

Running Head: INTEGRATING AND EXTENDING THE INFORMATION APPROACH

Integrating and Extending the Information Approach to the Mind Body Problem:
The Role of Information Exchange

by

Joseph (Yosi) Amram

Institute of Transpersonal Psychology

December 1, 2006

Abstract

This paper integrates and extends prior information approaches to the mind body problem by exploring a theory called global information holism. In global information holism matter and consciousness are understood as dual aspects of a single dynamic information reality. As information is neither purely objective nor subjective, but rather relational, information bridges the worlds of external objective matter and subjective consciousness. Global information holism extends prior information approaches to the mind-body problem by postulating the necessary mechanism of exchange — a Global Information eXchange (GIX), which can also be understood as a cosmic information bus — that connects all interacting parts of the global information process. The theory also accounts for anomalous phenomena, including mysterious psychosomatic interactions, unitary states of consciousness, and paranormal phenomena (Psi). For example, global information holism explains Psi as information transfer through GIX. Lastly, global information holism is used as a developmental and psychotherapeutic framework for human consciousness.

Introduction: Solving the mind body-problem by extending the information paradigm

How does our experience of conscious subjectivity in contemplating red wine, seeing its color, experiencing its taste, or feeling the headache the next morning, emerge in a world of physical objectivity? Called “the world knot” by Schopenhauer, the mind-body problem is one of the thorniest philosophical problems standing in the way of creating an integrative framework for understanding human conscious experience.

In this paper I attempt to untie this knot through an information approach to the mind-body problem. I elaborate, integrate and extend the information worldview, one in which information is seen as the ground of all reality, to its logical conclusion. The information worldview has been discussed by physicists (Wheeler, 1991), philosophers (Chalmers, 1995, 1996), computer scientists (Fredkin, 1990, 1992), psychologist/psychiatrist (Battista, 1978b, 1982a, 2004), systems theorist (Laszlo, 2004, 2006), and health practitioners (Schwartz & Russek, 1997). With the exception of Laszlo (2004, 2006), previous authors who proposed this approach have ignored the fact that any information process requires a mechanism of information exchange among all of its interacting parts. In this paper I extend the information worldview by exploring its necessary underlying ‘infrastructure’, which I call the Global Information eXchange (GIX). I propose that GIX is the underlying medium of global information sharing (or a cosmic information bus, in computer lingo) required to make the information world process function.

In extending the information paradigm I attempt to provide a framework that accounts for anomalous ‘fringe’ phenomena pertaining to consciousness and mind-body interactions, which are often ignored in discussions of the mind-body problem. In addition to the classical questions of the experience of subjectivity, scholars of consciousness must also account for other phenomena pertaining to mind-body interactions, such as strange psychosomatic interactions,

unitary states of consciousness, and paranormal phenomena (Psi). These 'fringe' phenomena, are controversial and often ignored. Because they cannot be explained through the prevailing scientific models, these anomalies reveal the inadequacies of the existing paradigm and the need for a broader framework (Khun, 1970/1996; Popper, 1959/1992).

Psi, including telepathy (mind to mind), psychokinesis (PK or mind to matter), clairvoyance (consciousness across space), and precognition (consciousness across time), have been well documented scientifically (e.g., Braud, 2000; Byrd, 1988; Byrd & Sherrill, 1995; Hastings, 1976; Leibovici, 2001; Nelson, 2001; Nelson, Radin, Shoup & Bancel, 2002; Radin, 1997; Schmidt, 1976, 1997; Steinkamp, Milton & Morris, 1998). And yet, with regard to the mind-body problem, most authors, (e.g., Chalmers, 1995, 1996; Humphrey, 2000; Marshall, 2001; Penrose, 1994; Searle, 2002) ignore Psi phenomena. If, as the prevailing scientific materialist perspective is correct and mind is equal brain state and consciousness is only the result of biological and neural processes in the brain (e.g. Humphrey, 2000), it is impossible to account for Psi phenomena. For example, telepathy seems to work even when subjects are placed in a Faraday cage to shield all known methods of physical energy transfer (Radin, 1997).

In addition to Psi phenomenon, most authors also disregard other phenomena such as experiences of 'pure' consciousness (consciousness without an object) or unitary states of consciousness, when a person experiences themselves as one with the universe (Goleman, 1988), or the fact that trained yogis can walk on hot coals without burning their skin by simply altering their awareness (Chopra, 1993; Dossey, 1989). These phenomena also challenge the frameworks and assumptions held by most authors. If 'mind' emerges and in is localized in the brain through neural or quantum complexity (e.g. Humeroff & Penrose, 1996; Humphrey, 2000; Penrose, 1994; Silberstein, 1998; Stapp, 1995; Zohar, 1990; Walker, 1970), and mind controls the body through classical transmission of chemicals and hormones, how the yogi can avoid the burning

of her skin remains a mystery. There are as yet no known chemicals transmitted through the blood that can account for the inhibition of burning. Other bodies of evidence such as psychosomatic disorders known in psychiatry (e.g., in dissociative identity disorders even the person's 'physical ailments' such as skin rash can nearly instantaneously disappear when they change personality) are also usually left out of discussions of the mind-body problem (Kihlstrom, 2002).

This paper explores a modern version of the holistic and panpsychistic approaches to the mind-body problem (e.g. De Quincey, 1994, 1999; Griffin, 1997, 1998; Hunt, 2001; Spinoza, 1677/1994), builds on Chalmers (1995, 1996) information approach, and extends, integrates, and elaborates on Battista (1978b, 1982a, 2004), and Laszlo (1994, 2004, 2006). In doing so, it addresses the mind-body problem within a paradigm that also accounts for these 'fringe' anomalies pertaining to consciousness while also providing a developmental and psychotherapeutic framework for understanding consciousness.

Before exploring and extending this information worldview further, it is important to define what is meant by information. Information is frequently thought of as a 'thing' carried by a signal or medium such as a book or a CD. However, according to information theory, information is the amount of uncertainty reduction that a medium provides a receiver (Shannon, 1948). This implies a receiver (a subject of sorts) that has uncertainty which can be reduced by the information. As originally defined by Bateson (1972) and adopted by Chalmers (1995, 1996), information is "a difference that makes a difference." A 'difference that makes a difference' implies a subject to whom the difference makes a difference. In other words, by its very nature information is relational, neither purely objective nor purely subjective.

For example, a computer disk with a movie on it has different levels of information depending on the receiver (the video player). A black and white video player versus a color one,

a mono sound versus stereo system, all represent different receivers or ‘subjects’. Different players will interpret the same disk as containing different amounts of information encoded in the binary bits. Though one can presume to compute the theoretical maximal amount of information in the disk based on the number of bits stored, these can be interpreted differently based on the temperature, color of the package or time of day. And a ‘quantum’ sensitive player may find a whole new level of information in the disk. Hence, information does not exist “objectively” in the medium, and neither is it purely subjective independent of anything in the medium ‘out there’. Information is always a relational property. It is relative to the receiver/subject’s expectations that the information exists and makes a difference. Herein, information holds promise for reuniting the split between the world of objective matter and the world of subjective mind into the one (relational) world.

In the next section of this paper I argue that physical reality can be seen as an information process, and present a number of experiments in which inanimate matter exhibits qualities normally associated with consciousness. Next, I will argue that consciousness can also be seen as a hierarchically organized information process. In the next section I review the empirical evidence and explanatory power of information holism. Seeing matter and consciousness as dual aspects of single information reality, in the following section I define and characterize the Global Information eXchange (GIX)—the cosmic information bus that is necessary to serve as the medium for information exchange among all parts of the process. Next, I use this model, called global information holism, to explain various consciousness and other ‘fringe’ phenomena. In the following section I apply such framework to questions of human consciousness development, therapy and wellbeing. In the last section, I discuss some limitations of this framework.

