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Consciousness: Quantum and Jainism

Dr. Narayan Lal Kachhara

Summary

Development of Quantum Mechanics in Physics introduced an interesting phase in scientific history as it made some scientists to invoke application of consciousness to explain certain phenomena at micro level. Since the inception of this idea in 1950s many studies have been made to support or oppose the proposal. Part I of this paper reviews the quantum theories of consciousness, which essentially mean that consciousness is a material phenomenon, and presents arguments forwarded for and against this proposition.

The Part II of the paper first presents the concept of soul and consciousness in Jainism and then briefly reviews the views of different religions and philosophies on this subject. Next the relation between soul and mind is discussed. Lastly the cognition phenomena are studied in the light of Jaina principles and the role of brain in this process is discussed.

Part I: Quantum Mechanics and Consciousness

1. Introduction

Quantum mechanics is a more fundamental theory than Newtonian mechanics and classical electromagnetism, in the sense that it provides accurate and precise descriptions for many phenomena these "classical" theories simply cannot explain on the atomic and subatomic level. Quantum mechanics was initially developed to explain the atom, especially the spectra of light emitted by different atomic species. The quantum theory of atom was developed as an explanation for the electron's staying in its orbital, which could not be explained by Newton's laws of motion and by classical electromagnetism. In quantum mechanics the point – like particle is replaced by a wave function – a smeared out, cloud like structure, assigning a probability to each space-time point for electron to occupy it.

Quantum theory tells us that 'particles' are actually interactions between fields. When two fields interact with each other, they do it instantaneously and at one single point in space. These interactions and localized interactions are 'particles'. Quantum field theory merges quantum mechanics and relativity, albeit in a limited way. It is an adhoc but a successful physical theory premised on the assumption that physical reality is essentially non-substantial and fields alone are real. Fields, and not particles, is the substances of the universe.

Quantum mechanics identifies the silent, or unexpressed phase of matter (the wave function), the dynamic or expressed phase of matter (the classical particle), and also the relationship between them. As elaborated in quantum measurement theory, it is the phenomenon of attention that causes the unmanifested to manifest. This 'collapse of the wave function' was thought by some to be brought about by the act of observation itself. The mathematician John von Neumann (1955) said that consciousness is a factor in deciding the quantum measurement. Eugene Wigner (1967) supported the idea of von Neumann, both looked upon consciousness as part of the mind, and consciousness collapsing the quantum wave function. However recent experiments have determined that this phenomenon does not require any human observer, but will take place spontaneously in order to preserve order in the universe.

Albert Einstein, and with him Louis DeBroglie and later David Bohm, believed that quantum mechanics was incomplete, that the wave function was only a statistical description of a deeper structure which was deterministic. Einstein saw quantum mechanics as analogous to statistical device and the wave function as just a peculiar statistical device for observers who are ignorant of the values of the hidden variables underneath.

According to Martin Flechl (2006) the interpretations mainly differ in the answer to two questions:

A. Does the wave function represent (1) anything real (A_1) or (2) just a symbol in equations (A_2)?
B. What kind of interaction causes the collapse of the wave function (1) any contact interaction (B_1), or (2) only a consciousness – like interaction (B_2).

The Copenhagen Interpretation concludes that since interaction changes the way a system evolves and since each measurement constitutes an interaction between the measurement device and the measured system, the specific experimental set up influences the outcome of a measurement and is therefore part of the measurement itself. Nature is divided into two parts: The observed system and the measurement device used.

So far the Copenhagen Interpretation is compatible with all four combination of answers to the questions A and B. Interestingly, Bohr, Heisenberg and Born were advocating A2 (statistical interpretation of the wave function) and B1, while Stapp, who claims to agree with the Copenhagen Interpretation, clearly is in favour of B2 and rather A1, although he is not explicit regarding this question.

Although quantum physics is not necessary to account for indeterminism in nature, it does accurately explain the behavior of particles in the microscopic world.

Holism and non-locality are features of the quantum world with no precise classical equivalents. The former implies that interacting systems have to be considered

as wholes – you cannot deal with one part in isolation from the rest. Non-locality means, among other things, that spatial separation between its parts does not alter the requirement to deal with an interacting system holistically.

The original motivation in the early 20th century for relating quantum theory to consciousness was essentially philosophical. It is fairly plausible that conscious free decision (free will) is problematic in a perfectly deterministic world, so quantum randomness might indeed open up novel possibilities for free will. (On the other hand, randomness is problematic for volition!)

The quantum mind or quantum consciousness hypothesis proposes that classical mechanism cannot explain consciousness, the apparently chaotic or quantum behavior associated with neural networks cannot be accommodated by classical physics. While quantum mechanical phenomena, such as quantum entanglement and superposition, may play an important part in the brain's functions, and could form the basis of an explanation of consciousness. Quantum theory has however been intriguing for scientists eager to provide a physical explanation of consciousness.

