may remain coupled through space in a unique way. However, this view contrasts with other notions of thoughts, minds, and bodies acting directly on each other over long distances or of minds being delocalized and quantum mechanically coupling through any sort of ether or via strange spirits.

The hypothesis proposed here supposes that all interactive effects and perceptual impressions store quantitative impacts that primarily reside in the brain and immediate vicinity of the body, and the source of connected action would emanate from a kind of classical interdependent local realism. Presumed “nonlocal” effects would then have to be explained using this line of reasoning, which could sometimes involve other aspects of the influencing environment. Such a relatively “deterministic” premise could not be trumped by increasingly popular notions of a special nonlocal interaction or by belief in an excessive autonomy to act outside the limiting conditions of material human biological existence. Conscious organisms are considered to be deeply involved in their experiences and relationships, and at some level the strong internal and environmental forces affecting and molding them must be treated as inescapable factors involving real constraints. There are relatively strong “forces” generated and felt within and amongst a group structure and system, and this can be modeled using a simple two-person dyadic system (Haas, 2011a).

During the long history of the search for special physics effects in psychology, thinkers have often believed in directly transmitted and mediated forces or nonlocal effects through space between brains and minds. For instance, this is assumed in the direct or indirect actions of these forces in telepathy or telekinesis. However, the model proposed here contends that the perception of these experiences arises primarily from chemical forces that are solely lodged and

changing strictly from within an individual’s own head and body in an independent but often interdependently coordinated way with others. This is rather than specific thoughts being significantly physically stored or directly transferrable somewhere else, or being “acausally” mediated through space. The interactional forces are not proposed to be identical to electromagnetic waves, electric and magnetic fields, or induction; although they may in fact be quite closely related to those phenomena in their nature because they are based on charge and energy transformations in the brain. The question would then become, how and in what ways are cognitive and behavioral responses genuinely related to the laws of electromagnetism and chemistry?

This novel version of a physical model of psychology follows the view that behavior must be substantially deterministically influenced. This is currently an unfashionable line of thought, and opposes the increasingly popular view of treating human behavior and cognition as being indeterminate and relatively unpredictable (Glimcher, 2005). The latter view is commonly promoted by those who prefer to apply different physical analogies (Smith, 2006), particularly some specialized ones based on microscopic quantum principles such as the uncertainty principle, the observer effect, or quantum entanglement. While these principles may be useful in describing psychology in an analogous quantum-like way, the importance of actual quantum events in macroscopic behavior may sometimes be overestimated. Functionally useful quantum based events are most likely to occur in biochemical processes between the most microscopic components of the brain itself (Tarlaci, 2010). When applied to psychology that would extend beyond the body, quantum effects probably become largely metaphorical. Their application may overlook the dominating role of other causal factors and macroscopic parameters in interpersonal behavior and thought that are probably more classical-like in nature (Tegmark, 2000). The importance of directly mediated quantum physics effects between biologically separate individuals during the salient features of human life may sometimes be exaggerated.

In this paper, it is suggested that neural events are physico-chemical processes in themselves that often do operate relatively conservatively and “in sync” with those of others’ brains, and will sometimes display concrete, discrete and emergent macroscopically determined effects that appear as unique coincidences or moments of social effectiveness. Conscious social beings may be psychologically bonded on a mental level and perhaps interact with each other in a currently underappreciated semi-ordered fashion, reflecting an intuitive connection between individuals and their internal processes. To a large degree, this coupling can and does occur through space and often in simultaneous time through an important kind of biological synchronization. Sometimes it may express itself in particularly well-timed synchronicities or moments of “meetings of mind” (Hogenson, 2009). These are suggested to be due to a mutually complementary summation of microscopic neurochemical events that lead to behavioral action from the “clockwork” (Schwartz *et al.*, 2005) of separate but relatively cooperatively synchronized brains.

The model elucidated here offers a new explanation for unusual numinous experiences previously considered to be phenomena such as synchronicity and telepathy (Haas, 2011a). The mechanism described in this paper provides a causal explanation and a general application of the effect to social behavior that is less coincidental in nature and would be more akin to moments of peak psycho-social efficiency and cooperation. When individuals think about and interact with each other and seek objects at specific times, it may be because the timing of biological needs and the actions of the body are regulated by the processes of the brain and this often occurs in parallel with others. There may be a sub-perceptive chemical bonding and a physical attractive-repulsive quality that sometimes appears as a strange orderliness in psychology and behavior. This may be a universal organizational phenomenon that perhaps should be taken into greater account in understanding interactive thought, feeling, and social behavior.