Toward an Information Model of Physics: How Matter Exhibits Conscious Qualities

A number of authors have drawn parallels between modern physics, and consciousness (Capra, 2000; Friedman, 1997; Goswami, 1995; Keutzer, 1982; Mindell, 2000; Pauli & Jung, 1955; Talbot, 1992; Tipler, 1994; Wade, 1996; Wolf, 2000; Zukav, 1980). Nobel Prize-winning physicist, Wolfgang Pauli, in his effort with Carl Jung to unite physics and psyche, writes:

Yet modern science may have brought us closer to a more satisfying conception of this relationship by setting up, within the field of physics, the concept of complementarity. It would be the most satisfactory of all if the physics and the psyche could be seen as complementary aspects of the same reality. (Pauli, 1955, p. 209)

Pauli is advocating a vision of mind and body as dual complementary aspects of a unified reality.

Nobel-Prize-winning-physicist, John Wheeler, claims that in order to find a unifying framework in physics to explain matter and space-time, scientists and philosophers must look for something more fundamental: something that can explain both matter and space-time. Wheeler (1991) suggests that this unifying framework is information and calls this the “it from bit.”

every it—every particle, every field of force, even the spacetime continuum itself—derives its function, its meaning, its very existence entirely—even if in some contexts indirectly—from the apparatus-elicited answers to yes-or-no questions, binary choices, bits. (Wheeler, 1991, p. 5)

Computer scientist turned physicist, Fredkin (1990, 1992) advocates a similar information view of the universe in a model called Digital Mechanics. Fredkin’s model is based on the Finite Nature hypothesis. Finite Nature says that all things in nature are discrete rather than continuous. As scientists go down in scale they find all properties in nature—such as electric charge, spin, and energy level—to be taking on discrete multiples of a basic unit. A standard example of this quantum nature of reality involves the electron “jumping” from one orbit around the nucleus to the next without ever being detected in between. As Fredkin (1992) says, “So far, there is no convincing argument based on experimental evidence that points to any quantity of physics as definitely continuous” (p. 1).

Interestingly, in his later years, while searching for the grand theory to unify relativity and quantum physics, Einstein proposed giving up the idea that space and time are continuous (Smolin, 2004). The most advanced of current attempts at unification of relativity and quantum mechanics are string theory and loop quantum gravity. “And, on the question of spacetime’s constituents, both theories suggest that there is some kind of atomized structure.” (Green, 2004, p. 490).

If all things (including space and time) are discrete, then the space and time position of every element in the universe can be described relative to some coordinate system by a finite number of bits. Similarly everything else about the atomic elements, such as mass, electric charge or spin, could also be described as a discrete finite multiple of some basic units (i.e., by a finite number of bits.) In other words, an information vector containing a finite number of bits can describe the state of every element in the universe. (And if the universe is finite, as current scientific theories assume, then there are a finite number of such elements in the overall universe. However, such assumption is not necessary for the remainder of the argument that follows.) This information state evolves in discrete time steps from one instant to the next, producing what is referred to here as a dynamic information process. The basic model for such a dynamic information process is a finite state machine, a generalized computer of sorts known as ‘cellular automata’ (Hopcroft, Motwani & Ullman, 2001). And the most basic unit of information is a bit. In a cellular automata, the information state of each cell evolves utilizing an algorithm based on the state of other (potentially all) cells in the network. The algorithm can be thought of as the manifestation of the laws of physics.

I have argued that matter can be modeled as an information process. Now we can consider several well-known experiments that show how qualities normally associated with consciousness are exhibited in matter. In the famous double-slit experiment, particles such as

electrons pass through either a single or a double slit. Depending on whether one or two slits are open, the particle exhibits its particle or wave nature. When only a single slit is open the particles pass through the slit and create a scatter diagram when they land on the screen.

However, when the second slit is open, an interference pattern is formed and some points that would have been hit on the screen when only one slit is open show no particles. So the particles seemed to “know” that a second slit was open, or may be said to be “conscious” of the opening of the second slit. Hence, physicist Walker says:

Consciousness may be associated with all quantum mechanical processes...since everything that occurs is ultimately the result of one or more quantum mechanical events, the universe is ‘inhabited’ by an almost unlimited number of rather discrete conscious, usually nonthinking entities that are responsible for the detailed workings of the universe. (cited in Zukov, 1980, p. 63)

An even more puzzling version of this experiment is Wheeler’s classic delayed choice experiment (Horgan, 1992; Goswami, 1995). In this experiment the experimenter waits until the photon passes through one, or both slits, and only after that decides on the detection system. Either the photons are detected on a regular screen, like in the above experiment (with the interference pattern discussed above), or two telescopes are focused on the path. Each telescope focuses on one slit, detecting if the photon passed through one, the other, or both (in practice scientists observe the photon passing through only one.) Experimental evidence shows that the choice of detection mechanism seems to dictate the behavior path of the photon at a prior point in time.

An astronomical scale version of the delayed-choice experiment (Horgan, 1992) can be performed on light from quasars (mysterious objects near the edge of the universe, emitting light billions of years old). In place of slits, scientists observe the light splitting through a massive gravitational lens such as a galaxy. The astronomer’s choice of how to observe the photons in the present apparently determines if the photons took both paths (thus showing interference), or

just one path (as seen in the telescope) around the gravitational lens billions of years ago (Horgan, 1992). Wheeler calls this the “observer-participatory” universe, one in which reality is formed through the dynamic relationship between the observer and the observed (Wheeler, 1979, 1991).

Alternatively, we may say that the photons exhibited “precognition” of the astronomer’s choice billions of years later. It is worth noting, however, that from the point of view of photons traveling at the speed of light, there is no notion of time or any sense of pre-cognition. According to the theory of relativity, time stops at the speed of light. From the point of view of the photons everything just is.

The most direct evidence for the instantaneous information transfer across space-time comes from Bell’s theorem and its confirmation in the Aspect Experiment (Stapp, 1975, 1977). Based on the Einstein, Podolsky, Rosen (EPR) thought experiment, two photons with a common origin fly apart. Because of their common origin, and the conservation of properties such as spin in the overall two photon system, measuring the spin on one photon (the result of which is undetermined in advance according to quantum physics) instantaneously determines the spin of the other photon, even if it traveled to a very far away place on the other side of the universe.

This “entanglement” and instantaneous information transfer between the two photons led Bohm to conclude that all of reality must be a projection of a higher-dimension unified and unbroken wholeness (Bohm, 1980). In this higher-dimension reality of unbroken wholeness Bohm (1980) views mind and body as one.

So we are led to propose further that the more comprehensive, deeper, and more inward actuality, which is their common ground and which is of nature beyond both. Each of these is then only a relatively independent sub-totality and it is implied that this relative independence derives from the higher-dimensional ground in which mind and body are ultimately one. (Bohm, 1980, p. 209)

Another way to see how all matter and basic physical forces may be understood as the result of an informational exchange is to consider the simple force of gravity. Any object (including an elementary particle such as an electron) that has mass is presumed to create a gravitational field that extends across the entire universe. The gravitational force field around photons or very distant objects may be very small but still exists. This is true in both classical Newtonian physics and modern relativity theory. The notion of fields was originally based on wave mechanics — a study of disturbances in some substrate such as water in which waves exhibit interference. Classical nineteenth century physicists presumed that waves forming fields (e.g., electromagnetic fields) must travel through a yet to be discovered medium called ether. No such medium was ever discovered, and current field theories no longer presume the existence of a material substance through which the wave propagates. To solve the problem, Nobel Prize winning physicist Robert Oppenheimer (1956) construed such waves as simple carriers of information, writing, “These waves represent, if one wants to say what they are, not matter, not forces, not electric fields, but essentially the state of information about an atomic system” (p. 131).

Furthermore, according to the theory of general relativity gravity is viewed as the curvature of space-time itself (Mindell, 2000; Lemley 2004). But space-time is the framework in which we observe things rather than a material substance that ‘causes’ objects to move. If we deny ‘action at a distance’ (ala the bending of space-time itself) and insist on an elementary particle (graviton) as the carrier of the gravitational force field, it would need to carry some energy in order to have an impact on all objects in the universe which experience the gravitational field. This would mean that the rest mass of any particle, such as an electron, that creates a gravitational field around it would have to decay over time due to principle of energy conservation. And recursively, the graviton carrying some energy would create a gravitational

field around itself. This gravitational field would then necessitate a whole set of other gravitons that emanate from the graviton in order to transmit the graviton's gravitational field throughout the cosmos, leading to a strange infinite regress. Alternatively, we might postulate a zero energy graviton. But such a zero energy graviton would be a pure carrier of information. To date, no graviton has even been detected.

