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QUANTUM COMPUTATION AND ERROR CORRECTION TO ORCH OR MODEL

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ABSTRACT
Here we attempt to create a transparent distinction between quantum mysticism and quantum mind theory. Quackery continually accompanies science particularly in controversial and still underneath development areas and since the quantum mind theory may be a science huddling it should clearly demarcate itself from the nice stuff of pseudo-science and highlighted by "quantum mind". Its doctrine and investigational foundations are as strange because the development of consciousness itself, hence quantum theory has attracted a giant deal of attention and opened new avenues for build up a physical theory of mind. Yet, the unwarranted recourse to paranormal phenomena as supporting the quantum min theory and the extraordinarily unhealthy biological mismodeling of brain physiology result in nice agnosticism regarding the viability of the approach. We tend to offer as an example the Hameroff-Penrose Orch OR model with an inventory of twenty four issues not being repaired for couple of decades since the birth of the model in 1996. Within the exposition we've got tried not solely to present critique of the noticed flaws, however to produce novel potentialities towards creation of neuro-scientific quantum model of mind that comes with all the accessible information from the fundamental disciplines (physics, biology, cell biology, etc.) up to the clinical observations. Therefore in a very compact fashion we tend to define what may be done scientifically to enhance the Q-mind theory and begin a groundwork programme that's autonomous on the actual flaws in a number of the prevailing Q-mind models.
Keywords — Quantum mind, Orch OR model, quantum Computation, brain physiology, Microtubule.

I. SCREENING OF MICROTUBULE

Hameroff and Tuszynski propose extraordinarily unconventional screening of microtubules against external electrical fields by dual Debye coatings structured by the C-terminal tubulin tail (CTT)

ISSN: 2348 9510
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Volume 2, Issue 9, December 2015

presence [41]. The prime plan is that CTTs "shield" the tubule against external electrical fields. The suggestion but is predicated on misapplication of Debye-Hückel hypothesis of charge screening in solution.

A. Remark or Observation

If microtubules are accountable for consciousness however are insensitive to the electrical excitations of neurons, then the Penfield's and Dobelle's investigational consequences proving the role of electrical processes as direct input resources of acutely aware expertise would be left outside the idea of quantum consciousness.

Second far more necessary result stems from the most mathematical derivation of the Debye-Hückel theory itself. It's approximation during a model within which is assumed Ludwig Boltzmann distribution of ions within the solution and one among the important steps is that the electrical neutrality of the electrolyte. Since all the way through electrical excitations the ion flow across dendritic membrane is electrogenic, the electrolyte of the cytosol is no more electro-neutral and the Debye-Hückel approximation might not be valid, and it is not at all evident why tubules ought to be insensible for exterior electric field as generated by the electric excitations. Indeed the electro-sensitivity of microtubules could remodel exactly through the CTTs that Hameroff wrongly believes are responsible to shielding. If neuronal electrical excitations are modeled within quantum field theory (QFT) as proposed by Jibu et al. [45] [46] [47], it can be shown that electromagnetic sine-Gordon solitons might propagate at intervals the neurotic cytoplasm [1] , and these solitons can be including conformational modification within the CTTs [32].

II. BIERMAN'S "PRESPONSE"

Wherever Stuart Hameroff provides Bierman's presponse as an experimental evidence for quantum mind theories and Orch OR.

A. Remark or Observation

The reported unconscious presponse by Bierman and Radin is indeed a mixture of bad statistical manipulation of experimental data plus misunderstanding of neurophysiology [3]. Briefly described the experiment is as follows: subjects are shown in a random fashion pictures divided into three groups: (i) neutral pictures, (ii) fear-inducing pictures and (iii) photos with highly pornographic content. The pictures were shown randomly to a subject and the activity of various brain areas was monitored by fMRI. Then it was shown that the neural arousal as detected by fMRI just before the manifestation of the extremely pornographic images is superior to the neural awakening before the other two sets of pictures.

Indeed except for the fact that Bierman felt perverted pleasure to show in his lecture slides

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

"examples" of the pornographic pictures he had presented to his test-subjects thus shocking the auditory, there is nothing else special to be discussed. Severe statistical errors in the manipulation of the data were reported independently by Georgiev and Jiri Wackermann pointing out the possibility that the observed arousal before the pictures with pornographic content might be explained with the *gambler fallacy effect* [29] [72]. If this is accounted for in the statistical analysis, the observed "presponse" will be washed out as an artifact of the bad mathematics used by Biermann.

III. MACHINE-BRAIN INTERFACES AND THOUGHT CONTROL OF ROBOT ARM

Hameroff-Penrose Orch OR model utterly leaves out the chance for microtubules to regulate the procedure of neuromediator unleash except indirectly through control of nerve fibre spiking. If the microtubules so controlled solely the nerve fibre hummock potential (by however strange mechanism) then for every nerve fibre terminal you'd better expect that the exocytosis won't occur (you have 70% likelihood to guess) rather than hoping on neuromediator unleash (the likelihood is barely 30%). Since neuromediator unleash is followed by inevitable postsynaptic electrical activity of nerve fibre tree, it appears that among Orch OR the microtubules cannot regulate the pattern of electrical excitations of the animal tissue neurons (that is as a result of the randomness introduced by junction failures is calamitous, and, so as to be avoided, a subneuronal regulate is needed).

A. Remark or Observation

Carmena et al. (2003) during a breakthrough surgical process have deep-rooted electrodes within the monkey's cortex that live the animal tissue nerve cell potentials, so send them to laptop that processes the measured information by an explicit computer code program [4]. Consistent with the measured electrical excitations of the animal tissue neurons, the pc deterministically controls an automaton arm. The wonderful factor is that monkeys in time were ready to find out how to maneuver "by thought" the automaton arm for his or her purpose. Once the complete connected computer was just a transmission device operational in absolutely settled manner, within the same approach the transmission of an automobile is navigated. You don't need to know how precisely all machinery of your automobile works, you only need to know that it operates deterministically and what you have got to find out is what sort of commands you need to output so as to manage the automobile. Within the case of monkeys this happens by try-and-error mechanism. What's significantly wonderful is that within the starting the monkeys enraptured the automaton arm with associated movement of their arms, but in time the parasitic movement of the monkey arms disappeared.

Recently the experiment has been established prosperous in humans. Thought control of laptop coupled to the brain cortex of paraplegic human all the way through machine-brain interface has

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

been accomplished by Hochberg et al. and therefore the technique remains the sole chance to revive the independence for humans with dysfunction [44].

What is the necessary winding up from such experiments? In fact they point towards the necessary place wherever your mind outputs its orders - specifically the consciousness is ready to regulate the neuronal excitations. This might occur if the mind controls exocytosis at synapses and therefore neuromediator unleash. As a result of neuromediator binding to postsynaptic substance gated ion canals, the excitation of the postsynaptic nerve fiber is taken into account a settled event following exocytosis. Since microtubules cannot regulate directly the operation of the voltage-gated ion canals (the channels are voltage-gated, not microtubule-gated), they must regulate them indirectly through management of the discharge of neurotransmitters (synaptic exocytosis). Explicit support for the recommended explanation (for mind regulation of electrical excitations by means of control of the exocytosis) is the examination which in instance the monkeys will eradicate the parasitic motion of their arms. This implies that the electrical excitation is there to be captured by the electrodes, however once the electrical signal appear at the workstation switch of the pyramidal glide system (within the spinal cord axons that output the motor data to the motorneurons from the cortex), it doesn't unleash neuromediator.

