**What is consciousness?**

### Consciousness as epiphenomena

The purely sensate mode of comprehending reality embraces mathematics, and can ignore or deny the reality of mind and consciousness, seeing them as merely incidental by-products, or epiphenomena [1], of physical processes. It is odd however, that the mere epiphenomenon of mind could itself bring forth the tool of mathematics, the final arbiter of sensate reality.

# Consciousness and the Brain

### Strong AI: Consciousness as an emergent property

According to a Berkeley (UCB) web page, Strong AI's goal is to develop computer artificial intelligence to the point where the machine's intellectual capability is functionally equal to a human's. The ideal Strong AI machine would be built in the form of a man, have the same sensory perception as a human, and go through the same education and learning processes as a human child. [2] That is, according to Strong AI, artificial intelligence would be “conscious”.

Emergent properties do not exist among individual components, but arise out of the combination of very large numbers of components. The whole is greater than the sum of the parts. Examples of emergent properties include the properties of elements and compounds which are made up of large numbers of molecules, the life of big cities made up of many separate buildings, and the properties of biological structures made up of many biological cells. Consciousness is considered by many to be an emergent property of brain cells. This appears to be supported by the observation that as the number of neurons increases along the evolutionary scale, for example from fish to animals to humans, the quality of consciousness appears to increase.

Is consciousness an emergent property, or a fundamental property of matter? A computational neuroscientist claims the scientific evidence supports the idea that it is an emergent property of the brain. Yet the “evidence” he provides is just a list of the features of the brain, and in no way is evidence that consciousness is an emergent property of the brain. He even admits that the emergent property hypothesis is not a specific explanation, but rather a category of model. “Within the emergent property view, there are several specific interrelated proposals that are in various stages of scientific evaluation. These proposals include: global workspace model, information integration theory, dynamic core hypothesis, and recurrent feedback loops.” In his view, the "fundamental property of matter" concept of consciousness is a dead end [3]

But is consciousness as a fundamental property of matter a dead end? Christoff Koch proposes that consciousness is an intrinsic property of all matter, just like mass or energy, yet also advocates for Integrated Information Theory, which holds that consciousness is an emergent property of huge numbers of interconnections in the brain, Koch, as well as other AI advocates, believe that these interconnections could be mechanical as well as biological. Koch states: "If you were to build a computer that has the same circuitry as the brain, this computer would also have consciousness associated with it." [4] Koch and Giulio Tononi believe that consciousness can and will be artificially created; that it will be reduced to patterns of electrons storable on a computer.

They observe that consciousness does not seem to require many of the things we associate most deeply with being human, including emotions, memory, self-reflection, language, sensing the world, and acting in it. So what *is* necessary? They believe the answer has to do with the amount of *"integrated information"* that an organism, or a machine, can generate. [5] Integrated Information Theory (IIT) is grounded in information and complexity theory, and assumes that consciousness is caused by the binary (on/off) connections between neurons; the more the connections, the more the integrated information, or Φ (Phi), expressed in bits, and the higher the level of consciousness. [6] IIT was developed by Tononi, a psychologist and neuroscientist at the University if Wisconsin at Madison. [7] [8]

The *Consciousness Wars* website, hosted by Neuroscientist John Kubie, focuses largely on philosopher critic John Searle's critique of IIT. For Koch and Tononi, consciousness IS information, while for Searle, information isn't information until it is "read" by an entity with a mind.

On the *Consciousness Wars* website, an IIT enthusiast, Phiguy, notes "Searle didn't get the theory AT ALL! He was stuck on the idea that information requires a conscious receiver to make sense, but … IIT is the exploration of the notion that a system, if "wired" in a particular way can be its own information channel, sending and receiving causal information about itself to itself." [9]

Searle also takes issue with Koch and Tononi's adaption of Panpsychism. Koch and Tononi argue that consciousness is everywhere, so it also must be in a computer, which is a form of Panpsychism. Searle asks "why would a computer be conscious? Why not each part of it? Each microprocessor? Each molecule? " [10]

Kubie finds Searle's argument clear and powerful, while admitting to not "get" IIT, as it is explained by Koch and Tononi. He also observes that in a close reading of Chapter 8 of Koch's book *Consciousness: Confessions of a Romantic Reductionist,* which contains the entirety of Koch's description of IIT, no definition is given of what a "connection" is. Koch and Tononi advocate IIT despite acknowledging that currently no one really knows exactly what consciousness is. Nor do we understand life, as we have been unable to create life from "scratch." For these reasons I doubt the assumption that mechanical interconnections could produce consciousness. The issue seems to boil down to weather mere electrical connections, as commonly understood, no mater how cleverly

implemented, can amount to anything other than connections. Further, what would consciousness be without emotion? Psychology has already shown that human decision making is based to an extent on emotion as well as logic. [11] On the *Consciousness Wars* website, Enzo reasonably observes "So my general view is that information integration is an important feature of consciousness but cannot be the whole story." [12]

**The default network**

But what of Koch's proposed mechanical "consciousness circuitry"? People have long envisioned the brain as being like a computer on standby, lying dormant until called upon to do a task. However, in 1953, physician Louis Sokoloff found that the volunteer subject's brain consumed no more oxygen while doing mental arithmetic than when resting with eyes closed. [13] It turns out that there is a huge amount of activity in the resting brain, and we don't know why. The activity occurs in a cluster of regions arching through the midline of the brain, from front to back, dubbed the "default network". [14] This neural activity in the default network has been found in heavily sedated monkeys, as well as in sedated humans. Researchers have since found that the default network's pattern of activity is disrupted in patients with Alzheimer's, depression, attention deficit hyperactivity disorder (ADHD) autism and schizophrenia. It also plays a mysterious role in victims of brain injury or stroke who hover in the grey netherworld between consciousness and brain death. [15] The presence of the default network suggests the brain does not work like a computer, and it may be a very long time, if ever, before this default network circuit is duplicated in a machine.