It is important to note that an information paradigm of physical reality, in contrast to idealist philosophies, upholds the primacy of matter and physical reality. Nor does such a paradigm view matter as a subjective illusion running in the "big mind." The framework simply offers a lawful explanatory model of what humans experience as matter in terms of a more fundamental construct: information.

Informational Holism: Consciousness as Hierarchical Dynamic Information

Just as matter can be understood as information, consciousness can also be seen as an information process. But first, what does consciousness mean? Since consciousness is irreducible and fundamental to all our experiences, it is difficult to define without being circular and referring to specific conscious phenomena like awareness, or subjective experience. There are several uses of the term "consciousness." Battista (1978b) discusses three:

First as a theoretical construct referring to the system by which an individual becomes aware; second, to refer to reflective awareness, an awareness of being aware; third, as a general term encompassing all forms of awareness. (Battista, 1978b, p. 57)

Wilber (1975) echoes the point that humans exhibit a broad spectrum of consciousness. In this discussion, I use the third and broadest meaning Battista offers, referring to all forms of conscious experience, including but not limited to, sensations, perceptions, emotions, cognition, and self-awareness.

Global information holism as explored in this paper builds on Battista (1978a; 1978b; 1982a; 1982b; 2004) who offers an information framework for understanding consciousness. Though there are some differences that will be elaborated on later, I will first explain Battista's model.

Battista conceives of consciousness and the self as hierarchically ordered set of information processing systems. But what does it mean to say that consciousness is an information processing system? Information is frequently conceived of as a 'thing' carried by a signal or medium such as a book or CD. According to information theory, information is the uncertainty reduction that a signal or medium provides a receiver. Hence, information always exists in relation to some receiver ("subject") who has some form of expectations relative to the information, which reduces the uncertainty. Information does not exist as an object separate from others. Information by its nature is relational and exists only in relationship to a receiver.

It is easy to see how information can be organized hierarchically when a piece of information is integrated and incorporated with lower levels of information. In Battista's holistic informational model, these different hierarchical levels of information are equated with the different forms and levels of conscious experience. According to Battista, the impinging of physical stimuli on the nervous system (e.g., a photon hits the retina and the associated nerve transmission), results in sensation, information level 1. The processing, integration and interpretation of such sensory stimuli results in perception, information level 2 (e.g., an image of a snake). The processing, evaluation and meaning of such perception results in emotion, information level 3 (e.g., fear). Awareness is information about such aspects of consciousness (information about sensation, perception, or emotions, etc.) and is conceptualized as information level 4.

At the next level, level 5, several prior experiences are held in consciousness simultaneously. For example, seeing three dogs and three cats, or feeling hunger and joy. From the concrete the details are abstracted and concepts are formed (e.g., the concept of three or the concept of emotion). This forms the next level of information, resulting in concepts, language, and cognition. The acquisition of language, and the ability to form and communicate abstract concepts creates the possibility of identifying particular qualities of experience (e.g., hot, hungry, happy, etc). Concepts and cognition enable the creation of higher-level information such as abstractions about prior conscious experiences.

Self-awareness constitutes the 6th level of information. Self-awareness is achieved by reflecting on lower levels of information such as the prior processes of awareness and cognition. In this way, “pure-awareness” as an experience can be viewed as direct awareness of self-awareness. The specific objects of awareness are abstracted away or fade into the background. Thus, “pure awareness” is the 7th level in the information consciousness hierarchy.

The 8th level of consciousness, unitive consciousness, results when the level of information is raised to include the universe as a whole. At this transcendent level, the entire universe is an information process where the individual is aligned as part of the process that reflects on itself. The individual experiences herself as part of the one absolute all.

In this holistic information model, the evolution of consciousness is understood as the formation of higher levels of information by increasing complexity and organization. Increasing complexity and the ability to form higher-level structures co-evolves with more complex biological structures. This enables the system to represent second and higher levels of information about itself. In this regard, evolution is understood, from a developmental point of view as increases in complexity and orders of information, rather than just random process in inert matter from which consciousness mysteriously appears. For example, an animal may be

conscious and have the experience of fear (information level 3) but may lack awareness of it (information level 4). According to the developmental hierarchy, this animal is less evolved than a self-aware human.

In the holistic information model, the self is conceptualized as a hierarchically organized system of wholes within wholes (Battista, 1982a, 1982b; Koestler, 1968; Wilber, 1979, 1993). Such a framework is consistent with other systems approach to consciousness (e.g. Tart, 1983.) A systems approach implies several important properties: the whole is greater than the sum of its parts, hierarchical organization of subsystems, interdependence among subsystems, and self-maintenance and self-transformation.

Empirical Support, Evidence and Explanatory Power of Informational Holism

The holistic informational model of consciousness can account for several important phenomena, such as habituation, the unitary nature of consciousness, the dynamic nature of self-identity, and various other psychology experiments such as virtual reality environments. This explanatory power lends additional support to the information model of consciousness.

First, consider habituation. As a stimulus first occurs, it is unexpected, and, therefore, conveys a large amount of information, which results in a perceptual shift (Battista, 1978b, 2004). With ongoing stimulation, the probability of continued stimulation increases and the uncertainty reduction (information value) associated with the stimulus decreases (i.e., the stimulus becomes un-noticed). For example, after getting used to a background noise we stop hearing it. After a while, the absence of such stimuli conveys more information and we “hear the silence.” This is explained by information not being a “thing” but rather “a difference that makes a difference” (Bateson, 1972; Chalmers, 1996).

Informational holism also accounts for the unitary nature of consciousness—we experience ourselves as a holistic unit, even though our body consists of many organs and our brain has billions of neurons in it. At each level of the information hierarchy, we integrate the lower levels. At whatever level we identify the informational self integrates everything below and becomes identified with the whole. Thereby, we experience ourselves as a single whole.

In psychological development, the whole of any level becomes a part of the whole of the next level, which in turn becomes a part of the next whole, and so on throughout the evolution of consciousness. (Wilber, 1979, p. 2)

An informational model of consciousness can also account for the dynamic nature of self-identification. Consider the following experiment (Ramachandran, 1998). You sit at a table with one of your hands hidden from your sight. Another person strokes the surface of the table with a hand visible to you while with another invisible hand he taps your invisible hand. After a minute or so you start experiencing the table and the taps as emerging from your own body. The sheer statistical improbability of the correlation between the two sequences of taps conditions the mind to conclude that the table is now a part of your body. A similar process occurs when we feel pain as someone scratches our car—our self-concept is conditioned to include the car as part of our extended self. Due to this and many other similar experiments, Ramachandran (1998), a neuroscientist, concludes:

Your own body is a phantom, one that your brain has temporarily constructed purely for convenience...For your entire life, you've been walking around assuming that your 'self' is anchored to a single body that remains stable and permanent at least until death. Indeed, the 'loyalty' of your self to your own body is so axiomatic that you never even pause to think about it, let alone question it. Yet these experiments suggest the exact opposite—that your body image, despite all its appearance of durability, is an entirely transitory internal construct that can be profoundly modified with just a few simple tricks. (p. 58-62)

In a series of experiments, subjects who were given special glasses that inverted their vision input, adjusted and viewed the world “normally” even though their signal was “upside down” (Pribram, 1971). Within a period of about a week of conscious effort, the perceptually

constructed model was adjusted so that the person functioned without special attention. They saw the world right-side-up. If they removed the glasses after the adjustment period, they saw things inverted again, though they were receiving a non-inverted signal. This suggests, again, that perception of reality is a constructed model.

