

Quantum Mind 2007

Salzburg, Austria - 17th July – 20th July 2007

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 Concurrents .....12  
 Posters.....38

10.15 Opening addresses - Alois Lametschwandtner, Chair Dept Org Biology  
 Gustav Bernroider, Günther Bernatzky: Introduction  
 11.15-12.15 Keynote - Stuart Hameroff: Schrödinger’s proteins: how quantum biology can explain consciousness.  
**13.00-17.45 Plenary 1 Audi Max**  
*Foundations* (Chair: Jack Tuszynski )  
 13.00-13.45 A.Elitzur: Why Quantum Mind to begin with? A Proof for the incompleteness of the physical account of Behavior.  
 13.45-14.30 Henry Stapp: Whiteheadian quantum ontology: the emergence of participating conscious observers from an unconscious physical quantum universe.  
 15.00-15.45 Lothar Schäfer: Aspects of cosmic consciousness in the non-material and non-empirical forms of physical reality.  
 15.45-16.30 Marshall Stoneham: Quantum ideas and biological reality: the warm quantum computer ?  
**17.00 – 19.00 Poster Presentations Main Hall**  
 P01 Marcus Abundis: A Model of Human Consciousness (Global Cultural Evolution).  
 P02 Valentin Ageyev: Quantum spaces of human thinking.  
 P03 cancelled.  
 P04 Gerard Blommesteijn: Consciously 'chosen' Quantum Design.  
 P05 Michael Cloud, Sisir Roy & Jim Olds: Two Gedankens, One Answer; Cloudy weather on the Mind/Body Front.  
 P06 Erik Douglas: Reassessing the Relationship between Time and Consciousness.  
 P07 Veronique Elefant-Yanni, Maria-Pia Victoria Feser & Susanne Kaiser: The Affect is all at once cognition, motivation and behavior.  
 P08 Roman Fuchs & Gustav Bernroider: The sum over history interpretation of neural signals applied to orientation sensitive cortical maps.  
 P09 Johann Ge Moll: Consciousness as a black hole. Perceptory cell and dissociated quantum.  
 P10 Catarina Geoghan: The enhanced perceptual state.  
 P11 Sanjay Ghosh & Papia Ghosh: Reveals the core secret of mind and it’s mechanism.  
 P12 Peter Hudoba & Zhi Gang Sha: Soul mind body medicine: a complete soul healing system using the power of soul.  
 P13 Alex Kaivarainen: Unified Theory of Bivacuum, the Matter, Fields & Time. New Fundamental Bivacuum - Mediated Interaction and Paranormal Phenomena.  
 P14 Iwama Kenzo: Sequences of combinations of energy levels that describe instances of self and invoke a current instance of self.

Quantum Mind 2007: Abstract Proceedings

P15 Mohammadreza (Shahram) Khoshbin-e-Khoshnazar: Why I’m not an "Orch Or"ian?  
 P16 Sean Lee: An Operational Treatment of Mind as Physical Information: Conceptual Analogies with Quantum Mechanics.  
 P17 Reza Maleeh, Afshin Shafiee & Mariano Bianca: How Quantum Entanglement Provides Evidence for the Existence of Phenomenal Consciousness.  
 P18 Marty Monteiro: Model of Mind & Matter: The Second Person.  
 P19 Gloria Nobili & Teodorani Massimo: Spreading culture on quantum entanglement and consciousness.  
 P20 Scott Olsen: The Golden Section: Nature's Greatest Secret.  
 P21 Mojtaba Omid: Proving the digitalizing the manner of data reserve and recreating the memory in brain and the experimental witnesses suggesting it.  
 P22 Jean Ratte: Embryological embodiment of protopsychism and Wave Function.  
 P23 Michael Shatnev: Life and Consciousness.  
 P24 Josiah Shindi: Visions as special form of altered state of consciousness.  
 P25 Malini Shukla & Jaison A. Manjaly: Metacognitive awareness: adopting new tasks for the remediation program for dyslexics.  
 P26 cancelled.  
 P27 Meera Mary Sunny & Jaison A. Manjaly: Does attention mediate the apparent continuity of Consciousness? : A change detection Perspective.  
 P28 Yoshi Tamori & Noriyuki Tomita: Implicit activities in auditory magnetoencephalography (MEG).  
 P29 Massimo Teodorani & Gloria Nobili: Anomalous light phenomena vs. bioelectric brain activity.  
 P30 Ximena Velásquez, Edgar Emir Gonzalez & John Forero: Quantum brain or classic brain, a review.  
 P31 Ram Lakhan Pandey Vimal: Proto-experiences and Subjective Experiences.  
 P32 Serge Volovik: Disorders of consciousness in schizophrenia: a reverse look at consciousness’ nature.  
 P33 John Yates: New quantum approach to qualia, consciousness and the brain.  
**8.45-12.15 Plenary 2: Audi Max**  
*Quantum Realizations – Quantum Biology* (Chair: Stuart Hameroff)  
 8.45-9.30 Nancy Woolf: Neuropharmacology, neurotransmitters, and quantum level interactions.  
 9.30-10.1 Jack Tuszynski, Avner Priel and Horacio F. Cantiello: Electrodynamics signaling by the dendritic cytoskeleton: towards an intracellular information processing model.  
 10.45-11.30 Luca Turin: Why is consciousness soluble in chloroform ?  
 11.30-12.15 Paavo Pyykkänen: Quantum jumps and explanatory gaps.  
**13.00-15.0 Concurrent 1a : Blue Lecture Room (402)**  
*Quantum Ontology I* (Chair: Paavo Pyykkänen)  
 13.00-13.25 Donald Mender: The subject of Physics.  
 13.25-13.50 Koen Stroeken: Why meaning is the harder matter: a Boh(e)mian anthropology.  
 13.50-14.15 Thomas Schumann: Quantum theory, the dream metaphor and meta-brain model.  
 14.15-14.40 George Weissmann: Towards a quantum paradigm: an integrated view of matter and mind.

14.40-15.05 Richard Shoup: Causality, randomness and free will.  
**13.00-15.30 Concurrents 1b: Green Lecture Hall (403)**  
*Wavefunction Collapse and Quantum Mind Theories* (Chair: Lothar Schäfer)  
13.00-13.25 Imants Baruss: Characteristics of consciousness in collapse-type quantum mind theories.  
13.25-13.50 Michael Steiner, Uzi Awret, R.W. Rendell and Sisir Roy: Fundamental biological quantum measurement processes.  
13.50-14.15 Andrei Khrennikov: Consciousness as a quantum-like representation of classical consciousness.  
14.15-14.40 Peter Jedlicka: Quantum stochasticity and neuronal computations.  
14.40-15.05 Jonathan Edwards: Consciousness as access to active information: progression, rather than collapse of the quantum subject.  
15.05-15.30 Carpenter RHS, Andrew J Anderson: The death of Schrödinger's cat and of consciousness-based quantum wavefunction collapse  
**16.00-18.05 Concurrents 2a Blue Lecture Room (402)**  
*Quantum Ontology II* (Chair: Luca Turin)  
16.00-16.25 Travis Craddock and Jack A. Tuszynski: Examining the effect of physiological temperature on the dynamics of microtubules.  
16.25-16.50 James Beichler: A four dimensional hologram called consciousness.  
16.50-17.15 Francis Schwanauer: Overlap with the 'different' qua.  
17.15-17.40 James Nystrom: Teleological mechanism for the simulation argument.  
[17.40-18.05] Shannon Foskett: Differentials of deep consciousness: Deleuze, Bohm and virtual ontology.  
**16.00-18.05 Concurrents 2b Green Lecture Room (403)**  
*Time and non-locality* (Chair: Harald Atmanspacher)  
16.00-16.25 Georg Franck and Harald Atmanspacher: Intensity of awareness and duration of nowness.  
16.25-16.50 Robert Boyd and Adrian Klein: Toward a new subquantum integration approach to sentient.  
16.50-17.15 Anastasia Gurbunova and Samuel Levin: Time reversal effects in visual word recognition.  
[17.40-18.05] Sisir Roy: Dynamic geometry, Bayesian approach to Brain function and computability.  
[18.05-18.30] Ken Mogi: The origin of non-locality in consciousness.  
**8.45-12.0 Plenary 3: Audi Max**  
*Quantum Concepts in Neural Signaling* (Chair: Nancy Woolf)  
8.45-9.30 Karl Pribram: Minding quanta and cosmology.  
9.30-10.15 James Olds: The neuron: no longer the atom of neural computation.  
10.30-11.15 Menas Kafatos, S.Roy, KH Yang and R.Ceballos: Quantum mechanical implications for the mind-body issues.  
11.15-12.00 Gustav Bernroider and Johann Summhammer: The role of quantum cooperativity in neural signaling.  
**13.00-16.30 Plenary 4: Audi Max**  
*Brain dynamics and oscillations* (Chair: James Olds)  
13.00-13.45 Giuseppe Vitiello and Walter J. Freeman: Dissipative many-body dynamics of the brain.  
13.45-14.30 Daniel Sheehan: Experiments in retrocausation.  
15.00-15.45 Frank Echenhofer: EEG gamma coherence changes and spiritual experiences during Ayahuasca.  
15.45-16.30 Francoise Lepine: Principles of quantum Buddhism.  
**16.30-19.00 Concurrents 3a: Blue Lecture Room (402)**

*Fields, waves and synchrony* (Chair: Giuseppe Vitiello, Menas Kafatos)  
16.30-16.55 Michael Lipkind: Memory and time:spatial-temporal organization of episodic memory analyzed from a molecular level perspective.  
16.55-17.20 Russel Hebert, Rachel Goodman, Fred Travis and Alarik Arenander: A steady state EEG phase synchrony model of consciousness: insights from transcendent meditation practice.  
17.20-17.45 Patrick Heelan: The role of consciousness as universal (classical) and contextual (quantum) meaning maker.  
17.45-18.10 Alberto Faro and Daniela Giordano: Mind backward paths: from axons to dendrites passing through quantum memories.  
18.10-18.35 Anatoly Goldstein: Modeling consciousness in complex spacetime using methodology of quantum and classical physics.  
18.35-19.00 Alexey Alyushin: Moire' wave patterns as the brains own language.  
**16.30-19.00 Concurrents 3b: Green Lecture Room (403)**  
*Entanglement and experiments* (Chair: Paola Zizzi, Stephen Whitmarsh)  
16.30-16.55 James Hurtak and Desiree Hurtak: Consciousness, coherence and quantum entanglement.  
16.55-17.20 Massimo Pregnotato and Paola Zizzi: Human biocatalysis and human entanglement: how to fill the gap between quantum and social sciences.  
17.20-17.45 Reinhard Blutner: Combining prototypes: quantal macrostates and entanglement.  
17.45-18.10 Huping Hu and Maoxin Wu: Experimental approach to quantum brain: evidence of nonlocal neural, chemical, thermal and gravitational effects.  
18.10-18.35 Rita Pizzi, D. Rosetti, G.Cino and AL Vescovi: Neurons react to ultraweak electromagnetic fields.  
[18.35-19.00] Arkady Plotnitsky: The minds image of the world, the classical physics of motion and the quantum physics of the brain.  
**8.45-12.00 Plenary 5: Audi Max**  
*Experiments with consciousness* (Chair: Imants Baruss)  
8.45-9.30 Stephen Whitmarsh and Dick Bierman: Schrödinger's cat: empirical research into the radical subjective solution of the measurement problem.  
9.30-10.15 Paola Zizzi: The truth-observable: a link between logic and the unconscious.  
10.45-11.30 Jeff Tollaksen, Yakir Aharonov and Sandu Popescu: A new model of time and consciousness: each moment of time is a new universe.  
11.30-12.15 Richard Healey: Do quantum phenomena provide objective evidence for consciousness ?  
**13.00-15.30 Concurrents 4a: Blue Lecture Room (402)**  
*Whitehead, process philosophy and the quantum brain* (Chair: Henry Stapp, Gernot Falkner)  
13.00-13.25 Spyridon Koutroufinis: Process philosophy and mental quantum events.  
13.25-13.50 Franz Riffert: Whitehead's tri-modal theory of perception in the light of empirical research.  
13.50-14.15 Gernot Falkner, Kristjan Plaetzer and Renate Falkner: Does microbial information processing by interconnected adaptive events reflect a premental cognitive capacity?  
14.15-14.40 Peter Ells: Existence and consciousness.

- 14.40-15.05 Jaison A Manjaly: Why panpsychism falls into dualistic metaphysical framework.
- 15.05-15.30 Wolfgang Baer: Identifying the interaction between the quantum and classical world as the blue print for conscious activity in cognitive vision systems.
- 13.00-14.40 Concurrents 4b: Green Lecture Room (403)**  
*Cosmology and Consciousness I* (Chair: Maurice Goodman, Mary Fries)
- 13.00-13.25 R.W. Boyer: The big condensation – not the big bang.
- 13.25-13.50 Uzi Awret: What could possibly count as a physical explanation of consciousness? The view from the inside and the Bekenstein bound.
- 13.50-14.15 Laura Weed: Spinoza, Leibniz and quantum cosmology.
- 14.15-14.40 Bernd Binder: A general quantum-gravitational scaling strategy connecting different dimensional fluxes.
- 15.45-19.00 Concurrents 5a: Green Lecture Room (403)**  
*Computations and quantum-models* (Chair: Ken Mogi, Helmut Mayer)
- 15.45-16.10 James Beran: Disambiguation in conscious cavities.
- 16.10-16.35 Maurits Van den Noort, Peggy Bosch and Kenneth Hugdahl: Quantum information theory and the human brain: the special role for human unconscious information processing.
- 16.35-17.0 David Scharf: Neural correlates and advanced physics.
- 17.00-17.25 Dagene Song: Can a computer have a mind? non-computability of consciousness.
- 17.25-17.50 Tarik Hadzibeganovic and Chu Kiong Loo: Neuro-quantum associative memory for letter-strings and faces.
- 17.50-18.15 Attila Grandpierre: Integral aspects of the action principle in biology and psychology: the ultimate physical roots of consciousness beyond the quantum level.
- 18.15-18.40 Alfredo Pereira Jr and Roberson S. Polli: Entropy reversal and quantum-like coherence in the brain.
- 18.40-19.05 Loo Chu Kiong and Mitja Perus: Cortical based model of object recognition: quantum Hebbian processing with neurally shaped Gabor wavelets.
- 15.00-16.15 Concurrent 5b Green Lecture Room (403)**  
*Cosmology and Consciousness II* (Chair: Gustav Bernroider, Stuart Hameroff)
- 15.00-15.25 Mary Fries: Overcoming discontinuity and dualism in modern cosmology.
- 15.25-15.50 Imre Andras Török and Vincze Gabor: Gravity minds ? Parallels between the basic characters of consciousness and gravity.
- 15.50-16.15 Maurice Goodman: Quantum mechanics, cosmology, biology and the seat of consciousness.

## Plenaries

**1 Digital Solution of the Mind-Body Problem** Ralph Abraham, Sisir Roy <abraham@vismath.org> (Department of Mathematics, Santa Cruz, U.S.A.)