Historical Origins of the Relation of Electromagnetism to Synchronous Behavior

Throughout the course of the history of psychology, as well as during the long period it fell under the rubric of ‘philosophy,’ there have been numerous attempts to apply concepts from established scientific disciplines and other lines of thought to psychology proper. Perhaps one of the most famous examples of this was Sigmund Freud’s effort to make psychoanalysis into a science based on principles similar to thermodynamics (Freud, 1895; Freud, 1939). The “libido,” as he called the sexually based energetic life-force sustaining human activity, was a substance of limited available supply – blockages in its smooth flow or a balance in this energy’s discharges could cause sickness or health. While many psychologists would probably now agree that Freud’s analogy has fallen short in some ways (Rychlak, 1984), we also know his general model of psychoanalysis was extraordinarily successful in providing a foundation for a revolution and century of advances in psychology. Therefore, it is not unreasonable to consider the possibility that his physical sciences comparison was not merely wishful thinking, and that there is truth to his view to be investigated further. As Freud himself always wanted to believe, there is the genuine possibility that psychology will eventually become more like the rigorous science he was seeking if new conceptual models and supporting evidence can be found to substantiate these claims.

Perhaps not coincidentally, at about the same time as Freud entered onto the scene, other scientists had already begun seriously investigating the explicit connections between psychology and physics, particularly as pertained to the new laws of electromagnetism. Most notably, a physicist named Oliver Lodge began formal studies into paranormal psychological phenomena, such as telepathy and telekinesis. He used the concept of the ether as the basis for the conduction and transmission of both physical and psychical transformations (Raia, 2007). Lodge believed that human “minds” could essentially exert forces on each other and communicate through the medium of the ether via electromagnetic waves. This belief,

cautiously pursued under the haven of the newly founded Society for Psychical Research, was developed in parallel with his pioneering work in physics on wireless (radio) telegraphy. Another outgrowth of his physical science research was the entertainment of the idea that consciousness could be located and stored outside the brain, much as electrical and magnetic fields surround the area outside conductors, a field analogy still being speculated on in a variety of ways by researchers today (Mansfield, 1996; Tubert-Oklander, 2007). But he always understood that more proof was needed to support his heretical views, and his research in this area was limited because he was constantly trying to avoid being considered a pseudoscientist.

Oliver Lodge's belief in the physics and a kind of "immortality" of the human soul contrasted with the neurophysiological and biochemical based views of other thinkers who felt, perhaps rightly so, that the epiphenomenon of consciousness disappeared when the brain ceased to exist (Raia, 2007). Nevertheless, Lodge represents one of the most serious and legitimate early thinkers in the direct application of electromagnetic effects to psychological phenomena, despite the fringe treatment he received for his inquiries into the subject. With the possible exception of Mesmer and his followers, he was perhaps the most important contributor in making a real connection between electromagnetism and the conscious mind; i.e., between ordinary psychology and the possibility of interactive electromagnetic cognitive and behavioral effects. This would be beyond the relatively ordinary application of basic quantitative physics to psychological sensory perception as begun by Fechner in psychophysics (Fechner, 1860). However far from the truth he may have been regarding mind and matter, he certainly made a significant contribution by proposing and testing how actual electromagnetic-like signals could play an explicit role in psychology, a milestone that rightfully earns him a place in the history of this subject.

Themes described in Lodge's work seemed to recur throughout the next century. Particularly relevant were various versions of a "tuning fork" analogy he liked to use (Raia,

2007). In this model, two minds may communicate with each other if they are properly attuned and in resonance. The belief was that minds transmit information through brain waves if they are in some way tuned to the same wavelength, when they exhibit a sort of resonance or symmetry. This kind of coherence effect, in addition to its use to attempt to explain mental telepathy, began to appear as a universal theme to be explored by many others since his time. For example, it is well-exemplified in common expressions such as "operating on the same wavelength" or being "in sync" with another person or group, meant to convey thinking and feeling much alike them in a socially coherent way. In contemporary times, there is certainly no shortage of such concepts in discourse, although the effect may remain incompletely understood.

In the mid-twentieth century, the esteemed psychologist Carl Jung seriously investigated synchronous phenomena, what he called "synchronicity" (Jung, 1955). Jung's idea of a synchronous event was defined as two simultaneous psychological or social events that are confluent in meaning, or thoughts that occur in conjunction with other natural events, that otherwise have an extremely low probability of transpiring at the same time. He believed these convene and are guided by unknowable or unpredictable unconscious feelings and forces influenced by archetypal structures, and could possibly be described using quantum physics or another physical basis. His ideas were directly spurred by quantum mechanical concepts newly available at that time, as he believed the events were indeterministic and acausally "connected" to each other, much like probabilistic quantum mechanical events that may not be rationally expected. Much of Jung's work was developed in a famous and well-documented collaboration with the physicist Wolfgang Pauli (Donati, 2004). However, upon Pauli's insistence, he was ultimately forced to conclude that the events could not be directly physically mediated through a quantum interaction. Yet a definitive conclusion about other possibilities to explain the potential physical nature of synchronicity was never reached.