IV. LAMELLAR BODIES AND DENTRITES

Hameroff relentlessly mismodels the meticulous gap junction coupling between neurons suggesting an extremely fictious structural construction with chondriosome and nerve fibre lamellar corpse (DLB). "The nerve fibre lamellar bodies are bound to tiny cytoskeletal proteins anchored to microtubules, and it's prompt that the mitochondria inside the bodies offer free electrons for tunneling, forming a tunneling diode pair or Josephson junction between cells" [42].

A. Remark or Observation

The delineated by De Zeeuw et al. nerve fibre lamellar bodies are set in dendrites and are presumably derived from swish endoplasmatic reticulum or Golgi complex [5]. DLBs are consists of heap of cysternae which is short of ribosomes. In some cases DLBs are hooked up to chondriosome. There's but massive misunderstanding once it involves the links with gap junctions. The DLBs are situated invariably in bulbous components of the most nerve fiber and also the correlation between DLBs and gap junctions was recommended by the actual fact that antibody for gap junction macromolecule cross-labels the DLBs. Therefore De Zeeuw and associates accomplished that DLBs are somehow concerned within the synthesis of gap junctions [5]. Additionally the DLBs don't seem to be situated within the nerve fibre spines that contain the gap junctions; so the space between DLBs and gap junctions is many micrometers. Another hanging comment by De Zeeuw and associates is that the bulbous configuration of the nerve fiber that contains the DLB contains neither microtubules, nor neuro-filaments. This is often expressly

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

declared in order that readers don't seem to be lead into delusion - DLBs ought to be concerned within the synthesis of gap junctions, however there's not structural link between DLBs and gap junctions. The "correlation" is predicated on biogenesis of gap junctions.

We wind up that one amongst the most causes for selecting gap junction tunneling, rather than coherence through the colligation cleft, is that the extraordinarily short distance among the neuronic membranes at the gap junctions that's simply four nm. But the imagined construction done by Hameroff extends tens of micrometers and utterly destroys the concept of appropriate distance for lepton tunneling. The decoherence time of gap junctions has been already mentioned before.

V. PHOTON CAPTURING IN MEMBRANE

The Hameroff and associates recommended that coherent states of photons in membrane may be transmitted to the brain cortex, which microtubules may capture photons directly [67]. Therefore this can be one in all the twenty testable Orch OR predictions projected by Hameroff.

A. Remark or Observation

Color blindness is consequence from defect of protein genes in retinal neurons (retinal cones), and there's intensive proof that visual image process happens within the layers of the membrane at the extent of amacrine, and bipolar cells. Explicit importance in neuroscience is paid to the development of lateral inhibition that's answerable for the result of sharpening (i.e. increasing the distinction of) the boundaries of percepted objects. This impact is answerable for the sensation of motion rabbit on the skin of your for-arm below distinct skin stimulation, and is involved within the operation of all analysators (sense organs); for details we have a tendency to refer the reader to the wonderful exposition of that matter by Georg von Bekeshy in his Nobel lecture [71].

Therefore if the visual photos enter the brain cortex in the sort of electrical impulses it's not possible the quantum data (consistent conditions) of photons to be emitted to the brain cortex. The very fact that visual data enters the brain cortex in the sort of electrical excitations has been employed by Dobelle to input through ingrained electrodes within the cortical area of a visually handicapped person captured by camera visual data [6]. so if the visual info is to be classically practiced by the lateral inhibition method at the extent of neural membrane generated electrical excitations, the concept of Hameroff and associates is in theory doomed to failure from the terribly starting. Indeed St. Hillaire in an exceedingly personal communication confessed that the anticipated by Georgiev failure of the complete experiment so did occur [68] [22].

VI. FREUD AND SUBCONSCIOUSNESS

One of the foremost ingredients of Hameroff's Orch OR is that the emergence of conscious processes out of subconscious ones. The quantum coherence results in sub-consciousness,

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

whereas the Orch OR event could be a conscious occasion. Hameroff's try is to somehow in build within the Q-mind model the Freudian psychoanalysis and Freudian theme for the structure of human psyche being Ego (conscious) + Id (subconscious) + Superego (conscious).

A. Remark or Observation

Freudian psychoanalysis (Freud has been a subject of extensive critique, and it had been shown that psychoanalysis hardly can be referred to as a science [7] [8] [9] [10] [11] [12] [13] [14] [15]. There is nothing that is prohibited from incidence in psychoanalysis, and astonishingly the analysis done by the psychiatrist hardly may be subject to any counter-argument or revision. Typical example might be if you are doing not agree with the conclusions of your psychiatrist that you just simply have Edip's difficult ("subconscious got to produce sex together with your own mother"), your arguments are considered as substantiation which you simply "sub-consciousness is resisting the particular realization by you that you have this sexual complex", and therefore the psychoanalyst can never assume that your denial perhaps is proof that his theory is wrong. Freudian theory is therefore immunized against any form of critique, as a result of it does not forbid something, and will make a case for everything regarding the functioning of the human psyche.

There has been extensive biological work to indicate that "sub-consciousness" is results of extra-cortical neural substrates like neural structure. That the modern biological advances is which "subconsciousness" is brain action external to your consciousness, whereas your consciousness is exclusively results of your brain cortex activity (classical or quantum one). However in the modern neurobiological approach towards psychoanalysis the term "sub-consciousness" is by now superfluous, confusing, and "dangerous". Simply this is not qualitatively completely different state from consciousness. "Freudian sub-consciousness" in smart vocabulary is "extra-cortical neurotic activity" therefore no qualitative transitions from subconscious to conscious activities ought to happen in your cortex. The cortex is either conscious, or unconscious (e.g., throughout anesthesia), and extra-cortical neuronal impulses become conscious when they enter the cortex. Therefore analyst standing evolution from sub-conscious mind status into conscious mind state is no more necessary. The mind is always conscious (tautologically), and solely the physical signal carrier of knowledge undergoes dynamics i.e. it is outside or within the mind.

Example of extra-cortical activity may be neuronal impulse entering from the periphery towards the spinal cord that will trigger sensation of pain when it reaches the brain cortex. This entering pain impulse may be blocked with local anesthetic (spinal anesthesia) before it goes to the brain cortex. Therefore spinal anesthesia acts by making all pain impulses remain outside the brain cortex - i.e. they are blocked somewhere on their way from the body to the brain cortex, and this block happens at the extent of neural structure neurons. You don't expertise these pain impulses, but nevertheless they may affect the body functions.