Loosely speaking, the point is that consciousness is unlikely to arise from classical properties of matter, which are well known and well testable. But quantum theory allows for a new concept of matter altogether for something that is not purely material or purely extra-material. The danger in this way of thinking is to relate consciousness and Quantum only because they are both poorly understood: both are mysterious and unattainable.

Another quantum phenomenon of interest in consciousness studies is Bose-Einstein Condensate (BEC). A BEC is a state of matter that occurs in certain gases at very low temperatures. As temperature drops each atom's wave grows, until the waves of all the atoms begin to overlap and eventually merge. After they merged, the atoms are located within the same region in space, they travel at the same speed, they vibrate at the same frequency, etc.: they become indistinguishable. In BEC many parts of a system not only behave as a whole, they become whole. Their identities merge in such a way that they lose their individuality. Each particle in a BEC fills all the space and all the time in whatever container that holds the condensate. Many of their characteristics are correlated. They behave holistically as one. The condensate acts as one single particle. There is no "noise" or interference between separate parts. This is why super fluids and super conductors have their special frictionless qualities and laser becomes so coherent. Super conductors, super fluids and lasers are BEC, but this happens at very low temperature or very high energy systems.

Herbert Frolich (1968) argues that BEC is achievable in biological organisms at body temperatures. He found quantum coherence in body cells at body temperature where biological dipole oscillators, such as dielectric protein molecules, vibrate under the influence of an electrical short range force between the poles of a single oscillator and the coulomb forces between oscillators. Prior to that quantum physicist Fritz Popp discovered that biological tissue emits a weak glow when stimulated at the right energy levels. Cell walls of biological tissue contain countless proteins and fat molecules which are electrical dipoles. When a cell is at rest these dipoles are out of phase and arrange themselves in a haphazard way. But when they are stimulated they begin to oscillate or giggle intensely and broadcast a tiny microwave signal. Frolich found that when the energy flowing through the cell reaches a certain critical level, all the cell wall molecular dipoles line up and come into phase. They oscillate in unison as though they are suddenly coordinated. This emergent quantum field is a BEC and has holistic properties common to any quantum field

Quantum mechanical phenomenon such as Bose – condensation interference within the nervous system has been proposed by several physicists. Coordination of the indeterminacies within a neural network on many neurons is a quantum phenomenon associated with Bose condensation is conjectured. However appealing such a model might be, it is only one facet of our understanding. Chris Clarke in his essay Quantum Mechanics, Consciousness and the Self, states that "physics will be just one contributor to a growing understanding that draws on all facets of our knowing and being."

The similarities between the computer circuits and the brain cells have driven brain researches to construct computer models for the brain. However computer models are many orders of magnitude lower than needed to account for the speed of human beings. A neurobiologist has calculated that if the brain was a standard serial or a parallel computer it would take more than the age of the universe to perform all the necessary calculations associated with just one perceptual event. But if the brain were a quantum computer, it would try out all the various possible combinations of data arrangement at once and thus unify its experience. It has also been pointed out that anything that is infallible cannot be intelligent; computer being infallible cannot be intelligent. A computer model of the brain cannot explain the distinctive indivisibility of our thoughts, perceptions and feelings

All theories of consciousness are highly speculative and in general currently only their self-consistency and their consistency with other theories (in particular quantum theories which have been tested to highest precisions) can be tested. We are talking of possible solutions – without disrespect, since even in centuries no consistent and satisfactory concept of consciousness has been evolved in science.

2. Quantum Approaches to Consciousness

Stanford Encyclopedia of Philosophy surveyed some popular approaches for applying quantum theory to consciousness. Variants of the dichotomy between mind and matter range from their fundamental distinction at a primordial level of description to the emergence of mind (consciousness) from the brain as an extremely sophisticated and highly developed material system.

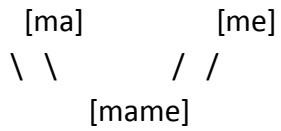
According to the Stanford group in most approaches material (ma) brain states are considered as directly related to mental (me) states of consciousness, the direct way (A),

[ma] <==> [me]

This point of view claims that it is both necessary and sufficient to explore and understand the material domain, e.g., the brain, in order to understand the mental domain, e.g., cognition and consciousness.

The most discussed counterarguments emphasize the impossibility for material accounts to properly incorporate the quality of the subjective experience of a mental state. Nagel (1974) asked "what it is like" to be in that state. This leads to a gap between third-person and first-person accounts for which David Chalmers (1995) has coined the notion of the hard problem of consciousness".

As an alternative to (A), it is possible to conceive mind-matter relations indirectly (B)



Here denoted [mame], is often regarded as being neutral with respect to the distinction between [ma] and [me], i.e., psychophysically neutral. The scenario (B) depicts the "dual aspect" option of reality.