As the twentieth century progressed, the idea that mysterious meaningful consciously manifesting effects and behaviors could possibly be guided by a conjunction of psychological and physically generated processes in the human psyche and its relation to the larger universe was well on its way to becoming a legitimate subject of study. This was supported both through tangible empirical observations as well as the new theoretical explanations. Interest in synchronicity continues stronger than ever today. Some variations on this theme now revolve around the possibility of the appearance of a special kind of moment of order from chaos, and has appeared in new and improved concepts such as “emergence” (Cambray, 2002). These are related to synchronicity in their proposition that higher order conscious properties are due to the summation of collections of lower order unconscious processes and their interaction with the environment when they are considered from a holistic perspective. According to these models, distinct moments of order may occur from a physical alignment and arrangement of component parts, and this may be based upon chemical properties that are recognized to be fundamentally electromagnetically interconnected (Cambray, 2009).

In recent times, research into the characteristics and mechanisms of possible special physics based psychological effects is typically relegated to the field commonly known as parapsychology. Some of the topics studied in this category include telepathy, ESP, and precognition. They retain strong similarities to Lodge’s ideas in that they are sometimes considered to be psychological experiences influenced by physical forces acting over distances via an elusive force known as “psi.” In many cases, the effect of psi also resembles synchronicity in that it takes advantage of an ill-defined mechanism operating directly or indirectly and somehow interdependently through space. However, these controversial phenomena and ideas of such a strange and spooky force remain for the most part incompletely proven. They remain in exile from mainstream psychology, and perhaps justifiably so. But they are also innately intriguing and present the opportunity for consideration of new possibilities of physical

interpretations of cognition and behavior. They could potentially have extraordinary implications for ordinary psychology if they are found to exist in one form or another (Lazar, 2001). The pertinent question may be whether or not they could actually represent another poorly understood effect, such as an electromagnetically based “force” that has not been properly explained.

Much of the current inquiry in the parapsychology field, like most of the past research in this area, seeks to apply the most recent developments in contemporary physics to the human psyche and social interaction. For example, many paranormal psychologists and physicists are now proponents of the view of the “quantum entanglement” of minds (Radin, 2006). However, this may be a belief that is not so different from a contemporary variation of the idea of electromagnetic forces in thoughts being directly telepathically transmitted and acting somehow through a kind of ether. In this contemporary version of telepathy, the entanglement of minds would involve mind-to-mind pairwise interactions presumably taking advantage of “spooky action at a distance” (Leder, 2005) in the form of an instantaneous coupling through space and matter due to the strange quantum mechanical effects of the initial pairing together of objects at a point in time.

In the entanglement of minds, the paired minds are believed to change state simultaneously according to Bell’s theorem (Bell, 1964), even though there is no local connection. Unfortunately, however, this may still be nearly the same as belief in a direct form of telepathy. It must be caused by the assumed interconnectedness of brains through a signal or a coupled pair of states that utilizes specifically correlated energy transitions and information. This popular version of an “interconnectedness of reality” would consequently probably also assume the existence of a microscopic quantum based grid or a string theory based fabric-like material holding the universe and our minds together (Greene, 2004; Wilczek, 2008). Further, how the entanglement of minds would work with or without a specific chemical and biological mechanism in the brain and human body is not entirely clear. While quantum coherence has been

repeatedly experimentally observed and is established for quantum particles, its relevance and application to the socially interdependent neurochemistry in human brains and behavior is at best questionable and certainly open to debate. This would be not to mention that the “hidden variable” model of quantum entanglement itself has not even been disproven, and such a variable would not seem likely to carry or conduct brain signals.

The new contemporary view of telepathy-like effects first presumes a full version of telepathic transmission of thought actually exists, and also postulates a specialized quantum physical mechanism. It may not properly take into account the overwhelmingly biological and compartmentally separate and independent operation of macroscopic human brains and bodies. It assumes that pairs of relatively enormous and extremely complex composite objects behave exactly like some of the smallest ideally coupled quantum-sized particles. While there may be the possibility for the extension of an approximated classical-like entanglement phenomena to some specially treated macroscopic objects (Julsgard *et al.*, 2001), a specific quantum effect must be different from a complex multilevel macroscopic one in some ways.