A similar notion is advocated by Russell (2003) who claims “the colors and sounds we experience are not really ‘out there’; they are all images in the mind, pictures of reality we have constructed...no color exists there. The green we see is a quality created in consciousness.” (p. 39-50). Indeed, the quality of green is the result of a particular wavelength of light, a form of electromagnetic radiation, interacting through our senses and resulting in a particular form of perception. In fact, human eyes are sensitive only to light in a narrow and particular frequency range and completely miss the infrared or ultraviolet spectrum. But the reality of other animals that are sensitive to different frequencies and modes of energy transmission, such as dolphins or bats, could be very different and hard to picture for humans. Dolphins experience the world and people around them through sonar. A dolphin can ‘perceive’ the beating of the human heart or churning of their stomach. Similarly, no sound exists in external ‘physical’ reality. Sound is a quality we create in our mind from vibrations transmitted through our senses. Furthermore, modern science tells us that the chair a person feels as solid is mostly empty space and that the person never literally touches the chair. Rather, the person is supported by the electric force field that elementary particles from the chair exert. Hence, concludes Russell (2003), “what we take to be reality is simply the particular way the human mind sees and interprets the physical world...” (p. 52).

A similar idea of the body, self, and world, as a constructed informational model, can be inferred from experiences with a computer generated virtual reality environments (Tart, 1990a, 1991). By wearing goggles containing color TV sets, earphones, and tactile gloves a person can

enter a virtual reality environment where their sensations emerge from a computer generated, simulated world. Tart calls this the World Simulation Model of consciousness. Virtual reality simulations have been shown to be as effective as standard exposure therapy for the treatment of phobias such as the fear of flying (Rothbaum, Hodges, Price & Smith, 2002). In fact, such simulations can be so “realistic” that after a while the subjects get disoriented when they step back into “ordinary” reality. The model works so well that the mind becomes identified with the simulation and makes it perfectly real. Through simple reprogramming in a computer generated virtual reality, human subjects can experience having four arms, or actually change the physical “laws” of nature. Tart (1991) concludes:

My studies of consciousness over the last three decades have convinced me that, right now, each one of us is living in a virtual reality. What we experience as our self (both physical and mental) and the ‘real’ world around us is not a simple, straightforward perception of what is actually here at this moment, but a semi-arbitrary construction, created by relatively automatized brain (and probably mind) process. (p. 12)

This does not mean the world is merely a creation of the mind. As Tart (1990a) reminds us, such a simulation model seems to work, so we can survive. But an informational model does mean the world is experienced as a relationship between our self and the global information process.

The aforementioned theories and experiments demonstrate that mind and body, matter and consciousness, can be seen as dual aspects of a single reality, ontologically understood as a dynamic information process. In this model, even the physical body is understood as information. Over the course of a year, and certainly over a lifetime, humans lose virtually all of the cells and molecules that form the physical body. However, we experience ourselves to be the same person and to have the same body. The body is in-formation (i.e., in-the-formation of relationships) between its parts (Chopra, 1993). Viewed in this light, we can understand consciousness, or mind, as not being localized merely in the brain, but as manifested throughout the body (Louchakova & Warner, 2003).

Information is Exchanged through the Global Information Exchange

So far I have argued that matter and consciousness can each be viewed as dynamic information processes. Any dynamic process requires a means for information exchange among its interacting parts. As discussed earlier, Bell's theorem and the Aspect experiment show that two photons that are very far apart are connected in such a way that information moves instantaneously between them. Measuring the spin of one, determines the spin of the other no matter how far away it is. This remarkable phenomenon has never been explained scientifically. In addition, every particle in the universe extends some field, whether gravitational, electrical, or otherwise. These fields inform every other particle in the entire cosmos. In this regard, everything in the universe is connected and communicates with everything else. So, how is this information exchanged? Through what mechanism or medium?

In a cellular automata model, every information cell evolves based on the values of other (potentially all) cells in the matrix. This requires each cell to be able to know the state of other cells. In the human body, the central nervous system and the circulatory system provide such functions by enabling information transfer among various cells and organs. In a parallel computing environment, information transfer is usually achieved through a global network or an information bus. In the everyday world, the Internet functions as such a network. Over time, the Internet may well connect every computer on our planet and create universal access to computer-hosted information.

In the global information holism model explored in this paper, I call this communication medium the Global Information eXchange (GIX). GIX is the substrate that enables information exchange among every element through space-time. Everything in the universe is connected to GIX and exchanges information with every other thing through GIX. Being non-local, GIX is

everywhere and in everything. Everything is connected to and through GIX. And to the extent one views the entire universe as an information process, GIX is the ground for the entire cosmic consciousness.

Similar concepts to the Global Information eXchange have been proposed and discussed by others. For example, Laszlo (1994) in explaining synchronistic and spontaneous transmission of information among creative minds offers a similar model in which the mechanism of inter-connection is illustrated with the analogy of networked computers that share information via a computer bulletin board. Laszlo (2006) further discusses a global mechanism of information exchange, called the Akashic Field:

The Akashic or A-Field is a universal field...A-field connects organisms and minds in the biosphere, and particles, stars and galaxies throughout the universe. This transforms a machine-like universe that is blindly groping its way from one phase of its evolution to the next into a whole-system universe that builds on the information it has itself generated. (Laszlo, 2006, p. 34-35).

Further, Laszlo (2004) offers the zero-point quantum vacuum, as the underlying mechanism to explain the information field:

the zero-point field of the quantum vacuum is not only a superdense energy field; it is also a super-rich information field—the holographic memory of the universe...The A-field takes its place among the fundamental fields of the universe, joining science's G-field (the gravitational field), EM-field (the electromagnetic field), and the various nuclear and quantum fields. (Laszlo, 2004, p. 56)

It is worth noting however, that despite the significant overlap between Laszlo's Akashic field theory and global information holism, Laszlo places information on an equal footing with other physical fields (gravitation, EM, etc.). Global information holism, on the other hand, similar Wheeler (1991), views every physical field, including our experience of space-time, as deriving from an underlying information reality.

In addition to Laszlo, other holographic paradigms of the universe have been used to explain the simultaneous inter-relatedness and interpenetration of all phenomena (Bohm, 1980;

Pribram, 1985; Talbot, 1992; Wilber, 1985). For example, Bohm (1980) suggested an undivided wholeness and holds that each sub-unit of the universe inter-penetrates every other part of the whole. And neuroscientist Pribram (1985) says, “in the holographic domain, each organism represents in some manner the universe, and each portion of the universe represents in some manner the organisms within it” (p. 34). Hence, much like the GIX model in which each sub-part connects with, and has access to information from each other part, each part and sub-unit of the hologram contains information about all other parts and the entire whole.

For GIX to be a scientific framework, science should be able to test it. Hence, this author proposes tests that measure the impact of distance and time on Psi phenomena. In fact, some research has tested the effects of telepathy and the impact of prayer on healing to find that they do not vary with distance (Dossey, 1989; Radin, 1997). Further tests to measure not only if the strength of telepathy varies with distance, but also if there is a measurable delay in ‘guess time’ with distance, looking to see if the information is available instantly or if it takes time to travel the distance, can be done.

The GIX model predicts the possibility of information transfer across time. Therefore, evidence of mind-matter interaction (PK) across time would shed some light on evidence for GIX. Some evidence suggesting pre-cognition, which can be construed as the transfer of information from the future to the present, already exists (Freeman, 1962; Radin, 1997; Steinkamp et al., 1998). However, predictions of practical utility, such as stock market data or the weather have not proved reliable (Steinkamp, 2000, 2001).

Variations of Wheeler's delayed choice experiment, measuring mind-matter interaction into the past, could also help in understanding the nature and existence of GIX. For example, in retro PK experiments scientists can look for ‘time-reversed’ causality, where the events to be affected happen prior to the PK effort. Consider the following experiment: A random process

such as radioactive decay is used to automatically record a string of numbers. Nobody is present or knows what the numbers are. Later, during a slow playback each number results in a red or blue light. A human subject is assigned the task of influencing the light to be red or blue randomly. By showing statistically significant influence, this implies the possibility of transmission of information into the past.