Following Stanford approach we briefly review below the major theories of quantum consciousness.

2.1 First Category Approach

This category, belonging to scheme (A), refers to accounts discussing quantum theory in relation to consciousness that adopt basic ideas of quantum theory in a purely metaphoric way. Quantum theoretical features such as randomness, entanglement, superposition, collapse, complementarity, and others are used without specific reference to how they are defined precisely and how they are applicable to specific situations. For instance, conscious acts are just postulated to be interpretable somehow analogously to physical acts of measurement, or correlations in psychological systems are just postulated to be interpretable somehow analogously to physical entanglement. Such accounts may be important to inspire new ideas to be worked in detail but are considered fascinating science fiction.

2.2 Second Category Approach

The second category, also falling in scheme (A), includes approaches that use status quo of present-day quantum theory to describe neurophysiological and/or neuropsychological processes. The early approaches of von Neumann and Wigner mentioned above fall in this category. The first detailed quantum model of consciousness was probably the American physicist Evan Walker's synaptic tunneling model (1970), in which electrons can "tunnel" between adjacent neurons, thereby creating a virtual network overlapping the real one. It is this virtual nervous system that produces consciousness and that can direct the behavior of real nervous system. The real nervous system operates by means of synaptic messages; the virtual one operates by means of the quantum effect of tunneling. The real one is driven by classical laws, the virtual one by quantum laws. Consciousness is therefore driven by quantum laws, brain's behavior is described by classical laws.

In 1989 British psychiatrist Ian Marshall showed similarity between the holistic properties of BEC and those of consciousness and suggested that consciousness may arise from the excitation of such BEC.

We briefly discuss the important more recent approaches here.

Stapp

American physicist Henry Stapp (1993) proposed a quantum theory of consciousness based on Heisenberg's interpretation of QM, that reality is a sequence of collapses of wave functions, i.e. of quantum discontinuities. He observes that this view is similar to William Jame's view of the mental life as "experienced sense object." Using von Neumann's approach he remarked that the state of the universe is represented by a wave function which is a compendium of all the wave functions that each of us can cause to collapse with her or his observations. That is, the state of the universe is an objective compendium of subjective knowing.

Stapp's interpretation of quantum theory is that there are many knowers. Each knower's act of knowledge results in a new state of the universe. Quantum theory is not about the behavior of matter, but about our knowledge of such behavior. "Thinking" is a sequence of events of knowing. The physical aspect of nature is a compendium of subjective knowledge. The conscious act of asking a question is what drives the actual transition from one state to another, i.e. the evolution of the universe. The universe is a repository of knowledge, that we have access to and upon which our consciousness has control.

Stapp claims that von Neumann extended the Copenhagen Interpretation by replacing the observer observed-system separation by a separation into a physically described part, consisting of the system to be measured, the measurement device, as well as the brain and body of the observer, and a psychologically described part, the

consciousness of the observer. The link between both parts is then the brain of the observer, which is being acted upon by the consciousness of the observer. It is our consciousness which collapses the physical state of a system. According to this interpretation, the universe (and each part of it) is only in a well-defined state when we observe it. This has strange consequence like that if no one looks at the moon for some time the moon would finally spread out into the entire universe. Conscious being can therefore influence the physical world by asking questions to the nature and by specifying possible answers. Note that collapse is also possible without the presence of a conscious agent.

Stapp sees collapse as a mental process and the deterministic evaluation of brain states as physical. The process by which collapse selects an actuality from a set of possibilities is seen a process of choice, and not merely a random dice-throw. Stapp envisages consciousness as exercising top-level control over neural exercising in the brain. Quantum brain events are suggested to occur at the whole brain level, and are seen as being selected from the large – scale excitation of the brain. The neural excitations are viewed as a code, and each conscious experience as a selection from this code. The brain, in this theory, is proposed to be a self – programming computer with a self sustaining input from memory, which is itself a code derived from previous experience. This process is suggested to result in a number of probabilities from which consciousness has to select. The conscious act is a selection of a piece of top-level code, which then exercises ongoing control over the flow of neural excitation. Stapp thinks that this process refers to the top level of brain activity involved with information gathering, planning and the monitoring of the execution of plans. Conscious events are, in this theory, proposed to be capable of grasping a whole pattern of activity, thus accounting for the unity of consciousness, and providing a solution to the "binding problem."

Stapp follows the logical consequences of this approach and achieves a new form of idealism: all that exists is that subjective knowledge, therefore the universe is not about matter, it is about subjective experience. Quantum theory does not talk about matter; it talks about our perceiving matter. Stapp rediscovers George Berkeley's idealism: we are only our perceptions (observations).