**EM and the brain**

Neurologist Norman Geschwind was the first researcher to note and catalog a set of religious behavioral traits associated with temporal lobe epilepsy (TLE) seizures.[16] Such seizures are in effect electrical storms in the temporal lobes. During the 1980s Michael Persinger stimulated the temporal lobes of human subjects with a weak magnetic field using an apparatus that popularly became known as the "God helmet" and reported that many of his subjects claimed to experience a "sensed presence" during stimulation. Although Wikipedia claims that Persinger's effects have not been replicated, [17] Persinger's blog, as well as other internet sources cite the work of Brazilian scientists Carlos A. Tinoco and João P. L. Ortiz, confirming these effects.

http://sacredneurology.com/2015/06/07/god-helmet-and-many-other-of-our-results-have-been-replicated-a-blog-by-dr-michael-a-persinger/
http://www.scribd.com/doc/267811996/God-Helmet-Replication-Study
Journal of Consciousness Exploration & Research| April 2014 | Volume 5 | Issue 3 | pp. 234-257

In addition to "sensed presence," euphoria, anxiety, fear, and sexuality have been elicited, each from a different electromagnetic pattern. The patterns have generated their intended effects with great regularity, so that Persinger has started naming them and is creating a sort of EM pharmacological dictionary. Persinger envisions a series of EM patterns that

work the way drugs do. Just as you take an antibiotic and it has a predictable result, you might be exposed to precise EM patterns that would signal the brain to carry out comparable effects. [18]

**Electromagnetic field theories of consciousness**

The central idea of the electromagnetic (EM) field theory of consciousness, according to neuroscientist Dr Susan Pockett, from the University of Aukland, is that conscious perceptions … are identical with certain spatiotemporal electromagnetic patterns generated by the normal functioning of waking mammalian brains. In a sense, this view is analogous to AI and Tononi and Koch's Integrated Information Theory, discussed above, where the EM field replaces IIT's connected neurons. Pockett believes that external EM fields effect neurons of the brain. John Joe McFadden, University of Surrey, UK, who apparently got credit for Pockett's ideas, cited studies from Koch's Lab that showed neurons being effected by endogenous EM fields. [19] External EM fields also can effect neurons. MRI machine operators exposed to the magnetic field of the MRI machine sometimes experience "Mag Lag". The symptoms include memory loss and delays in information processing, and have been reported, in some cases several hours after exposure. [20] The literature is also rife with documentation on the effect of external (commercial) EMF on biological tissue in general. Mainstream medicine has admitted at least a weak link between commercial EMF and adverse health effects, [21] however, the actual severity of such effects is politically charged and highly controversial. [22] Pockett, noting the large distances between motor and sensory neurons, disagrees with McFadden that sensory consciousness fields can effect motor neurons, that is, she believes consciousness cannot directly effect behavior. She admits her views are potentially damaging if not fatal to the EM field theory of consciousness. Although Pockett's version of EM field theory allows for a global EM field, she believes the individual fields are too weak to allow that global field. [23] It is not clear how Pockett's particular views, as opposed to McFadden's move the EM field theory of consciousness forward. However, the general idea seems compatible with Persinger's views.

**Consciousness as a quantum (brain) process**

While most mainstream scientists advocate that consciousness is a result of local brain processes, others have considered that consciousness is a non-local, or quantum process. There is a historic precedent for this. Austrian born physicist and theoretical biologist Erwin Schrödinger was one of the first scientists to suggest a study of quantum biology in his 1944 book "What is Life?" [24]

Quantum biology refers to applications of quantum mechanics to biological objects and problems. Usually, it is taken to refer to applications of the "non-trivial" quantum features such as superposition, nonlocality, entanglement and tunneling, as opposed to the "trivial" applications such as chemical bonding which apply to biology only indirectly by dictating quantum chemistry. [25] Mainstream science has shown that quantum-coherent energy transfer occurs in photosynthesis. [26] But if quantum processes are manifest in

simple vegetative material, why not in the much more complex tissue of mammals, and in particular human beings?

**Holographic brain processes: memory, perception and the quantum level**

In 1947, Dennis Gabor demonstrated that the information pattern of a three-dimensional object could be encoded into an interference pattern of coherent light waves or photons. This process is called holography.

The Fourier transform allows any signal to be represented by a sum of sine or cosine functions. The sine and cosine as functions of time are periodic and infinite through time. Although certain brain functions may have a holographic quality, it has been determined experimentally that these are more accurately represented by a windowed Fourier transform; ie. by the product (multiplication) of the sine or cosine and a window localized in time.