Despite being counter to our common daily notions of cause and effect and the linear flow of time, the results of such experiments examining the retroactive influence of consciousness on both inanimate and organic matter suggest the existence of retro PK (Braud, 2000; Leibovici, 2001; Schmidt, 1976, 1981, 1985, 1993, 1997). For example, Leibovici (2001) studied the effect of retroactive intercessory prayer on 3393 adult patients using a double blind, randomized control and found statistically significant results with regard to the effect of retro-PK on the length of hospital stay and duration of fever among patients ($p=.01$ and $p=.04$, respectively). Such experiments suggest the possibility of information transmission into the past and lend some plausibility to the GIX model. Some researchers have suggested that retro-PK effects would only occur if the pre-recorded targets are not pre-inspected since without an observation the quantum wave function may remain in a superimposed state and only collapse upon observation (Schmidt, 1976.) Evidence of this appears mixed. Some experiments suggest the persistence of retro-PK effects even when the targets have been pre-inspected (Leibovici, 2001; Schmidt, 1981). Other studies (including some by one of the same authors; Schmidt, 1985, 1993) found evidence to the contrary, indicating such retro-PK effects seemed to disappear if the targets were pre-inspected or observed.

Overall, retro PK or transmission of information into the past would contradict common sense ideas about linear causality, and past-present-future distinctions. It is worth noting that according to relativity theory, events that appear simultaneously or in sequence in one frame of

reference could be reversed in another. And from the point of view of something moving at the speed of light, time stops. One potential explanation is that our image of space and linear time is a model constructed by the mind, which is a projection of a higher-dimension reality or is a transformation of another (frequency) domain. Much like the mathematics of Fourier Transforms show the equivalence of a time changing signal and its static representation in the frequency domain (Smith, 2003), our experience of space-time could be a transformation from another information-frequency domain. Interestingly enough, “another attribute of the Fourier ‘mandalas’ is that the entire pattern can be regenerated from any shard of the data bound within the ‘graph’” (Samples, 1985, p. 123). Therefore, each part has access to information about the whole and the GIX model can be seen as the unfolding of the enfolded holographic universe.

The concept of GIX appears to defy the everyday sense of linear time and simple causality. In global information holism the entire space-time continuum is a dynamic information process in which each part interconnects and has access to the whole and which simply is. As the mystics have argued, and some modern physicists such as Einstein have said, "People like us, who believe in physics, know that the distinction between past, present, and future is only a stubbornly persistent illusion." (cited in Dyson, 1981, p. 193). Predicting the future (such as stock prices while others are doing the same, which in turn modifies the prices) or trying to affect the past, involves a tangled self-referential hierarchy (Hofstadter, 1980). This results in paradoxes that may defy our linear thinking. Unfortunately, we appear to live in such a tangled self-referential information space called our universe.

Global Informational Holism: Differentiation and Applications

Global information holism also provides a framework for psychology and the study of consciousness. It is important to distinguish between global information holism as presented in

this paper and information holism as defined by Battista (1978a, 1978b). Despite their significant overlap, global informational holism introduces the notion of the Global Information eXchange (GIX) as the mechanism for global information transfer across space-time. It also presupposes an inherently non-deterministic model as postulated by quantum mechanics. Battista's informational holism presupposes the 'experience of free will' but still presumes a deterministic world.

Free will exists for the individual at the same time he appears to be determined. The individual is free because there is no compulsion to act in a particular manner. However, how an individual does act is determined by the way in which information about the environment is processed. The process is predictable and thus appears to be determined. (Battista, 1978b, p. 80)

While non-determinism is difficult to prove, quantum theory offers such a non-deterministic worldview, and hidden variable theories have essentially been disproved. Hence, in contrast to Battista, global information holism accepts quantum physics' non-deterministic worldview.

Global information holism offers a dynamic view of human consciousness and self. The self is a continually evolving dynamic information process, changing, interacting, and in relationship to the environment. In global information holism there is no static object of 'self'. This is similar to the Buddhist notion that the self is not a static object, but rather a dynamic experience (Kornfield, 1993). According to object relations theory, "the self probably is more rightfully considered a process than an entity" (Cashdan, 1988, p. 47). In fact, there are no static 'objects,' physical or conscious. Even a 'solid object' like a table is in a constant state of relational flux interacting and exchanging information in the form of force fields with its environment. As physicist Capra (2000) writes, "quantum theory forces us to see the universe not as a collection of physical objects, but rather as a complicated web of relations between various parts of a unified whole" (p. 138).

Unitary states of consciousness, when people experience themselves as one with the universe, are discussed and studied in transpersonal psychology. In such states, the boundaries between the individual and the cosmos fall as the person perceives one 'ocean of being' (Goleman, 1998). The holistic information models provide a framework for understanding such states as the highest level of conscious integration. Similarly and at a lower level, the brain experiences itself as 'one with the person' rather than as a separate organ. At each level the part becomes identified with the whole. It would appear developmentally 'immature' and perceptually limited for 'liver consciousness' to see itself as only an independent organ rather than as a part of the organism. Similarly, at the highest level, the entire universe is viewed as a single information process reflecting on itself. The individual becomes identified, and experiences her self, as one with the whole cosmic organism (Whitmont, 1990; Keutzer, 1982.) As individual particles at one level, and as part of the cosmic field at another, we exist both as individuals and as a part of a transcendent whole (Rowan, 2000). And while the 'cosmic organism' may be explained by any holarchical systems worldview (Koestler, 1968; Wilber, 1984,1999), an information model of consciousness provides further specificity and explanatory framework for understanding the possibility and nature of such personal experiences.

Another important phenomenon studied on the fringe and not accounted for by the mainstream of psychology is Psi. The global informational holism model, which views matter and consciousness as dynamic information processes connected through the GIX, is able to explain such phenomena. If everything is information and is connected with everything else, it is much easier to understand how telepathy might work. It can be understood how one person's mind can generate or send information that has an impact on matter elsewhere, as in PK. Similarly, the measurable effect of prayer on healing (Byrd, 1988; Byrd, et al., 1995; Dossey, 1989; Leibovici, 2001; Sicher, Targ, Moore & Smith, 1998) can be more readily understood.

Global Informational Holism as a Framework for Self Development and Therapy

Global information holism also offers a developmental view of the self and a framework for therapy and wellbeing. In the information holistic model several layers of self-structure are posited, each corresponding to a level in the information hierarchy--body, sensations, perception, emotion, abstract thoughts, etc. At the lower levels the infant has sensations but has not integrated them into coherent perceptions. Later, as development proceeds, the infant has emotions but has not developed self-reflective awareness of them or a way to verbalize them. As we develop, what was the subject of experience at one developmental stage becomes the object of awareness at the next (Kegan & Lahey, 2001). At the highest developmental level of unitary states the individual becomes identified with the entire cosmic organism (Battista, 2004).

An informational model of consciousness posits a relational view of self: information only exists in relationship, between the receiver/subject and the environmental context. At the physical level, one's weight is their relationship to the earth (on the moon we experience our weight differently.) Similarly, at the cognitive levels, a person's self-identity as wise or compassionate comes from their relationship to others. In this framework, a person comes to know and define himself through interactions with the environment. On their own, and in isolation, they would not know who and what they are. An informational model is a model of 'being in relation'. In the modern psychodynamic terms of object relations theory, "the human psyche is fundamentally relational in nature. The 'stuff' of which mind is made has less to do with libidinal impulses and psychic energy than with the internalization of relationships" (Cashdan, 1988, p. 23). Proper development and growth requires interaction and relationship, or "all real living is meeting" (Buber, 1971). Such a view of self is consistent with new feminist

theories of self-development that emphasize the centrality of relationship in self-development and therapy (Jordan, 1992, 1995, 2000).

Pathology, in this information model, develops when there is failure in proper relationship formation (Cashdan, 1988; Jordan, 1995, 2000) or when the integration task in a particular stage of the hierarchy is not successfully completed (Battista, 2004; Wilber, 1984, 2000). Levels of pathology are related to the stages of development of the self. For example, the first developmental tasks would involve integrating sense information to form perceptions. Later on in the developmental hierarchy, the ability to develop awareness of one's emotions and the ability to cognitively verbalize them develops. This is a never-ending developmental process and some level of pathology and personal growth can be found in most individuals. In this regard, a person may develop to higher levels of consciousness without having erected a perfect base at the lower layers. Even mystics and experienced meditators who have achieved unitary consciousness may still have some neurosis and benefit from therapy (Kornfield, 1989.)