Quantum Brain Dynamics (QBD)

In QBD, the electrical dipoles of the water molecules that constitute 70% of the brain are proposed to constitute a quantum field, known as the cortical field. The quanta of this field are described as corticons. In the theory, this field interacts with quantum coherent waves generated by biomolecules in the neurons and propagating along the neural network. Frohlich is the source of idea that quantum coherent waves could be generated in the neuronal network.

The proponents of QBD, differ somewhat as to the exact way in which it produces consciousness. Riccardi and Umezawa (1967) suggested utilizing the formalism of quantum field theory to describe the brain states, with particular emphasis on memory. The basic idea is to conceive of memory states in terms of states of many-particle systems, as inequivalent representations of vacuum states of quantum fields. Jibu and Yasue (1995) show how consciousness could arise from interaction between the electromagnetic field and molecular fields of water and protein. Jibu and Yasue explain how the classical world can originate from quantum processes in the brain. They think that several layers of the brain can host quantum processes, whose quantum properties explain consciousness and cognition. They focus on structures such as microtubules which lie inside the neuron, and which contain quassi-crystalline water molecules that again lend themselves to quantum effects. The function of this quantum field could be cognitive: some particular quantum states could record memory. Viitiello (2001) thinks that the quantum states involved in QBD produce two poles, a subjective representation of the external world and a self. This self opens itself to the representation of the external world. Consciousness is, in this theory, not in either the self or the external representation, but between the two in the opening of one to the other.

The majority of presentations of this approach do not consistently distinguish between mental states and material states. This suggests reducibility of mental activity to brain activity, within scenario (A), as an underlying assumption. However, QBD approach avoids the restrictions of standard quantum mechanics in a formally sound way.

Danah Zohar

Physicists at Weizmann Institute in Israel have done a variation of the “double – slit” experiment; they used electrons, instead of photons, and observed how the resultant influence pattern (which indicates wave – like properties of the particle) dissipated the longer you watched the electrons go through the slits. As a wave the electron passes through both slits simultaneously but if it “senses” that it is being watched, the electron (as a particle) goes through only one path, diminishing the interference pattern. Elementary particles (such as photons and electrons) appear to possess a certain degree of “intelligence” and awareness of the environment.

(This is assumed to mean) consciousness appears to be as fundamental a property to elementary particles as properties that make it “matter” or a “physical force” (for example, mass, spin and charge). This is more evident in BEC which behave as super particles. However, low energy and low frequency elementary particles easily lose their property of consciousness when they become entangled with other particles and decoherence sets in. This state is analogous to the state of a demagnetized metal

object. Like magnetization, when groups of particles are in the same quantum state, i.e. when they are in a state of quantum coherence, the property of consciousness in exhibited. A state of an extremely low degree of consciousness is exhibited by inanimate matter at macroscopic scales in highly decoherent low-energy classical universe. This means that bulk matter in a non-coherent state is effectively unconscious.

Quantum physicist Danah Zohar (1991) of the above group describes consciousness as something that includes general capacity for awareness and purposive response. Roger Penrose refers to these as active consciousness and passive consciousness. When a person is awake the information about his/her surroundings is presented to his/ her brain by his / her sense organs. The brain processes and computes millions of bits of information presented to it every second by the sensory organs and present the processed information to consciousness.

Danah Zohar points out that ion channel oscillations in neurons are quantum phenomena which generate a Frolich like coherent electric field. There are ion channels (protein molecules) lining the membrane walls of individual neurons, which open or close in response to electrical fluctuations resulting from stimulation. They act like gates to let Sodium, Potassium and other ions through. They are of a size to be subject to quantum fluctuations and superposition. Each channel as it oscillates generates a tiny electric field. When a large number of ion channels (there are 10 million in each neuron) open and close in unison, as they do when stimulated, the whole neuron fires or oscillates and a large scale electric field is generated across the neuron, certain neurons act as pace makers. When a pacemaker neuron oscillates in response to stimulation, bundles of neurons oscillate with it, a finding by a neurobiologist that when a person sees an object all neurons in the cerebral cortex, associated with that perceptual object, oscillates in unison regardless of their location in the brain. This explains how a large number of disparate and distant neurons can integrate their information to produce a holistic picture.

BEC creates a unity from the diverse bits of information drawing them to a meaningful whole. The millions of sensory data from sense organs received every moment are channeled to various disparate areas of the brain and processed by the computing facility of the brain. Consciousness receives this processed information through and creates a holistic scene. It is this integration of all the processed bits of information to create a one whole that creates the identity as a person, the self or the "I" ness. Danah Zohar concludes that consciousness functions, according to the laws of quantum mechanics.