Photons and electrons in their quantum states are directly physically coupled with counterpart halves at their starting points in entanglement experiments. Clearly, brains and bodies do not begin physically attached or “glued” to each other. The structures and energies involved in an entire brain are much larger and far more complex than those of the smallest and purest particles that experimentally exhibit the peculiar quantum mechanical feature of a direct physical entanglement. In fact, it is acknowledged that demonstration of the effect for larger objects and even in some of the smallest biological materials has hardly ever been shown (Radin, 2006). Only a very small number of molecular biological phenomena have been shown to employ an actual direct and substantial functional use for quantum coherence itself (*e.g.*, Collini *et al.*, 2010). It would therefore not be unreasonable to be skeptical about the physical mechanism proposed in these

recent speculations. An entanglement mechanism would appear to run into same problems that have been historically faced by so many other researchers, who were later obligated to moderate their beliefs.

The existing evidence or the lack thereof, seems unlikely to support the possibility that the matter of brains is ideally physically coupled to other people’s brains through direct or indirectly mediated forces. It is very difficult to see how these forces would act in an identical manner as within atoms and molecules that begin within angstroms of each other. The quantum mechanical principle of decoherence implies that these specific types of highly sensitive entanglement effects should all but disappear at the macroscopic level (Tegmark, 2000). The correlations will decrease, and most quantum effects must revert to classical approximations at the macroscopic level in accordance with the correspondence principle (Bohr, 1920). For example, large objects may have some wavelike properties but they become vanishingly small as the macroscopic level is approached. While there may be large statistical mechanical effects that create measurable brainwaves, for example, these are quite different from individual precisely entangled quantum states. Though the superposition of many individual states may seem feasible, it may be more appropriate to treat any such observable biological events as being more thermodynamic or electrical in nature. People are far from being identical to quantum bits and waves. So it comes as no surprise that the new entanglement models are a long way from being accepted as legitimate explanations to describe simultaneous and synchronous thought and behavior in human beings. It seems most likely that other approaches will eventually prevail, and these would of course be expected to include the actual complex psychological principles involved in interpersonal interaction and behavior.

Thus, a central theme that can be discerned from these past and present studies is the attempt to explain what occurs on a physical-scientific level when two conscious beings are separated, or together, and they experience a highly improbable but functionally meaningful simultaneous

thought. The question is how the two thoughts or events occur in alignment at the same time, whether in the same location or not, when there is a very low probability of it occurring otherwise. Most of us would probably agree that social congruences and synchronicities do commonly occur. But they have been interpreted by researchers in a number of ways, and perhaps often inaccurately. Nonetheless, it is clear that both conscious and unconscious thoughts and motivations account for much of the drive and control of this biological behavior and that there are some “forces” created within the physical mind and body. However, none of the previous explanations credibly accounts for the ordered nature of these interactions from a physical perspective, and they fail to provide an adequate psychological and physical scientific mechanism for the effect. It is these conceptual and mechanistic deficiencies for which a hypothesis involving interpersonal synchronistic effects and their electrochemical nature is proposed and discussed in this paper.

Discussion

As regards the presumed existence and validity of a special kind of synchronicity and related paranormal phenomena themselves, healthy doses of realistic skepticism can be found from many researchers. For instance, many believe that the effects are anywhere from actual psychological resonances (Bright, 1997; Mishlove and Engen, 2007) to events mistakenly attributed a special meaning when they are really only meaningless misperceived chance or trivial occurrences. Clinical researchers have frequently interpreted synchronicity as the conflation of infantile thoughts and feelings with external observations and experiences (reviewed in Williams, 2010). They have been described as projections and “entanglement with early emotional trauma” or the product of the basic inability to process and mentalize experiences properly (Reiner, 2006). The danger of interpreting these experiences as anything more than psychological regression itself or a regression to the mean effect always remains very high (Haas, 2011b; Williams, 2010). Yet it may also be proposed that there is a continuum of subjective experience and varying degrees of

accuracy in perceiving and conceptualizing this unusual class of experiences. An individual’s interpretations may range from experiencing them as completely random “chaos” or disorder to understanding them as the perception of a unique order that sometimes emerges out of the complexity of psychological and biological life (Haas, 2010b).

If the skeptics are taken seriously, however, any attempt to explain such irrational and unfounded emotionally generated ideas of perfectly simultaneous or harmonious thoughts and interactions as direct thought communication or quantum “entangled” thinking would be precluded and becomes a moot point. In fact, at some point along the proposed continuum of possible interpretations for these uniquely aligned phenomena the doubters are likely to be correct (Haas, 2010b). But as pertains to modeling them as specific physical effects with respect to the historical developments reviewed in this paper, there is an additional factor that would support the argument for the need to reformulate a better physical model. A reason why the models proposed by researchers may so commonly be inaccurate physical descriptions is because advances in physics and technology offer alluring new concepts and designs that would seem to conveniently fit and supplement current psychological theories in a desired way. From the historical evidence, it is clear that the most recent advances in physics, in this case highlighted for electromagnetic effects, inevitably lead to attempts to apply the new concepts in an identical way to psychology. Yet discoveries and innovations in the physical sciences are not always ideally matched with and appropriate for incommensurable psychological phenomena they do not correspond precisely with. Therefore, when attempting to use such physical principles where they may in fact be applicable, they must be carefully tailored and designed to fit correctly when applied to the observed neurological phenomenon. They must be both corresponding and commensurate for those specific cases and must be closely conceptually related whenever they are applied.

