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 today's reality.

Consciousness as an emergent property

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. This observation appears to support the notion that consciousness is an emergent property.

Is consciousness an emergent property of the brain, 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, based on the following arguments: The awake brain is conscious, while the asleep or dead brain is not; the brain is neurally as active asleep as awake (The default network.); changes in conscious state can be observed as synchronized neural activity which can be recorded by an EEG. These observations, however, do not prove that consciousness is a result of brain activity at all. They merely show that consciousness may be reflected in brain activity.

The author 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 [2]

Is consciousness as a fundamental property of matter really 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 of the brain, which holds that consciousness is an emergent property of huge numbers of brain interconnections, and that these connections could be mechanical as well as biological. He 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." [3]

The default network

But what of Koch's proposed mechanical 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. [4]

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". [5] 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. [6]

The presence of the default network suggests the brain does not work like a computer. It may be a very long time, if ever, before this default network circuit is duplicated in a machine.

Consciousness as a quantum process

While most mainstream scientists advocate that consciousness is a result of local brain processes, perhaps deriving from emergent properties of large numbers of neurons, 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?"

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. [7]

Quantum coherence is widely recognized in biological tissue even in mainstream science. In particular, mainstream science has shown that Quantum-coherent energy transfer occurs in photosynthesis. [8]

But if quantum processes are manifest in simple vegetative material, why would it not be expected to be manifest in the much more complex tissue of mammals, and in particular human beings?

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. [9]

The Penrose/Lucas argument invoking Gödel's incompleteness theorem for computational theories of human intelligence has been roundly attacked,[10] most notably by advocates of strong AI.

Anesthesiologist Stuart Hameroff 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. [11]

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. [12]

Penrose and Hameroff have argued that consciousness is the result of quantum gravity effects in brain microtubules, which they dubbed Orch-OR (orchestrated objective reduction). [13]

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. [14] Tegmark's work was supported by the observation that "We're not working with a brain that's near absolute zero. It's reasonably unlikely that the brain evolved quantum behavior". Hameroff et al have whittled down the decoherence time for their actual Orch-OR model, and find other mechanisms to make up the difference. [15]

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 Roger Penrose and Stuart Hameroff gives an updated model of their Orch-OR theory, in light of criticisms, and discusses the place of consciousness within the universe. [16]

From biology, a microtubule is a microscopic tubular structure present in numbers in the cytoplasm of cells, sometimes aggregating to form more complex structures. The Penrose Hameroff Orch-OR theory hypothesizes that consciousness is produced by brain microtubules. However, microtubules provide critical support in the cytoplasm of all cells, so why restrict consciousness to brain microtubules?

Electromagnetic field theories of consciousness

The central idea of the electromagnetic (EM) field theory of consciousness, according to Dr Susan Pockett, is that conscious perceptions … are identical with certain spatiotemporal electromagnetic patterns generated by the normal functioning of waking mammalian brains.

Pockett believes that EM fields effect neurons of the brain. McFadden cited studies from Koch's Lab that showed neurons being effected by endogenous EM fields. [17]

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. A clear example of EM fields effecting neurons. [18]

However, noting the large distances between motor and sensory neurons, she disavows that sensory consciousness fields can effect motor neurons, that is, 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 to weak to allow that global field. [19] It is not clear how Pockett's views move the EM field theory of consciousness forward.

An electromagnetic field theory of consciousness seems to be supported by 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. [20] Although a disclaimer by Gary Schwartz recognizes this does not "prove" angels or divine light exist, or that they can effect cosmic rays, [21] here consciousness of spirits and angles are manifest with visible light and cosmic rays, respectively.

Consciousness beyond the brain

If consciousness is an intrinsic property of all matter, then not only machines, but also biological tissue in general, as well as gasses plasmas and fields might be capable of

consciousness. As we currently understand it, matter is subject to four forces; the weak and strong forces; electromagnetic and gravitational forces. 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.[22] Because of this, it might be reasonable to hypothesize that electromagnetism and gravity may play some role in consciousness.

EM signaling in the body

Jacques Benveniste's contribution was to show that molecules and atoms had their own unique EM frequencies by using modern technology both to record this frequency and to use this recording itself for cellular communication. [23]

From 1991, Benveniste demonstrated that one could transfer specific molecular signals simply using an amplifier and EM coils. Four 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. [24]

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. [25]

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…” [26]

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.[27] 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 this work has been criticized, and has, to date, apparently not been replicated by other researchers,[28] the results he reports are intriguing. In addition to “sensed presence,”he claims he can also elicit euphoria, anxiety, fear, and sexuality, 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. [29]

Interestingly, Persinger’s conception of brain function is consistent with Jacques Benveniste’s EM theory of molecular signals.

Quantum Electromagnetic body consciousness

Based on the work of Becker, Benvineste, Persinger, Veljkovic, Cosic and others, it seems certain that electromagnetism is fundamental to the functioning of the body/brain. Penrose and Hameroff have implicated consciousness as a quantum process. Of brain only or also of body? Microtubules are in all body tissue.

Mae Wan Ho propose 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. [30]

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. [31]

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.

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 the basis of *sentience*, the pre-requisite for conscious experience that involves the participation of the whole organism.

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.

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.

If quantum coherence is characteristic of the organism as 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. [32]

Might this be the aura of the human body?

HERE 2

Water

The field p 69-70
Water is among the most mysterious of substances, becaues it is a compound formed

from two gases, yet is a liquid at normal temperatures and pressures. 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 carying 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. the shaking of the containers appears to speed up this process

The field, p 70
In Japan, a physicist Kunio Yasue of the Research Institute for Information and Science, Notre Dame Seishin University in Okayama, also found that water molecules have some role to play in organizing discordant energy into coherent photons; a process called superradiance. This suggests that water acts as the essential conductor of a molecules signature frequency . If Benveniste is right, water both sends and amplifies the signals.

Superradience: yasue; also depends on water. Yassue believes this process is happening in microtubules, and thus is consistent with Penrose's theory.

Consciousness as a causal reality

Roger sperry consciousness as a causal reality.

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