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

Block of sensory impulses can be done higher in the sensory pathways at the amount of thalamic neurons, or the communications of thalamic neurons with brain cortex. For instance radiatio optica is composed from axons of thalamic neurons that enter the visual cortex. If they are cut, despite of the actual fact that your eyes "see" the visual image, and your thalamus as well "sees" the image, you are not consciously attentive to that because your brain cortex i.e. visual cortex cannot input this visual information. However your thalamus is center for triggering numerous vegetative reactions, hence the "thalamic visualing" might direct to extra-cortical/unconscious triggering of vegetative responses or alternative reflexes like blinking of the eyes (this is wrongly called "subconscious" in analyst psychoanalysis).

Our conclusion is that there's no needing of accounting for "subconscious" processes within the (quantum) physical theory of mind. Any such method if being a "real" method and therefore having impact on bodily functions, may embrace "extra-cortical" neuronal representation. Hence theorizing a consciousness being at the elemental level of Universe at the quantum level, doesn't want neither associated "fundamental sub-consciousness", nor any threshold for consciousness to occur. Chris C. King for the primary pre-biotic development of molecules within the primary ocean on Earth [49] [50] [51] [53] [54] [55]. During this state of affairs each molecule manifests a style of "free will" in quantum transactions within the primary ocean, and also the whole method of evolution of life, currently will be seen as a growing quality of aware decisions (panpsychism). After all the quantum states of single molecules cannot be as rich as macroscopic quantum states realized in brain. Therefore in a sense the experience is always there, however its complexity evolves with evolving life systems that could have harvested mechanisms to sustain macroscopic quantum coherence entangling billions of protein molecules in the cellular cytoskeletons of millions neurons.

VII. "SHIELDING" IN ORCH OR

Hameroff suggests that the possible water lasing by superradiance in and around microtubules could have the function of a shield against environmental decoherence.

A. Remark or Observation

One of the important questions in the Q-mind models is to clarify how neurons will uphold long-ranged quantum consistency in their interiors. Jibu et al. have suggested that water molecules manifest lasing effect known as *superradiance* [46] [47]. The influential duration of this procedure conversely is 10-14s, and might be too fast in order to have some impact on much slower protein dynamics through which all cellular functions are realized (timescale of 10-11s). The constancy time on top of the duration of thermodynamical oscillations (10-13s) is obtained the basic laser principle, Jibu and Yasue reveals [45]. The laser action is consummate for the duration of 10 to 15 ps according to Georgiev and Glazebrook [32]. In this case travelling electromagnetic pulses in the

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

form of sine-Gordon solitons might affect the enzymatic function of the C-terminal tubulin tails of microtubules. The model describes the interaction between the electromagnetic field within neurons and the cytoskeleton concerned about currents in extracting conscious experiences and the role of electric fields.

The quantum coherent process taking part in a biomolecule will suffer a significant decoherence from the surrounding dipole disorder of the solvent molecules is exposed by Gilmore and McKenzie [35]. That is why it seems impossible to be realized a quantum theory of brain function without including in the model coherent ordering of water molecules. In other words a quantum coherent process within a biomolecule cannot last for significant biological timescale if the biomolecule is coupled with equilibrium thermal bath.

However is there any rational argument that will urge us to replicate the neuronal inside as electrolytic solution at thermodynamical balance? Certainly not only such argument does not exist, but it is quite the opposite - the neuronal interior is a system far from equilibrium.

Biological systems are systems that evolve far from equilibrium. This is well known in biophysics and indeed the continuous supply of metabolic energy is what keeps the organized neuronal interior. Yet, under such conditions Fröhlich nature of Bose-Einstein condensation might form. Laser operation is a characteristic illustration of quantum coherent process realized at room temperature. Thus coupling of the microtubules or any other protein molecule residing within the neuronal interior with equilibrium thermal bath will be relentless genetic mis-modeling. Most physicists trying to "disprove" Q-mind, do exactly this vicious circle reasoning - they couple the quantum system of interest with an equilibrium thermal bath, and prove what they want to prove (i.e. Q-mind is not feasible *in vivo*? !). Yet, properly pointing out that the neuronal interior is a system far from equilibrium, should invalidate all kind of such flawed critiques. So far, biophysical replication for neurotic cytoplasmic as structure far-off from stability suggests that Fröhlich type of Bose-Einstein condensation occurs for 10-15 picoseconds, a duration which is adequate to report for long-range quantum correlations between the enzymatic function of neuronal proteins [32].

Therefore in the current Orch OR model Hameroff wrongly suggests that there is an equilibrium thermal bath nears the microtubule, so that the microtubule needs to be shielded. Indeed this is a severe mismodelling also. Once accepting the flawed argument that (i) the neuronal inner is "thermal shower" then one would proceed to discover (ii) various additional mismodels in order to counteract the wrong supposition (i). Our conclusion is that Q-mind models cannot be properly developed if one does not clarify and resolve this confusion. The supply of metabolic energy makes the neuronal interior a system far from equilibrium and further no shielding mechanisms are needed. What one needs is a proper understanding of the quantum behavior of systems far from equilibrium, and this should be done with advanced mathematics, not by philosophical arguments. A pioneering work in that direction was done already by Fröhlich [16] [17] [18] [19].

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

VIII. SPLIT BRAIN

Before Hameroff overestimates the role of dendro-dendritic method and additionally the role of gap junctions between neighbor dendrites as a result of the most mechanism for coherence between tissue neurons, mechanizing entangled quantum coherent "super neuron". It's mistakenly over by Hameroff that nerve filament microtubules somehow have an impression on the fibre hill potential and at the instant the fibre firing follows the well-known classical settled behaviour as diagrammatical by the Hodgkin-Huxley equation. So Hameroff claims that in fibre microtubules happen the quantum actions coupled with consciousness and at the instant axons manifest strictly classical nonconscious activity. It's believed that "Axons serving to execute and communicate consequences of acutely aware fibre processes and consciousness happen in the main in dendrites. The main theoretical grounding of such extreme position is that the finding that some tissue neurons don't have axons. "Some tissue neurons haven't got any axons, and intensive fibre activity might occur whereas not inflicting spikes. Excitative postsynaptic voltage levels beneath prickle doorsill (momentous thought of noise by many neuroscientists) oscillate coherently at intervals the gamma varies across wide regions of brain. Although it's wide assumed to be so, initiation of fibre spikes is not essentially the raison d'etre of dendrites." [39].

A. Remark or Observation

Conventional research with split-brain human matters confirmed that axons in pathway are necessary for "united mind" and wounding them by surgery disintegrates the acutely aware activities of the 2 cerebral hemispheres generating prodigious Jekyll-Hyde syndrome. Once cutting the axons of pathway within the brain there are 2minds each being fully unaware of other's mind existence and every mind taking management over the alternative partly of the body.

The split-brain impact occurs within the early Sixties invented by Roger Sperry and Ronald Myers. Myers showed that once the cat had its chiasm and pathway cut off, 2 autonomous learning hub were recognized - one in each hemisphere of the cat's brain [58]. If the cat had its left eye coated and its right eye open and learned to create a straight-forward learned reaction, it had been unable to create an equivalent response once the right eye was lined and therefore the left eye was open. It had been as if the training was unable to be communicated to the opposite facet of the brain; therefore, it absolutely was obvious that data accessible to 1 facet remained restricted to the opposite.