It is therefore argued in this paper that what are sometimes believed to be

certain kinds of synchronicity and telepathic effects are not really the direct or “spooky” simultaneous transmission of thoughts or any other strange and unusual confluence of special quantum effects. Rather, they are more likely to be relatively normal time dependent psycho-social effects that involve an underlying electrochemical or “electromagnetic” basis. People are bonded and connected through the more ordinary neurochemistry of the brain, and this may possibly represent a poorly understood interconnecting “force.” Such a subconscious force may often be misunderstood or misinterpreted as an unrealistic psi-like phenomena and ascribed elaborated causes. For instance, direct telepathy itself may never really occur, although it may sometimes be believed to exist on occasions when individuals are separated or isolated from others for a period of time. Instead, these may actually be misperceptions of feelings and thoughts about ourselves and others when apart from them, or when suddenly and perhaps unexpectedly or with surprise rejoined. The most straightforward and viable explanation is that they are misinterpretations that may be like mild hallucinations or basic miscomprehensions of the causal reasons and factors behind the events.

The perceived experiences are suggested to be based primarily on strongly felt internal biochemical forces and biological needs. It may be the strain or tension caused by the separation of two people that sometimes leads to an erroneous solipsistically biased perception and belief that there are specially transmitted or exchanged forces (see Haas, 2011a). Much of this may be due to periods of delay in gratification and miscomprehended moments of transition between interpersonal states, and there may often be some confusion or confabulation. This can lead to attributional mistakes regarding the sources and actual forces of cognition during this type of pairing effect. Something does indeed happen to people and the objects of their interest while they are separated, though it may not be accurate to postulate that there are distinct physical forces that are actually transmitted and conducted, or acting acausally through the proverbial ether. Instead, these experiences may perhaps

represent an underappreciated aspect of physical attachment and interdependently timed behavior, and this may be electrochemically charged and energetically driven. This kind of a chemical or “electromagnetic” explanation may represent the beginning of a proper physical and physiologically derived psychological model.

It is most plausible that the psychological changes that occur are attributable to the compartmentally separate and often synchronized biological chemistry in the individual brains and bodies of mutually involved people. Coincidences of thought and action may transpire largely due to a confluence of exigencies in interpersonal needs and the normal unconscious processing of thoughts about other people that both parties feel and undergo at approximately the same period of time. For instance, Sally believes her boyfriend is thinking about her a few days after their last date has passed, and indeed, she does receive a call that evening. But this might very well have been an imminent and inevitable event because if it did not occur within a certain time frame, both she and Frank would be unhappy, and it would put a strain on the natural course of the relationship. In this case, the synchronistic event may be newly interpreted as emotionally desired and physically necessary, and even predetermined to occur at a specific time regardless of their separation in location.

This kind of interpretation of coincidental phenomena as being embodied psychological experiences with a subconscious material basis is only very recently beginning to be accepted as a normal part human life (Totton, 2007). Satisfactory explanations for the mechanisms of distinctly synchronous events are now becoming available. In the example of the phone call or e-mail, which most of us have surely experienced some variation of, it is the normal subconscious processing and synchronization of personal and interdependent biological needs that is considered to result in the approximately simultaneous thinking of or being in the same place as someone else at the same time. The timing of an individual’s own desires, instincts, and intuition offers the simplest and best explanation. There is no need to

invoke superfluous external forces and to invent paranormal explanations, only to recognize there must be a sum total of energy and chemically driven electromagnetic charge that is determined in the biochemistry of cognition and the features of biological functioning in the body.

Others are beginning to recognize the importance of synchronous coherence in psychology, although these models may not have grasped the proper mechanisms and functional importance of “electromagnetic fields” in the brain and body (Bischof, 2008; Manzalini, 2010). They have usually been described as “bioelectric” effects (Burr, 1939) that are typically considered to be primarily a byproduct or a reflection of some cognitive and biological processes. Fortunately, these suggestive potentials are now becoming increasingly commonly observed with techniques such as EEG and EMG, and this is leading to an increased appreciation of their importance. There has also been increasing use of bioenergetic concepts in psychology and therapeutic healing. But these descriptions tend to provide only a general and relatively vague description of aspects of the “energy” of some emotional and mental states, and have not yet been implemented into fully comprehensive and reliable scientific models.