Gabor pioneered the use of windowed Fourier transforms for use in communication theory and noted its similarity to its use in describing quantum processes in subatomic physics. Gabor therefore called his units of communication "quanta of information", and his windowed Fourier functions became known as Gabor functions. [27]

Using the windowed Gabor functions, Karl Pribram fashioned the "holonomic brain" (or windowed holographic) model of cognitive function in 1987 in collaboration with David Bohm, and conjectured that the reason subatomic particles are entangled is because at a deeper level of reality these particles are not individual but actually extensions or emanations of the same wave-forms. [28]

Taking the visual system as an example of holonomic theory, the form of an optical image is transformed by the retina into a quantum process that is transmitted to the visual cortex. Each dendritic receptive field thus represents the "spread" of the properties of that form originating from the entire retina. Taken together, cortical receptive fields form patches of dendritic local field potentials described mathematically by Gabor functions. The spread of properties occurs within each patch; there is no spread of the Fourier process over the large extent of the entire cortex. [29]

The inverse Fourier (or Gabor) transformation has to occur to get the properties of images and objects back into our space-time world from the frequency domain. This inverse transformation is accomplished in the brain by movement.

Pribram writes that holonomy in brain function is really achieved at the quantum level. Waveforms embedded and spread throughout the matrix of a neural system allow new patterns to be produced via the transmutation of quantum waves into particles and back again into waves, vice versa, ad infinitum. [30] He also writes that perceptual processes as well as memory may be described by this approach. [31]

In 1968, Frohlich proposed that energy can be stored without thermal loss in a thin two-dimensional region of cells in coherent, dipolar propagating waves. The result was a globally coherent thin layer that could be seen as a biological superconducting medium. Frohlich waves are predicted to appear in a frequency region between 10 II and 10 12 S-I called the Frohlich frequency. Experimental evidence for Frohlich excitations in biological systems includes observation of GHz range phonons in proteins. In 1989, Marshall proposed that Frohlich's 'pumped phonons' result in a Bose Einstein condensate in the brain which is the substrate for consciousness [32]

In 1977, Umezawa Takahashi and Stuart proposed a brain system with two spatially distributed quantum dynamical degrees of freedom. As a consequence of spontaneous symmetry breaking, these two modes are distinguished as the 'corticon' field and an exchange boson field, which provides a theoretical model of nonlocal memory storage and recall processes. More recently, Jibu and Yasue presented a physically realistic picture of the system of corticon and exchange boson fields, and proposed to call the new quantum field theoretical framework 'Quantum Brain Dynamics' ('QBD')

**Superradience and holographic quantum (brain) processes in the microtubule**

A paper published in 1994, authored by Mari Jibu, Scott Hagan, Stuart R. Hameroff, Karl H. Pribram, Kunia Yasue, [33] pulled together several new ideas in consciousness studies.

Foot note:
Living tissue transmits light more readily than non-living material; in experiments with mammalian brains, temporal poles and hippocampus manifest the maximum light penetration (Hameroff, 1987). This led Hameroff to consider microtubules as waveguides for photons. He also proposed that cytoplasmic interference of coherent sources from and among multiple microtubules may lead to holographic information processing mechanisms. [34]

Optical holography requires a coherent, laser like light source. A laser system normally cannot emit coherent photons without some light pumping mechanism. However, a laser-like process of coherent photon emission due to symmetry breaking without pumping light was first introduced by Dicke in 1954, and is called superradiance. [35]

The total Hamiltonian for the quantized electromagnetic field and water inside the microtubule cylinder is essentially of the same form as Dicke's Hamiltonian for the laser system and also that of Stuart et al. for Quantum Brain Dynamics. Therefore, it can be expected that each microtubule in the cytoskeletal structure of brain cells manifests not only the memory printing and recalling mechanism in QBD but also a laser-like coherent optical activity.

The authors propose that the quantum dynamical system of water molecules and the quantized electromagnetic field confined inside the hollow microtubule result in superradiance, by which the microtubule can transform any incoherent, thermal and disordered molecular, electromagnetic or atomic energy into coherent photons. [36] These

photons penetrate the internal hollow core of the microtubule as if the optical medium inside it were made transparent. This is a quantum theoretical phenomenon called selfinduced transparency. Superradiance and self-induced transparency in cytoskeletal microtubules can lead to optical neural holography.

**Penrose, Hameroff, and quantum gravity**

In *The Emperor's New Mind* (1989), Roger Penrose argues that the current laws of physics are inadequate to explain the phenomenon of consciousness and thought. He argues that Gödel's incompleteness theorem prevents an algorithmically based system of logic from producing things like mathematical insight. Using Turing's 'Halting Theorem', he also argues that processes can be deterministic without being algorithmic, and believes that such non- algorithmic processes may come into play in the brain during collapse of the quantum mechanical wave function, and may be harnessed by the brain. These claims were originally made by the philosopher John Lucas of Merton College, Oxford, and are in direct contrast to the notion that the rational processes of the mind are completely algorithmic and can thus be duplicated by a sufficiently complex computer. [37] The Penrose/Lucas argument invoking Gödel's incompleteness theorem for computational theories of human intelligence has been roundly attacked,[38] most notably by advocates of strong AI.

Hameroff, an anesthesiologist, was inspired by Penrose's work, and contacted him regarding his own theories about the mechanism of anesthesia, and how it specifically targets consciousness via action on neural microtubules. [39] With the help of Hameroff, Penrose elaborated on his ideas in the subsequent books *Shadows of the Mind* (1994), and *The Large, the Small and the Human Mind* (1997). Hameroff's contribution to the theory derives from studying neurons. His interest centered on the cytoskeleton and microtubules.