This model of the development of self and pathology readily explains the central role of bringing awareness and acceptance of 'what is' in therapy (Battista, 2004; Cortright, 1997; Wilber, 2000). Awareness of 'what is' provides the information necessary for the proper integration of lower layers. Such awareness (information) is always necessary to achieve this proper conscious integration, regardless of the therapeutic modality. As Cortright (1997) explains, "For therapeutic purposes, consciousness = growth = freedom = movement = health" (p. 56).

Regardless of the modality, various schools of therapy work on different layers of the self (Wilber, 2000; Battista, 2004). In this regard, no single therapy modality is likely to address all problems. For example, cognitive therapy works at the level of cognitions by bringing awareness to thoughts and enabling their examination and modification. Gestalt therapy works

in the here-and-now by bringing awareness to the self layers of body sensations, perceptions, emotions, etc. Wilber (2000) asks and answers, “is there a common thread to all these levels of treatment? A common thread to psychoanalytic, cognitive, humanistic, transpersonal? In a very general sense, yes. It is this: awareness in and of itself is curative” (p. 99).

Similarly, various meditation techniques (Goleman, 1972, 1988) offer methods for developing the non-cognitive layers of the self by quieting the thinking mind and bringing awareness to direct experience. Hence, meditation follows a similar principal of awareness and is complementary to psychotherapy (Goleman, 1971, 1976; Welwood, 1980). This helps explain the importance of meditation (Goleman, 1977) for wellbeing. Various studies have demonstrated the positive impact of meditation and mindfulness training on physical and psychological wellbeing (Carlson, et al., 2003; Kaplan, et al., 1993, Majumdar, et al., 2002; Walsh, 1999). Like therapy, awareness in meditation enables the integration of lower level information, which leads to greater health. And since the self exists at several layers simultaneously, no single meditation technique is likely to be the cure all for all psychological and physical problems.

Compared to dualistic models, the holistic information paradigm is better able to account for the link between awareness of ‘what is’ (integrating information) and wellbeing, as well as for the two-way link between psychological and physical health (Bankart, et al., 1992; Carlson, et al., 2003; Louchakova & Warner., 2003, Walsh, 1999).

Global Informational Holism: Limitations

Despite some of the promise and arguments made earlier, global information holism remains an exploratory paradigm with potential criticisms and limitations. Despite its non-deterministic notion of free will, a computer-like information paradigm may be seen as ‘highly

rational'. Godel's incompleteness theorem, reminds us that mystery is inevitable—any finite non-contradictory or self-referential system (the universe and consciousness are certainly self-referential) contains propositions that are undecidable and unknowable (Hofstadter, 1980; Hopcroft et al., 2001). Similarly, the halting theorem of computer science means that other than living (i.e., by running the process to the end), we can't predict if and when such a process will ever reach a steady state or halt.

Godel's Incompleteness Theorem, Church's Undecidability Theorem, Turing's Halting Theorem, Tarski's Truth Theorem—all have the flavor of some ancient fairy tale which warns you that 'to seek self-knowledge is to embark on a journey which...will always be incomplete, cannot be charted on any map, will never halt, cannot be described'. (Hofstadter, 1980, p. 697)

As self-referential beings, mystery is an inevitable part of the global information process for us as individuals, and for the cosmos as a whole. In that regard, global information holism retains the element of mystery in life and places a limit on what can be known within the information universe.

For example, some natural questions to ask about GIX are: What is GIX made of? Does it have any parts? How does it work? Is it conscious itself? Unfortunately, these questions are likely to be not answerable. To the extent GIX exists, it is likely not conscious in the normal sense as defined in this paper. If GIX was running an information process within it self, it would likely be of a very different kind than what we know, and likely not knowable. For us to know how GIX works, or what GIX is made of, we would need a way of exchanging information with it. And since GIX is the fundamental medium of all information exchange, communicating information with it would require another medium outside of it, which is not possible by definition. If such more fundamental medium existed, we would name it GIX. In that regard, GIX is the axiomatic ground of all experience and enables any information communication and knowledge, but remains an unknowable mystery itself.

Concluding Remarks

Global information holism builds on prior information paradigms that view all of reality—energy, psyche and matter—as a hierarchically organized dynamic information process. In these paradigms matter, consciousness and the self are understood as dynamic information; neither purely objective nor purely subjective, but rather relational.

Global information holism integrates and extends these information paradigms by postulating a mechanism of Global Information eXchange (GIX) that is necessary to connect and make the cosmic information process function. Global information holism also accounts for the often ignored but important anomalous phenomena, such as mysterious psychosomatic interactions, unitary states of consciousness, and Psi. Lastly, global information holism offers a developmental and therapeutic framework of consciousness and self. As it remains a speculative paradigm, further research to validate and expand the specifics is called for.

References

- Bankart, Peter, Koshikawa, Fusako, Nedate, Kaneo, & Haruki, Yutaka (1992), 'When west meets east: Contributions of Eastern traditions to the future of psychotherapy', *Psychotherapy: Theory, Research, Practice, Training*, **29**(1), pp. 141-149.
- Bateson, Gregory (1972), *Steps to an Ecology of Mind*, (San Francisco: Chandler).
- Battista, John (1978a), 'The holographic model, holistic paradigm, information theory and consciousness', *Re-Vision*, **2**(1), pp. 99-102.
- Battista, John (1978b), 'The science of consciousness', in *The Stream of Consciousness*, eds. K. Pope & J. Singer (New York: Plenum).
- Battista, John (1982a), 'The holistic paradigm and system theory', in *General System Theory and the Psychological Sciences* (Vol. I), eds. W. Gray & J. Fiddler & J. Battista (Seaside, CA: Intersystems).

- Battista, John (1982b), 'Self psychology and system theory', in *General System Theory and the Psychological Sciences* (Vol. II, pp. 25-34), eds. W. Gray & J. Fiddler & J. Battista (Seaside, CA: Intersystems).
- Battista, John (2004), 'Framework for a general theory of transpersonal psychology', paper presented at the annual conference of the Association of Transpersonal Psychology (Palo Alto, CA).
- Bohm, David (1980), *Wholeness and the implicate order*, (London: Routledge & Kegan Paul.)
- Braud, William (2000), 'Wellness implications of retroactive intention influence: Exploring an outrageous hypothesis', *Alternative Therapies in Health and Medicine*, **6**(1), pp. 37-48.
- Buber, Martin (1971), *I and Thou*, (New York: Touchstone.)
- Byrd, Randolph (1988), 'Positive therapeutic effects of intercessory prayer in a coronary care unit population', *Southern Medical Journal*, **81**(7), pp. 826-829.
- Byrd, R. & Sherrill, J. (1995), 'The therapeutic effects of intercessory prayer', *Journal of Christian nursing*, **12**(1), pp. 21-23.
- Capra, Fritjof (2000), *The Tao of physics*, (Boston: Shambhala).
- Carlson, L., Speca, M., Patel, K., & Goodey, E. (2003), 'Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress, and immune parameters in breast and prostate cancer outpatients', *Psychosomatic medicine*, **65**(4), pp. 571-581.
- Cashdan, Sheldon (1988), *Object Relations Therapy*, (New York: W.W. Norton).
- Chalmers, David (1995), 'Facing up to the problem of consciousness', *Journal of Consciousness Studies*, **2**(3), pp. 200-219.
- Chalmers, David (1996), *The conscious mind: in search of a fundamental theory*, (Oxford, England: Oxford University Press).
- Chopra, Deepak (1993), *Ageless body, timeless mind: the quantum alternative to growing old*, (New York: Harmony Books).
- Cortright, Brant, (1997), *Psychotherapy and spirit*, (Albany, NY: State University of New York Press).
- De Quincey, Christian, (1999), 'Past matter, present mind: A convergence of worldviews. *Journal of Consciousness Studies*', **6**(1), pp. 91-106.
- De Quincey, Christian (1994), 'Consciousness all the way down? An analysis of McGinn's critique of panexperientialism', *Journal of Consciousness Studies*, **1**(2), pp. 217-229.