Using the concepts of the mathematical theory of self-organizing systems in understanding the emergence of space-time at Planck scale, we proposed a digital solution of the mind-body problem. This will shed new light on the interconnection of consciousness and the physical world. **PL**

**2 The role of quantum cooperativity in neural signaling** Gustav Bernroider, Johann Summhammer <gustav.bernroider@sbg.ac.at> (Neurobiology, University of

Salzburg, Salzburg, Salzburg, Austria)

According to the neural doctrine (1), propagating membrane potentials establish the basis for coding and communication in the nervous system. The physical representation of information is assumed to be contained in the spatio-temporal characteristic of propagating membrane potentials as originally described by Hodgkin and Huxley (HH, 2). Despite an uncountable number of correlation studies employing HH-type signals (action potentials, APs) and brain function, the underlying equations of motion contain coupled dynamics of channel proteins and membrane voltage that still lack a consistent theoretical background. Generally, there is no fine grained level of precision in the correlation of action potentials with higher level brain functions and there are several inconsistencies behind experimental observations and HH type predictions. Action potentials are composed from the concerted flow of ions through aqueous membrane pores provided by a family of voltage sensitive membrane proteins. In a circular type of argumentation, selective permeability determines membrane voltage and membrane voltage determines permeability. There is no 'window' in the chain of events that could account for two indispensable features that are observed in 'real' neuronal ensembles and considered to be decisive in the exploration of cognitive processes: (i) large ongoing variability to repeated sensory representations as observed in the visual cortex more than ten years ago (3) and (ii) signal onset-rapidity in cortical neurons as shown previously (4). Both phenomena cannot be explained by classical HH type models. Further, in the view of recent advances in the atomic level reconstructions and molecular dynamics (MD) simulations, the originally proposed independence of within channel states (the 'gating particles' in the HH model) and independent gating states between channels seems to be untenable. In the present work we introduce quantum mechanical (QM) correlations (entanglement) into the dynamics of single channels and into the temporal evolution of multiple channel states. This is justified by at least two good reasons, (i) the gating transitions within channel proteins are established at the atomic scale, involving QM action orders at least over a certain number of vibrational periods of the engaged atoms, and ii) the states of the channel are not mutually independent as assumed in the classical model. Dropping the assumption of independent gating transitions, we introduce a model where sub-domains of the protein responsible for selectivity and permeation are in a short entangled state. The entanglement of gating domains implies that their probabilistic switching behaviour will be governed by some coordination, while each gating domain itself still appears fully random. The underlying model parameters can be tuned from independence, attaining the classical HH behaviour, to a two, three or more particle quantum mechanical entangled version. Our results show, that even with a very moderate assumption on the strength of entanglement that could resist the breaking

power of the thermal bath to which the protein is exposed, the signal onset can be several times faster than predicted by the HH model and is in accord with the observed in-vivo response of cortical neurons (4). This is a particularly important result in the view of the persistent debate about the survival time of coherent states in the brain. Further, we show that quantum correlations of channel states allow for ongoing signal variations that are observed in evoked cortical responses. (1) Barlow, H (1972) *Perception*, 1, 371-394. (2) Hodgkin, A.L. and Huxley, A.F (1952) *J Physiol (London)*, 117,500-544. (3) Arieli, A, Sterkin, A, Grinvald, A, Ad Aertsen (1996) *Science*, 273, 1868-1871. (4) Naundorf, B, Wolf F, M Volgushev (2006) *Nature*, 440, 1060-1063 **PL**

### **3 Schrodinger's Cat: Empirical research into the radical subjective solution of the measurement problem.**

Dick Bierman, Stephen Whitmarsh <d.j.bierman@uva.nl> (PN, University of Amsterdam, Amsterdam, Netherlands)

The most controversial of all solutions of the measurement problem holds that a measurement is not completed until a conscious observation is made. In other words quantum physics is a science of potentialities and the measurement i.e. the conscious observation brings about the reality by reducing the state vector to one of the Eigen-states. In a series of experiments modeled after the famous experiment by the Shimony group we have explored the brain responses of observers of a quantum event. In about 50% of the exposures this quantum event had already been observed about one second earlier by another person. This random manipulation was unknown to the final observer. The first experiment along these lines gave suggestive evidence for a difference in brain responses dependent on the manipulation. In subsequent experiments quantum events were mixed with classical events and the results of these experiments that have been reported elsewhere were ambiguous. In a final experiment we are trying to solve the paradoxical results obtained so far. In this experiment the final observer receives detailed information about the type of event that (s)he observes. Also the experimental protocol is such that not only pre-observed events cannot be distinguished from not pre-observed events on the basis of their physical characteristic but neither on the basis of inter-event time distributions. Results will be presented at the conference. **PL**

### **4 EEG Gamma Coherence Changes and Spiritual Experiences During Ayahuasca**

Frank Echenhofer <fechenhofer@ciis.edu> (Clinical Psychology, California Institute of Integral Studies, Richmond, CA)

Ayahuasca is a psychedelic sacramental brew used possibly for more than a thousand years by many indigenous communities of the Brazilian and Peruvian Amazon and by several syncretic religions that originated in 20th century Brazil and that combine ayahuasca sham-

anism and Christianity. In the last decade, a growing number of North Americans and Europeans have combined ayahuasca shamanism with other religious cosmologies and practices. Some ayahuasca reports are similar to archetypal spiritual experiences at the core of many religions. Studies have shown that authentic non-drug induced spiritual experiences cannot be distinguished from psychedelic spiritual experiences. Religious studies have suggested that psychedelics may have inspired the formative revelations of many shamanic cosmologies, some Greek mystery religions, the Hindu Vedas, and several ancient South and Central American religious traditions. Archetypal spiritual experiences, such as experiencing mandalas, journeying to other worlds, and encountering entities, are documented in monotheistic religions, ayahuasca shamanism, and in ayahuasca reports of North Americans and Europeans. Most spiritual traditions agree that waking consciousness can be transformed to reveal a more comprehensive reality. Studying ayahuasca may provide a reliable laboratory approach to use neuroscience and systematic phenomenological methods to reveal the neural correlates of archetypal spiritual experiences. Our findings, using a multi-disciplinary approach integrating the methods of comparative religion, anthropology, and qEEG, will be presented. Recently psilocybin was reported to facilitate profoundly meaningful experiences in healthy individuals. A psilocybin clinical trial designed to facilitate spiritual experiences in terminal patients has shown initial positive results. Research with a Brazilian ayahuasca religion found that long term users of ayahuasca had overcome alcohol addiction and neuropsychological testing revealed no detrimental effects. Previous psychedelic EEG research found theta and alpha power decreased during mescaline, psilocybin, and LSD, while some individuals showed increased modal alpha frequency. It has been theorized that EEG gamma coherence "binds" different modalities of cortical information processing. Because ayahuasca reports emphasize that the sensory, affective, cognitive, and spiritual modalities of experiencing are more integrated, we hypothesized that ayahuasca would enhance gamma coherence. Our research found that after 45 minutes of ingesting ayahuasca, participants reported the most intense consciousness alterations, or "peaking". Some reported very brilliant and unusual fast morphing visions comprised of dazzling colors, multiple layers, and exquisitely beautiful architectural structures. Some participants reported that music modulated the physiognomic aspects of the experiential display. Others experienced fear, being overwhelmed, and nausea and vomiting, all which are viewed in shamanism as bodily cleansing and healing. A few reported classical archetypal journey experiences, gaining entry to and exploring other realms of reality and communicated with intelligent entities. In eyes closed ayahuasca vs. baseline conditions, ayahuasca decreased alpha and theta power suggesting enhanced activation and information processing and enhanced

gamma coherence suggesting increased "binding" of sensory, affective, and cognitive processes. Some participants showed significant coherence changes in other EEG frequencies suggesting the importance of examining individual differences in future research. Our findings suggest ayahuasca may enhance both binding and cognitive complexity exemplified in feelings of interconnectedness and meaningfulness during archetypal spiritual experiences. **PL**

### **5 Why Quantum Mind to begin with? A Proof for the Incompleteness of the Physical Account of Behavior**

Avshalom Elitzur  
<Avshalom.Elitzur@weizmann.ac.il> (Univ, Rehovot, Israel)

Should quantum mechanics be applied to the study of consciousness? For this workshop's participants the answer is obvious, but mainstream science maintains that the burden of proof is on them. Penrose (1995) has put forward an ingenious argument that mathematical invention is non-algorithmic, but this argument failed to convince the mathematical community. This presentation presents a simpler argument of this kind. On the grounds of classical physics alone it is possible to prove that any physical description of behavior is, in principle, incomplete. Every simple analysis of a particular conscious experience, like that of a certain color or tone (a "qualia") reveals an ingredient that is not reducible to physical laws. While this is disturbing enough, worse consequences await any theory that allows these qualia to play any causal role in behavior. Chalmers (1996) has intensively studied the "zombie," a hypothetical human being that acts only by physical laws without having qualia. He then purported to prove that such a being must manifest all the actions manifested by a conscious human, including the assertion that consciousness is not explained by physical law. This way Chalmers hoped to maintain the closure of the physical world without denying that consciousness is a genuine phenomenon. I present a logical proof that Chalmers' argument is flatly wrong. Some form of dualism of the worst kind, namely interactive dualism, may be inescapable. I begin by showing that a zombie can never perceive a genuine contradiction between the physical mechanism underlying her perception and her immediate conscious experience. Zombies cannot – but humans do. From this difference it rigorously follows that consciousness, as something distinct by nature from any physical force, interferes with the brain's operation. The ways out of this conclusion are very few: 1. Dismiss consciousness as illusory, due to some kind of misperception afflicting numerous thinkers and scientists. In this case, "misperception" being a physical phenomenon by the very tenets of physicalism, the burden of proof is now back on mainstream physics: Future neurophysiology must be able to point out the particular failure in the human brain's operation which is responsible for many people's belief that

consciousness and brain mechanisms are not identical. 2. Concede that energy and/or momentum conservation laws do not always hold. This option ensures mainstream physics' antagonism. 3. Concede that the second law of thermodynamics does not always hold. This option too is bound to be vehemently opposed by the physical community. Since option (1) is an empirical question, the entire issue is no longer confined to philosophy. The answer is bound to come from scientific research. Returning to quantum mechanics, it is striking that, despite its abandonment of many basic notions of classical physics, it has never seriously considered options (2) and (3). I propose no solution to this problem. My aim is only to show that the riddle of consciousness is much more acute than usually believed, yet it can be resolved scientifically. **PL**

### **6 Realistic Superstring Mechanisms for Quantum Neuronal Behavior**

John Hagelin <hagelinj@aol.com>

(Physics, Maharishi International University, Fairfield, IA)

The abundance of "hidden sector" matter in the world today is a nearly inescapable conclusion of realistic superstring theories. Hidden sector matter provides a natural mechanism for macroscopic quantum coherent phenomena in biological systems, where characteristically high temperatures normally preclude such quantum behavior. String theory thus provides a plausible solution to the central challenge in quantum-mind research, namely, "how can the quantum-mechanical mechanisms one would naturally associate with consciousness possibly be supported by the human brain?" Elaboration: Many have speculated that aspects of conscious experience have their physical origin in quantum-mechanical mechanisms. The most challenging associated question has been, "How does the brain--a predominantly macroscopic organ immersed in a high-temperature, high-entropy environment--support quantum-mechanical mechanisms?" Whereas intracellular quantum-mechanisms have been proposed, it is probably essential that a complete quantum-mechanical understanding of consciousness will require quantum correlations that are intercellular--i.e., collective correlations among multiple neurons separated by macroscopic distances. Until now, fully viable quantum mechanisms have been elusive. We propose a plausible explanation for stable, large-scale quantum-mechanical coherence based on new physical mechanisms predicted by the superstring. All realistic string models contain "hidden sector" particles and forces, typically including a massless spin-1 "quasi-photon" and at least one light charged scalar meson. Whereas it had been previously assumed that these hidden sector particles interact only gravitationally with normal ("observable sector") fields, it now appears more likely that there is a weak electromagnetic coupling between the two worlds of matter. The hidden sector world is spatially and temporally coincident with ours, but due to its weak coupling, is only dimly observable through dedicated EM

detectors currently under development. Also due to its weak coupling, hidden sector matter does not equilibrate thermally with ordinary matter, and thus the hidden sector ambient temperature is calculated to be a few degrees Kelvin--similar to the cosmic neutrino background. This has two important physical ramifications: 1) Hidden sector matter, despite its weak coupling, clings electrostatically to normal matter--especially to carbon-based biological matter. Its concentration in the cellular interior is predicted to be high. 2) Due to its low ambient temperature, hidden sector particles are expected to exhibit macroscopic quantum coherent effects, and provide a viable mechanism for short-circuiting synaptic communication and for sustaining large-scale quantum correlation among distant neurons. In this talk, we present what is currently known about hidden sector matter and its potential relevance to quantum-mechanical biological functioning, and suggest avenues of future empirical and theoretical research. We also present published experimental evidence for long-range "field effects" of consciousness, that provide empirical support for the aforementioned quantum effects, and that help to discriminate among competing quantum-mechanical models of consciousness. **PL**

**7 Schrödinger's proteins: How quantum biology can explain consciousness** Stuart Hameroff <hameroff@u.arizona.edu> (Center for Consciousness Studies, University of Arizona, Tucson, Arizona)

Classical approaches to consciousness view brain neurons, axonal spikes/firings and chemical synaptic transmissions as fundamental information bits and switches in feed-forward and feedback networks of "integrate-and-fire" neurons. However this popular view 1) fails to account for unconscious-to-conscious transitions, binding, and the 'hard problem' of subjective experience, 2) forces the stark conclusion that consciousness is an epiphenomenal illusion and 3) conflicts with the two best correlates of consciousness: gamma synchrony EEG and anesthesia, both of which indicating that consciousness occurs primarily in dendrites (i.e. during collective integration - rather than fire - phases of integrate-and-fire). Gamma synchrony EEG requires dendro-dendritic gap junctions (lateral connections in hidden input layers of feed-forward network) and may require non-local quantum correlations to account for precise brain-wide coherence. Anesthetic gases selectively erase consciousness and gamma synchrony EEG, sparing evoked potentials, sub-gamma EEG, autonomic drives and axonal spike/firing capabilities. The anesthetic gases act solely by quantum London forces in non-polar pockets of electron resonance clouds within a subset of dendritic proteins. In the absence of anesthetic (i.e. consciousness), quantum superposition, coherence and non-local entanglement in these electron clouds are amplified to govern protein conformation and function, Thus anesthetic-sensitive proteins may act like quantum bits

("qubits"), engaging in quantum computation ("Schrödinger's proteins"). Scientists since Schrödinger have suggested an intrinsic role for biomolecular quantum effects in life and consciousness. The Penrose-Hameroff Orch OR model proposes consciousness to be a sequence of gamma-synchronized discrete events, corresponding with quantum computations among entangled, superpositioned microtubule subunits in gap junction-connected dendrites ("dendritic webs"). Microtubule quantum computations self-collapse by Penrose objective reduction (OR), a proposed threshold tied to instability in spacetime geometry separations/superpositions. Thus Orch OR connects brain processes to fundamental spacetime geometry in which (according to Penrose) Platonic values are encoded. Classical microtubule states chosen with each Orch OR event can trigger axonal spikes and convey the content of conscious experience. Orch OR appears vulnerable to decoherence in the "warm, wet" brain. However evidence suggests 1) heat can pump (rather than destroy) biomolecular quantum processes, 2) quantum coherence involving proteins occurs biologically in photosynthesis, 3) quantum correlations may govern ion channel cooperativity, 4) psychoactive molecules interact with receptors by quantum correlations, 5) quantum computing occurs at increasingly warm temperatures, 6) microtubules appear to have intrinsic quantum error correction topology, and 7) "quantum protectorates" occur in regions of non-polar electron resonance clouds in proteins, membranes and nucleic acids. Further, atemporal quantum effects can account for the famous "backward time" found in the brain by Libet, and allow real-time control of our conscious actions, rescuing consciousness from epiphenomenal illusion. So what is consciousness? According to Orch OR, consciousness is a sequence of events in fundamental spacetime geometry, "ripples on the edge" between quantum and classical worlds. The spacetime events are amplified through quantum processes in non-polar electron resonance regions to causally influence biomolecular functions, perhaps connecting us to quantum gravity instantiations of Penrose Platonic values, Bohm's "implicate order" or in some cases mystical, spiritual and/or altered state experiences. [www.quantumconsciousness.org](http://www.quantumconsciousness.org) **PL**