As neuroscience has progressed, the role of the cytoskeleton and microtubules has assumed greater importance. According to Hameroff, among other things, mirotubules provide a supportive structure for the cell, allow transport of molecules including neurotransmitter molecules bound for the synapses, and control the cell's movement, growth, and shape. [40]

Penrose and Hameroff have argued that consciousness is the result of quantum gravity effects in collections of microtubules within brain neurons, which they dubbed Orch-OR (orchestrated objective reduction). [41] Introducing gravity as a mechanism for consciousness is not so far fetched. As currently understood, matter is subject to four forces; the weak and strong forces; electromagnetic and gravitational forces. [42] The strong and weak forces are short range forces, acting primarily within the atomic nucleus, while the electromagnetic force may act at short range, as well as long range. Gravity is a long range force. Because of this, it might be reasonable to hypothesize that gravity as well as electromagnetism may play some role in consciousness.

This more developed version of their ideas was also widely attacked, notably by the physicist Max Tegmark, who calculated that quantum states in microtubules would survive for only $10^{-13}$ seconds, too brief to be of any significance for neural processes. [43] Hameroff et al have whittled down the decoherence time for their actual Orch-OR model, and have found other mechanisms to make up the difference. [44] In the last decade, some researchers who are sympathetic to Penrose's ideas have proposed an alternative scheme for quantum processing in microtubules based on the interaction of tubulin tails with microtubule-associated proteins, motor proteins and presynaptic scaffold proteins. These proposed alternative processes have the advantage of taking place within Tegmark's time to decoherence. A 2011 paper by Penrose and Hameroff updates their Orch-OR model, in light of criticisms, and discusses the place of consciousness within the universe. [45]

# Consciousness beyond the brain

### Spirits and consciousness

An electromagnetic field theory of consciousness seems to be compatible with the experiments of Dr. Gary Schwartz. CCD (Charge Coupling Devise) data, as well as FFT(Fast Fourier Transform) data of the CCD images were collected from a space into which human spirits as well as angels were invited. Results showed that the spirit of a deceased person did not produce the degree of high frequency cosmic ray FFT ripple effects as an angel, and the angel did not produce the degree of normal light frequencies as the deceased spirit. [46] Schwartz recognizes this does not "prove" the existence of angels or spirit, or that they can effect cosmic rays. [47] Note that these fields were not restricted to a "brain".

### Panpsychism and use of drugs to explore consciousness

Frederic William Henry Myers' (1843-1901) book *Human Personality and Its Survival of Bodily Death (1903)* argues that the mind is not generated by the brain but is instead limited and constrained by it. Myers strongly influenced his contemporary intellectual community, including William James and Aldous Huxley. [48] Huxley, in his book *The Doors of Perception*[49] suggests that all around us is Mind at Large, (being an information field) which comprises everything. This is panpsychism. He also proposed that the brain is a 'reducing valve,' narrowing that information to a small trickle, and suggested that drugs may temporarily open that valve. [50]

Myers' concept of mind is strongly supported by the authors of the book *Irreducible Mind: Toward a Psychology for the 21st Century,* Published in 2009. Edward F. Kelly, Professor of Research in the Division of Perceptual Studies at the University of Virginia School of Medicine, is lead author of the book. [51]

This concept is also supported by a British study, [52] which shows how psilocybin — the drug contained in certain mushrooms — affects the connectivity of the brain. Researchers found that this psychedelic chemical, which is known to trigger feelings of oneness with the universe, does not work by ramping up the brain's activity as they'd expected, but rather by reducing it, particularly in sensory regions. The largest decreases were observed in the medial prefrontal cortex (mPFC) and the anterior and posterior cingulate cortices (ACC and PCC respectively). Scans also showed a reduction in functional connectivity between the mPFC and PCC, so that their normally synchronous activity was de-synchronized.

When functioning normally, these connective 'hubs' appear to help constrain the way we see, hear and experience the world, grounding us in our local reality. They are also the key nodes of a brain network linked to self-consciousness and depression. Psilocybin cuts activity in these nodes and severs their connection to other brain areas, inducing a state of 'unconstrained cognition'.

"The results seem to imply that a lot of brain activity is actually dedicated to keeping the world very stable and ordinary and familiar and unsurprising," says Robin Carhart-Harris, a postdoctoral student at Imperial College London and lead author of the study, published in *Proceedings of the National Academy of Sciences*.

The article concludes: "Indeed, Huxley and Blake had predicted what turns out to be a key finding of modern neuroscience: many of the human brain's highest achievements seem to involve preventing actions instead of initiating them, and sifting out information rather than collecting and presenting it for conscious consideration." … "A growing body of literature suggests that these drugs can indeed help scientists understand the workings of the mind and brain, by revealing some of the underpinnings of consciousness." [53] These findings are consistent with the free-energy principle of brain function developed by Karl Friston of University College London, which states that the brain works by constraining our perceptual experiences so that its predictions of the world are as accurate as possible. [54]

**Neurocardiology and heart consciousness**

Almost a century ago, Rudolph Steiner said the greatest discovery of 20th century science would be that the heart is not a pump but vastly more, and that the great challenge of the coming ages of humanity would be, in effect, to allow the heart to teach us to think in a new way. [55]