Roger Sperry and Michael Gazzaniga commences a succession of revisions of split-brain humans, patients who had had the tract cut off as a therapeutic procedure, and therefore the observations of those clinical patients have fashioned the premise for variety of serious ideas regarding brain mechanism [20] [65] [66].

The World War II veteran had undergone surgery to alleviate his epileptic seizures. Once the

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

surgery W.J. simply named and delineated colors, letters, and different data flashed in brief to the proper facet of his visual field; so, W.J.'s left hemisphere required no facilitate managing essential duties necessitate vocal reactions. Then the scientists flashed things in W.J.'s left sight view and waited for the responses of his right brain. Because the anxious investigators looked on, W.J. acted like he had suddenly gone blind. He insisted that he couldn't see bursts of sunshine, boldface letters, or anything conferred to him. However his left hand, below the control of his right brain, pushed down on a key every time a visible data appeared, even as the scientists had tutored him to try and do.

In later series of experiments it had been shown that the right hemisphere has its own mind and may communicate in spite of the very fact that it's no control of the speech center set within the left hemisphere and so is disadvantaged from the privilege to talk. In his Alfred Nobel Lecture Roger Sperry concluded that once commissurotomy [64]:

"Each of the disengaged hemispheres, not solely the left, has its own advanced Gnostic purposes. Every hemisphere within the lateralized testing procedures gave the impression to be using its own percepts, mental pictures, associations and concepts. As within the split-brain animal studies, every might be revealed to possess its own learning processes and its own separate chain of reminiscences, all in fact, opposed hemispheres primarily inaccessible to conscious experience. Here we would discuss the extraordinarily vital purpose -the binding drawback cannot be resolved by classical communication of data [24] [57]. Hence Hameroff properly postulates quantum coherence to clarify the conscious binding [39] [40]. The acutely aware mind feels itself as one unit, it's a holistic entity and doesn't adequate to 2 persons communication with one another. You and your friend might communicate and exchange data, however you and your friend don't put together feel as being one world mind. In non-split-brain humans the dual hemispheres don't adequate to two separate minds that communicate such as you and your friend. In traditional state (non-split-brain humans) there's a "binding" that unites the 2 hemispheres in order that their expertise is united into one expertise. Therefore if quantum coherence is postulated to unravel the binding drawback, then axons should additionally convey the quantum coherent states. It is not possible for axons execute "communication and computation" as if among your friend and yourself, axons incontrovertibly unite consciousness, and if this is often achieved by quantum coherence then they have to at any cost expand the quantum consistent condition. The observation that some animal tissue neurons do not have axons mustn't be speciously comprehend in an extremely approach that "nerve fiber tubules and axons are unconscious conventional passageways solely". In addition this could be frequently not proficient to find out the split-brain data.

Additionally we would argue against nerve fibre classicality. The very low dependableness of terminal button exocytosis of 0.15 to 0.30 leads either to chaos, or reduces staggeringly the process control of brain via would like of classical error correction codes, as are mentioned during a succeeding discussion.

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

IX. GEL-SOL CYCLES

The actin gel sol cylces in Orch OR serve the function to shield the coherent microtubules for 25 milliseconds.

A. Remark or Observation

The fact that NMDA receptors activated actin dynamics (reduction, polymerization/ depolymerization) is responsible for change in dendritic spine shape is observed by special video-microscopic technique. This has great effect in synaptic transmission, and the generated postsynaptic potentials. However we do not see any purpose this to be relevant to microtubule shielding. Actually the spine is filled with scaffold protein cytoskeleton, and microtubules from different spines couple only indirectly by these scaffols proteins. So actin filaments and other scaffold proteins may be quantum coherent link between microtubules of neighboring neurons. Indeed there is no theoretical possibility for interaction of microtubules between neighbouring neurons without any scaffold protein being the link between the microtubules. In Orch OR such "linkage" was supposed to occur by gap junctions, but the ionic flows through gap junctions lead to problems with decoherence in Orch OR scheme. In recent work we were able to show that the synaptic environment is better for microtubule coupling between neighboring neurons, plus there is ensured direct output on neuromediator release, thus solving the problem of control of the electric excitations, and the synaptic failure problem [21], [30], [31], [32].

If the actin is "shield" then it cannot be used for mediating of coherence. However the evidence is that in muscle contraction actin uses quantum coherence [43]. Yet the mechanism in muscle contraction as well as the mechanism in spine contraction is the same - just myosin/actin action.

Also the microtubule insensitivity to local electromagnetic field is bad for the theory, and indeed after the revision of the dynamic duration of consciousness is approximately 10-15 ps, the proposed within Orch OR actin gel-sol cycling would be not necessary to account for microtubule shielding.

X. THALAMO-CORTICAL 40 Hz

The Hameroff's Orch OR is based on the idea that thalamocotical 40-80 Hz activity is somehow responsible for consciousness.

A. Remark or Observation

We agree that the β -EEG could be a sensible indicator of consciousness, which the correlation between-EEG and consciousness is reliable enough to serve watching operation in managing the depth of physiological state, etc. But we have a tendency to don't see why neural structure ought to be concerned in acutely aware experience, or why if expertise may be a basic ingredient of reality ought to be created by any "form of activity".

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

Indeed if quantum consistency is answerable for "conscious straping of occurrence" then it doesn't matter whether or not the sensory stimulation is existing in neural structure, or in cortex. The entire system manifests quantum wholeness and also the sensory stimulation ought to already exist within the acutely aware experience. This was the basic preliminary argument hoisted by Georgiev against the chance for coherent sates in tissue layer, that are at the same time coherent with the brain cortex, as accountable for vision [22]. If this were the case, then the neural impulses are useless to hold info to the cortex. so already at the terribly moment your tissue layer has detected the gauge boson, as a result of quantum coherence and acutely aware binding between the tissue layer and therefore the brain cortex you need to have seasoned the visual info. Otherwise if there's no such quantum coherence between the tissue layer and therefore the brain cortex, there's no mechanism to account for coherent transfer of the state of the gauge boson seen by the tissue layer. All quantum transportation schemes would like each quantum and classical channel. While not quantum Einstein-Podolsky-Rosen channel (existent quantum coherence) there's no chance for quantum transportation of unknown quantum state, like the state of the incoming gauge boson. And last, if you deny using the quantum coherence for binding of expertise, then why to use a quantum approach towards consciousness at first place.

Neural structure isn't concerned in consciousness as a result of the sensory impulses should be accomplished already once they enter within the neural structure, and not later once they are delivered to the brain cortex. Thus since cortico-thalamic connections/axons don't seem to be cut off, and you'll be able to imagine that alternativethalamic areas don't seem to be cut off – so that they deliver sensory data to the brain cortex, there ought to be still attainable "binding" of the perceived by the neural structure data with the perceived by the cortex info, via the quantum coherence mechanism.

Solution of these issues outlined previously as obligatory by facts from the neurology, will be found provided that one additionally believes the conclusion of neurology that solely and only the brain cortex is accountable for your consciousness (at least this can be the prime theory in European post-communist countries, and in Russia; Western science is most tolerable and has allowed for numerous tries to involve extracortical regions in conscious awareness, however all this can be self-controversial and that we don't see any use of it). Thus if the brain cortex is only accountable for consciousness and also the quantum coherence is maintained and shared solely between brain animal tissue neurons, then there'll be no issues with the hypothesis that quantum consistency tops up in "conscious fastening of diverse expertise".