**8 Do quantum phenomena provide objective evidence for consciousness?** Richard Healey <rhealey@email.Arizona.edu> (Philosophy, University of Arizona, Tucson, Arizona)

Kuttner and Rosenblum (2006a,b) argue that a theory-neutral version of the quantum two-slit experiment provides objective evidence for consciousness--indeed the only objective evidence. However, their description of the experiment is not theory neutral. Kuttner and Rosenblum's argument that a particular experiment provides objective evidence for consciousness fails: their argument rests on dubious assumptions about the phys-

ical effects of consciousness for which we lack objective evidence. Reflecting on our current understanding of quantum theory is one nice way to illustrate this objection. Each of a variety of different interpretations of quantum theory rejects at least one key assumption of Kuttner and Rosenblum's allegedly theory-neutral description. Moreover, these include interpretations within which consciousness plays no role. Perhaps none of those interpretations will prove acceptable. Quantum theory itself may one day be superseded by a superior theory. Neither eventuality would undermine my objection, which does not depend on quantum theory, under any interpretation. I suggest that if there is objective evidence for consciousness it will be manifested in a very different class of phenomena. **PL**

**9 Quantum Mechanical Implications for Mind-Body Issues** Menas Kafatos, S.Roy;K.H.Yang;R.Ceballos <mkaafatos@crete.gmu.edu> (College of Science, George Mason University, Fairfax, VA)

Many authors have speculated on the importance of quantum theory to brain dynamics and even its relevance to consciousness. In particular, mind-body issues, by their very nature, imply non-classical physics approaches. Quantum mechanics, through the role of the observer, the measurement theory and recent laboratory evidence at the ion channel level, may have serious implications for these issues. In the present paper, we explore the relevance of Quantum Mechanics and some possible ontological as well as laboratory issues. **PL**

**10 Principles of Quantum Buddhism** Francois Lepine <info@quantumbuddhism.org> (Quantum Buddhism Association, St-Raymond, Quebec, Canada)

Science and religion have been opposed regarding consciousness since Descartes separated matter and mind: Cartesian dualism. Non-dualist approaches include scientific materialism in which matter produces mind, and idealism in which mind produces matter. On the other hand Buddhists (and neutral monists in western philosophy) believe mind and matter both derive from a deeper-lying common entity. In recent decades it has become evident that quantum physics and quantum gravity can provide a scientifically plausible accommodation of the Buddhist (and neutral monist) approach. In Buddhism the deeper-lying monistic entity is a pure Platonic wisdom of the Supreme Unified Consciousness which can give rise to matter and/or mind. In scientific terms it is the quantum geometry at the tiniest level (Planck scale) of the universe (quantum gravity), or the unified quantum field. Sir Roger Penrose proposed that Platonic forms including mathematical truth, ethical and aesthetic values (which Plato assumed to be abstract) exist as actual configurations of the Planck scale. Cosmic wisdom in Buddhist Supreme Unified Consciousness pervades the universe, involving, informing and

interconnecting living and non-living beings. Planck scale quantum information encoding Platonic values – cosmic wisdom - is non-local and holographic, hence repeating everywhere, atemporally (“everywhen”) and at various scales. Buddhist Supreme Unified Consciousness manifests matter and/or mind. Quantum geometry gives rise to either matter or matter and mind, depending on whether quantum state reduction to classical states occurs via decoherence or measurement (in which case matter), or a type of threshold-based self reduction (e.g. Penrose objective reduction) giving matter and conscious mind. In Buddhism, conscious awareness in an individual – self consciousness - is a series of ripples on the universal pond of Supreme Unified Consciousness. In science, self-consciousness is a series of Penrose objective reductions, ripples in quantum geometry on the edge between the quantum world of multiple coexisting possibilities, and the classical world of definite states. In science, conscious ripples, or moments are coherently synchronized with gamma EEG brain waves, 40 or more conscious moments per second. In western philosophy these are Whitehead's “occasions of experience”. Buddhism meditators report underlying flickering in their perception of reality, momentary collections of mental phenomena. Sarvaastivaadins described 6,480,000 “moments” in 24 hours (75 conscious moments per second), and other Buddhists as 50 per second. Meditating Tibetan Buddhist monks show highly coherent, high amplitude gamma synchrony EEG in the range of 80 per second, twice normal and more highly coherent. Samadhi is a Sanskrit word describing awareness in which sensory inputs, memory and self dissolve, a person's consciousness becoming totally one with Supreme Unified Consciousness. Samadhi occurs during deep meditation. Scientifically, in altered states quantum brain activities may become more directly connected with the universal quantum geometry and its collective information. The Quantum Buddhism Association was founded in early 2007, and aims at providing a set of tools to develop a scientific-spiritual approach to the world, unburdened by traditional cultural ritualistic and dogmatic weight, where development of the self prevails to become a conscious scientific instrument. **PL**

**11 A new quantum gravitational model for consciousness based in geometric algebra** Javier Martin-Torres <fn.f.martin-torres@larc.nasa.gov> (Virtual Planetary Laboratory, AS&M, NASA, Hampton, VA)

A new mathematical model for Quantum Consciousness based in geometric algebra and its results are presented. Two of the basic pillars of the model are the use of: i) gravity as an Orch OR mechanism (Hameroff and Penrose, 1996) and ii) the collective electrodynamics approach developed by Caver Mead (Mead, 2000), in which electromagnetic effects, including quantized energy transfer, derive from the interactions of the wavefunctions of electrons behaving collectively. Be-

tween other processes, a new mechanism for acusto-conformational transformation (ACT) by which Micro Tubules (MT) communicate with each other, and a decoherence upper limit are proposed. The model presented establishes a theoretical basis for one of the important (and not yet explained) points in Hameroff and Penrose's work for quantum consciousness: why the global quantum superposition is the default state. An isomorphism between mono-dimensional binary Cellular Automata and the Clifford Algebra  $Cl(8)$  and its applications to the modeling of the consciousness, together with the main implications of the proposed model will be discussed. References Hameroff, S. and Penrose, R., Orchestrated Reduction Of Quantum Coherence In Brain Microtubules: A Model For Consciousness?, In: Toward a Science of Consciousness - The First Tucson Discussions and Debates, eds. Hameroff, S.R., Kaszniak, A.W. and Scott, A.C., Cambridge, MA: MIT Press, pp. 507-540 (1996) Mead, C., Collective Electrodynamics: Quantum Foundations of Electromagnetism, The MIT Press; 1st edition (August 28, 2000). **PL**

**12 The Neuron: no longer the atom of neural computation** James Olds <jolds@gmu.edu> (Krasnow Institute for Advanced Study, George Mason University, Fairfax, VA)

Subsequent to the 1906 shared Nobel Prize of Cajal and Golgi, the neuron doctrine has been accepted as dogma to the nascent field that became neuroscience. The approximate number of  $10^{10}$  neurons in the human brain is often used to reference the immense complexity of the central nervous system, and entire sub-fields are based on the notion of the neuron as computational machine, integrating massive inputs across the dendritic tree to reach a "decision" regarding whether or not to fire an action potential. Here we put forward the notion that neuroscience has now moved substantially beyond the neuron doctrine. Neurons themselves contain multiple hierarchical levels of internal computational machinery (e.g. the Trans Golgi Network, spines, glutamate receptors, potassium channels) all of which can be said to contribute to the overall emergence of intelligent behavior and cognition. We propose that the true complexity of the human brain is far greater than has previously been accepted, and conclude that this requires a modification of the current reductionist approaches to neuroscience. Integrative neuroscience combined with approaches that have been successful with regards to other complex adaptive systems may provide a fruitful scientific direction for the field. **PL**

**13 Minding Quanta and Cosmology** Karl Pribram <pribramk@gmail.com> (George Mason University, Fairfax, VA)

The revolution in science inaugurated by quantum physics made us aware of the role of observation in the construction of data. Eugene Wigner remarked that in

quantum physics we no longer have observables (invariants) but only observations. Tongue in cheek I asked whether that meant that quantum physics is really psychology, expecting a gruff reply to my sassiness. Instead, Wigner beamed a happy smile of understanding and replied "yes, yes, that's exactly correct." David Bohm pointed out that, were we to look at the cosmos without the lenses of our telescopes, we would see a hologram. I have extended Bohm's insight to the lens in the optics of the eye. The receptor processes of the ear and skin work in a similar fashion. Without these lenses and lens-like operations all of our perceptions would be entangled as in a hologram. Furthermore, the retina absorbs quanta of radiation so that quantum physics uses the very perceptions that become formed by it. In turn, the higher order systems send signals to the sensory receptors so that what we perceive is often as much a result of earlier rather than just immediate experience. This influence from "inside-out" becomes especially relevant to our interpretation of how we experience the contents and bounds of cosmology that come to us by way of radiation. **PL**

**14 Quantum jumps and explanatory gaps** Paavo Pylkkänen <paavo.pylkkanen@his.se> (Consciousness Studies Programme, University of Skövde, Skövde, Sweden)

One reason why researchers ignore quantum theory in the explanation of consciousness is the mysterious nature of the theory. If we cannot make sense of the paradoxical features of quantum theory (e.g. wave-particle duality, discontinuity of motion, non-locality, collapse of the wave-function), how could we possibly hope that this theory will be of any help when trying to understand another mysterious phenomenon, namely consciousness? We thus first need a coherent interpretation of quantum theory which resolves the various paradoxes and provides us with an intelligible view of quantum phenomena. Equipped with such a view, we can then explore whether the place of mind in nature could be understood in a new, better way. If you like, we first need to close the explanatory gap in quantum theory, before we can use this theory to tackle the better known explanatory gap between matter and consciousness. In this talk I will discuss some philosophical problems of mind and consciousness in the light of Bohm's interpretation of quantum theory which includes new notions such as implicate order and active information. This interpretation is arguably one of the best candidates for a coherent interpretation of quantum theory, although debate about these issues is ongoing. Of course, the crucial question for any attempt to make use of quantum theoretical ideas in this context is whether there are aspects of mind and consciousness that cannot be adequately explained and understood in terms of "classical" explanatory frameworks – i.e. neural and/or computational frameworks which do not make any significant appeal to quantum



theory or to the New Physics more generally. There are, in fact, many aspects of mind/consciousness which pose a mystery to "classical" frameworks, but might be better understood in "quantum" frameworks. There is the problem of mental causation: if mental states are non-physical, how could they possibly affect physical processes without violating the laws of physics? If we assume that mental states are physical it becomes easier to understand their causal effect upon physical processes. But there are serious problems of conceiving of mental states (especially conscious states) as physical states, if "physical" is understood in the spirit of classical physics. There are also paradoxical aspects to the phenomenal structure of conscious experience, for example "time consciousness", at least when one understands time in the spirit of classical physics. My proposal is that quantum theory, especially under its Bohmian interpretation, changes our key concepts (such as "physical", "causation", "time", "space", "process", "movement", "information", "order") in such a way as to open up a new and better way of understanding features such as mental causation and time consciousness. Such changes in our fundamental concepts also make it possible to tackle the hard problem of consciousness in a fresh way. References Bohm, D. & Hiley B.J. (1993) *The Undivided Universe. An Ontological Interpretation of Quantum Theory*. London: Routledge. Hiley, B.J. & Pylkkänen, P. (2005) "Can Mind Affect Matter via Active Information", *Mind & Matter* 3(2): 7-27. Pylkkänen, P. (2007) *Mind, Matter and the Implicate Order*. Heidelberg: Springer. **PL**

**15 Objective evidence for consciousness and free will in the quantum experiment** Bruce Rosenblum, Fred Kuttner <brucero@ucsc.edu> (Physics, University of California, Santa Cruz, Santa Cruz, CA)

In the absence of objective, third-person evidence of conscious experience, i.e. "qualia," one can logically deny the very existence of consciousness beyond these correlates. Consciousness has, in fact, been claimed to be no more than the behavior of a vast assembly of nerve cells and their associated molecules. However, since the origins of quantum physics in the 1920s, consciousness has been seen by some to intrude into the physical world in a manner other than by its physiological and neural correlates. In this view, objective evidence for a physically efficacious consciousness actually exists. The experimental facts, at least, are undisputed. We will illustrate what can be considered a physical manifestation of consciousness with a theory-neutral description of a quantum mechanical thought experiment that can be realized in practice. We will argue that the only escape from our conclusion must be to deny one's ability to freely (or randomly) choose behavior. Moreover, such denial of "free will" must also involve a strange and unexplained connectivity between physical phenomena. Therefore the conclusion that consciousness itself, though yet unexplained, is physically efficacious is

at least as modest a hypothesis as any other. This thesis is developed in our recent book, "Quantum Enigma: Physics Encounters Consciousness," Oxford University Press, 2006. **PL**

**16 Aspects of Cosmic Consciousness in the Non-material and Non-empirical Forms of Physical Reality.** Lothar Schäfer <schafer@uark.edu> (Department of Chemistry and Biochemistry, University of Arkansas, Arkansas, AR)

The quantum phenomena have shown that reality appears to us in two domains: one is open and empirical and forms the world of seemingly separated, material things. The other is hidden and non-empirical and consists of interconnected, non-material forms. The former is the realm of actuality; the latter, the realm of potentiality in physical reality. Discovering the realm of forms places contemporary physics into the center of powerful historic traditions of spirituality, in which non-material forms were considered as primary reality and connected with a Cosmic Consciousness out of which everything is emanating. The lecture will describe some of the parallels and explore to what extent the quantum phenomena support the view that the primary reality has aspects of mind. In the quantum structure of empirical systems, the non-material forms exist as empty states, called virtual by quantum chemists. The entire universe can be considered a quantum system. Its occupied states form the visible part of reality; its empty states, the non-empirical part. Everything that is visible is the actualization of some quantum states. Everything that is possible is deposited in virtual states. Thus, the complex order in the biosphere does not emerge out of nothing and is not created by chance, as Darwinians claim, but it emerges by the actualization of virtual states whose logical order already exists in the non-empirical part of reality before it is expressed in the empirical realm. **PL**

**17 Experiments in Retrocausation** Daniel Sheehan <dshsheehan@sandiego.edu> (Physics, University of San Diego, San Diego, California)

The fundamental laws of physics are time symmetric, equally admitting time-forward and time-reversed solutions. That the former are readily observed while the latter are not presents perhaps the starkest asymmetry in nature: the unidirectionality (one-way arrow) of time. Common notions of causation are tightly bound with this asymmetry, as are also the phenomena of consciousness. While causation has long been taken for granted, retrocausation (the future influencing the past) has not. Over the last few decades, however, this situation has changed as theory has begun to admit more freely this possibility and experiments -- e.g., from orthodox quantum mechanics, physiology, and parapsychology -- have begun to provide quantitative evidence for retrocausal effects [1]. In this talk, seminal experiments purporting retrocausation will be reviewed and an attempt will be

made to put them into a general theoretical framework. From this more decisive experiments should emerge. [1] "Frontiers of Time: Retrocausation -- Experiment and Theory," AIP Conference Proceedings, Vol. 863, D.P. Sheehan, editor (American Institute of Physics, Melville, NY, 2006). **PL**

**18 Whiteheadian Quantum Ontology: The emergence of participating conscious observers from an unconscious physical quantum universe.** Henry Stapp <hpstapp@lbl.gov> (Theoretical Physics, Lawrence Berkeley National Laboratory, Berkeley, CA)