It has been found that when a stimulus is presented to a sensory organ of an anaesthetized person all brain process relevant to that stimulus takes place as if he / she is not anaesthetized. None has yet pointed to a single event that occurs in awake but

not in anesthetized brain. When a hypnotherapist suggests, for example, that he / she is seeing red light to a hypnotized subject, all above processes take place in the brain as if the subject is actually seeing red light.

Beck and Eccles

Beck and Sir John Eccles (1992) think that mind or consciousness is separate from the brain, consciousness must first be there before the neurological events begin. Therefore, the mind controls matter rather than matter (the brain) controlling the mind. Eccles points out that the scope of consciousness may not remain limited within the confines of the human skull, because consciousness at times can remain completely disembodied. Beck (2001) states explicitly that "science cannot, by its very nature, present any answer to […] questions related to mind.

Sir Karl Popper (1977) describes the mind and brain exists in two separate realities. The brain is a functioning material organ of the body, and the mind or consciousness is the immaterial symptom of the living entity or soul which motivates the body.

2.3 Third Category Approach

The third category refers to further developments or generalizations of present-day quantum theory.

Penrose and Hameroff

In the approach presented by Penrose and Hameroff quantum theory is claimed to be effective for consciousness, but this happens in an extremely sophisticated way. It is argued that elementary acts of consciousness are non-algorithmic, i.e., non-computable, and they are neurophysiologically realized as gravitation-induced reductions of coherent superposition states in microtubule. Roger Penrose (1989, 1994) thinks that consciousness must be quantum phenomenon because neurons are too big to account for consciousness. In general, the collapse of the wave function is what gives the laws of nature a non-algorithmic element. Otherwise we would simply be machines and we would have no consciousness.

Microtubules are the main component of a supportive structure within neurons, known as the cytoskeleton. They are composed of tabulin protein dimer subunits. Tubulins have other smaller non-polar regions that contain pi-electron – rich indole rings, and Hameroff claims that these electrons are close enough to become quantum entangled. These electrons could become locked in phase, forming BEC. These BEC could extend to many others, Thus forming a macroscopic quantum feature across an extended area of the brain. When the wave function of this extended condensate collapsed, it could give access to non-computational influence related to mathematical understanding and ultimately conscious experience.

Hameroff further postulated that the activity of these condensates is the sources of gamma wave synchronization in the brain that has been viewed as a likely correlate of consciousness in conventional neuroscience.

Hameroff (1994) has pointed out that single cell organisms such as 'paramecium' can perform quite complicated actions normally thought to need a brain. He suggests that their 'brain' is in their microtubules (see BEC). Shape changes in the constituent proteins (tubulin) could sub serve computational functions and would involve quantum phenomena of the sort envisaged by del Guidice et all. This raises the intriguing possibility that the most basic cognitive unit is provided, not by the nerve cell synapse as is usually supposed, but by the microtubular structure within cells. The underlying intuition is that the structures formed by BEC are the building blocks of mental life; in relation to perception they are model of the world, transforming a nice view, say, into a mental structure which represents some of the inherent qualities of that view.

By and large, the ideas of Penrose and Hameroff represent a highly speculative approach with conceptual problems and without plausible concrete ideas for empirical confirmation. Jeffrey Reimers (2009) showed that coherent Frolich condensates, basis of Hameroff's postulate, could not exist in biological tissue.

Mind and Matter as Dual Aspects:

Bohm and Hiley

Several decades ago David Bohm (1951) pointed out many striking similarities between the behavior of our thought processes and that of some quantum processes. For example while entertaining a vague train of thought, the act of concentrating on one in order to bring it into better focus, changes the original sequence. Like electrons governed by Heisenberg's, uncertainty principle, which are never the same again once they have been looked at or measured, a thought which has been highlighted through attention is different from the vague musing which preceded it. The focused thoughts have "position" like the particle aspect of an electrons' two sided nature, whereas the vague musing has "momentum" like the electron's wave aspect. We can never experience both simultaneously. This is a characteristic feature of a quantum entity

Quantum systems are essentially unified, so are our thought processes. Thought processes and quantum systems are analogues in that they cannot be analyzed to much in terms of distinct elements, because the "intrinsic" nature of each element is not a property existing separately from and independently or other elements but is instead a property that arises partially from its relation with other elements.

Bohm's (1980) implicate order applies both to matter and consciousness, and he proposed that it could explain the relationship between them. Mind and matter are here seen as projections into our explicate order from the underlying reality of the implicate order. Bohm claims that when we look at the matter in space, we can see

nothing in these concepts that helps us to understand consciousness. Gustav Bernroider (2005) thinks that Bohm's implicate – explicate structure can account for the relationship between neural processes and consciousness.

In the latter approach, Bohm and Hiley (1990, 1993, 2001), the notions of implicate and explicate order mirror the distinction between ontic and epistemic domains. At the level of implicate order, the term active information expresses that this level is capable of "informing" the epistemically distinguished, explicit domains of mind and matter. While the proposal by Bohm and Hiley essentially sketches conceptual framework without further details, the suggestions by Pauli and Jung (1955) considers the distinction between epistemic and ontic domains of material reality due to quantum theory in parallel with the distinction between epistemic and ontic mental domains.