Remains to be explained the correlation between the forty Hertz thalamocortical activity (β -EEG) and consciousness. Well, the apparent factor is that sensory data from the encompassing surroundings is delivered continuously through neural structure, apart from olfaction. Thus once consciousness is rousing up it'll would like sensory input from neural structure. To possess consciousness solely with none external sensory data is useless as a result of all traditional

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

activities are fascinating, only wiped out communication with the external world. However it's attainable to be acutely aware, and to not have an interest in external sensory data. As an example mediating tibetian budhists might attempt to isolate themselves from the encompassing sensory input. During this case communication of consciousness residing at intervals the brain cortex with neural structure isn't necessary and slower waves are measured. Therefore our clarification is somehow inverted. The interaction of awarenes with the surroundings resulted in consciousness and it is not due to the interaction among neural structure and beta EEG and the later is to deliver sensory info. This paper is confirmed by the very fact that mediation or alternative acutely aware experiences would possibly happen without -EEG.

We conclude that forty Hz because the required objective time for a acutely aware step to occur is wrong and useless prediction. All proof is against. Additionally this opens chance for consciousness to be a hundred GHz development, as established initially by Georgiev [25]. This can be a tremendous proof since Q-mind theory with a hundred GHz quantum consciousness won't result in psychophysiological paradoxes. Currently the road for Q-mind theories is open all the way down to smaller time intervals required for coherence time till decoherence, and also the original hostility by Tegmark and others, for brain being "wet, noisy and hot", that are irrelevant [69]. The mandatory Bose-Einstein condensation will be achieved for 10-15 ps that's the timescale of protein macromolecular dynamics/catalysis exclusively by means that of energy pumping [32].

XI. SYNAPTIC FAILURES AND NEUROMEDIATOR RELEASE

The likelihood for exocytosis at a central nervous system junction varies between ranges of 0.15 to 0.30. The randomness/chaos from such a "lottery" is big variety. For a little somatic cell with solely one thousand synapses of which thirty percentage fires and seventy percentages are silent the randomness is one to 10^{263}. This implies that there are 10^{263} potentialities for the choice that three hundred synapses from the full one thousand can fireplace. If the exocytosis isn't subneuronally controlled then any of those 10^{263} potentialities can have equal likelihood to occur, and therefore the chaos within the brain operation appears to require calamitous dimensions. We have a tendency to also have stressed that Orch OR cannot resolve the matter with junction failures as a result of it insists on tubule output at the axonal hammock, thence no impact on junction boutons.

A. Remark or Observation

One will repair the said drawback with conjunction failures assumptive that the presynaptic anatomical structure is playing quantum computation, as recently advocated by Georgiev [23] [32] [34].

If one doesn't just like the plan for presynaptic structure scheming the exocytosis there remains the

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

"ugly" classical chance to assume a classical error correction code that tremendously decreases the calculation action of brain. In such a "horrible circumstances" not every junction ought to be thought of as a "bit" however a multitude of say ten or fifteen synapses can constitute a "bit". During this case it might be enough only one of these 10-15 synapses to fireplace so as for the complete bit to hold value 1. This could be achieved if of these synapses finish solely on one postsynaptic nerve cell and there's the necessity that the postsynaptic spines of these synapses be attached with classical OR-gates. Such chance is extraordinarily "ugly" since bio point of view and emerges to disagree with the very fact that nerve fibre spines perform all kind of process gates together with AND-gates that are hardly to be enforced if this immense error correction code was in operation. These classical error correction codes appear to be in disagreement with the precise subneuronal (molecular) be in command of individual synapses, that have their own memory through catalyst sequestration like CaMKII, native cell organ and messenger RNA cluster and native macromolecule synthesis beneath active spines.

XII. TUBULIN BOUND GTP

Hameroff and associates insisted that so GTP cycle of tubulin certain nucleotides would probably maintain a "boosting phenomena" [37] that power might be exploited for microtubules so as to accomplish Fröchlich kind of coherence.

A. Remark or Observation

It has been shown that α-tubule certain GTP ne'er hydrolyzes in accumulated tubule, whereas β-tubule certain GTP hydrolyzes to GTP shortly once the amalgamation within the tubule wall. Subsequently the consecutive α-tubulin fractional monetary unit occludes the preceding β-tubulin ester binding pocket and neither substitute of GDP for GTP, nor phosphorylation of the β-tubulin certain GDP is feasible. Hence tubulin certain GTP pumping cycle does not occur in stable microtubules [26]. Alternatives for energy offer ought to be originated as specifically proposed by Georgiev et al [32] [34].

XIII. BIONIC VISION AND DOBELLE'S BREAKTHROUGH

In Hameroff-Penrose Orch OR the microtubules are recommended to be screened from external electromagnetic fields.

A. Remark or Observation

In a step forward neuro-surgical procedure Dobelle was ready to implant electrodes directly within the cortical area of a visually handicapped person, who lost his vision as results of accident [6]. The electrodes were connected to a bionic camera that transmitted the visual image within the sort

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

of electrical pulses. Every electrical pulse created sensation of bright spot referred to as "phosphene" and therefore the totality of such "phosphenes" creates the visual input. Therefore the visually handicapped person referred to as Kraut, was ready to navigate in unknown surroundings like the subway, with the utilization of the bionic vision.

Dobelle's achievements are supported classical work of Penfield who showed that electrical stimulation of the brain cortex is ready alone to elicit acutely aware expertise. This is often in agreement with all the present medical data from medical specialty, wherever the sensory data is delivered to the cortex within the sort of electrical impulses through neural structure.

Hameroff-Penrose Orch OR theory has the massive disadvantage of supposing that microtubules are insensitive for the native field of force. We tend to believe the attainable quantum model of tubules ought to account for consciousness should have the benefit of microtubule sensitivity to native magnetic force fields. This issue was self-addressed during a pioneering work of Georgiev [27] that was refined into a QFT model with electromagnetic force sine-Gordon solitons plus the C-terminal tubulin tails sticking out out of the microtubules [30] [32] [34].

XIV. MICROTUBULE A-LATTICE IN BRAIN CORTEX

Based on replicating of microtubules as ferroelectric patterns done by Tuszynski and associates, Hameroff recommended that attainable smart prediction of Orch OR is to venture subsistence of A-lattice tubules in brain cortex, contrasted to the B-lattice microtubules indomitable to a different place in vivo. This can be additionally one amongst the twenty testable Orch OR predictions projected by Hameroff.

A. Remark or Observation

The ferroelectric model has no any biological advantage, and is additionally insensitive for native electrical fields. What's additional B-lattice for microtubules [48] was proved/observed directly by freeze fracture microscopy each for in vitro assembled microtubules and for microtubules isolated from numerous brain regions. To this point there's no ascertained case of in vivo microtubules with A-lattice.

Undeniably the turbulent pattern of microtubules was commenced to be extraneous for the recently projected information science by the C-terminal tubule tails in operation in an interaction with the native magnetic force field [33] [34].