The inability of classical physical concepts to accommodate consciousness is noted, and is contrasted to the way that orthodox von Neumann-Heisenberg quantum theory beautifully does so. Close parallels between the detailed structure of ontologically construed relativistic quantum field theory and the ontology proposed by Alfred North Whitehead are noted, and the way that Whiteheadian philosophy accounts for the natural emergence of local pockets of participatory consciousness from a physical world initially devoid of consciousness is explained. **PL**

**19 Quantum Ideas and Biological Reality: the Warm Quantum Computer?** Marshall Stoneham <ucapams@ucl.ac.uk> (London Centre for Nanotechnology and Physics and Astronomy, University College London, London, United Kingdom)

Quantum ideas take many forms. The recognition that matter is quantised as atoms underpins the chemical industry. The recognition that charge is quantised as electrons lies at the core of microelectronics. But the several phenomena we identify as "quantum" are subtle, encompassing exclusion, tunnelling, limits to measurement, and entanglement. These ideas are less intuitive and less tangible at the macroscopic (human) scale. Yet, when our science approaches the nanoscale, there is no way to avoid quantum phenomena. Moreover, as ideas spread from the purely physical sciences to the biosciences, it appears that nature already exploits quantum behaviour even at ambient temperatures in unexpected ways, e.g., in vision and in olfaction. There are also credible ideas for condensed matter processing of quantum information even at room temperature, and some are based on soft matter. These proposals and some experiments, exploiting entanglement, rightly contradict the widely-held physicist views that quantum information processing is possible only at cryogenic temperatures. Yet it is far less clear that the brain exploits quantum entanglement. Any suggestion that similar entanglement-based mechanisms might operate in the brain still has to meet plenty of challenges, first as to the actual atomic-scale processes exploited, and secondly as to how a quantum computer might handle problems more

like a brain than like an enhanced classical computer. **PL**

**20 Why is consciousness soluble in chloroform ?** Luca Turin <luccaturin@mac.com> (Physics, University College London, London, England, UK)

It is now quite clear that the target of general anaesthetic gases is protein, and there is good evidence that neurotransmitter receptors are involved. Exactly which protein(s) anaesthetic gases act on, and by what mechanism, remains to be determined. I shall describe empirical and computational evidence in support of the idea that general anaesthetics act not allosterically, but by altering protein electron chemical potential. I shall discuss the relevance of this notion to both protein electronics and redox regulatory mechanisms. **PL**

**21 Electrodynamics signaling by the dendritic cytoskeleton: towards an intracellular information processing model.** Jack Tuszynski, Avner Priel; Horacio F. Cantiello <jtus@phys.ualberta.ca> (Physics, University of Alberta, Edmonton, Alberta, Canada)

A novel model for information processing in dendrites is proposed based on electrodynamic signaling mediated by the cytoskeleton. Our working hypothesis is that the dendritic cytoskeleton, including both microtubules (MTs) and actin filaments plays an active role in computations affecting neuronal function. These cytoskeletal elements are affected by, and in turn regulate, a key element of neuronal information processing, namely, dendritic ion channel activity. We present a molecular dynamics description of the C-termini protruding from the surface of a MT that reveals the existence of several conformational states, which lead to collective dynamical properties of the neuronal cytoskeleton. Furthermore, these collective states of the C-termini on MTs have a significant effect on ionic condensation and ion cloud propagation with physical similarities to those recently found in actin filaments and microtubules. We report recent experimental findings concerning both intrinsic and ionic conductivities of microfilaments and microtubules which strongly support our hypothesis about an internal processing capabilities in neurons. Our ultimate objective is to provide an integrated view of these phenomena in a bottom-up scheme, demonstrating that ionic wave interactions and propagation along cytoskeletal structures impacts channel functions, and thus neuronal computational capabilities. Acknowledgements: This research was supported by NSERC, MITACS, PIMS, US Department of Defense, Technology Innovations, LLC and Oncovista, LLC. **PL**

**22 Dissipative many-body dynamics of the brain** Giuseppe Vitiello, Walter J. Freeman Affiliation: Department of Molecular and Cell Biology, University of California, Berkeley CA 94720-3206 USA <vitiello@sa.infn.it> (of Physics "E.R.Caianiello", Univer-

sity of Salerno, Italy, Baronissi, Salerno, Italy)

Imaging of scalp potentials and cortical surface potentials of animal and human from high-density electrode arrays has demonstrated the dynamical formation of patterns of synchronized oscillations in neocortex in the beta and gamma ranges (12-80 Hz). They re-synchronize in frames at frame rates in the theta and alpha ranges (3-12 Hz) and extend over spatial domains covering much of the hemisphere in rabbits and cats, and over domains of linear size of about 19 cm in human cortex with near zero phase dispersion [1]. The agency of the collective neuronal activity is neither the electric field of the extracellular dendritic current nor the magnetic fields inside the dendritic shafts, which are much too weak, nor is the chemical diffusion, which is much too slow. By resorting to the dissipative quantum model of brain [2], we describe [3] the field of activity of immense number of synaptically interactive cortical neurons as the phenomenological manifestation of the underlying dissipative many-body dynamics such as the one responsible of the formation of ordered patterns and phase transitions in condensed matter physics in quantum field theory. We stress that neurons and other brain cells are by no means considered quantum objects in our analysis. The dissipative model explains two main features of the electroencephalogram data: the textured patterns correlated with categories of conditioned stimuli, i.e. coexistence of physically distinct synchronized patterns, and their remarkably rapid onset into irreversible sequences resembling cinematographic frames. Each spatial pattern is described to be consequent to spontaneous breakdown of symmetry triggered by external stimulus and is associated with one of the unitarily inequivalent ground states. Their sequencing is associated to the non-unitary time evolution in the dissipative model. The dissipative model also explains the change of scale from the microscopic quantum dynamics to the macroscopic order parameter field, and the classicality of trajectories in the brain state space. The dissipative quantum model enables an orderly description that includes all levels of the microscopic, mesoscopic, and macroscopic organization of the cerebral patterns. By repeated trial-and-error each brain constructs within itself an understanding of its surround, the knowledge of its own world that we describe as its Double [4]. The relations that the self and its surround construct by their interactions constitute the meanings of the flows of information exchanged during the interactions. [1] W. J. Freeman, Origin, structure, and role of background EEG activity. Part 1 & 2, Clin. Neurophysiol. Vol. 115, 2077 & 2089 (2004); Part 3 Vol. 116, 1118 (2005) ; Part 4. Vol.117, 572 (2006). [2] G. Vitiello, Dissipation and memory capacity in the quantum brain model, Int. J. Mod. Phys. B 9, 973 (1995). quant-ph/9502006. [3] W. J. Freeman and G. Vitiello, Nonlinear brain dynamics as macroscopic manifestation of underlying many-body dynamics, Phys. of Life Reviews 3, 93 (2006), q-bio.OT/0511037. Brain dynamics, dissipation and spontaneous breakdown of symmetry, q-

bio.NC/0701053v1 [4] G. Vitiello, My Double Unveiled. Amsterdam: John Benjamins, 2001. PL

**23 Subcellular processing related to memory and consciousness by microtubules and MAP2** Nancy Woolf <nwoolf@ucla.edu> (Psychology, University of California, Los Angeles, CA)

Among the various parts of the neuron, dendrites are arguably the best candidates for being key to higher cognitive function because they alone integrate large numbers of inputs. The neuronal membrane is the initial site of response to inputs from other neurons, but what lies beneath the neuronal membrane controls the level of synaptic response by computing new inputs relative to information stored in memory. Dendrites are enriched with microtubules and microtubule-associated proteins (MAPs); yet we do not fully know the purpose of these proteins. Accumulating evidence suggests that microtubules and MAPs play critical roles in memory and consciousness, as well as in neuronal transport. Microtubule-associated protein-2 (MAP2) is a dendrite-specific cytoskeletal protein that also acts as a signal transduction molecule, mediating internal chemical responses following synaptic release of neurotransmitters glutamate and acetylcholine. MAP2 and microtubules bind together to form a matrix that stores memory: as new memories form, MAP2 and tubulin proteolysis or breakdown occurs followed by a new subcellular architecture, structured as a modified microtubule matrix (Woolf, NJ, Progress in Neurobiology, 55:59-77,1998). Information stored in the microtubule matrix is then accessed upon the release of certain neurotransmitters, such as acetylcholine and glutamate. Acetylcholine controls the level of consciousness mainly through its muscarinic receptor resulting in downstream activation of kinases PKC and CaMKII, both of which phosphorylate MAP2 and participate in memory. Phosphorylation of MAP2 affects its interaction with microtubules, leading to possible alterations in the protein conformation of tubulin subunits and subsequently to the ability of microtubules to transport receptors, cytoskeletal proteins, and mRNA to synapses. Because of their downstream activation by neurotransmitters, microtubules are in a position to compute current synaptic inputs in the context of previous synaptic activity, and then to increase transport of certain learning-related molecules to synapses. No synapse acting in isolation can bring about a mental state of consciousness: it is instead necessary to have co-activation of a large number of synapses for conscious activity to arise. En masse transport of essential synaptic proteins by microtubules is needed to sustain enhanced synaptic activity, and it is possible that quantum level computations play a role in directing coherent transport both locally and non-locally. We have previously proposed that acetylcholine facilitates quantum computations in microtubules by phosphorylating MAP2 (Woolf NJ & Hameroff SR, Trends in Cognitive Science, 5:472-8, 2001). In this

presentation, I propose that the pattern of MAP2 binding to the microtubule forms a gel-based contour which represents information stored by the learning mechanism and provides a physical basis for realizing that stored information (Woolf, NJ, Journal of Molecular Neuroscience, 30:219-22, 2006). When MAP2 is phosphorylated, this gel-based contour expands along a given microtubule and affects the propagation of information longitudinally down the microtubule, and tangentially, the contour affects the state of neighboring microtubules. In these two ways, physically activated microtubules transmit a particular pattern related to a barrage of current inputs in the context of information stored in memory resulting in a coherent response spanning multiple synapses. **PL**

**24 The Truth-Observable: A link between logic and the unconscious** Paola Zizzi <zizzi@math.unipd.it> (Mathematics, University of Padova, Padova, Italy)

In Quantum Mechanics, an external measurement of the physical state of a closed quantum system is described mathematically in terms of quantum operators, by which one defines physical observables satisfying the completeness relation: summing up the observables yields the identity. The logical meaning of the completeness relation is that the logical truth splits into partial truths, each of them corresponding to an act of measurement from outside. This is due to the physical fact that any external measurement is an irreversible process, which destroys quantum superposition. Then, an external observer can grasp only fragments of an inner, global truth. Only an internal observer would be able to achieve the global truth at once, as a whole, by making an internal measurement [1], as inside the closed quantum system, he can perform only reversible transformations, described by unitary operators  $U$ . The uniqueness and unitarity of such measurement operators allow defining a unique quantum observable that is just the identity: the truth-observable [2]. Notice that in quantum computing [3],  $U$  is a quantum logic gate. Then, in this case, an internal measurement corresponds to a quantum computational process. In the theory of a quantum-computing mind [4], we believe that there exists a deepest unconscious state that cannot be known directly from outside. We argue that it is the deep unconscious, which can achieve the "truth" as a whole; the conscious mind can grasp only partial "truths". Quantum information is processed by the unconscious and then is made available to our conscious mind as classical information. As a quantum computer is (due to quantum parallelism) much faster than its classical counterpart, the task done by the unconscious is fundamental to prepare our classical reasoning. The unconscious, endowed with global knowledge (the truth-observable), is rich enough to originate creativity. Global knowledge and creativity together is what enables us to use metalanguage, which makes us so different from (classical) computers, imprisoned in their object language. But also, the truth-observable

might be placed at the heart of the logical study of the most severe mental diseases (like schizophrenia) which are very hard to be cured psychoanalytically. On the other hand, less deep unconscious states (pre-conscious) are psychoanalytically interpretable from outside. For example, subjective experiences, which cannot be directly communicated (but only interpreted) should be included in the pre-conscious, not in consciousness. In fact, a shared knowledge (in Latin: cum-scio from which derives the English consciousness) is impossible without communication. References [1] P. Zizzi, "Qubits and Quantum Spaces", International Journal of Quantum Information Vol. 3, No.1 (2005): 287-291. [2] P. Zizzi, "Theoretical setting of inner reversible quantum measurements", Mod. Phys. Lett. A, Vol. 21, No.36 (2006): 2717-2727. [3] M. A. Nielsen, I. L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press (2000). [4] S. Hameroff, R. Penrose, "Orchestrated reduction of quantum coherence in brain microtubules: a model for consciousness". In: Toward a Science of Consciousness. The First Tucson discussions and Debates. Eds. S. Hameroff, A. Kaszniak, and A. Scott. MIT Press, Cambridge, MA (1996). **PL**

## Concurrents

**25 Moiré wave patterns as the own language of the brain** Alexey Alyushin <aturo@mail.ru> (Philosophical Faculty, Moscow Lomonosov State University, Moscow, Russia)

My hypothesis is that the own language of the brain is the dynamical geometry of bioelectrical wave patterns of the moiré origin. The moiré effect is produced by superposing of two or more periodical structures, like hardbody or graphical lattices or oscillatory wave sets, launching them into move in relation to each other, and obtaining an emergent (called alias) structure out of this superposition in move. There are a number of regular wave oscillations in brain, comprising the whole set of wave bands. Brain oscillations correspond to sequences of frames, being the synchronized in firing, although spatially dispersed, transient constellations of neurons (F. Varela). Given the existence of several oscillatory wave structures and the corresponding flows of frames in the brain, the suggestion is due that multiple overlays of rhythmical oscillations or frame flows should produce moiré patterns within their entire manifold. The question is what might be the function of these patterns. I suggest that moiré patterns are far not the distortive noise within a system, as they are commonly approached to in the TV and photo imaging technique; and they are not just empty by-products of some master process within the brain. They themselves are driving gears of brain working, the meaning-containing and meaning-processing units. The function of the lower-order brain oscillations is to bring about and to keep active the higher-order moiré patterns. The most important thing about moiré patterns is that they are emergent structures in respect to those

oscillatory patterns that underlay them. They are emergent in a sense that their structure is not contained in either of the underlying patterns; they are entities in themselves. Although with the change or fading of underlying oscillatory patterns the emergent pattern also changes or vanishes. I go further and suggest that the emergent moiré pattern might steer the underlying oscillations for the sake of its own self-sustention. It can well be so that at the early stages of the brain evolution only the lower-order oscillations were present in primitive brains providing for the basic perceptive data processing. But as the brain was developing into a more complex unit and proceeded to generate and to serve the higher mental functions, the formerly derivative and rudimentary moiré phenomena unveiled their abilities and acquired the master control. Enduring and self-sustained wave formations of the moiré origin in the brain are good candidates for being considered as the neural correlates of cognitive and mental structures, including consciousness. If we compare the moiré model with the holographic model of the brain (K. Pribram and others), the first will look advantageous for introducing dynamics. The holographic model is mostly static, dealing with distribution of wave interferences in space, whereas the moiré model stresses the temporal aspect of interaction of wave structures. As a matter of fact, it also deals with interferences, but in their temporal dynamics. Therefore, the holographic model and the moiré model could productively accompany each other. (Some visual moiré patterns will be generated and demonstrated during the presentation by means of computer simulation). C

**26 What could possibly count as a physical explanation of consciousness ? the view from the inside and the Bekenstein bound.** Uzi Awret <uawret@cox.net> (Falls Church, Va.)