As regards the genuine physical origin of these effects, the model introduced in this paper uniquely proposes that electrochemical states are inherently coupled with and tied to perhaps all active cognitive states, and that this is a fundamental characteristic of mental life and social behavior itself. This may become particularly important when attempting to understand the complementary “coupling” or energetic relation between two people or objects. It may therefore be considered that it would be useful to begin with a more precise physical description that involves the fundamental “electromagnetic” basis and nature of such energetic states. In this way, other physical parameters such as the potential/kinetic values and charges associated with the states may be understood to be causally related to behavior and to have distinct physiological origins. The origin of so-called “physiological potential” would

then be correctly understood and its functional importance would be obvious.

It is helpful to make reference to some other recent credible research that has already successfully applied simple basic physics concepts to psychology. Some of this work utilizes Newtonian models or classical descriptions of behavior in a relatively mechanical way. A small body of empirically supported research now exists on the idea of “behavioral momentum” (Nevin, 1984; Nevin and Grace, 2000). The behavioral momentum view, not unlike B.F. Skinner’s own efforts to make behaviorism into a strict science, considers that behaviors that are strongly reinforced exhibit higher resistances to extinction and thus contain more “momentum.” The concept has been successful and is applicable to activities such as athletic performance and political elections (Markman and Guenther, 2007), and even shopping (Dhar *et al.*, 2007). Indeed, the concept of behavioral momentum is now common parlance in discussion of sporting events and political campaigns. It represents an important example of how a physical concept applied to psychology has already become pragmatic for both scientists and laypeople to express a physical sense of motion, trajectory, or timing.

The idea of momentum also has electromagnetic ramifications because it is a concept that can be used to describe the dynamic behavior of rockets and the energies of subatomic particles. Likewise, paired groups of human brains and bodies may also contain a kind of momentum, and it is also a quantity known to follow physical conservation laws. As with conservation of charge and energy in electromagnetism, perhaps we must be aware of and “keep momentum” in our daily lives. It could very well be the case that cognitive experiences of this kind of momentum energy are what often cause the appearance of the seemingly extraordinary telepathy-like effects (Haas, 2011b). However, it may still be necessary to explain precisely how new physical concepts like cognitive momentum really work. The forces must be derived from basic chemical processes, and clearly the brain itself does not contain such physical velocity and

trajectory. Ultimately, these concepts may need to be improved and extended.

Contrarily to the argument presented in this paper, many have vehemently opposed the use of physical laws in psychology. Surprisingly, they often chide them as being too “superficial,” too simple, or too mechanical (Furedy, 2004). It should perhaps not be neglected to note that these critics often have a minimal physical science background or little to no understanding of physics and chemistry. Nevertheless, the primary arguments these opponents wield against using any law of physics to describe a social phenomenon, whether it be Newtonian, electromagnetic, or quantum mechanical, are usually begun with the assertion that biological organisms are complex entities and the subjects of the “special” sciences have unique intangible, incalculable, and evolving properties. This is also sometimes argued using empirical observations of exceptions to the rules. For instance, some rats are not conditioned through reinforcements at all (Furedy, 2004). Thus, the argument goes, “laws,” in the sense of rules that hold no exceptions, cannot be applied to psychology (Kim, 2005).

But this dissent may be countered in many ways. For instance, there are frequent clinically supported observations that the exceptions are almost always caused by underlying organic disturbances, such as a lesion in the brain. Further, on the basis of consistently replicatable conditioning effects, many behaviorists do believe their principles to be nearly universally valid. Of course any observed result will depend on the variable biological features of a given individual, group, or species, and there will be a large number of factors in the proverbial “equation.” But while there is no doubt that psychology is a complex and often frustrating subject, that does not mean there will never be a more satisfactory and complete scientific model utilizing a greater number of physical principles. If anything, the number of researchers beginning to apply such concepts seems to be growing, not shrinking, and the evidence would probably lean in favor of increasingly physical models.

Some are now vigorously arguing that physical principles can and ultimately must be applied to biological organisms because they exist within the space-time continuum (see Tarlaci, 2010). It has been proposed that there must be a distinct biological and psychological space-time (Palmeri, 2007), although how this would work has not been entirely clear. The space-time concept is certainly very reasonable except that it probably has not been a functional concept without there being a way to express the human brain and body within it using laws of physics or chemistry and an expression of actual forces. It may therefore be an excellent starting point for beginning to apply the electromagnetic physical model proposed here (Haas, 2010).

For example, as shown in Figure 1, a brain may exist in the present moment in a charged state that would then interact with other complementarily charged individuals existing within a field of other brains and bodies. The charged brains may move away from or toward each other as desired through decisions and movement of the body. This would perhaps most frequently involve other individuals who are already known and with whom there is a preexisting emotional involvement. Individuals move toward or away from other individuals who are attractively or repulsively charged (figure originally illustrated on the cover of Haas, 2010).