David Bohm took the view that quantum theory and relativity contradicted one another, and that this contradiction implied that there existed a more fundamental level in the physical universe. This more fundamental level was supposed to represent an undivided wholeness and an implicate order, from which arose the explicate order of the universe as we experience it.

Recently, Primas (2003, 2009) has proposed a dual-aspect approach where the distinction of mental and material domains originates from the distinction between two different modes of time: tensed (mental) time, including nowness, on the one hand and tenseless (physical) time, viewed as an external parameter, on the other. Primas conceives the tensed time of the mental domain as quantum correlated with the parameter time of physics via "time-entanglement", though it is still a tentative scheme without concrete indications of how to test it empirically.

Mental Quantum Features

Nein Bohr was convinced of the extraphysical relevance of complementarity. This idea has been developed with respect to psychology and cognitive science by Aerts et al. (1993), Khrennikov (1999), Atmanspacher et al. (2002), Primas (2007) and Filk and von Miller (2008). Generalizing quantum theory beyond quantum physics provides a formal framework which both yields a transparent well-defined link to conventional quantum physics.

David Chalmers

American Philosopher David Chalmness (1996) argues that consciousness cannot be explained with a reductionist approach, because it does not belong to the realm of matter. Chalmers distinguishes between a phenomenal concept of mind (the way it feels) and a psychological concept of mind (the way it does). Every mental property is either a phenomenal property, a psychological one or a combination of the two. The mind-body problem is therefore made of two parts, one that deals with the mental faculties, referring to phenomenal consciousness, and one that deals with

how/why those mental faculties give rise to awareness of them, referring to psychological consciousness.

Chalmer's dualism is different from Descartes in that it claims that "consciousness is a feature of the world" which is some how related to its physical properties. It follows from his theory that consciousness is due to the functional organization of the brain. It also follows that anything having the proper functional organization can have consciousness; regardless of the material it is made of. From this view, everything in the universe may have consciousness, at least to some degree.

Chalmers notes "Nevertheless, quantum theories of consciousness suffer from the same difficulties as neural or computational theories. Quantum phenomena have some remarkable functional properties, such as nondeterminism and nonlocality. It is natural to speculate that those properties may play some role in the explanation of cognitive functions, such as random choice and the integration of information and this hypothesis cannot be ruled out a priori. But when it comes to the explanation of experience, quantum processes are in the same boat as any other. The question of why these processes should give rise to experience is entirely unanswered."

Karl Pribram

Psychologist Karl Pribram (1971, 1990) proposed the "Holonomic" model of memory based on the hologram. Many properties of the brain are the same as that of holograms, memory is distributed in the brain and memories do not disappear all of a sudden, but slowly fade away. In Pribam's opinion a sensory perception is transformed in a "brain wave", a pattern of electromagnetical activation that propagates through the brain just like the wave front in a liquid. This crossing of the brain provides the interpretation of the sensory perception in the form of a "memory wave", which in turn crosses the brain. The various waves that travel through the brain can interfere. The interference of a memory wave and a perceptual wave (e.g. visual) generates a structure that resembles a hologram.

Pribram suggested that consciousness may occur primarily in dendritic – dendritic processing and that axonal firing may support primarily automatic, non-conscious activities.

Charles Leadbeater and Annie Besant

According to metaphysicists Charles Leadbeater and Annie Besant information about the relevant subtle body is stored in a "permanent particle" (its composition, frequency, structure and associative memories). In this way the experience that the subtle body has gone through in a particular universe are stored or are linked to this nucleus – which can be transferred more easily to another universe and body through microscopic wormholes. The particle is analogues to DNA in the bio-molecular body. DNA is referred to as a "bio-particle" in the medical literature and it stores or links vast

amounts of information about a particular life – form. This physical – etheric nucleus is transferred to higher energy bodies when the subtle body dies – preserving information about a particular life's experiences. This nucleus is also responsible for the life review in a NDE. According to Besant, the permanent particles are used to preserve within themselves as "powers of vibrations" (i.e. different frequencies and waveforms) the results of all experiences through which they have a passed. By the end of one life in the physical body the "permanent particle" would have stored up "innumerable powers of vibration" (i.e. a set of wave forms of different frequencies).

A personality is simply a packet of self-organized information". If this information can be transferred from one body to another that personality "lives" on Information stored in the physical-etheric body to be "reconstructed" or "resurrected" in a similar physical-etheric body later – in a process analogous to a teleportation. According to plasma metaphysics, the physical – etheric body provides an electromagnetic matrix which plays a critical role in the morphogenesis of the physical – bio-molecular body. The nucleic of the various subtle bodies can carry a large volume of complex holographic information about their corresponding bodies and experiences.