XV. G-PROTEINS AND PHOSPHORYLATION

One of the most conjectures by Woolf and Hameroff is that the nerve fiber microtubules input the knowledge coming back from extracortical neurons within the variety of neuromediator pulses with the assistance of G-protein coupled cascades that have an effect on the MAP-2 phosphorylation standing [36]. one in every of their estimates is that the time required for such a

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

method is 250-500 milliseconds and this should be comparable to each conscious step.

A. Remark or Observation

The G-protein effects are plentifully sluggish (utilize larger timescales) than the direct electrical depolarizations. It implies that the decay of the impact is extended in time. So once triggered such a G-protein cascade desires an extended time to be turned off. the most principle is that the G-protein after its activation triggers second order and third order messengers within the sort of kinases or phosphatases that amplify the signal in an exceedingly style of chain reaction. Hereafter it'll be troublesome for the chain reaction to be turned off. The electrical excitations in distinction have quicker dynamics and might be dissipated ("turned off") for shorter time.

In Orch OR appears that there's some drawback with the explanation that electrical phenomenon itself is evoking conscious occurrence when applied to the brain cortex [60] [61][62]. Additionally it's not seen direct link between Orch OR and therefore the applications of Penfield's discovery by Dobelle who deep-rooted directly the electrodes connected with bionic camera so as to recover the vision in blind human subject once surgery [6].

Although the Hameroff-Woolf's theme is predicated on the twin action of neuromediator, specifically to activate each particle channels and G-protein coupled receptors, within the case of direct electrical input to the cortex it's essential clarification however the electrical current itself induces conscious expertise. However if this piece has to be incorporated within the theory then it appears that Hameroff-Woolf's theory in its current type is incomplete as a result of it ignores (does not explain) how the electrical currents (generated by ion channels when activated by neuromediator) are inputted to microtubules. There's conjointly further drawback with the Hameroff and Tuszynski suggestion for screening/seclusion of microtubules against external electrical fields as a result of direct input are going to be impracticable [41].

XVI. BELATED EXPERIENCE OF LIBET

Hameroff advocates that the illustration by Libet back-referral of time must imply that consciousness uses quantum consistency - throughout the quantum coherent duration so the future and past co-exist together and future events might affect the outcome of past events.

A. Remark or Observation

As noted by Pockett it is always easier to read the conclusions of the articles and to skip the boring reading of the technical part that describes the actual setup of the experiment [63]. However if one struggles to understand the principles underlying the brain function then a careful study of the data is needed. Here we briefly summarize some of the most quoted results by Libet and point out obvious flaws in the interpretation of the experimental data.

As foundation fact of most of the Libet's winding up is taken the observation that direct

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

stimulation of the brain cortex with electric current elicits conscious sensation only some time after the start of the electric current. It was shown that the electric current I must have threshold level I_0. If $I < I_0$ the electrical current might be sustained for extended time without drawing any conscious awareness. If $I = I_0$ the conscious awareness take place just about five hundred ms after the start of the electric stimulation, and if $I > I_0$ the conscious sensation occurs faster than 500 ms in such a fashion that higher current elicited conscious sensation faster. With the used higher intensities of the currents the minimal period for duration of the current that elicited conscious report was approximately 200 ms. Libet interprets the I_0 as "normal" stimulus and then suggests that consciousness occurs with delay of 500 ms. There is nothing "normal" however in opening the skull of a human and delivering electric impulses to his brain with electrodes dipped in saline. Also Libet completely forgets about neuronal fascilitation - there is possibility for electric excitations to sum over time, so that sub-threshold agitations finally result in a spike. From such a perspective it is highly plausible that at the beginning of the electric train with I_0 the sub-threshold currents summated, so that only after 500 ms some relevant to induce conscious experience neuronal activity has been induced by the electrode. There seems nothing to be explained here; as all this is well known is modern neuroscience.

Based on misunderstanding of this first series of experimental data, Libet and colleagues perform a second experiment that is maybe the most quoted in the scientific literature experiment. A patient is delivered an electric stimulus with current I_0 for duration of 500 ms, while at the same time a supra-threshold skin stimulus on his hand is delivered 200 ms after the onset of the electric current I_0 delivered to his somato sensory cortex. It was reported that the hand stimulus is experienced before the sensation that resulted from the electrode stimulation. Libet then concludes that this is surprising because the skin stimulus would have been experienced with delay of 500 ms that summed up with the 200 ms delay from the onset of the current I_0 gives us delay of 700 ms. This prediction fails however Libet does not consider it as evidence that his pet hypothesis for delay in consciousness of 500 ms is false, but ridiculously claims that a novel explanation is needed (i.e. back-referral of time). Of course that taking into account that there is no any such delay in consciousness, the skin signal will need only about 80 ms to reach the brain cortex, so if the onset of the current I_0 is labeled as t_0 then it follows that the experience of the skin stimulus will be at time t_0+280 ms, while the direct current delivered to the cortex will evoke conscious experience only after some fascilitation takes place at time t_0+500 ms. Our prediction does not fail, so there is no whatsoever reason to search for unusual clarification such as Libet's supposition supported on misunderstanding of neurobiology.

Alas, as it often happens in science despite of the fact that Libet's work was pioneering (indeed it is irrelevant to our discussion) he became sufferer of his "favorite assumption". It's not so unusual in science that researchers demonstrate experimentally their expectations, or if the experimental data does not fit exactly their expectations they misinterpret it i.e. interpret it in "novel" (exotic)

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

way, so that in the end the expectations are confirmed.

And last, a note should be added on the meaning of the term "back-referral of time", which might be implicit in the scaffold proposed of Libet - consciousness occurs with delay of 500 ms after the neural mechanism that generate it, however the consciousness "pack up the space" by (erroneous) supercilious that it has activated itself the neural systems (thus consciousness is epiphenomenon here). Other possible interpretations of the term "back-referral of time" such as in Klein are not necessarily incompatible with our views, but they have completely different meaning from the one discussed here [56].

Our conclusion is that quantum mind theories do not need to specifically resort to Libet's experiments as something extraordinary.

XVII. INTERSTITIAL TISSUE ROLE IN CONSCIOUSNESS

Hameroff considered that interstitial tissue cells ought to be concerned in consciousness as a result of their count can enhance the process power of brain, and since interstitial tissue cells are associated with neurons via gap junctions.

A. Remark or Observation

In several neurological disorders (syringomielia, epilepsia, etc.), there's a demise of neurons and associated growth of interstitial tissue cells. However interstitial tissue cells cannot make amends for neuronic loss.