In the 1970s a small group of cardiovascular researchers joined with a similar group of neurophysiologists to explore areas of mutual interest. This represented the beginning of the new discipline of neurocardiology. One of the early pioneers, Dr. J. Andrew Armour, introduced the concept of a functional "heart brain" in 1991. His work revealed that the heart has a complex intrinsic nervous system that is sufficiently sophisticated to qualify as a "little brain" in its own right. The heart's brain is an intricate network of several types of neurons, neurotransmitters, proteins and support cells like those found in the

brain proper. Its elaborate circuitry enables it to act independently of the cranial brain – to learn, remember, and even feel and sense. [56]

Hormonal, chemical, rate and pressure information is translated into neurological impulses by the heart's nervous system and sent from the heart to the brain through several afferent (flowing to the brain) pathways which enter the brain in an area called the medulla, located in the brain stem. These signals have a regulatory role over many of the autonomic nervous system signals that flow out of the brain to the heart, blood vessels and other glands and organs. They also cascade up into the higher centers of the brain, where they may influence perception, decision making and other cognitive functions. [57]

A healthy heart has a natural variation, from minute to minute, beat to beat, even at rest. This phenomenon is known as Heart Rate Variability (HRV). It's a sign of health – the greater the variability the better. In states of stress, anxiety, anger and sadness the variation tends to be disordered and chaotic. In positive emotional states such as love and gratitude, the variation tends to be ordered and rhythmic. This state of rhythmic variation is known as Heart (Rate Variability) Coherence. Institute of Heart Math (IHM) research indicates that heart coherence is produced by the inter-relationship of the sympathetic and parasympathetic nervous systems. The sympathetic nervous system (sns), associated with the flight or fight response, tends to increase heart rate. The parasympathetic nervous system (pns), associated with biological processes during rest, tends to reduce heart rate. Coherence is produced by the interaction of these two systems. [58]

In addition to the extensive neural communication network linking the heart with the brain and body, the heart generates the body's most powerful and most extensive rhythmic electromagnetic field. When the brain entrains to the heart, an electrocardiogram of the heart brain combination shows that the brain wave patterns, including alpha are, in fact, embedded within the larger field of the heart. When brain neurons entrain to the heart's ECG activity, research shows that the timing of neuronal firing conveys several times more information than the brain alone. On the other hand, when the heart is entrained to the brain's oscillating wave-form, the heart begins to lose coherence. The more the heart entrains to the brain, and the longer it does so, the lower the HRV, the less fractal its processes are. The more predictable and regular the heart becomes, the more diseased it is. [59] These observations further suggest the AI notion of brain centered machine intelligence, and Koch's notion of a brain centered human like consciousness without emotion, are not adequate.

It is generally believed that conscious awareness originates in the brain alone. Recent scientific research however, suggests that consciousness actually emerges from the brain and body acting together. A growing body of evidence suggests that the heart plays a particularly significant role in this process. IMH proposes that the heart's electromagnetic field acts as a carrier wave for information that provides a global synchronizing signal for the entire body. This perspective requires an energetic concept of information, in which patterns of organization are enfolded into waves of energy. IMH has demonstrated that sustained positive emotions (ie Heart Rate Variability Coherence) appears to give rise to a distinct mode of functioning, which they call psychophysiological coherence. In this state, heart rhythms not only exhibit a sine wave-

like pattern, but also the heart's electromagnetic field becomes correspondingly more organized. IHM research suggests that psychophysiological coherence is important in enhancing consciousness– both for the body's sensory awareness of the information required to execute and coordinate physiological function, and also to optimize emotional stability, mental function, and intentional action. [60]

Experiments conducted at the IMH have found evidence that the heart's electromagnetic field can transmit information between people. An exchange of heart energy between individuals up to five feet apart has been measured. One person's brain waves may actually synchronize to another person's heart. When an individual is generating a coherent heart rhythm, synchronization between that person's brain waves and another person's heartbeat is more likely to occur. [61]

The website Neurologica Blog, [62] and others like it, take issue with Joseph Pearce's statement: "The idea that we can think with our hearts is no longer just a metaphor, but is, in fact, a very real phenomenon. We now know this because the combined research of two or three fields is proving that the heart is the major center of intelligence in human beings."

The Blog states: "The primary misconception here is to confuse 'neuron' with 'brain cell,' followed by equating brain cells with mind…. A recent review of the evidence indicates that the heart contains a complex intrinsic nervous system comprised of multiple ganglia (clusters of neurons) that network with each other….None of this means that the heart has a mind. It takes more than neurons, or even a system of neurons, to form a mind. A complex network of neurons can function like a computer chip, and no more has a mind than your laptop does… The mind is entirely the product of the brain."

This Blog does not address the issue of research showing that "the heart is the major center of intelligence in human beings," noted above. It merely assumes the mind is entirely the product of the head brain, even though it has not been shown that the head brain itself is anything other than complex clusters of neurons, like the heart, and as AI advocates would say, like a computer chip. Since it has been acknowledged that we do not understand mind/consciousness, how is it known to be a product of the head brain?