In 1992 in the 'Times Literary Supplement' Jerry Fodor laments. 'Nobody has the slightest idea how anything material could be conscious. Nobody even knows what it would be like to have the slightest idea about how anything material could be conscious. So much for the philosophy of consciousness.' 20 years later in an article destined for the 'Encyclopedia of Cognitive Science' Ned Block claims that: 'There are two reasons for thinking that the Hard Problem has no solution. 1. Actual Failure. In fact, no one has been able to think of even a highly speculative answer. 2. Principled Failure. The materials we have available seem ill suited to providing an answer. As Nagel says, an answer to this question would seem to require an objective account that necessarily leaves out the subjectivity of what it is trying to explain. We don't even know what would count as such an explanation.' The purpose of this paper is to respond to Fodor and Block's challenge by producing a highly speculative physical theory that can count as a possible physical explanation of consciousness. The biggest

problem in attempting to conceive of a physical explanation of consciousness is not the irreducible need to sweep certain difficult issues under the carpet. That is true to some degree for any physical explanation. The problem is to conceive of the carpet. The approach taken by this paper will be to: 1) Establish the possible existence of physical singularities in the brain assumed to be created by informational self interaction and informational self collapse by taking advantage of the shifting and vague line of demarcation separating physical interaction and information theoretic communication. 2) Adopt John Wheeler and Bryce DeWitt's 'black hole bounce' which allows for the possibility of a whole new universe in the singularity at the center of certain black holes. This will provide us with a 'view from the inside' that is completely inaccessible from an 'outside' that has no room for it. 3) Subject questions about the nature of that space, especially the possibility of a phenomenal nature, to a radical suspension. A radical suspension is not a temporary suspension employed for tactical reasons but a more permanent suspension of the type that physicists or mathematicians adopt in the exploration of singularities. 4) Use our knowledge of neural architecture and the physics of brains to establish the conditions that would enable the emergence of such singularities based on 1). For example, if some brain region with a volume of one cubic centimeter was made to contain more than  $10 \exp(60)$  bits of information it would have to be a singularity because of the Bekenstein Bound. 5) Conceive of an experiment that is capable of verifying 4) in real brains and establish the existence of such singularities as a minimal NCC. (Neural Correlates of Consciousness.) This paper claims that if 1) through 5) are satisfied then it is possible to furnish at least one possible physical explanation of consciousness despite the radical suspension imposed by 3) precisely because singularities can be explored from the outside in the same way that physics can determine the Chandrasekhar Limit and the Schwarzschild Radius of black holes from the outside. This approach is compatible with Kant's Transcendental Epistemology which seeks to determine the scope and limits of knowledge from the inside. (See Janic and Toulmin's Wittgenstein's Viena.) A mature science is one which explores its own limitations. Instead of attempting to establish the general conditions of possibility that would have to be satisfied in order to produce a scientific explanation of consciousness the paper will end with a putative token singularity based physical theory of consciousness that is capable of satisfying 1) to 5). C

**27 Identifying the Interaction between the Quantum and Classical World as the Blue Print for Conscious Activity in Cognitive Vision Systems.** Wolfgang Baer <baer@nps.edu> (Information Sciences, Naval Postgraduate School, Monterey, California)

I present a physically viable mind/body model based

upon Whiteheads assumption that events called 'actual occasions' are conscious and fundamental building blocks of the universe. This building block is a process connecting first person experience with its explanation and is independent of any belief system defining reality for an individual. I will select quantum theory as a physically viable reality belief and will show that in this case consciousness is identified within its measurement and state preparation cycle. I generalize this result by identifying the architecture of the interaction between the quantum and classical world is the blue print for conscious activity. According to this theory consciousness itself can be modeled by a cycle of activity required to transform a description of experience into a description of the physical reality causing the experience in any model of reality we chose to believe. It is not the specific model of physical reality but rather the activity of reading from and writing into the model that captures the essence of consciousness phenomena, and such activities can be found in all systems and from microscopic to cosmological scales. As a practical application I will then identify the conscious process in cognitive vision systems being developed to support Unmanned Aerial Vehicle operations at the Naval Postgraduate School in Monterey Ca. By recognizing the conscious process executed by man-in-the loop systems and identifying the cognitive algorithms being executed, we can automate the process by systematically transferring human to machine operations. I will conclude by presenting the results of target mensuration and vision understanding experiments utilizing sensor report to database explanation transforms that implement Whiteheads actual occasions **C**

**28 Characteristics of Consciousness in Collapse-Type Quantum Mind Theories** Imants Baruss <baruss@uwo.ca> (Psychology, King's University College, London, Ontario, Canada)

Whereas there has been considerable effort expended to develop the technical aspects of quantum mind theories, little attention has been paid to what must be the nature of consciousness for such theories to be true. The purpose of this paper is to rectify that imbalance by looking at some of the apparent characteristics of consciousness in some of the theories in which consciousness is said to collapse the state vector (Baruss, in press, for a review of such theories), on the understanding that decoherence can not entirely solve the measurement problem (Adler, 2003). Three characteristics become immediately apparent. The first is a volitional aspect of the mind that needs to be distinguished from awareness or observation (Baruss, 1986; Walker, 2000). Some insights about this notion of will can be gleaned also from evidence outside the quantum mind context that intention can affect physical systems (e.g., Jahn & Dunne, 2005). The second characteristic is the stratification of consciousness so that the experiential stream that

goes on privately for a given person needs to be distinguished from a universal deep consciousness, somewhat akin to David Bohm's implicate order (Bohm & Hiley, 1993), that might underlie ordinary consciousness. Thus, the question arises regarding quantum mind theories of the relative contributions of deliberately intentional acts that occur within one's experiential stream (cf. Stapp, 2004; 2005) and nonconscious coordinated intentions implicit in deep consciousness (cf. Goswami, 1993, 2003; Walker, 1970, 2000). Support for introducing such stratification also comes from modelling anomalous human-machine interactions such as the M5 theory of Robert Jahn and Brenda Dunne (2001) as well as from reports of apparently direct participation in such deep consciousness (e.g., Baruss, 2003, Merrell-Wolff, 1994, 1995). Third, in transferring the notion of the collapse of the state vector from the context of observation in experimental physics to manifestation of everyday life, the temporally discrete nature of such collapse is usually retained so that ordinary waking state consciousness would actually be discontinuous. This suggests the possibility of a flickering universe (cf. Matthews, 2000) whereby physical reality, including its spatial features, arises from a pre-physical substrate, perhaps at the rate of once per Planck time. This idea is consistent with efforts to liberate quantum theory from classical restrictions (e.g., Durr, 2005; Aerts & Aerts, 2005; Mukhopadhyay, 2006) and with speculations about Planck-scale physics (cf. Ng, 2003; Ng & van Dam, 2005). Although these particularly need to be judged critically, there are also some reports of the direct apprehension of the discontinuous arising of physical reality from a pre-physical substrate in altered states of consciousness (e.g., Wren-Lewis, 1988; 1994). A volitional aspect of mind, the stratification of consciousness, and discontinuity of the ordinary waking state are some of the characteristics of consciousness implicit in some collapse-type quantum mind theories. **C**

**29 A four-dimensional hologram called consciousness** James Beichler <jebco1st@aol.com> (Physics, Division of Natural Science and Mathematics, West Virginia University at Parkersburg, Belpre, Ohio)

The reality of a fourth spatial dimension is now being established in science. The fourth dimension of space is magnetic in nature and thus offers a suitable medium for the storage of memories in mind and consciousness. Consciousness also emerges as a holographic magnetic potential pattern in the fourth dimension. When the passage of time is added to the picture, consciousness becomes a holomovement in five-dimensional space-time. The magnetic potential pattern is induced in the higher dimension by the electrical activity of microtubules (MTs). Each MT is an individual quantum magnetic inductor. When successive MTs inside an axon "fire" in sequence they induce a unique and complex magnetic potential pattern in the higher-dimensional extension of

the three-dimensional material brain. This pattern of magnetic potential in the higher-dimensional field constitutes holographically stored memories that can be retrieved by the brain through a reverse process. The vast complexity of the different stored memory patterns constitutes the consciousness of an individual. On the other hand, MTs within different neurons, neuron bundles and neural nets also act coherently to form individual thoughts and streams of thought within the brain. Coherence is established as the inductor-MTs in individual neurons act in concert with axon wall-capacitors to form a complex of microscopic LRC (tuning) circuits. Each MT-axon wall circuit resonates with similar MTs in a complex pattern of neurons, thus establishing and maintaining coherence within the brain. **C**

**30 Disambiguation in conscious cavities** James Beran <jimberan@earthlink.net> (Richmond, Virginia)

Using information-based causal principles to work back from our conscious experience, we can develop models of how consciousness might be produced. This paper discusses one such model that can be tied to features found in cerebral cortex and possibly also in other parts of the brain. In this model, neural signals with ambiguous sensory information are received at an input level of a multi-level structure, and, in response, output neural signals, which can be thought of as disambiguated results, are provided at an output level of the structure; between or around the input and output levels is a region in which neural signals interact with conscious information to disambiguate the sensory information and obtain the results. This combination of features can be modeled as a cavity, by rough analogy to certain optical cavities. Disambiguation has mathematical similarities to separation or collapse of an entangled system (referred to herein as "disentanglement") [1], and these similarities suggest that the disambiguating interactions could include disentanglement events that affect disambiguated results. This paper compares disentanglement effects with other mechanisms that could plausibly affect disambiguation in such a cavity, such as action potentials traveling along lateral axons or electromagnetic effects resulting from action potentials. One point of comparison is whether each type of interaction is consistent with known features of cerebral cortex and other parts of the brain. Another is whether evolution could and did produce neural structures in which conscious information could have each type of interaction; this paper therefore examines mutations that might have enabled DNA to produce such neural structures. Even though we may not find a sharp evolutionary divide between our non-conscious and conscious ancestors, the emergence of such neural structures would suggest when earlier forms of consciousness emerged. [1] Bohm, D. and Hiley, B.J., *The Undivided Universe*, 1993. **C**

**31 A General Quantum-Gravitational Scaling Strategy Connecting Different-Dimensional Fluxes** Bernd Binder <binder@quanics.com> (Quanics.com, Salem, Germany)

The paper will present a unique view about the scaling of different-dimensional quantum fluxes and wave functions, which allows to understand and predict the geometric structure and dynamics of (neuronal) networks able to interact via local and non-local quantum-gravitational processes. It is nowadays commonly agreed that the weakness of gravity can in general be assigned to extra-dimensions (holographic principle). Further, it can be argued that an extra-dimensional interface can provide for the necessary coherence and stability (cooling) for lower-dimensional topologies and structures in a thermodynamic sense. To connect, adjust, or transform different-dimensional flux topologies it will be shown that it is the intrinsic unit scale (and not the semi-classical Planck scale) that can build the reference-bridge between the scaling laws of different fields. Therefore, defining the quantum-gravitational fields carrying this intrinsic unit scale dynamics, insures that any power law scaling with or without extra-dimensions will intersect at this scale (since any power of 1 is 1). In this manner it can be shown that different-dimensional interaction fluxes follow a general spatio-temporal scaling scheme on all scales, which can be found on the cosmic scale as Kepler's 3rd law and on the quantum scale as Compton's law. The necessary transformations of the general spatio-temporal scaling scheme can be quantified on a pure geometric ground, where relevant physical properties are the signal dynamics given by the spatio-temporal metric adjusted to the proper number and mass scaling encoding a closed holographic system. Finally, it will be shown that living things, brains, cells, and molecular clusters in the mid-scale are well-designed to focus, transform, and project weak extra-dimensional and non-local gravitational fluxes onto strong low-dimensional currents in (neuronal) network channels pumping, driving, and triggering local electromagnetic processes. **C**

**32 Combining prototypes: quantal macrostates and entanglement** Reinhard Blutner <blutner@uva.nl> (ILLC, University of Amsterdam, Amsterdam, The Netherlands)

Classical truth-functional semantics and almost all of its modifications have a serious problem in treating prototypes and their combination. Though some modelling variants can fit many of the puzzling empirical observation, their explanatory value is seldom noteworthy. I will argue that the explanatory inadequacy is due to the Boolean characteristic of the underlying semantics, which only allows mixing possible words but it excludes the idea of superposition crucial for geometrical models of meanings. In the main part, I will present a quantal model of combining prototypes. The model elaborates a

recent proposal by Aerts & Gabora (2005) and systematically explores an orthoalgebraic approach to propositions as subspaces of an underlying Hilbert space. The quantum model is a minimalist variant of a classical possible world approach and rests on four general assumptions: (1) concepts are superpositions of linearly independent base states that conform to possible worlds; (2) typicality is represented by quantum probabilities; (3) combinations of concepts are calculated as tensor products; (4) there is a diagonalization operation involved, which leads to states that entangle the prototypical properties of the involved concepts. I demonstrate that the model can predict the basic findings on combined prototypes without further stipulations. Firstly, this concerns the existence of the 'conjunction effect of typicality' (goldfish is a poorish example of a fish, and a poorish example of a pet, but it's quite a good example of a pet fish) and secondly the strength of this effect (in case of "incompatible conjunctions" such as pet fish or brown apple the conjunction effect is greater than in "compatible conjunctions" such as red apple). In the final part, I will reflect the philosophical background and look for possible generalizations. In agreement with Aerts & Gabora (e.g. 2005), Chalmers (1995), beim Graben & Atmanspacher (2006) I suppose that the emergence of quantal macrostates does not necessarily require the reference to corresponding quantal microstates. Instead, complementary observables (traditionally restricted to quantum systems) can arise in classical systems as well. Crucial is the concept of generating partitions in the theory of nonlinear dynamical systems: a partition is generating if it divides the state space into regions prescribed by the dynamics of the system, thus permitting the definition of states that are stable under the dynamics. Complementary observables can arise in classical systems whenever the partitioning of the corresponding state space is not generating (Graben & Atmanspacher, 2006). The composition of classical systems with generating partitions can lead to a complex system with quantal characteristics. That is true for conjoined prototypes, and it's perhaps also true for semantic systems that combine the effects of contexts and possible worlds (see Kaplan's (1979) two-dimensional semantics of demonstratives). Interestingly, diagonalization is admitted in this case too, whereas certain other operations ('monsters') are forbidden. Quantum Theory can explain the admission of constraints due to the unitary character of quantal evolution. **C**

**33 toward a new subquantum integratio approach to sentient reality** Robert Boyd, Dr. Adrian Klein, MDD <rboyd@iqonline.net> (Princeton Biotechnologies, Inc., Knoxville, TN)

Recent experimental results have proved intractable to explanation by resorting to existing physics paradigms. This fact, along with certain fallacies inherent in mainstream physical-cognitive theories of mind, have en-

couraged the authors of this paper to transcend the currently operative limits of investigation, thus to explore the abyssal depth of the still uncharted, but highly rewarding, SubQuantum regimes. The subquantum is herein assumed to co-existentially accommodate proto-units for matter, energy and Information, which are thereby brought onto an equal ontological footing, in the subquantum domains. Devolving its argumentation and orientation from the Nobel Prize winning Fractional Quantum Hall Effect, which opened the perspective toward a further divisibility of the Quantum domain, hitherto considered as an irreducibly fundamental description of nature, the hereby proposed inter-theoretic model claims to satisfy advanced scientific and philosophic requests, as reformulated for a conceptually new working hypotheses. Subquantum potentials evolving in the Prime Radiation Matrix result in organizing functions able to interfere with classical local determinacy chains, operating at the Quantum levels of randomness inherent in space-time-like matter configurations, leading to highly complex representational patterns, linked to their phenomenal correlates in macroscopically detectable systems. Our model is strongly rooted in an overwhelming experimental evidence derived from multidisciplinary contexts. Our basic understanding identifies the Quantum Potential as a superluminal SubQuantum Information-carrying aether able to interact with matter and physical forces at well defined space-time positions, injecting their Information content into our world of observables by modulating the event potential. This interaction is possible as soon as matter is defined by an n-degree entanglement state of SQ complexity. Absolute void refers to lack of matter which equals to a space-time sequence contending Information in its nascent, non-aggregative form (the Sub quantum plenum) as observed from our Space-Time perspective. It contains implicated layers of increasingly subtle pre-quantum domains, where each manifestation range may be organized into complete worlds, such as our own, each of them ranging until its own "absolute void", the transition state to the next implication level of reality. Pre-quantum tenets rely upon experimentally testable assessments. Our proposal has a strong outreach into unprecedented explanatory options for anomalous output data distribution in non-conventional exploration fields, whose statistically significant results become logically integrated into epistemologically sustainable blueprints. Our views are perfectly consistent both with conventional empirical treatment of space-time defying representational variables, and their causal primacy upon Quantum implementation systems of their content, in the integral range of their polyvalent manifestation. Detailed descriptions of mind/matter entanglement patterns are supplied, as running in the holistic superimplicative sentient reality domains, under the overarching regulation of Cosmic Harmony, underpinning a continuous creation cosmogenetic process. As our analysis addresses a pre-temporal range, the thus defined endless time vector allows ab-



initio existing inherent resonance links in any SQ subtlety domain to turn into fluxes and organization effects leading to sequential entelechial self-contained worlds. These primeval harmonic SQ resonances are the very pattern of our overarching cosmic harmony just mentioned, the source of all conceivable manifestation and interconnectedness. **C**