As regards the space-time of such a “field” of individuals, there would then be a limited number of possibilities for interaction with those who are available within a given period of time and accessible space (even if humans could move at the speed of light!). It is also important to note that this field concept differs from other popular notions of “quantum field” theories of mind, as it is much more classical-like and chemical in nature. An argument for this kind of a field model rather than the specialized quantum field ones would follow from the same line of reasoning as for entanglement discussed in this paper. It may also be considered that this sort of an electrodynamic model could potentially represent a piece of the puzzle in defining consciousness itself, if the question is about

what constitutes the present moment in the diagram (large circle).

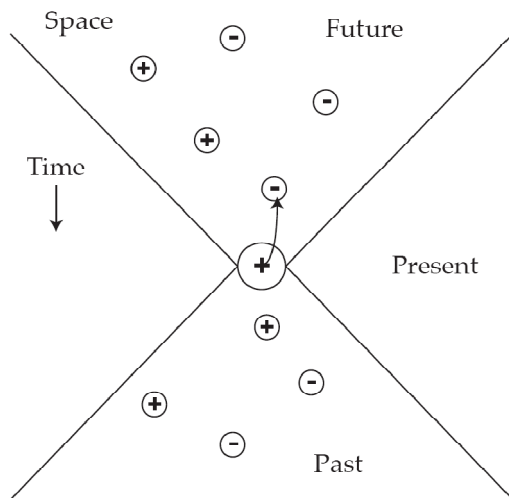


Figure 1. Brain/Body and Social Space-time Diagram. Individuals are considered to reside in a net charged state of the brain and body for a given cognitive and behavioral state (large circle in center). Action is treated as positive and receptivity is negative (Haas, 2011a). In the illustrated example, the positive brain shown in the center of the diagram will actively seek and be attracted to another individual who is negative in desired attributes. He or she will move away from previous individuals with whom there is a charge-charge repulsion. The range of possible individuals who may then be interacted with would constitute a psychological “field.” The possibilities for productive involvement with others faces a range of favorable potentialities as well as limitations and constraints. It therefore represents a social space and time diagram for which there are defined social structural and spatial locations that may be occupied at any given time in accordance with social needs and decisions.

Regarding the effects of time, it is also helpful to consider the way mechanical and electronic clocks are used to organize and schedule time and meetings. Physically based technologies certainly aid and enhance the natural biological sense of timing. People and civilizations have become virtually dependent on them to arrange events at specific times and places to meet with others. Clocks, when useful, may be considered to facilitate a strong intuitive sense of biologically driven timing and enhance the physical mechanics of the perception of duration and spatial location. Timing may represent more than a crude mental estimation of duration during existence within a constrained sequence of events, space, and resources. As enhanced by clock machines, it is possible to maintain a higher level of attunement and an optimal functioning of internal clocks, needs, and desires in order to cooperate with, or to act

against, others. This is because biological time, energy, and other resources are to some extent finitely limited and may constantly apply a great deal of pressure on individuals to perform with each other and to survive as conserved within a spatiotemporal context.

But humans are not so perfectly aligned with each other and the universe that they must automatically think specific things and be in specific places at precise moments because they are quantum entangled. You will not vanish and die if you do not have tea with a colleague at precisely 11:01 am, although one might have a problem if not there by 11:15 on multiple occasions. It is obvious that biology and evolution operate much less optimally than sometimes fancied, and organisms and circumstances are probably not perfectly intelligently designed (Gould, 2006). It is only suggested that people may follow psychologically driven laws and an underappreciated cognitively regulated synchronization in their life dynamics through strong needs, intuition, and the decisions they make. Individuals are driven by thoughts and feelings, and make responsive reactions. These decisions and movements must have an underlying chemical and physical basis. To a great extent humans are a part of nature and the environment, and are compelled to be social and meet with others. But it may not be at such a refined level that the single quantum activities of neurons in brains or entire superpositioned brain “wavefunctions” are directly linked up. It may, however, be approximately the case for much larger groups of quanta in the unique bulk and “statistical” aggregate way proposed in this paper.

In this model, sum totals of neurobiochemical events result in states of mind, intentions, and actions that may be experienced, read, and inferred by others through standard communication and body language. If fully direct and corresponding linking through an unconventional mechanism were truly the case, externally perceived signals and cues would no longer be needed to tell us where to be, when to be there, and what to do. It would be automatically and miraculously known precisely what to do at each moment in

relationships through a much more science fiction-like form of quantum psychic information communication. Instead, I prefer to believe people are responsive to each other in the normal imperfect and approximating bumpy ways relationships and social structures tend to proceed. When someone gets their actions particularly right or optimally coordinated on occasion, it may perhaps sometimes be believed to be an extraordinary thing. But it may really be only an optimal agreement or resonance of estimations and inferences between two people under a particular set of circumstances when a mutually complementary need is met. This may really represent the fulfillment of optimally aligned and gratified wishes and their perceived and felt “forces.” The gross biological and psychological needs can then be summed as specific quantities of complementary charge and energy.