- Dossey, Larry (1989), *Recovering the soul: a scientific and spiritual search*, (New York: Bantam).
- Dyson, Freeman (1981), *Disturbing the Universe*, (New York: HarperCollins).
- Fredkin, Edward, (1990), 'Digital mechanics: An informational process based on reversible universal cellular automata', *Physica D*, pp. 254-270.
- Fredkin, Edward (1992), 'A new cosmogony', paper presented and published in the Proceedings of the IEEE conference of the Physics of Computation Workshop.
- Freeman, J. (1962), 'An experiment in precognition', *Journal of Parapsychology*, **26**, pp. 123-130.
- Friedman, Norman (1997), *Bridging science and spirit: Common elements in David Bohm's physics, the perennial philosophy and Seth*, (St. Louis, MO: Living Lake).
- Goleman, Daniel (1971), 'Meditation as meta-therapy: Hypotheses toward a proposed fifth state of consciousness', *Journal of Transpersonal Psychology*, **3**(1), pp. 1-25.
- Goleman, Daniel (1972), 'The Buddha on meditation and states of consciousness: II. A typology of meditation techniques', *Journal of Transpersonal Psychology*, **42**(2), pp. 151-210.
- Goleman, Daniel (1976), 'Meditation and consciousness: An Asian approach to mental health', *American Journal of Psychotherapy*, **30**(1), pp. 41-54.
- Goleman, Daniel (1988), *The meditative mind: Varieties of meditative experience*, (New York: Jeremy P. Tarcher / Putnam).
- Goleman, D., Houston, J., & Cousins, E. (1977), 'Importance of meditation', *Journal of Dharma*, **2**, pp. 231-239.
- Goswami, Amit (1995), *The self-aware universe: how consciousness creates the material world*, (New York: Jeremy P. Tarcher / Putnam).
- Greene, Brian (2004), *The fabric of the cosmos: Space, time, and the texture of reality*, (New York: Random House).
- Griffin, David Ray (1997), 'Panexperientialist physicalism and the mind-body problem', *Journal of Consciousness Studies*, **4**(3), pp. 248-268.
- Griffin, David Ray (1998), *Unsnarling the world-knot: Consciousness Freedom, and the mind-body problem*, (Berkeley: CA: University of California Press).
- Hastings, A. & Hurt, D. (1976), 'A confirmatory remote viewing experiment in a group setting', *Proceedings of the IEEE*, **64**, pp. 1544-1555.
- Hofstadter, Douglas (1980), *Godel, Escher, Bach*, (New York: Vintage).

- Hopcroft, John, Motwani, Rajeev, & Ullman, Jeffrey (2001), *Introduction to automata theory, languages, and computation*, (Singapore: Pearson Education).
- Horgan, John (1992), 'Quantum Philosophy', *Scientific American*, Jul 1992.
- Humeroff, S. & Penrose, R. (1996), 'Conscious events as orchestrated space-time selections', *Journal of Consciousness Studies*, **3**(1), pp. 36-53.
- Humphrey, Nicholas (2000), 'How to solve the mind-body problem', *Journal of Consciousness Studies*, **7**(4), pp. 5-20.
- Hunt, Harry (2001), 'Some perils of quantum consciousness: Epistemological pan-experientialism and the emergence-submergence of consciousness', *Journal of Consciousness Studies*, **8**(9-10), pp. 35-45.
- Jordan, Judith (1992), 'The relational self: A new perspective for understanding women's development', *Contemporary Psychotherapy Review*, **7**, pp. 56-71.
- Jordan, Judith (1995), 'A relational approach to psychotherapy', *Women & Therapy*, **16**(4), pp. 51-61.
- Jordan, Judith (2000), 'The role of mutual empathy in relational/cultural therapy', *Journal of clinical psychology*, **56**(8), pp. 1005-16.
- Kaplan, K., Goldenberg, D., & Galvin-Nadeau, M. (1993), 'The impact of meditation-based stress reduction program on fibromyalgia', *General Hospital Psychiatry*, **15**(5), pp. 284-289.
- Kegan, R., Lahey, L. (2001), *How the way we talk can change the way we work: Seven languages of transformation*, (San Francisco: Jossey-Bass).
- Keutzer, Carolin (1982), 'Physics and consciousness', *Journal of Humanistic Psychology*, **22**(2), pp. 74-90.
- Kornfield, Jack (1989), 'Even the best meditators have old wounds to heal', *Yoga Journal*, **88**(Sept-Oct), pp. 46-102.
- Kornfield, Jack (1993), *A path with heart*, (New York: Bantam).
- Koestler, Arthur, (1968), *The Ghost in the Machine*, (Basingstoke, Hampshire, UK: Macmillan).
- Kuhn, Thomas (1970/1996), *The structure of scientific revolutions*, (Chicago: University of Chicago Press).
- Laszlo, Ervin (1994), 'The "genius hypothesis": Exploratory concepts for a scientific understanding of unusual creativity', *Journal of Scientific Explorations*, **8**(2), pp. 257-267.
- Laszlo, Ervin (2004), *Science and the Akashic Field*, (Rochester, VT: Inner Traditions).

- Laszlo, Ervin (2006), *Science and the Reenchantment of the Cosmos: The Rise of the Integral Vision of Reality*, (Rochester, VT: Inner Traditions).
- Leibovici, Leonard (2001), 'Effects of remote, retroactive intercessory prayer on outcomes in patients with bloodstream infection: Randomized controlled trial', *British Medical Journal*, **323**, pp. 1450-1451
- Lemley, Brad (2004), 'A tangled life', *Discover*, **25**(9), pp. 26-30.
- Louchakova, Olga, & Warner, Arielle (2003), 'Via Kundalini: Psychosomatic excursions in transpersonal psychology', *The Humanistic Psychologist*, **31**(2-3), pp. 115-158.
- Majumdar, M., Grossman, P., Dietz-Waschkowski, B., Kersig, S., & Walach, H. (2002), 'Does mindfulness meditation contribute to health? Outcome evaluation of German sample', *Journal of Alternative and Complementary Medicine*, **8**(6), pp. 719-730.
- Marshall, Paul (2001), 'Transforming the world into experience', *Journal of Consciousness Studies*, **8**(1), pp. 59-76.
- Mindell, Arnold (2000), *Quantum mind: the edge between physics and psychology*, (Portland, OR: Lao Tse).
- Nelson, Roger (2001), 'Correlation of global events with REG data: An Internet-based, nonlocal anomalies experiment', *Journal of Parapsychology*, **65**(9), pp. 247-271.
- Nelson, R., Radin, D., Shoup, R. & Bancel, P. (2002), 'Correlations of continuous random data with major world events', *Foundations of Physics Letters*, **15**(6), pp. 537-550.
- Oppenheimer, Robert (1956), 'Analogy in science', *The American Psychologist*, **2**(3), pp. 127-135.
- Pauli, W. (1955), 'The influence of archetypal ideas on the scientific theories of Kepler', in *The Interpretation of Nature and Psyche*, eds. C.G. Jung & W. Pauli (New York, NY: Bollingen Foundation).
- Penrose, Roger (1994), 'Mechanisms, microtubes and the mind', *Journal of Consciousness Studies*, **1**(2), pp. 241-249.
- Popper, Karl (1959/1992), *The logic of scientific discovery*, (London: Routledge).
- Pribram, Karl (1971), *Languages of the brain: Experimental paradoxes and principles in neuropsychology*, (New York: Brandon House).
- Pribram, Karl (1985), 'What the fuss is all about', in *The holographic paradigm and other paradoxes: Exploring the leading edge of science*, ed. K. Wilber (Boston: Shambhala).