**34 The Big Condensation-Not the Big Bang** R.W. Boyer <rw.boyer@yahoo.com> (Fairfield, IA)

R. W. Boyer Girne American University Girne, Northern Cyprus According to the consensus cosmological theory of the inflationary ‘Big Bang,’ the universe originated, presumably instantaneously from nothing, as an inherently dynamic, randomly fluctuating, quantum particle-force field that eventually congealed into stars, planets, and organisms such as humans complex enough to generate consciousness. This fragmented, reductive materialistic view is associated with a bottom-up matter-mind-consciousness ontology, in which the whole is created from combining the parts. In this view, consciousness is an emergent property of random bits of energy/matter that somehow bind into unitary biological organisms mysteriously developing control over their parts. On the other hand, the holistic perspective in Vedic science is a top-down consciousness-mind-matter ontology, in which the parts manifest from the whole. In that perspective, the origin of the universe is better characterized as the ‘Big Condensation’ rather than ‘Big Bang.’ Phenomenal existence remains within the unified field and manifests, limits itself, or condenses into subjective mind and objective matter. The holistic perspective of ultimate unity and its sequential unfoldment is contained in the structure of Rik Veda.<sup>1</sup> Vedanta is from the experiential perspective of unity, and the sequential unfoldment of phenomenal levels of nature within unity is articulated, for example, in Sankhya and Ayurveda. The holistic perspective is more consistent with developing understanding in unified field theories, spontaneous symmetry breaking, quantum decoherence, the ‘arrow of time,’ and the 2nd law of thermodynamics, which imply the universe originated from a lowest entropy, supersymmetric, even perfectly orderly, super-unified state. The holistic perspective in Vedic science provides means for resolving fundamental paradoxes in the reductive, materialistic, bottom-up ontology? including the ‘hard problem’ of consciousness, order emerging from fundamental random disorder, life emerging from non-life, free will, and everything emerging from nothing.<sup>2</sup> **C**

**35 Examining the Effect of Physiological Temperature on the Dynamics of Microtubules** Travis Craddock, Jack A. Tuszyński <traddock@phys.ualberta.ca> (Physics, University of Alberta, Edmonton, Alberta, Canada)

The leading objection against theories implicating quantum processes taking place within neuronal micro-

tubules states that the interactions of a microtubule system with an environment at physiological temperature would cause any quantum states within the system to decohere, thus destroying quantum effects. Counter arguments state that physiologically relevant temperatures may enhance quantum processes, and that isolation of microtubules by biological mechanisms, such as actin gel states or layers of ordered water, could protect fragile quantum states, but to date no conclusive studies have been performed. As such working quantum based models of microtubules are required. Two quantum-based models are suggested and used to investigate the effect of temperature on microtubule dynamics. First, to investigate the possibility of quantum processes in relation to information processing in microtubules a computer microtubule model inspired by the cellular automata models of Smith, Hameroff and Watt, and Hameroff, Rasmussen and Mansson is used. The model uses a typical microtubule configuration of 13 protofilaments with its constituent tubulin proteins packed into a seven-member neighbourhood in a tilted hexagon configuration known as an A-Lattice. The interior of the tubulin protein is taken to contain a region of two areas of positive charge separated by a barrier of negative charge and is based on electrostatic maps of the protein interior. The interior arrangement constitutes a double well potential structure within which a mobile electron is used to determine the states of an individual tubulin dimer. Dynamics of the system are determined by the minimization of the overall energy associated with electrostatic interactions between neighbouring electrons as well as thermal effects. Classically the model allows transitions for electrons with sufficient energy to overcome the potential barrier in which the new configuration lowers the system’s energy, or if the configuration raises the system’s energy, with a finite probability. Quantum mechanically the model allows the electron to tunnel through the potential barrier allowing transitions for which the system’s energy is lowered even if the electron does not possess the necessary energy to overcome the potential barrier, or for configurations that raise the system’s energy with the same finite probability as in the classical scenario. The emergence of self-organizing patterns that are static, oscillating, or propagating in time are taken as the determining factors of the system’s capability to process information. Second, to further the investigation of quantum processes taking place in microtubules, an exciton model of the microtubule is used. Tubulin monomers are taken as quantum well structures containing an electron that exists in its ground state, or 1st excited state. Following previous work that models the mechanisms of excitation energy transfer in Scheibe aggregates the issues of determining the strength of excitation and phonon interactions, and the effect on the formation and dynamics of coherent excitation domains within microtubules are discussed. Also estimates of energy and time scales for excitons, phonons, their interactions and thermal effects are presented. **C**

**36 Consciousness As Access To Active Information: Progression, Rather Than Collapse, Of The Quantum Subject**

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The link between consciousness and quantum theory often draws on the views of von Neumann on wave function collapse. From a biological standpoint several arguments favour a different approach. Any quantum mechanical process involved needs to link in to classical biophysics and the most plausible route is through the correspondence principle (as Feynman's QED life history of a photon scales up to classical diffraction by Young's slits). In this scaling up, wave function collapse loses significance, the dynamics being dictated by the laws of linear progression (von Neumann type 2, rather than type 1). Moreover, wave function collapse is not required by all interpretations of QM, a widespread view being that it is neither useful nor meaningful to divide the quantum system into arbitrarily defined "sub-processes". There are also severe difficulties in defining the boundaries of the "quantum system" with wave function collapse or decoherence approaches. Linear progression through a physical environment (Young's slits, brain) involves an interaction with the environment which entails access by the quantum system (e.g. photon) to what Bohm and Hiley usefully call "active information" about its environment. Access to information is both an indivisible and a bounded phenomenon. Since consciousness appears to be a state of access to a rich, indivisible, yet bounded, pattern of information this makes access to active information at the quantum level an attractive explanation. In macroscopic structures the life histories of quantum systems represented by particles with rest mass, such as electrons, with wavelengths close to the size of atoms, are both too 'fine-grained' and too biologically irrelevant to be plausible as "quantum-dynamic subjects" accessing the active information that would be our experience of the world. However, massless bosons such as photons and acoustic phonons, with much longer wavelengths, might be candidates. Fields or modes of large numbers of such bosons can mediate classical mechanical effects and lose nothing of their indivisibility of acquisition of information in doing so. No form of phase coherence is required for this aspect of QM to apply on a large scale. The implied identity of the "quantum-dynamic subject" might upset philosophers, but that can happen with biology. Phononic modes in cell membranes may be attractive candidates for quantum-dynamic subjects because their functional wavelengths could match the micron scale at which electrical information is held in neuronal dendrites and the known piezoelectric properties of the membrane would allow coupling of electrical information (and not irrelevant "cell housekeeping" processes) to the phononic mode. Recent thermodynamic reassessment of the action potential suggests that electromechanical coupling may be integral to membrane excitability. Electromechanically

coupled modes are documented in neurons in the inner ear. Whether such modes can, or should, involve groups of cells is uncertain. Relevant phononic modes in cortical neurons would be at or beyond the limit of current direct detection methods but might be probed indirectly with e.g. anaesthetics or calcium levels. Standing wave modes based on local longitudinal "dendritic telescoping", possibly linked to cytoskeletal microtubules, might be the most plausible. **C**

**37 Existence and consciousness** Peter Ells  
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Stephen Hawking (1988) wrote, 'What is it that breathes fire into the equations and makes a universe for them to describe. The usual approach of science of constructing a mathematical model cannot answer the questions of why there should be a universe for the model to describe. Why does the universe go to the bother of existing?' This paper cannot answer these 'What' or 'Why' questions. Instead it asks, 'What do we mean when we say that our universe actually exists, and how does this concept of actual existence take us beyond mere mathematical existence?' The paper considers various types of existence: experiential existence of experiential beings possessing subjective, qualitative, perceptual states (that do not necessarily amount to thinking states); Physical existence of external objects that can be inferred by collating the percepts of experiential beings; Material existence of entities obeying physical laws without reference to experiential beings; Finally mathematical existence, which is merely formal description that is logically consistent. There might not be any life elsewhere in our universe, and it is quite conceivable that, had the history of our planet been slightly different, life might never have emerged here. In these circumstances, our universe would have completed its history lifeless, and thus (according to the dominant viewpoint) only ever have contained entities with material existence. In such circumstances the problem arises that material existence, (as will be shown), collapses into mere mathematical existence. We can be very confident that we and our universe have more than mere mathematical existence, and so something must be wrong. The solution I argue for here is that all material existence must in fact be experiential existence, and so all matter is subjective and experiential in its essence. From a study of what it means for a universe actually to exist, I thus arrive at panpsychism. A dodecahedral universe is used as an example to show how conceptually simple experiential beings might be. Finally, I sketch in very general terms how the well-known, problematic characteristics of quantum theory are in harmony with panpsychism. Hawking, S. (1988), A brief history of time (London: Bantam Press). **C**

**38 Does microbial information processing by interconnected adaptive events reflect a pre-mental cog-**

**nitive capacity?** Gernot Falkner, Kristjan Plaetzer; Renate Falkner <Gernot.Falkner@sbg.ac.at> (Organismic Biology, University of Salzburg, Salzburg, Austria)

We discuss possible cognitive capacities of bacteria, using a model of microbial information processing that is based on a generalized conception of experience, from which all traits characteristic for higher animals (such as consciousness and thought) have been removed. This conception allows relating the experience of an organism to the phenomenon of physiological adaptation, defined as a process in which energy converting subsystems of a cell are conformed "" in an interconnected sequence of adaptive events "" to an environmental alteration, aimed at attainment of a state of least energy dissipation. In adaptive events the subsystems pass, via an adaptive operation mode from one adapted state to the next. An adaptive operation mode occurs, when a subsystem is disturbed by an environmental alteration. In this mode the environmental change is interpreted in respect to a reconstruction that appears to be useful in the light of previous experiences. Connectivity exists between adaptive events in that the adapted state resulting from an adaptive operation mode stimulates adaptive operation modes in other subsystems. When in these systems adapted states have been attained, the originally attained adapted states are no longer conformed and have to re-adapt, and so on. In this way adaptive events become elements of a communicating network, in which, along a historic succession of alternating adapted states and adaptive operation modes, information pertaining to the self-preservation of the organism is transferred from one adaptive event to the next: the latter 'interprets' environmental changes by means of distinct adaptive operation modes, aimed at preservation of the organism. The result of this interpretation is again leading to a coherent state that is passed on to subsequent adaptive events. A generalization of this idea to the adaptive interplay of other energy converting subsystems of the cell leads to the dynamic view of cellular information processing in which an organism constantly observes its environment and re-creates itself in every new experience. This model of cellular information processing is exemplified in the adaptive response of cyanobacteria to external phosphate fluctuations. It is shown that adaptive processes have a temporal vector character in that they connect former with future events. On the one hand they are influenced by antecedent adaptations, so that in this respect a cellular memory is revealed in adaptive processes. On the other hand they bear an anticipatory aspect, since adaptation to a new environmental situation occurs in a way that meets the future requirements of the cell. A computer model of the intracellular communication about experienced environmental influences allowed simulating the experimentally observed adaptive dynamics, when during the simulation the program altered the parameters of the model in response to the outcome of its own simulation. Falkner R., Priewasser M., & Falkner G. (2006): Information processing by Cyanobacteria during

adaptation to environmental phosphate fluctuations. *Plant Signaling and Behaviour*, 1, 212-220. Plaetzer K., Thomas S. R., Falkner R., & Falkner G. (2005): The microbial experience of environmental phosphate fluctuations. An essay on the possibility of putting intentions into cell biochemistry. *J. Theor. Biol.* 235, 540-554. **C**

**39 Mind backward paths: from ascons to dendrites passing through quantum memories** Alberto Faro, Giordano Daniela <albfaro@gmail.com> (Ingegneria Informatica e Telecomunicazioni, Univesita' di Catania, Catania, Italy)

Neural networks in the brain convey forward signals from dendrites to axons, whereas backward paths have not been identified yet. This makes it difficult to explain how the mind, an open system mutually dependent on the environment, reaches equilibrium states with the surrounding context. In a previous work the authors have proposed five hypotheses envisaging a model (i.e., the Frame Model of the Quantum Brain) in which the adaptation between self and environment is regulated by a high order cybernetics loop without entailing any 'entity' in mind. This paper refines the five hypotheses proposing that quantum memories have a role in implementing the backward paths from axons to dendrites as follows: 'ç Human activity is sustained by two quantum fields, i.e., the cortical and ordering fields produced by the vibrations of the myriad of dipoles existing at neuronal and cytoplasm level, allowing the subjects to enact each action (coded by a Humezawa's corticon) of a scene (coded by a Faro&Giordano's orderon) depending on the performed actions and the planned ones. Awareness of the scene is only achieved a-posteriori, when the scene has been concluded without contradicting the initial hypothesis. This extends the notion of 'backward time referral'. 'ç The orderons are classified according to their regularities by a Clustering Quantum Field (CQF) produced by the vibrations of dipoles at dendrites level. This generates an ontological space whose axes are coded by CQF particles (i.e., Faro&Giordano's clusterons). 'ç The problem at hand and some external representation activate selectively the mRNAs on the dendrites which on their turn activate the axons of the related neuronal groups. The excitation of the postsynaptic potentials generates a global EEG profile together with the emission of photons specific for the given input. These photons activate a set of orderons (coded by vacuum states). This explains why the received inputs address the attention towards areas of the ontological space containing scenes having some analogy with the situation hypothesized by the subject. The collapse of the activated vacuum states towards the state representing the prevailing scene produces the emission of photons that inhibit or reinforce the synthesis of the proteins on the dendrites. This loop evolves until the stimuli received and the codification of the information perceived by the self in correspondence to these stimuli are one the mir-

ror of the other in DQBM (Dissipative Quantum Brain Model) sense. 'ç If the subjects recognize not being experienced to deal with the current situation, a new scene and related order is created consciously by cross-over and mutation of relevant existing scenes. The inputs of the new scene will reactivate in future similar situations the zones of the ontological space containing the scenes originating the new one. 'ç The external representations mediate the communication of the scenes among people in order to create conventions and rituals that are at the basis of a social life. Empirical evidences at the basis of the model and hypotheses to be tested will be pointed out, thus identifying the lines of the future work. C

**40 Differentials of Deep Consciousness: Deleuze, Bohm and Virtual Ontology** Shannon Foskett <foskett@uchicago.edu> ( , University of Chicago, London, Canada)