**Water and EM signaling in the body**

The career of the French scientist Jacque Benveniste followed a distinguished arc until the 1980s. An M.D., he was appointed research director at the French National Institute of Health and Medical Research (INSERM) In 1984, his bright future became derailed by what at first appeared to be a small error in computation. His best laboratory technician kept returning to his office with data showing powerful biological effects from a solution so weakened by dilution that it could not have enough antigen to have caused them. After careful testing, Benveniste concluded this effect, better known as homeopathy, was real.[63]

In a 2007 article, Martin Chaplin, Professor and lab chief at the Department of Applied Science at London South Bank University, comments on the legitimacy of the memory of

water. While individual molecular bonds are in a constant state of flux, large-scale patterns can remain intact - a little like a dance where everyone constantly changes partners but the basic pattern persists. [64] Chaplin notes that many scientists who deny the memory of water do not produce data showing no memory, but rather produce arguments why it cannot have memory. He also notes a number of reasons why computer modeling, nuclear magnetic resonance, and diffraction data could not successfully model the long term stability seen in memory of water. [65]

Some researchers have suggested that long term patterns might lead to an effect called epitaxy, by which one arrangement of atoms can act as a template, compelling other atoms to take up the same arrangement. The original substance would act as the template, the water then retaining some vestige of the properties of the original substance. This process is analogous to homeopathy, and has long been used to make microchips from semiconductor material. [66]

According to Yolene Thomas [67], Beneviniste et al continued to probe the phenomenon of the remembered antibody, [68] eventually hypothesizing the memory effect was electromagnetic in nature, and that molecules could communicate via EM waves. He wanted to find which molecular vibration modes are efficient, and how these modes themselves could be used to mimic some of the biological function of a molecule without its physical presence. He experimented with a devise that was essentially a standard audio amplifier connected to another coil to create an "audio frequency oscillator". Thomas notes that she worked with Beneviniste between 1992 and 1996 to show that they could transfer molecular signals indirectly to water or directly to cells with this amplifier, giving rise to "digital biology".

Several years later, he was able to record and play these signals using a multimedia computer. Over thousands of trials, Benveniste recorded the activity of the molecule, and replayed it to a biological system sensitive to that substance. In every instance, the biological system had been fooled into thinking it was interacting with the substance itself. Other studies showed that Benveniste 's team could erase these signals and stop activity in the cells through an alternating magnetic field. … The inescapable conclusion: as Fritz Albert Popp theorized, molecules speak to each other in oscillating frequencies. [69]

Despite the Establishment's hit job on Benveniste's results, reputable research supporting his work slowly began to surface in other areas. In 1992, the Federation of American Societies for Experimental Biology (FASEB) held a symposium, organized by the international Society for Bioelectricity, examining the interactions of electromagnetic fields with biological systems. Numerous other scientists have replicated high dilution experiments, and several have endorsed and successfully repeated experiments using digitized information for molecular communication. [70]

Chaplin points out that ignoring the evidence for such phenomena as Benveniste's digital biology is scientifically unsound.[71]

In 2007, Dr. Mae-Wan Ho wrote: "[Veljko] Veljkovic and [Irena] Cosic essentially asked a fundamental question in biology: what is it that enabled the tens of thousands of different kinds of molecules in the organism to recognize their specific targets…" They proposed that molecular interactions are electrical in nature, and take place over macroscopic distances. Cosic later introduced the idea that molecules recognize their particular targets and vice versa by electromagnetic resonance. "In other words, the molecules send out specific frequencies of electromagnetic waves which not only enable them to 'see' and 'hear' each other, as both photon (light) and phonon(sound) modes exist for electromagnetic waves, but also to influence each other at a distance…" [72]

Interestingly, Benveniste's and Cosic's EM theory of molecular signals in the body corresponds to Michael Persinger's conception of an EM theory of signals in brain function.

**(Quantum Electromagnetic) body consciousness**

Gravity and electromagnetic radiation are pervasive. Based on the work of Becker, Benvineste, Persinger, Veljkovic, Cosic and others, it seems certain that electromagnetism is fundamental to the functioning of the human body/brain. Why do many electromagnetic theories of consciousness, as well Penrose and Hameroff's ORCH-OR theory, insist that consciousness resides only in the brain?

Mae Wan Ho proposes that quantum coherence is the basis of living organization and can also account for key features of conscious experience, including the "unity of intentionality", our inner experience of the singular "I", the simultaneous binding and segmentation of features in the perceptive act, and the distributed, holographic nature of memory. [73]

The very first edition of Mae Wan Ho's book *The Rainbow and the Worm*, in 1993, provided evidence that quantum coherence was responsible for biological organization. Ho notes in her book that conventional quantum theory must be modified to account for a system that is coherent in many frequencies. [74]

Magnetic tomography and EEG show large scale spatiotemporal coherence of brain activities that show the brain functions, not as a collection of specialized brain cells, but as a coherent whole. Detailed investigations over the past decades have revealed that many cells respond to isolated features such as edges or bars in the visual cortex, but no special cells have been found to respond to higher categories such as squares or cubes for example. So how are the separate features bound into a whole? Several researchers (W. J. Freeman and W. Singer) have found evidence of simultaneous oscillations in separate areas of the cortex of animals, accurately synchronized in phase as well as frequency. A possible solution to the binding property of consciousness.

Connective tissue make up the bulk of all multicellular animals. Ho's optical imaging techniques show that this is a flexible, highly responsive, yet ordered liquid crystalline

continuum. Structured water in the organism is responsible for most of the crystalline effect.

Ho believes the connective tissue constitutes a "body consciousness" that precedes the nervous system in evolution, and works in tandem with, and independently of the nervous system . This body consciousness is for Ho the basis of *sentience*, the pre-requisite for conscious experience that involves the participation of the whole organism. If this is true, then structured water would appear to fill some role in consciousness.