- Radin, Dean (1997), *The conscious universe: The scientific truth of psychic phenomena*, (New York: HarperEdge).
- Ramachandran, V.S. (1998), *Phantoms in the brain*, (New York: HarperCollins).
- Rothbaum, B., Hodges, L., Anderson, P., Price, L. & Smith, S. (2002), 'Twelve month follow up of virtual reality and standard exposure therapies for the fear of flying', *Journal of Consulting and Clinical Psychology*, **70**(2), pp. 428-432.
- Rowan, John (2000), 'The self, the field and the either-or', *International Journal of Psychotherapy*, **5**(3), pp. 219-227.
- Russell, Peter, (2003), *From science to GIX: The mystery of consciousness and the meaning of light*, (Novato, CA: New World Library).
- Samples, Bob (1985), 'Holonomic Knowing', in *The holographic paradigm and other paradoxes: Exploring the leading edge of science*, ed. K. Wilber (Boston: Shambhala).
- Schmidt, Helmut (1976), 'PK effect on pre-recorded targets', *Journal of the American Society for Psychical Research*, **70**(3), pp. 267-291.
- Schmidt, Helmut (1981), 'PK tests with pre-recorded and pre-inspected seed numbers', *Journal of the Parapsychology*, **45**(2), pp. 87-98.
- Schmidt, Helmut (1985), 'Addition effect for PK on prerecorded targets', *Journal of the Parapsychology*, **49**(3), pp. 229-244.
- Schmidt, Helmut (1993), 'PK with prerecorded random events and the effects of pre-observation', *Journal of the Parapsychology*, **57**(4), pp. 331-349.
- Schmidt, Helmut (1997), 'Random generators and living systems in retro-PK experiments', *Journal of the American Society for Psychical Research*, **91**(1), pp. 1-13.
- Schwartz, Gary, & Russek, Linda (1997), 'The challenge of one medicine: Theories of health and eight "world hypotheses"', *The Journal of Mind-Body Health*, **13**(3), pp. 7-23.
- Searle, John (2002), 'Why I am not a property dualist', *Journal of Consciousness Studies*, **9**(12), pp. 57-64.
- Shannon, C. E. (1948), 'A mathematical theory of communication', *Bell Systems Technical Journal*, **27**, pp. 379-423.
- Sicher, F., Targ, E., Moore, D., & Smith, H. (1998), 'A randomized double-blind study of the effect of distant healing in population with advanced AIDS', *The Western Journal of Medicine*, **169**(6), pp. 356-363.
- Silberstein, Michael (1998), 'Emergence & the mind-body problem', *Journal of Consciousness Studies*, **5**(4), pp. 464-482.

- Smith, Steven (2003), *Digital Signal Processing: A Practical Guide for Engineers and Scientists*, (Burlington, MA: Newness Elsevier Science).
- Smolin, Lee (2004), 'Einstein's lonely path', *Discover*, **25**(9), pp. 36-41.
- Spinoza, Benedictus (1677/1994), *The ethics and other works*, edited and translated by Edwin Curley (Princeton, NJ: Princeton University Press).
- Stapp, H. (1975), 'Bell's theorem and world process', *Nuovo Cimento*, **29B**(2), pp. 270-276.
- Stapp, H. (1977), 'Are superluminal connections necessary?', *Nuovo Cimento*, **40B**(1), pp. 191-205.
- Stapp, H. (1995), 'Why classical mechanics cannot naturally accommodate consciousness but quantum mechanics can', *Psyche*, **2**(5).
- Steinkamp, F., Milton, J., & Morris, R. (1998), 'A meta-analysis of forced-choice experiments comparing clairvoyance and precognition', *Journal of Parapsychology*, **62**(3), pp. 193-218.
- Steinkamp, F. (2000), 'Does precognition foresee the future? A postal experiment assess the possibility of true precognition', *Journal of Parapsychology*, **64**(1), pp. 3-18.
- Steinkamp, F. (2001), 'Does precognition foresee the future? Series 2, A laboratory replication and Series 3, A world Wide Web replication', *Journal of Parapsychology*, **64**(1), pp. 3-18.
- Talbot, Michael (1992), *The holographic universe*, (New York: HarperPerennial).
- Tart, Charles (1982), 'Transpersonal realities or neurophysiological illusions: Toward an empirically testable dualism', in *General Systems Theory and the Psychological Sciences*, eds. W. Gray & J. Fidler & J. Battista (Seaside, CA: Intersystems).
- Tart, Charles (1983), *States of Consciousness*, (El Cerrito, CA: Psychological Processes).
- Tart, Charles (1990a), 'Multiple personality, altered states and virtual reality: The world simulation process approach', *Dissociation*, **3**, pp. 222-233.
- Tart, Charles (1990b), 'Psi-mediated emergent interactionism and the nature of consciousness', in *The psychophysiology of mental imagery: Theory, research and application*, eds. R. Kunzendorf & A. Sheikh (Amityville, NY: Baywood).
- Tart, Charles (1991), 'Mind Embodied! Computer-generated virtual reality as a new, dualistic-interactive model for transpersonal psychology', speech given at the L.E. Rhine Centenary Conference on Cultivating Consciousness for Enhancing Human Potential, Wellness and Healing (Durham, NC, November 9, 1991).
- Tipler, Frank (1994), *The physics of immortality: modern cosmology, God and the resurrection of the dead*, (New York: Doubleday).

- Wade, Jenny (1996), *Changes of mind: A holonomic theory of the evolution of consciousness*, (Albany, NY: State University of New York Press).
- Walker, Evan (1970), 'The nature of consciousness', *Mathematical Biosciences*, **7**, pp. 131-178.
- Walsh, Roger (1999), 'Asian contemplative disciplines: Common practices, clinical applications, and research findings', *Journal of Transpersonal Psychology*, **31**(2), pp. 83-107.
- Welwood, John (1980), 'Reflections on psychotherapy, focusing, and meditation', *Journal of Transpersonal Psychology*, **12**(2), pp. 127-141.
- Wheeler, John (1979), 'Forum: Interview with John Wheeler', *The Cosmic Search*, **1**(4).
- Wheeler, John (1991), 'Information, physics, quantum: The search for links', in *Complexity, entropy, and the physics of information: the proceedings of the SFI workshop on complexity, entropy, and the physics of information*, ed. Wojciech Zurek (Redwood City, CA: Addison-Wesley).
- Whitmont, Edward (1990), 'The cosmic organism', *Quadrant*, **23**(2), pp. 21-37.
- Wilber, Ken (1975), 'Psychologia perennis: The spectrum of consciousness', *Journal of Transpersonal Psychology*, **7**(2), pp. 105-132.
- Wilber, Ken (1979), 'A developmental view of consciousness', *Journal of Transpersonal Psychology*, **11**(1), pp. 1-21.
- Wilber, Ken (1984), 'The developmental spectrum and psychopathology: I. Stages and types of pathology', *Journal of Transpersonal Psychology*, **16**(1), pp. 75-118.
- Wilber, Ken (1985), 'Physics, mysticism and the new holographic paradigm: A critical appraisal', in *The holographic paradigm and other paradoxes: Exploring the leading edge of science*, ed. K Wilber (Boston: Shambhala).
- Wilber, Ken (1993), 'The great chain of being', *Journal of Humanistic Psychology*, **33**(3), pp. 52-65.
- Wilber, Ken (1998), *The marriage of sense and soul: integrating science and religion*, (New York: Random House).
- Wilber, Ken (1999), 'An approach to integral psychology', *Journal of Transpersonal Psychology*, **31**(2), pp. 109-136.
- Wilber, Ken (2000), *Integral Psychology: Consciousness, spirit, psychology, therapy*, (Boston: Shambhala).
- Wilber, Ken (2003), 'Waves, streams, states and self', *The Humanistic Psychologist*, **31**(2-3), pp. 22-49.

Wolf, Fred (2000), *Mind into matter: a new alchemy of science and spirit*, (Portsmouth, NH: Moment Point Press).

Zohar, Danah (1990), *The Quantum Self*, (New York: Quill/William Morrow).

Zukav, Gary (1980), *The dancing Wu Li masters*, (New York: Bantam).