This paper will explore the relevance for the study of consciousness of the surprising relationship between David Bohm's Implicate Order and the ontological thought of late French philosopher Gilles Deleuze. The uncanny connection between Bohm's thought and the oft-misrepresented work of various 'postmodern' philosophers such as Derrida or Lacan has been addressed most notably by mathematician and cultural theorist Arkady Plotnitsky. Plotnitsky's work, however, stops short of looking at Deleuze and does not consider the relationship to consciousness. I would like to suggest the mutual relevance of Deleuze and Bohm for scholars of their work, but also, and more importantly, the new flexibility that their combined vision might offer for theorizing consciousness in wider disciplinary contexts and in conjunction with existing notions of consciousness in the humanities. This ability to address more prevalent conceptions of consciousness in the academic community will be in increasing demand as empirical research on consciousness matures. Fortunately, there already exists an intuitive understanding on the part of some humanities scholars of an implicit relationship between quantum theory and ideas within what can be loosely considered as 'postmodern' thought. Bohm's 'holomovement' and 'implicate order' express much the same ideas as the notion of intensive depth in Deleuze. Both sets of terminology describe being as a process of (en)folded and unfolding. Deleuze even uses the same descriptor, referring to intensive depth as 'an implicated order of constitutive differences.' This depth corresponds to the infinite nature of the wave form of each potential particle. In a quantum field theory context, the situation is described in terms of an infinite overlapping of fields, where the field replaces the sub-atomic particle as the 'ultimate, fundamental concept in physics, because quantum physics tells us that particles (material objects) are themselves manifestations of fields.' This set of all matter waves is nothing but Deleuze's pure spatium, from which 'emerge at once the extensio and the

extensum, the qualitas and the quale.' Being, in its intensive depths, is drawn out, or explicated, through a motion of differentiation that produces it as extensity. This causes intensity to appear 'outside itself and hidden by quality.' For Bohm, the explicate order is also a merely limited case of the implicate order. I will argue that Deleuze's unique concept of the Idea as a particular point of intensity within the Implicate may be a theoretical placeholder for phenomena in quantum-based models of consciousness. Finally I will discuss how Deleuze's model contributes to Bohm's with an understanding of what role of chance processes might play within various levels of consciousness. C

**41 Intensity of awareness and duration of nowness** Georg Franck, Harald Atmannspacher <franck@iemar.tuwien.ac.at> (Digital Methods in Architecture and Planning, Vienna University of Technology, Vienna, Austria)

It has been proposed to translate the mind-matter distinction into terms of mental and physical time. In the spirit of this idea, we hypothesize a relation between the intensity of awareness in mental presence and a crucial time scale (some ten milliseconds) relevant for information updates in mental systems. This time scale can be quantitatively related to another time scale (some seconds) often referred to as a measure for the duration of nowness. This duration is experimentally accessible and offers, thus, a suitable way to characterize the intensity of mental awareness. Interesting consequences with respect to the idea of a generalized notion of mental awareness, of which human consciousness is a special case, will be outlined. C

**42 Overcoming Discontinuity and Dualism in Modern Cosmology** Mary Fries <mfries@ciis.edu> (Philosophy, Cosmology, and Consciousness, California Institute of Integral Studies, Oakland, California)

Begun as an explanation for the stepwise emittance and absorption of energy observed in physical systems, quantum mechanics, by its very name, asserts the discontinuity of matter, a modern atomism that influences the development of current attempts to unite quantum mechanics and general relativity. The ensuing schemata of superstring theory and loop quantum gravity reinforce our tendency to objectify the foundations of an evolving reality, and while, via these ideas, we have transcended the billiard-ball notion of point-like particles, we have in no way evaded reductive abstraction. The spatiotemporal-limitations of human form justify this natural tendency toward generalization, yet this predisposition still recurrently hinders scientific progress. While formulaic abstractions do no harm in so far as we recognize them as limitations of our assumptions, in order to truly integrate quantum mechanics and relativity, we will need to overcome our expectation of subatomic happenings to mirror the behavior of macroscopic bodies. According to

modern theory, spin nets or strings (depending on the model used), the supposed 'fundamental particles' of reality, form the very fabric of the universe. They do not embed themselves within space-time; they define space-time. Hence, a supposition of their discreteness implies discreteness of both time and space. Planck's contribution of a 'smallest size' and a 'smallest time', Planck length and Planck time respectively, fortifies the discretization of reality, as does Heisenberg's uncertainty principle by placing a lower limit on our capability to conduct measurement. But do a handful of constants and a threshold to our investigations justify delimiting our work by potentially premature quantification of the natural universe? History abounds with cases of simplifications of mind being finally overturned by less intuitive explanations. The redefinition of Bohr's atomic model, the discovery of cosmic inflation, and perhaps the most popularized realization of the earth as a round satellite of the sun all required significant mental reorientation to the cosmos. Quantum mechanics continues to baffle those seeking to assimilate its implications into minds predisposed to entirely different logic and causal relationships. As every abstraction is by definition a limitation, it may well be the case that, in much the same way, our attachment to quanta holds us back from an integration of the four forces. But would such a re-envisioning of the 'fundamental particles' necessarily imply a continuous universe instead? Perhaps, but while certain problems are more easily formulated from within the framework of such a dualism, it may well be the case that the much-anticipated union will occur to those who refuse to be bound, to those who come to view reality as organism, perhaps with a mixture of continuity and breaks such as black holes and the seeming origin of the universe, as a universe that favors its own direction over constructions of the human mind. Within a more accommodating model, the flexibility of the wave and the stability of the particle may be formulated in a higher-order abstraction with broader limitations and wider reconciliations wherein mind can be finally integrated as a fundamental component of reality. **C**

**43 Modeling Consciousness in Complex Spacetime Using Methodology of Quantum and Classical Physics.** Anatoly Goldstein <a\_goldshiteyn@yahoo.com> (Voice Center, Massachusetts General Hospital, Boston, MA)

It is argued that even if quantum mechanical formalism does not directly apply to consciousness mechanisms, the methodology used for solution of Schrödinger equation and its interpretation may be very useful for modeling of consciousness. According to I. Thompson (2002) Hamiltonian and wave function of Schrödinger equation resulting in probabilities of observation outcomes correspond to conscious activities such as intentions and thoughts resulting in actions. R. Penrose & W. Rindler (1984) indicated that "space-time geometry, as well as

quantum theory, may be governed by an underlying complex rather than real structure". A geometric model of consciousness (E. Rauscher & R. Targ, 2001) shows importance of imaginary space and time coordinates in interpretation of non-local consciousness phenomena such as remote viewing and precognition. The current author is suggesting to model information dynamics of consciousness with a complex function in complex spacetime. This automatically accounts for the ability of consciousness/awareness to access imaginary coordinates of complex spacetime. Max Born formula shows how one can extract real-valued observable data from the complex-valued function that might be applicable to modeling of consciousness. Consciousness is commonly considered to be directly related to vibration processes such as brainwaves, electrical activity in neural membranes. It is suggested to model these processes with a linear combination of complex exponents (CE), similar to complex form of Fourier expansion, see K. Pribram (2003). A single CE represents a solution of classical harmonic oscillator problem in complex spacetime. If we assume that human intention focus can be in zero approximation modeled by a virtual particle that we call intention and describe the behavior of intention in human brain/body with a known quantum mechanical model of a particle in 3D box, we are also arriving at a solution containing CE. Group theoretic aspects of modeling consciousness-related vibrations with CE are considered. If we assume that human consciousness is supported in part by tachyons rotating around human body, then precognition may be possible due to the ability of the superluminal tachyon to cross its own past light cone (move backwards in time). This hypothesis is consistent with results of M. Davidson's (2001) numerical simulation of tachyon circular (in space) & helical (in spacetime) movement based on Feynman-Wheeler electrodynamics seemingly confirmed in its J. Cramer's (1986) version by S. Afshar (2004) experiment. Role of entropy, information, and symmetry in modeling of moral aspects of consciousness is considered. The author is suggesting a mechanism of reverse psychology (reactance) based on Faraday's law of electromagnetic induction applied to interaction of two or more minds. Following A. & A. Fingelkurts (2001), the minds in the suggested mechanism are represented by human brain biopotential fields. Based on K. Pribram's (1987) holonomic brain theory the current author suggests that neural oscillations interference may be responsible not only for the memory mechanisms of image storage/retrieval, but also potentially for the very essence of active operational function of consciousness. Specifically if we attempt to establish a correspondence between waves (characterized by frequency, amplitude and phase) and elementary ideas (e.g., an idea of a number) then we can conclude that interference of coherent waves in brain may be responsible for, or, at least, closely related to the ability of consciousness to add numbers, while interference of pi-phase-shifted brainwaves might support the conscious operation of

subtraction. It remains to be seen whether a natural author's hypothesis that brain math, logic and information processing/thinking in general are based on interference of neural oscillations and on K. Pribram's storage in/retrieval from memory of resulting interference patterns. **C**

**44 Quantum Mechanics, Cosmology, Biology and the seat of Consciousness** Maurice Goodman <maurice.goodman@dit.ie> (School of Physics, Dublin Institute of Technology, Dublin 8, Ireland)

All fundamental particles and structures obey the uncertainty principle. If we ignore particles and structures traveling at close to the speed of light ( $c$ ) (i.e.  $>0.9c$ ) the maximum uncertainty in momentum is of order  $mc$  where  $m$  is the mass of the structure/particle. This implies there is a minimum region of space such particles and structures can be confined to without violation of the uncertainty principle. Furthermore the mass of key structures found in nature generally varies in proportion to  $R^2$ , where  $R$  is size, and not  $R^3$  as might be expected. By assuming all fundamental particles also obey this relation a sequence of 'minimum' masses ( $M$ ) can be calculated, one from another using  $M(n+1) = h/cRn$  ( $n = 0, +/-1, +/-2^i$ ), where  $h$  is Planck's constant. These coincide with the fundamental particle/structure masses found in nature over 80 orders of magnitude of mass. This allowed a prediction for the neutrino mass, 20 years ago, that recent experimental results agree with. The above mass sequence insists on a direct link between Biology and the cell on the one hand and the neutrino and the weak force on the other. No one can seriously buy into the notion that the millions of millions of complex molecules within a cell exchange information, and organize themselves by nearest neighbour interactions only. The 'hand in glove' sine qua non of all molecular transfers of information in biology is simply not sufficient to explain overall co-ordination within and between cells. There must also be, almost instantaneous, long-range communication to prevent chaos. Quantum coherence is an attractive candidate here. The range ( $r$ ) at which quantum coherence ceases is given by  $r = h/(3mkT)^{0.5}$ , where  $m$  is the mass of the particles involved,  $T$  is the absolute temperature and  $k$  is Boltzmann's constant. The lightest particle associated with chemical processes is the electron and this limits  $r$  to less than  $10^{-8}$  m. for all electromagnetic processes at room temperature. This is too short for cellular and intercellular communication and information transfer. The equivalent range ( $r$ ) for neutrinos at room temperature is less than  $10^{-4}$  m, which is the scale on which neurological processes occur. Therefore, if quantum effects are at the root of consciousness, in the mind, then they are more likely to relate to the neutrino and weak force rather than the electron and the electromagnetic force. Neutrino's would also provide the two necessary characteristics of the substrate for quantum computation i.e. insulation from

the cell sap (electromagnetic processes) to allow for quantum entanglement and, the possibility of intercellular continuity to allow for multicellular quantum coherent states. While the input/output signals to/from the mind are clearly electromagnetic processes the 'processing' of these signals could conceivably be based on the half spin 'quantum bit' neutrino. The linchpin between the electromagnetic inputs/outputs and the processing in the mind would be spin. In short, the mind may exhibit consciousness as a result of the weak force and neutrino and not the electromagnetic force and the electron. **C**

**45 Time Reversal Effects in Visual Word Recognition** Anastasia Gorbunova, Gorbunova, Anastasia A.; Levin, Samuel. <gorbunov@email.arizona.edu> (Psychology, University of Arizona, Tucson, AZ)

The present study investigated time-reversal effects in visual word recognition using a traditional technique called lexical decision with masked priming. In this paradigm the subject is presented with strings of letters of various durations on a computer screen. The first string is a forward mask (usually a sequence of non-linguistic symbols such as hash-marks), which is followed by the target letter sequence. The subject's task is to decide whether the target letter sequence is a word or not. A prime, usually related (e.g. one letter different from the target) or unrelated (e.g. all letters different from the target), is presented briefly after the forward mask and before the target. The subject is usually unaware of the prime. In this type of experiments, it has been shown that presentation of a related prime facilitates the processing of the target thereby producing faster reaction times when compared to trials where the target is preceded by an unrelated prime. The current study attempted to move beyond conventional applications of this paradigm by introducing a post-prime that followed the target in addition to the common pre-prime that precedes the target. The latter addition was aimed at exploring some of the current ideas of time and retro-causation by comparing the amount of priming obtained in the following conditions: (i) a 50 ms either identical or unrelated pre-prime with a dummy post-prime (presented as a row of x's), (ii) a 30 ms identical pre-prime with either a 30 ms identical or a 30 ms unrelated post-prime, (iii) a 30 ms unrelated pre-prime with either a 30 ms identical or a 30 ms unrelated post-prime, and (iv) a 50 ms either identical or unrelated post-prime with a dummy pre-prime. Additionally, half of the words in this experiment were emotional (e.g. murder) and the other half were neutral (e.g. garden). This was done to test whether emotional words would produce more priming either in the pre-prime, the post-prime, or both conditions, than neutral ones. The results of this study are intended to shed light on the influences of emotional states on visual word recognition, as well as provide evidence for small-scale temporal reversal effects in conscious and unconscious processes. **C**

**46 Integral Aspects Of The Action Principle In Biology And Psychology: The Ultimate Physical Roots Of Consciousness Beyond The Quantum Level** Attila Grandpierre <grandp@iif.hu> (Konkoly Observatory of the Hungarian Academy of Sciences, Budapest, Zebegeny, Hungary)

During the last centuries it became more and more clear that the highest achievement of modern physics is its most fundamental law, the action principle. The action principle itself is not understood, its physical content is obscure, and its integral character is ignored. Here we consider the nature of action and found it having a biological nature. We point out that the action principle usually takes a minimum value in physical systems, while in biological organism it usually takes its maximal value. Therefore, we could recognize in the already established action principle's most general form the first principle of biology. We show that biological organisms employ first its maximum version and determine the biological endpoint using the maximal form, and when the endpoint is determined on a biological basis, the realization of the physical trajectory occurs on the basis of the minimum version. We demonstrate that it is the till now ignored integral character of the action principle which serves as the ontological basis of the unity of living organisms, offering a wide variety of physical processes not considered yet because of their biological and teleological nature. We found a new interpretation of the classic two-slit experiment of quantum mechanics, offering a new, causal interpretation of quantum physics that connects it on a fundamental way with biological processes. We show that the biological form of the action principle acts in the realm beyond quantum physics and represents a new frontier of science. It offers integral principles and quantitative methods to determine biological equations of motion of living organisms, therefore making it possible to extend the range of modern science and develop a real theoretical biology. We present fundamental equations of biology, numerical methods and examples, propose new experiments, and presents experimental predictions. We derive from the biological principle such fundamental life phenomena as self-initiated spontaneous macroscopic activity, regeneration, regulation, homeostasis, and metabolism. We present detailed evidences on the concrete physical aspects of elementary consciousness of quanta, like instantaneous quantum orientation of quanta in their environment, behaving 'as if' they 'know' about the whole situation, having collective memory, and show ability of learning. Clarifying the concrete physical aspects of consciousness, science becomes able to approach consciousness and self-consciousness on a mathematical, physical and biological basis. In this way, it seems we can enter to a new era of quantitative biology and psychology above the molecular level, based on biology meeting physics below the quantum level. **C**