The involvement of interstitial tissue cells in psychological feature processes as memory storage devices has been advised within the dawn of neurobiology and has been incessantly fuelled with "ground-breaking particulars" by examiners of neurogliacyte biology [59] [70]. Now a day the proof is that interstitial tissue cells are solely biological process cells for the terribly capricious neuronic cells, which require extraordinarily slender range of physiological parameters for their correct operation. Little deviations in aldohexose concentrations, pH, ionic concentrations, etc., don't seem to be tolerated by neurons, and though neurons don't die, state of mind follows in tens of seconds. In fact interstitial tissue cells are subject to the common molecular transduction pathways however each cell within the body is concerned in some kind of process of classical data. Each phase transition within the cell might be a kind of conservative "reminiscence trace" for history proceedings therefore for the inexperienced research worker who has not featured seriously with the matter of consciousness it's straight forward to confuse the classical "memory traces" that outcome from the time when irrevocable procedures, with the "cognitive memory storeroom". So the engrams of consciousness ought to be physical, however it's not possible to localize a phase transition in brain then claim that this can be essentially a "cognitive reminiscence sketch". Up to now it's been established that injury of neurons leads straightaway to psychological feature amnesia, whereas the initial stages of reaction diseases against interstitial

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

tissue cells (e.g. multiple sclerosis) doesn't seem to be related to serious psychological feature loss. The psychological feature deficits seem later within the evolution of the malady once the neurons are broken. So there's proof that neurons only are accountable for consciousness and psychological feature performance, whereas interstitial tissue cells are solely biological process and protecting cells.

Expanding of consciousness in the course of alternative cell varieties like interstitial tissue cells, fibroblasts, even animal tissue, blood vessels, immune cells, etc. is of no real purpose for finding the enigma of consciousness. For feature additional issues and to create additional hypotheses than necessary is simply too unconventional, and against the aesthetic notion for a theory to be as straight-forward as attainable, however not less complicated than required. Somatic cell morphology and biology is therefore difficult and plenty of times more affluent in particulars than interstitial tissue biology. To outline their mechanism in congregating consciousness mutual by interstitial tissue cells in addition and it's "offensiveness to neurons".

XVIII. DE-COHERENCE AND GAP JUNCTION TUNNELING

Hameroff incorrectly supposed that gap junctions will sustain coherence among cortical neurons for instant of twenty five ms. The celebrated model needs electrons resulting from mitochondria, then tunneled although gap junctions, and transmitted to microtubules via therefore referred to as nerve fibre lamellar bodies (DLBs). The coherent conditions of microtubules extend in each neurons and interstitial tissue cells.

A. Remark or Observation

Gap junctions' electronically couple neighboring neurons and that they are hexameric channels composed of subunits known as connexins, or recently delineated novel proteins known as pannexins. There's intensive particle flow, and little molecule transfer through gap junctions like Ca^{2+}, nucleotide (ATP), or metabolites. Gap junction hemi-channels also are used for non-SNARE dependent unleash of neuromediators like salt in developing brain. Hameroff strictly agrees that particle superposition across semipermeable membrane is not possible as noted by Max Tegmark wherever he calculates time until decoherence to be solely 10^{-23}s [69]. However ions flowing through gap junction can decohere the system within the same decoherence time cautiously done numerical estimate by Georgiev provides decoherence time $t_{dec}=10^{-9}$ s [22].

Another important issue – the biological science is totally tousled. DLBs are found solely within the main branch of dendrite. The nerve fibre spines that communicate with gap junctions and in the past it is not being observed. De Zeeuw et al. undoubtedly confirm that DLBs are establish tens of micrometers aloof from the particular gap junction couplings, which there's solely "connection" among the subsistence of gap junctions and existence of DLBs in sense that DLBs could be concerned within the biogenesis of gap junctions, however there's no direct

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

structural link between these [5].

And last, however not least, the small astrocytic/glial projections extremely couple with neurons through gap junctions; however the connexin proteins are primarily Cx43, whereas neuronic kind is Cx36. Though this is often not a giant drawback, the apparent drawback is that the little interstitial tissue projections are lacking microtubules however are crammed with simple protein filaments. So there appears to be an enormous morphological diffrences – neuronic projections have principally microtubule-based anatomical structure, whereas interstitial tissue projections have nearly completely actin-based anatomical structure lacking microtubules.

XIX. GRAVITATIONAL ORS

Roger Penrose contemplated that the psychological arrow of your time, ought to be connected with the cosmological time arrow, which probably our consciousness and also the "sensation of transitory time "could be initiated by the ensuing attractive force objective reductions (ORs).

A. Remark or Observation

It was bestowed by Georgiev and already acknowledged from neurologic observation, that there are human subjects (e.g. once stroke, or unconventional neurotic malady) which endure from time encephalopathy – they can't consciously understand the time flow, nor will decide length of your time intervals [25]. it's been disagreed that these patients don't feel passage of your time, and various psycho-physiological experiments have established the best-known by everyone indisputable fact that a similar objective interval, subjectively will be intimate as "too fast" or "too slow" reckoning on the case, the corporate, and different factors. Therefore the existence of patients with time encephalopathy clearly shows the chance for a subject matter to be acutely aware, while not having associated feeling of your time flow.

However a far additional general idea ought to be hassled upon. Georgiev have originate out that the spatial expansion of the brain doesn't stimulate "consciousness of multi dimensions", and this could be widespread by the proclamation that the physical distinctiveness of the brain (mass, hotness, etc.) don't turn out united "feeling of mass", "feel of hotness" etc.,[30]. Accordingly it's theoretically insufficient to suppose that objective passage of your time itself ought to turn out biased feeling of transitory time.

The proposition that ORs turn out the basic consciousness is mentioned in an exceedingly separate subsection, wherever we have a tendency to disagree that Protestantism and emergentism as approaches towards consciousness ought to be used along.

XX. MICROTUBULE'S TWENTY FIVE MILLI SECOND "COHERENT FREEZING"

One of the foremost frustrating options of the Orch OR model is that the indisputable fact that microtubules ought to be coherent for twenty five ms so as to execute their psychological feature

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

mechanism. Each Orch OR event desires tubule seclusion from the cellular atmosphere to stop decoherence for twenty five ms. This supposed seclusion is postulated to occur via acting gelation.

A. Remark or Observation

All supermolecule enzymatic/catalytic operation take place at dynamic time duration of 10-15 picoseconds and this quick dynamics ought to have continued existence worth so as the biological complexness at intervals the cell to be efficiently controlled against the damaging action of the natural philosophy arrow, which suggests raise of entropy in time. Thus the proteins at intervals cells should be quick enough to counteract the rise of entropy (at the expense of metabolic energy), in order that all entropic errors in operation are repaired/corrected, all waste product be eliminated, etc.

Microtubules have bound catalyst functions through their C-terminal tails in dominant the MAP accumulation spots, and kinesin toddle. Why subsequently microtubules and tubule don't employ the swift unit of time dynamics done by all proteins? Classical (irretrievable) actions like attachment/detachment, motor protein management, reaction chemical action, want essentially crumple of the wave function, so as the state to develop into irreversible. If the state is quantum consistent, followed by the whole thing is retraceable, everything is in superimposed and so no "real" time flow has happened, as a result of there are multiple space-times in superposition. Thus no "output" by the microtubules might be achieved while not crumple of the wavefunction. So as to possess "output" from microtubules an objective time flow (irretrievable encroachment) is required, therefore ORs should occur in picoseconds.

Illustration of the difference among the quantum consistency and therefore the irreversible time flow composed of separate events (collapses, or ORs) might be the picture show analogy - within the quantum coherent case, you've got only 1 image with several superposed pictures one over the opposite, therefore no time flow happens, whereas within the irreversible classical time flow you'll watch a picture show within which each cadre is replaced by another one in time, there's each motion and time flow, the photographs are dynamic, not still.