This liquid crystalline continuum is responsible for the direct current (DC) electrodynamical field, permeating the entire body of all animals. Becker has demonstrated that this DC field has a mode of semi-conduction that is much faster than nervous conduction, and may be responsible for signaling of finely coordinated human motion.

From the perspective of the whole organism, the brain's primary function may be the mediation of coherent coupling of all subsystems, so the more highly differentiated or complex the system, the bigger the brain required. This, as well as consciousness as an emergent property, would also account for the increasing number of neurons along the evolutionary scale.

If quantum coherence is characteristic of the organism as a conscious being, then the conscious being will possess something like a macroscopic wave-function. This wave function is ever evolving, entangling its environment, transforming and creating itself anew. [75] Might this correspond to the metaphysical “aura” of the human body?

Note that coherence, in which the many parts act as a unity, does not quite seem to map into IIT’s idea of integrated information, unless it is the totality of integrated information that acts as a whole. Earlier versions of IIT seemed to allow for nesting of consciousness, which would fit into the context of whole body consciousness. However, later IIT versions no longer allowed this. [76]

**Water, superradience, and homeothapy**

Water is among the most mysterious of substances. Scientists have identified over 60 anomalous properties of water, many having a direct effect on life on Earth. Biologists are finding ever more connections between the processes of life and the detailed properties of water.

Giuliano Preparata and Emilio Del Giudice have demonstrated mathematically that when closely packed together, atoms and molecules exhibit a collective behavior, forming what they call "coherent domains" They demonstrated that water molecules create "coherent domains". These single wavelengths of water molecules appear to become "informed" in the presence of other molecules; that is, they tend to polarize around any charged molecule, storing and carrying its frequency so that it may be read at a distance.

This would mean water is like a tape recorder, imprinting and carrying information whether the original molecule is still there or not. Shaking of the containers appears to speed up this process. [77]

This suggests that water acts as the essential conductor of a molecules signature frequency . [78] If Benveniste is right, water both sends and amplifies the signals. Coherent domains and superradiance are entirely consistent with Benveniste's findings, and the concept of homeopathy.

**Consciousness as a causal reality**

***Conscious experience* textbook 1995**

Roger sperry consciousness as a causal reality.

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[5] https://en.wikipedia.org/wiki/Integrated_information_theory
[6] http://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1003588
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[11] https://www.psychologytoday.com/blog/intense-emotions-and-strong-feelings/201012/it-or-not-emotions-will-drive-the-decisions-you
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[13] *Nothing: Surprising Insights Everywhere From Zero to Oblivion*
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[15] *Nothing: Surprising Insights Everywhere From Zero to Oblivion*
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[17] http://en.wikipedia.org/wiki/Neurotheology
[18] http://www.wireheading.com/brainstim/godbrain.html

[19] http://www.scholarpedia.org/article/Field_theories_of_consciousness
[20] http://en.wikipedia.org/wiki/Electromagnetic_theories_of_consciousness

[21] http://ec.europa.eu/health/scientific_committees/emerging/docs/scenihr_o_041.pdf
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3341445/ (Reproductive system)
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(This website appears legit, but has not been researched exhaustively)
http://www.foxnews.com/tech/2014/10/20/experts-why-wearable-tech-could-pose-health-risks.html
http://emfsafetynetwork.org/harvard-doctor-warns-against-wi-fi-hazards/

[23] http://www.scholarpedia.org/article/Field_theories_of_consciousness

[24] Other links between consciousness and quantum theory include probabilistic synaptic functions (Eccles 1986; Beck and Eccles 1992), Holography (Pribram 1966, 1971, 1991; Gabor 1986), and application of uncertainty principle (Bohm 1951 and Bohr 1958) P. 196

"Quantum optical coherence in cytoskelatal microtubules: Implications for brain function" Mari Jibu, Scott Hagan, Stuart R. Hameroff, Karl H. Pribram, Kunia Yasue BioSystems 32 1994
http://www.karlhpribram.com/wp-content/uploads/pdf/D-122.pdf

[25] http://en.wikipedia.org/wiki/Quantum_biology

[26] http://rsta.royalsocietypublishing.org/content/370/1972/3613.short

[27] http://www.scholarpedia.org/article/Holonomic_brain_theory

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[33] "Quantum optical coherence in cytoskelatal microtubules: Implications for brain function" Mari Jibu, Scott Hagan, Stuart R. Hameroff, Karl H. Pribram, Kunia Yasue BioSystems 32 1994
http://www.karlhpribram.com/wp-content/uploads/pdf/D-122.pdf

[34] http://www.karlhpribram.com/wp-content/uploads/pdf/D-122.pdf

[35] This was apparently first described by R.H. Dicke in 1954, in an article in Physical Review. (Volume 93, 1, page 99, January 1954)

[36] In Japan, one of the authors, physicist Kunio Yasue of the Research Institute for Information and Science, Notre Dame Seishin University in Okayama, found that water molecules have some role to play in organizing discordant energy into coherent photons; a process called superradiance.

[37] http://en.wikipedia.org/wiki/Roger_Penrose

[38] http://en.wikipedia.org/wiki/Roger_Penrose

[39] https://en.m.wikipedia.org/wiki/Stuart_Hameroff

[40] http://en.wikipedia.org/wiki/Roger_Penrose

[41] http://www.sciencedirect.com/science/article/pii/S1571064513001188

[42] http://sciencepark.etacude.com/particles/forces.php

[43] https://en.m.wikipedia.org/wiki/Stuart_Hameroff

[44] http://en.wikipedia.org/wiki/Roger_Penrose

The time scale of neuron firing and excitations in microtubules is slower than the decoherence time by a factor of at least ten billion.