The existence of an electromagnetic foundation for psychology and behavioral interaction is postulated and argued for in this paper. A model is derived and modified from historical ideas, in which synchronistic and telepathic-like phenomena are proposed to be coherences dependent primarily on the biological and biochemical processes of the brain and body. Thought and behavior may be determined in an attractive or repulsive way due to the summation of mutually complementary charge and energy states. These effects are not considered to be the direct transmission of the psychological force of thought or due to “acausal” factors that occur simultaneously and haphazardly, nor any other kind of paranormal effect caused by an unexplained physical coupling through space. Instead, they are proposed to be primarily a kind of resonance effect of large brains and bodies being highly involved and synchronized together, much in the same way two clocks may be synchronized in time but located in different regions of space (Basar and Karakas, 2006). Simultaneous thoughts and coincidences of meetings are the result of the compartmentally separate but significantly coupled interdependent timing of psychological processing, like spikes in thought patterns that occur concurrently (Kitana and Fukai, 2007). These are the product of natural biological and social desires within a milieu and

external environment. The chemistry, biology, and physics involved are located primarily within the brain and body, and are considered to be electrochemical or “electromagnetic” in nature. The net result may be described in the form of charge and energy.

Normal conscious and unconscious processes are expected to lead to coherences in social interactions and cognition after periods of mutual involvement, and this may express itself in the form of the residual thoughts and social desires. This strongly suggests methods for experimentation, and work to verify this is under way. Synchronistic experiences are of course also readily observable in everyday life, such as in the ordinary coincidences of “bumping into” someone shortly after meeting them for the first time, or when we receive that phone call or e-mail from a friend moments after thinking about them. These experiences may often be taken for granted and are commonly dismissed as coincidences or as ordinary events in relationships with others. Yet they may also have a deep underlying physical-chemical meaning and a sense of timing that is meaningful and that might in some way be considered extraordinary. The idea of attraction and repulsion to other people, whatever the biological motivation may be (sexual, filial duty, etc.), may now be seen as electromagnetic-like and essentially “ionic.” It will be of varying strength and degree, and perhaps not much qualitatively different from the various types of bonds and their cohesive properties known in chemistry. Whatever laws have always applied to those molecules and ions may be extensible and potentially applied to people in the same way, and this may have enormous implications.

Concluding Remarks

Some might argue that this theory represents nothing more than an overly simplistic philosophical application of concepts from physics and chemistry to psychology. For instance, the idea of attraction and repulsion may be nothing more than traditional behaviorism using physical sciences jargon or a commonplace idea of being “attracted” to or repulsed by others. The behaviorist might say it does not matter how attraction

and repulsion is expressed — individuals are simply attracted to objects from which they expect to receive a reward, and are repelled from and avoid those things from which an unpleasant or an aversive stimulus was received in the past. It does not matter whether this has anything at all to do with physics, and psychology does just fine by giving a probable predictable output from a given set of inputs, which some believe is about all it can do in any case (Uttal, 2007).

But the emphasis in this paper on the idea that the effect is of a chemical and electromagnetic nature, while not only being closer to the long sought after “hard scientific” model this paper began with, offers important new implications, advantages, and possibilities. For instance, pairs of interacting individuals would be predicted to feel strong and distinct effects when separated from each other, whereas this expectation might not be deduced from within a classical Skinnerian “black box” or a non-physically based psychology. One might typically assume there to be no conscious sign or manifestation of an attached or desired object when it is absent. Yet in reality pairs may now be understood to be mentally connected or explicitly bonded in a special way. This may result in some simultaneous thoughts and idiosyncrasies that have previously been misinterpreted as

strange effects such as synchronicity, telepathy, or other notions of an interconnectedness through a “conscious field” pervading the universe (McTaggart, 2007).

It is hoped that the model presented here could represent the beginning of a reliable theoretical foundation for a new kind of psychology based on established nineteenth and twentieth century principles of physics and chemistry, including both electrodynamics and some carefully applied aspects of quantum mechanics. It may supplement our current higher-level understanding of psychology, much in the same way useful insights have been gleaned from evolutionary biology to explain ordinary behavior. However, it is important to be careful when applying seductive ideas of “quantum” behavior, a trend that seems to have become very popular. Nevertheless, the principles described in this paper could represent the beginning of a science of psychology based on a physics-like model for the fundamental unit of individuals and groups behaving like interacting charged particles or spheres. From this foundation, other psychological phenomena may potentially be interpreted and explained in a more scientifically accurate and effective way.

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