Emerges the embarrassing question - why if all proteins within the cell work against the rise in the appraise of disorder, the tubules for that end is "frozen" in stagnant coherent image. Once microtubules consign to "deice" and "give order" to the cellular macromolecule interior at such long unit of time intervals might they very be ready to organize the cellular functions? Isn't it higher if the microtubules control everything at unit of time duration, further as turn out acutely aware actions in 10-15 ps?

Georgiev explains - we tend to don't feel that our acutely aware flow is therefore quick as a result of our conscious steps don't turn out associated expertise of your time flow the least bit [25]. The proof from patients suffering time brain disorder suggests that consciousness happens while not co-producing a subjective feeling of your time.

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

XXI. OUTPUT AT THE AXONAL HILLOCK

Hameroff believes that dendritic microtubules solely are accountable for acutely aware Orch OR events, which the output of the tubule gravitative OR event is to have an effect on somehow by unknown mechanism the nerve fiber hammock potential. Subsequently the Hogkin-Huxley dynamics of the nerve fiber is classical (deterministic) and therefore the communication with different neurons is ensured.

A. Remark or Observation

One of the most important considerations is that every axone winds up with regarding ten thousand synapses for a animal tissue nerve cell. The chance for exocytosis and neuromediator unharness at every terminal button (hence dependability of junction transmission) is simply 0.15 to 0.30. Thus it appears that ifthere's no subneuronal management of the junction unharness haphazardly solely concerning three thousand of the synapses of the animal tissue nerve cell can "fire", whereas seven thousand of them are going to be "silent". Therefore it's not clear however the Orch OR can stop the massive chaos for sure because of junction failures.

XXII. DATA PROCESSING NERVE FIBER

Hameroff is silent on the likelihood for axo-axonal gap junction couplings with two hundred Hertz activity that guarantee nerve fiber couplings and potentialities for induction of nerve fiber spike in gap junction coupled silent axone with smaller diameter than the firing one. So in Orch OR all this can be not relevant as a result of axons don't seem to be concerned in conscious course of actions. Mentioning of two hundred Hertz gap junction activity at intervals Orch OR are going to be somehow different with the forty cycle gap junction activity projected by Hameroff.

A. Remark or Observation

It looks unfair to possess contraposition nerve fibre vs. axonal microtubules, nerve fibre versus axonal computation. We predict that none of those extreme points of idea stressing on priority of only 1 kind of neurites is appropriate. Thus there's undeniable proof for axons to "integrate mind", and for the split-brain studies Roger Elmer Ambrose Sperry took Nobel Prize in 1981. Therefore each dendrites and axons ought to be concerned in psychological feature processes.

Another frustrating observation is that the logical mess - in Orch OR the nerve fibre microtubules are accounting entirely for consciousness, whereas the axonal microtubules aren't supported with the priviledge to be acutely aware. However why such injustice - these are components of a same somatic cell and exclusion of axonal microtubules from mind processes decreases the mind process power? On the opposite hand interstitial tissue cells are concerned in acutely aware

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

activity (in order to extend the process power of mind), however they're utterly totally different cell kind that has the first duty to confirm the biological process desires of neurons. Orch OR in its current type may be unhealthy cell biology with nothing positive for the model except the actual fact that's fully scandal.

XXIII. EVOLVING AND ORIGINAL PRACTICE

In Orch OR model there is bizarre mixture of "fundamental consciousness" that "emerges" at OR events. The whole approach is *over-complicated* for the sake of satisfying some old and mainly non-scientific Freudian concepts.

A. Remark or Observation

We suggest a direct elementary experience/consciousness manifested by quantum systems. Therefore we expect of the quantum events/collapses as "decisions" done by the experiencing quantum system, not as "procedures generating consciousness". In this innovative construction the OR incident are going to be "resolution building", and not "knowledge generating" event. If consciousness is irreducible phenomenon at the quantum level there's no would like for it to "emerge" from "subconsciousness" that could be a false-scientific Freudian thought.

XXIV. WHERE ACT THE ANESTHETICS?

Hameroff suggests that the main action of volatile anesthetics (as well as anesthetic gases) is to cause unconsciousness via binding to the hydrophobic pockets of tubulins. Also Hameroff argues that volatile anesthetics are the most perfect agents to produce unconsciousness that we currently have.

A. Remark or Observation

The model suggested by Hameroff is certainly interesting; however it is too simplistic to be used as a general approach towards anesthesia. In the following we will raise two particular issues that need to be considered.

The volatile anesthetics have numerous molecular targets: the core SNARE complex, two pore domain potassium channels, and calcium and sodium voltage gated ion channels, gap junction hexamers, $GABA_A$ receptors, etc. Therefore it is arguable that microtubules are the primary target that leads to unconsciousness. In this way it is experimentally impossible to find out the principal objective of unpredictable anesthesia without evaluation with the effects of other more selective drugs that have less number of molecular targets. Here is where the role of intravenous anesthetics should be considered i.e. almost all known intravenous anesthetics realize their anesthetic action through activation of $GABA_A$ receptors Thus, it appears that the explanation towards accepting analgesic achievement should engross the GABAergic neuromediation as one of the major mechanisms for producing unconsciousness.

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 2, Issue 9, December 2015

The second issue we would like to stress upon, is the fact that volatile anesthetics are far from being the perfect anesthetics as argued by Hameroff. Indeed the induction is anesthesia is slow (currently intravenous induction is preferred), the effect within brain is diverse (multiple molecular targets as listed above), and as a consequence the recovery from anesthesia is delayed and associated with unpleasant experiences. All this is avoided with the usage of intravenous anesthesia, and a particularly close to perfect anesthetic agent is *propofol* (except that it is relatively expensive). Propofol should be the primary choice in all cases where there is no contraindications for its usage (such as accompanying heart disease, newborn child, etc.), yet, the range of applicability of propofol is growing and if the anesthetist is experienced propofol could be used even in cases where the contraindication is relative. Compared to volatile anesthetics, the time needed for propofol induction in anesthesia is rapid (roughly equal to the circulation time from the place of injection to brain), and the recovery is also rapid (in most cases associated with pleasant experiences, possibly mediated by dopamine receptors). It seems that GABAergic mechanism is very close to the physiologic mechanism generating unconsciousness during sleep; hence usage of selective $GABA_A$ agents predictably leads to better anesthesia compared to volatile anesthetic anesthesia (agents with diverse molecular targets one of which is the $GABA_A$ receptor). Despite of the fact that our notes are sketchy, the key argument is that hardly one could point out solely the microtubule as the main target for producing unconsciousness.

XXV. OUTLOOK

As stated in the beginning of this paper the purpose of the current work is to outline a research programme that will put the Q-mind theory on stable scientific grounds. Unfortunately at the present time a lot of pseudo-scientific notions are utilized beneath the appearance “quantum mind” and which has detrimental consequences on the advancement of “quantum consistency in brain as illumination of several facial appearance of consciousness such as nonlocality and noncomputable development.”

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