Granville Dharmawardena

Many who research on the brain mind-problem proceed with a priori assumption that consciousness is an emergent property of the brain. They consider consciousness as another property, emerging as a result of trillions of electrical pulses shuttling across the brain. According to this assumption consciousness is only a property and not an entity. However, on the basis of practical observations made by us and many others we have to reject these assumptions and regard consciousness as a non-material entity capable of independent existence.

The major stumbling block in solving the brain mind problem had been how the brain-mind binds together millions of disparate neuron activities into an experience of a perceptual whole. How does the "I" or "Self" or the perceived wholeness of my world emerge from a system consisting of so many parts, billions of neurons. What creates the "oneness" or individuality and "I" ness or "Self"? What creates feelings, free will and creativity?

Observations on Out of Body Experience (OBE) and Near Death Experiences (NDE) show that while the body is in an anaesthetized or inactive state consciousness can remain disembodied, observe events from outside the body and later relocalize in the brain. After the body renormalizes the person can relate what his consciousness observed and heard from an out of body location while the body was inactive. Other experiments have shown that consciousness can leave a dying person, float around observing things and events and later, as Eccles had pointed out, attach itself to an

unborn fetus to start a new existence as another individual. Consciousness is therefore a non-material entity capable of independent existence and not a property, it is not emergent.

Dharmawardena proposed a three tier model for Body-Brain-consciousness, where the brain is sandwiched between the body and consciousness. Here the brain – body link is mechanical and it is fairly well understood from classical science considerations. Body and brain operate in Einstein's space-time domain where non-locality is forbidden. The brain-consciousness link is established by the property P which links the brain to the quantum domain where non locality can operate. Consciousness is a non-material entity in the quantum domain that is capable of independent existence. Consciousness can remain localized in the brain so long as the emergent quantum property P is functional, just as a electron which is a quantum entity can remain localized in an atom so long as the energy of the electron matches the quantum state it occupies. Whenever the property P breaks down or becomes weak consciousness can leave the brain and take up a floating existence in the way an electron leaves its atom if it acquires excess energy and starts a floating existence as a free electron. Consciousness can return to the brain if the property P is re-established.

This model explains all the observed properties of consciousness including NDE, OBE and reincarnation. Since all information transfer in a non local quantum correlation is instantaneous, it explains the speed of human action. It can be extended to explain phenomena such as telepathy. It explains the individual identity or the "I" ness or self.

Mihai Draganescu

The brain is an information processor. The forms of information in the brain / mind cannot, perhaps, be reduced only to the information carried by bits, even if their organization may carry context and reference significance. There is also a kind of information that has a manifestation in feelings, meaning, in qualia. Both kinds of information may act also together, constituting a mixed type of information. The brain/mind is working like a computer with the first type of information, called structural, which can always be reduced, in principle, to bits. With the other type of information, called phenomenological, the brain/mind is not working as a computer, but still it is processing this second type of information. And when the two kinds of information are working together, the brain/ mind is capable of quite genuine performance as are the processes of deep creation. Roger Penrose (1994) proved that the brain has really non-computing ways of processing information.

The second type of information of the brain / mind are not yet recognized and explored by science; the information is not a fundamental notion of science. All the electronic computers are structural processors of information.

There are many levels of information processing in the brain:

a. The psychological level- the highest level. It comprises behavior, intellectual activities, thinking, sentiments, will and others. Could these be explained only by reduction to the known structures of the brain that is only by levels b and c below?
b. The neuronal level that comprises the network of neurons, modules of neurons and the structural organization of the brain.
c. The molecular level that comprises the molecular activities inside the neurons and at the synapses between neurons.

At these levels it may be added:

d. The quantum level, which was proposed by a number of physicists, and
e. The experiential level (phenomenological level) which proved to be a fact of brain and mind reality.

The main attention by science was given to the levels a, b and c, although there are still problems referring to their interconnection, especially of the level (a) with the levels (b) and (c).

The phenomenological level has been studied by Stapp. If the phenomenological sense is a reality, and is a kind of information, it must have a physical substrate. This becomes another serious problem for science. Further, there is a way of coupling (still to be established) between structural processes and phenomenal processes. This is another challenge for science, and there is an explanatory gap.

There is something more, namely the justified inference of the existence of a deep underlying reality of the universe which might be the substratum of the phenomenological senses and a sources of primary energy. It is very difficult today to contradict this assertion. This is also a challenge for science.