[45] http://en.wikipedia.org/wiki/Roger_Penrose

[46] *The Sacred Promise*; Gary Schwartz Atrea Books 2011 p. 205-206

[47] *Sacred Promise*; Gary Schwartz Atrea Books 2011 p. 208-209.

[48] Irreducible Mind: Toward a Psychology for the 21st Century Edward F. Kelly et al (2007) p.

[49] Huxley's book takes its title from a phrase in William Blake's poem *The Marriage of Heaven and Hell*.
[50] Huxley's exact words:
http://www.ianmack.com/aldous-huxley-dont-mistake-the-trickle-for-ultimate-reality/

[51] Others include Emily Williams Kelly, Professor, U of Va.; Adam Crabtree, Canadian psychotherapist; Alan Gauld, Retired Reader in Psychology of Nottingham University and President of the Society for Psychical Research from 1889 until 1992. Michael Grosso, Professor of Philosophy, U of Va.; and Bruce Grayson, Professor of Psychiatry, U of Va.

[52] *Neural correlates of the psychedelic state as determined by fMRI studies with psilocybin* http://www.pnas.org/content/109/6/2138

[53] http://healthland.time.com/2012/01/24/magic-mushrooms-expand-the-mind-by-dampening-brain-activity/#ixzz2BcbUbdYC

http://healthland.time.com/2012/01/24/magic-mushrooms-expand-the-mind-by-dampening-brain-activity/

**Note: Contrary Results**
Another study of the effects of psilocybin on the brain found the opposite effect of Carhart-Harris' group:
"We have completed a number of similar studies and we always saw an activation of these same areas,"
says Franz Vollenweider at the University of Zurich in Switzerland. "We gave the drug orally and waited an hour,
but they administered it intravenously just before the scans, so one explanation is that [their] effects were not that strong."
Or, perhaps the effect had worn off after an hour.

[54] http://www.nature.com/news/psychedelic-chemical-subdues-brain-activity-1.9878

[55] http://www.ratical.org/many_worlds/JCP98.html

[56] http://www.newciv.org/nl/newslog.php/_v151/__show_article/_a000151-000012.htm

[57] http://www.newciv.org/nl/newslog.php/_v151/__show_article/_a000151-000012.htm
[58] http://www.rocklandmindbody.com/BiofeedbackHeartmath.html
[59] http://peaceandloveism.com/blog/2010/04/knowing-our-hearts-creating-coherent-electromagnetic-fields/
[60] [60] http://www.livingwisdomschool.org/newsarticles/heartmind.html
The value of Heart Math research has been validated in educational settings such as livingwisdomschool.

[61] http://www.heartmath.org/research/science-of-the-heart-head-heart-interactions.html

[62] http://theness.com/neurologicablog/index.php/brain-cells-in-the-heart/

[63] The Field P. 60 f.

[64] http://www.thenational.ae/news/uae-news/science/the-most-mysterious-substance-known-to-man

[65] http://www.scribd.com/doc/47787595/The-Memory-of-Water-an-Overview-Chaplin-Homeo-2007.

[66] http://www.thenational.ae/news/uae-news/science/the-most-mysterious-substance-known-to-man

see also http://www.theguardian.com/global/2015/may/11/water-weirdest-liquid-planet-scientists-h2o-ice-firefighters

http://www.psc.edu/science/Jordan/Jordan.html

[67] Yolene Thomas The history of the memory of water Homeopathy 2007 96:151-157 http://www.scribd.com/doc/47787580/The-History-of-the-Memory-of-Water-Thomas-Homeo-2007

[68] http://www.scribd.com/doc/47787580/The-History-of-the-Memory-of-Water-Thomas-Homeo-2007 They discovered that if secussion (agitation) is eliminated, the memory effect disappears. They also found that although solute molecules reacted to heat with distinctive heat sensitivity, the memory effect is inactive between 70 and 80 degrees C. The presence of silica in solution, dissolved from the glass containing the solution, is also important for the memory effect. The effect is also removed by exposure of diluted solutions to magnetic fields. it has been suggested that electromagnetic fields in some way mediate information processing in cell communication.

[69] Lynn McTaggart, *The field*, p. 68

[70] Lynn McTaggart, *The field*, p. 70

[71] http://www.scribd.com/doc/47787595/The-Memory-of-Water-an-Overview-Chaplin-Homeo-2007. Chaplin also notes that as with the basic memory of water concept, experimental confirmation of the phenomena may not confirm the proposed mechanism.

[72] 02/02/07 http://www.i-sis.org.uk/TheRealBioinformaticsRevolution.php

[73] http://www.i-sis.org.uk/brainde.php
*Quantum Coherence and Conscious Experience* by Mae Wan Ho

[74] https://www.heartmath.org/assets/uploads/2015/01/pursuing-the-science-of-global-coherence.pdf

[75] http://www.i-sis.org.uk/brainde.php
*Quantum Coherence and Conscious Experience* by Mae Wan Ho

[76] http://schwitzsplinters.blogspot.com/2014/07/tononis-exclusion-postulate-would-make.html

[77] The field p 69-70

[78] The field, p 70