Many authors consider the brain as a specific type of quantum device. But all these are lacking an explanation of the manifestation of the phenomenological sense or experience. Draganescu and Kafatos (1998) proposed for the necessity of a new quantum – phenomenological theory. They observed "concerning living objects; it happens that in these objects, from itself, by self-organizations, a coupling of the structural and phenomenological parts emerges as a general property of nature. This coupling may be the basis for explaining the "explanatory gap" of the brain-mind problem. This coupling is different from the coupling of energy and phenomenological information in the deep reality. It seems that there are many forms of coupling of objects and phenomenon in existence."

Two possibilities for quantum – phenomenological theories have been proposed.

(A) Based on the concept of intra – openness as proposed by Draganescu (1985)

(B) Based on an imbrications of structural and phenomenological properties manifested by some quantum fields and corresponding particles.

The possibility (B) has been examined by Stapp (1993). Richard Amoroso, dismissing the role of the wave function collapse (reduction) for producing experience, considers the coherent quantum waves to play an important role in mind and consciousness phenomena. Amoroso then presented a Noetic Field Theory (1997, 1998) making reconciliation of the quantum coherent wave with the phenomenon of experience, a quantum- phenomenological theory. Amorosao shows the possibility of BEC even for protein oligomers in vitro and states that "coherence in biology and mind seems to be rule rather than the exception". Coherent quantum wave are possible in polypeptides, DNA, microtubules, implying water molecules, synaptic connections.

What about the phenomenal experience in connection with quantum wave and BEC in organisms and brain? Is the explanatory gap reduced from the < neuro structure – experience gap to the < BEC – experience > gap? Still remains the problem of the way in which experience is present.

According to Amoroso (1997) "BEC allows the process to go unlocal and couple the Noumenon state of elemental intelligence." To accept this, it means that something in the stuff of the BEC has not only a structural character, but also a phenomenological character; therefore there are imbrications of type (B). These imbrications are superior to the Stappian imbrications which are declared to have only physical – informational sources for experience.

It seems that the ingredients of physics, biology (both of the classical and quantum physics) and of the present science of information are not sufficient for the study of the brain / mind. There is more in nature: The phenomenological sense (experience in mind and perhaps in any organism) and the deep underlying reality may be, even, a fundamental consciousness. All these may lead us towards a renewed science.

2.4 Is Consciousness a Quantum Phenomenon?

Victor J. Stenger (1992) thinks that the seemingly profound association between quantum and mind is an artifact, the consequence of unfortunate language used by Bohr, Heisenberg and the others who originally formulated quantum mechanics. In describing the necessary interaction between the observers and what is being observed, and how the state of a system is determined by the act of its measurement, they inadvertently left the impression that human consciousness enters the picture to cause that state come into being. This led many who did not understand the physics, but liked the sound of the words used to describe it, to infer a fundamental human role in what was previously a universe that seemed to have a need for neither gods nor humanity.

If Bohr and Heisenberg had spoken of measurement made by inanimate instruments rather than "observers", perhaps this strained relationship between quantum and mind would not have been drawn. For, nothing in quantum mechanics requires human involvement.

Quantum mechanics does not violate the Copernican principle that the universe cares not a whit about the human race. Long after humanity has disappeared from the seen; matter will still undergo the transitions that we call quantum events.

The field theories of consciousness do not appear to have been as widely discussed as other quantum consciousness theories, such as those of Penrose, Stapp or Bohm. David Chalmers argues that there is no particular reason why particular macroscopic physical features in the brain or a particular quantum features e.g. the electromagnetic field in the brain, should give rise to consciousness. Jeffrey Gray (2004) also thinks that tests looking for the influence of electromagnetic field on brain function have been universally negative in their result.

The main argument against the quantum mind proposition is that quantum states in the brain would decohere before they reached a spatial or temporal scale, at which they could be useful for neural processing. Michael Price says that quantum effects rarely or never affect human decisions and that classical physics determines the behavior of neurons. Price's position does not necessarily imply that classical mechanics can explain consciousness, but that quantum effects including superposition and entanglement are insignificant.

Max Tegmark (2000) concluded that quantum systems in the brain decohere quickly and cannot control brains functions. The proponents of quantum consciousness theories like Vitiello, Penrose and Hemeroff, and Bernroider, have, however, defended themselves and insist that coherence is preserved.

Bernard Baars, a neurobiologist and co-editor of consciousness and cognition wrote "No serious researcher I know believes in an electromagnetic theory of consciousness. It is not really worth talking about scientifically."

No theory of brain can explain why and how consciousness is a fundamental property of matter? Any theory that tries to manufacture consciousness from some property of matter is doomed to failure. Existence of consciousness is separate from the physical properties of matter. The main problem is the lack of an empirical test for consciousness. We cannot know whether a being is conscious or not. We cannot "measure" consciousness. There is not, up to the moment, any satisfactory explanations for the mechanism of formation of a conscious experience, typified by individuality, subjectivity; the self.

2.5 Bibliogrphy

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