**47 Neuro-quantum associative memory for letter-strings and faces** Tarik Hadzibeganovic, Chu Kiong Loo (Faculty of Engineering and Technology, Multimedia University, Melaka, Malaysia) <ta.hadzibeganovic@uni-graz.at> (Language Development & Cognitive Science, University of Graz, Graz, Austria)

We present an integrative, two-stage complex-valued neuro-quantum hybrid model of face-specific and letter-string-specific neural activations, consistent with the recent report of Tarkiainen, Cornelissen, and Salmelin (2002). In the first stage, at about 100 ms following the stimulus onset, the low-level visual feature analysis in the occipital cortex (V1) is represented by the natural production of Gabor-like receptive fields. This processing stage was, as showed by Tarkiainen et al. (2002), common to both the analysis of letter-strings (words) and faces. In the second stage, about 150 ms after the stimulus presentation, we show that the object-level analysis in the inferior occipito-temporal cortex is representable by the Hebbian-like multiple self-interference of the resulting, quantum-implemented Gabor wavelets (Perus, Bischof, & Loo, 2005). With some differences in hemispheric distribution, both letter-strings and faces activate largely overlapping areas in the inferior occipito-temporal cortex, with practically identical onset and peak latencies (Tarkiainen, 2003). We reflect on these equalities in activation and the corresponding processing similarities of words and faces with our quantum associative network model by obtaining similar face and letter-string reconstruction (recognition) quality functions. Our modeling results argue in favor of a quantum-like nature of conscious visual information processing in the human brain. **C**

**48 A steady state EEG phase synchrony model of consciousness: insights from transcendental meditation practice** Russell Hebert, Rachel Goodman; Fred Travis; Alarik Arenander; Gabriel Tan <tmeeg@aol.com> (Neuroscience, Maharishi University of Management, Houston, Tx)

This presentation adopts these perspectives: that a fully developed consciousness theory is compatible with quantum field theory, that the theory of consciousness must be holistic (non-reductionistic); it must include a concept of the 'self'; it must address the origin of consciousness and it must resolve the 'binding' problem. In the presented research (Hebert et al., 2005) two approaches have been taken: subjective and objective. The subjective, theoretical approach is derived from Maharishi Vedic Science, an ancient model of consciousness with modern applications. The objective approach involves research utilizing EEG alpha phase synchrony analysis. Maharishi Vedic Science describes consciousness as inner and outer. The inner (transcendental) value explains consciousness as an unbounded field underlying and informing human experience. When the individual accesses this state, it is called self-referral con-

consciousness, or below as 'unified wholeness'. When the individual experiences the perception of thoughts and objects, this type of conscious awareness is termed object-referral consciousness (or below as 'unified diversity'). Both the 'ground state' of the universe in quantum physics and the properties of the self-referral state of consciousness are described as: unmanifest, de-excited, holistic, unified and field-like (see Hagelin, this volume). Hagelin states that the ground state of the universe is also comprised of resonant vibrational modes which can also be referred to as standing waves. Both from the research conducted, and the theoretical background we conclude that alpha standing waves may connect individual consciousness to the quantum level of Nature's functioning. In line with this idea, Chris King (Tuszynski, ed., 2006) suggests a plausible link 'between EEG phase coherence in global brain states and anticipatory boundary conditions in quantum systems!' (p.407). New research has shown that the phase behavior of alpha controls global cortical excitability ((Klimesch et al., 2007). Our study agrees with this hypothesis. We suggest further however that global and instantaneous shifts of excitability can only occur in stationary environments. Alpha standing waves found in our study are the epitome of the globally de-excited cortex, a 'ground' state of consciousness corresponding to John's (2001) field theory postulations. This, in relation to quantum physics, is a possible description of the origin of consciousness. Recent developments agree with our proposal that alpha phase synchrony may also provide the solution of the binding problem. Palva and Palva (2007) suggest that alpha-gamma cross-frequency phase synchrony ('unified diversity') orchestrates the creation of each 'snapshot' of discrete perception. The emerging picture is that changing modes of alpha regulate perceptual frames within the boundaries of time and space (the binding problem) and that alpha, as well, frames the timeless infinity of self-referral consciousness described as 'unified wholeness'. Palva and Palva (2007) 'New Vistas for alpha band oscillations' Trends in Cognitive Neuroscience 34(4), 150-8. Hebert et al., Enhanced EEG alpha phase synchrony during Transcendental Meditation. Signal Processing Journal(2005)85, 2213-2232 Klimesch et al (2007) 'EEG oscillations: the inhibition-timing hypothesis' Brain Research Reviews 53(1) 63-88 E.R.John, 2001 'A field theory of consciousness' Cons. and Cogn 10, 184-213 King, In 'The Emerging Physics of Consciousness' (Tuszynski, ed., 2006 Springer, Berlin) C

**49 The Role of Consciousness as Universal (Classical) and Contextual (Quantum) Meaning-Maker** Patrick Heelan <heelanp@georgetown.edu> (Philosophy, Georgetown University, Washington, DC)

Thesis: Human consciousness is the Governor of Mental Life {1} through its function of constituting the world of human experience by meaning-making or " to use Husserl's term - intentional constitution. The forms of mean-

ing-making are syntheses of experience through the formal modeling of individual perceptual objects under a categorial description. These formal models are extensional (space-like) symmetries based on a group-theoretic similarity of common qualitative (meaningful intensional) features that fulfill the same kind of cognitive model as characterizes quantum physics, namely, Hilbert Space. Individual perceptual objects are recognized interpretatively on the basis of common meaningful qualitative features organized in a group-theoretic synthesis of a manifold of profiles, that are then accepted by the perceiver as having a common categorial description named in language. Having a common categorial description is for something to be recognized as belonging to a symmetry group of particular exemplars. Both individual and categorial descriptions involve group-theoretic ways of organizing the interpretation of the flowing inputs from the sensory field in a constructed synthesis that functions in sustaining and developing the quality of human life. As such, both individual and categorial syntheses serve human life, and do so through the organization of human decision-making and activity, some under universal (classical) group-theoretic symmetries and others under contextual (quantum-like) group-theoretic symmetries. As in the quantum theory; part of this process is unconscious and part is dialogical, social, deliberate, and linguistic (in the sense known as systemic functional linguistics, Tomasello, Halliday, Thibault, et al.). Karl Pribram's notion of a Windowed Fourier transformation within the dendritic fibers could well be the quantum neurological aspect of this process (2). Notes: (1)This term is used by Donald, Merlin, A Mind So Rare, Chap. 3 (New York: Norton, 2001); Pribram calls it "central processing complement." In Pribram, K. Brain and Perception (Hillsdale, NJ: Erlbaum,1991), p. 96. (2)Pribram, K. (1991) Brain and Perception; Holonomy and Structure in Figural Procession (Hillsdale, NJ: Erlbaum), pp. 26-27.

C

**50 Experimental Approach to Quantum Brain: Evidence of Nonlocal Neural, Chemical, Thermal and Gravitational Effects** Huping Hu, Maoxin Wu <hupinghu@quantumbrain.org> (Biophysics Consulting Group, Stony Brook, New York)

Many if not most scientists do not believe that quantum effects play any role in consciousness. Thus, to gain credibility and make real progress, any serious attempt at a quantum brain should also stress experimental work besides theoretical considerations. Therefore, we have recently carried out experiments from the perspective of our spin-mediated consciousness theory to test the possibility of quantum-entangling the quantum entities inside the brain with those of an external chemical substance. We found that applying magnetic pulses to the brain when an anesthetic was placed in between caused the brain to feel the effect of said anesthetic as if the test subject had actually inhaled the same. Through addi-



tional experiments, we verified that the said brain effect was indeed the consequence of quantum entanglement. These results defy common belief that quantum entanglement alone cannot be used to transmit information and support the possibility of a quantum brain. More recently, we have carried out experiments on simple physical systems and we have found that: (1) the pH value of water in a detecting reservoir quantum-entangled with water in a remote reservoir changes in the same direction as that in the remote water when the latter is manipulated under the condition that the water in the detecting reservoir is able to exchange energy with its local environment; (2) the temperature of water in a detecting reservoir quantum-entangled with water in a remote reservoir can change against the temperature of its local environment when the latter is manipulated under the condition that the water in the detecting reservoir is able to exchange energy with its local environment; and (3) the gravity of water in a detecting reservoir quantum-entangled with water in a remote reservoir can change against the gravity of its local environment when the latter was remotely manipulated such that, it is hereby predicted, the gravitational energy/potential is globally conserved. These non-local effects are all reproducible, surprisingly robust and support a quantum brain theory such as our spin mediated consciousness theory. Perhaps the most shocking is our experimental demonstration of Newton's instantaneous gravity and Mach's instantaneous connection conjecture and the relationship between gravity and quantum entanglement. Our findings also imply that the properties of all matters can be affected non-locally through quantum entanglement mediated processes. Second, the second law of thermodynamics may not hold when two quantum-entangled systems together with their respective local environments are considered as two isolated systems and one of them is manipulated. Third, gravity has a non-local aspect associated with quantum entanglement thus can be non-locally manipulated through quantum entanglement mediated processes. Fourth, in quantum-entangled systems such as biological systems, quantum information may drive such systems to a more ordered state against the disorderly effect of environmental heat. We urge all interested scientists and the like to do their own experiments to verify and extend our findings. **C**

**51 Consciousness, Coherence and Quantum Entanglement** James Hurtak, AFFS, Basel, Switzerland; Prof. Desiree Hurtak, SUNY-Purchase College, New York <affs@affs.org> (AFFS, Wasserburg, GERMANY)

Coherence as a universal, organizing principle that opposes the increase of entropy, is present throughout the basic field properties of our natural system. Coherence can be applied not only to local, but nonlocal, atemporal interactions. Understanding a coherent system would help to examine the number of quantum entanglement measures that quantify the total state as has

been demonstrated by studies on photons, atoms and electrons (Chou, 2005; Bao, 2003). An explanation of the basic coherent properties can also be applied to the behavior of living systems and not only to the physics of matter. Here both the biological and the psychological experience are effected. For the biological experience we see how there exists a high degree of coherence of a quantum state in the order of living systems, because otherwise any mass movement within the environment would create, instead, 'increasing' random effects. Regarding the psychological experience which includes cognition, memory, intention, intuition, perception and reasoning, we see coherence working as a 'stream' of consciousness flow which manages and focuses life through linear adaptability and the organization of thoughts, events, and actions. However, to apply quantum entanglement in a living coherent systems, we need to address both the 'mind-body' problem and that of 'bioentanglement'. The latter claims that quantum entanglement only becomes applicable to particles that have previously interacted, that is, for neurons to be entangled, there must be some prior physical interaction in the brain. No doubt, the structural world comprises various fields and waves structures. The brain process, as it is, with neurons, dendrites and molecules (Hameroff, 2006), merely plays an overlapping role, along side quantum entanglement which exists throughout nature. The brain exists in its own coherent-entangled field within the larger space-time. Because there is an interaction of structures by forces, in essence there is an exchange of virtual particles that works with the stream of consciousness playing out in our physical existence. This paper will examine recent research and models of entanglement as they apply to coherence (and decoherence) in the nature of biological and psychological systems. Chou, CW, et al. (2005) 'Measurement-induced entanglement for excitation stored in remote atomic ensembles' in *Nature*. 2005; 438(7069):828-32. Jiming Bao, et.al (2003) 'Optically induced multispin entanglement in a semiconductor quantum well.' in *Nature Materials* 2, 175-179. Hameroff, Stuart (2006) 'Consciousness, Neurobiology and Quantum Mechanics: The Case for a Connection' in *The Emerging Physics of Consciousness*, edited by Jack Tuszynski, Springer-Verlag, pp. 206-215. **C**

**52 Quantum stochasticity and neuronal computations** Peter Jedlicka <jedlicka@em.uni-frankfurt.de> (Institute of Clinical Neuroanatomy, J.W. Goethe-University, Frankfurt, Germany)

The nervous system probably cannot display macroscopic quantum (i.e. classically impossible) behaviours such as quantum entanglement, superposition or tunneling (Koch and Hepp, *Nature* 440:611, 2006). However, in contrast to this quantum 'mysticism' there is an alternative way in which quantum events might influence the brain activity. The nervous system is a nonlinear system

with many feedback loops at every level of its structural hierarchy. A conventional wisdom is that in macroscopic objects the quantum fluctuations are self-averaging and thus not important. Nevertheless this intuition might be misleading in the case of nonlinear complex systems. Because of a high sensitivity to initial conditions, in chaotic systems the microscopic fluctuations may be amplified upward and thereby affect the system's output. In this way stochastic quantum dynamics might sometimes alter the outcome of neuronal computations, not by generating classically impossible solutions, but by influencing the selection of many possible solutions (Satinover, Quantum Brain, Wiley & Sons, 2001). I am going to discuss recent theoretical proposals and experimental findings in quantum mechanics, complexity theory and computational neuroscience suggesting that biological evolution is able to take advantage of quantum-computational speed-up. I predict that the future research on quantum complex systems will provide us with novel interesting insights that might be relevant also for neurobiology and neurophilosophy. **C**

**53 Consciousness as a quantum-like representation of classical unconsciousness** Andrei Khrennikov <Andrei.Khrennikov@vxu.se> (International Center for Mathematical Modeling in Physics, Economy and Cognitive Science, Vaxjo University, Vaxjo, Sweden)

We present a quantum-like (QL) model in that contexts (complexes of e.g. mental, social, biological, economic or even political conditions) are represented by complex probability amplitudes. This approach gives the possibility to apply the mathematical quantum formalism to probabilities induced in any domain of science. In our model quantum randomness appears not as irreducible randomness (as it is commonly accepted in conventional quantum mechanics, e.g., by von Neumann and Dirac), but as a consequence of obtaining incomplete information about a system. We pay main attention to the QL description of processing of incomplete information. Our QL model can be useful in cognitive, social and political sciences as well as economics and artificial intelligence. In this paper we consider in a more detail one special application -- QL modeling of brain's functioning. The brain is modeled as a QL-computer. Our model finely combine classical neural dynamics in the unconscious domain with the QL-dynamics in the consciousness. The presence of OBSERVER collecting information about systems is always assumed in our QL model. Such an observer can be of any kind: cognitive or not, biological or mechanical. Such an observer is able to obtain some information about a system under observation. In general this information is not complete. An observer may collect incomplete information not only because it is really impossible to obtain complete information. (We mention that according to Freud's psychoanalysis human brain can even repress some ideas, so called hidden forbidden wishes and desires, and send them into the

unconsciousness.) It may occur that it would be convenient for an observer or a class of observers to ignore a part of information, e.g., about social or political processes. In the present QL model of brain's functioning the brain plays the role of such a (self)-observer. [1] A.Yu. Khrennikov, Quantum-like brain: Interference of minds. BioSystems 84, 225--241 (2006). **C**

**54 Process-Philosophy and Mental Quantum Events** Spyridon Koutroufinis <koutmsbg@mailbox.tu-berlin.de> (Philosophy, Technical University of Berlin (TU-Berlin), Berlin, Germany)

The paper investigates the usefulness of the ideas of Alfred North Whitehead for a natural philosophy of organismic processes in general and for the dynamics of the nervous system in particular. Taking the physics of non linear dynamic systems and basic considerations of the philosophy of consciousness as a starting point, we expound fundamental principles and concepts of Whitehead's process philosophy. Using these principles, the possibility of integrating modern system theoretical methods and findings into a new theory of mental and neural events is elaborated in a way that avoids vitalism and reductionism. **C**

**55 Memory and Time: Spatial-Temporal Organization of Episodic Memory Analyzed from Molecular Level Perspective** Michael Lipkind <lipkind@macam.ac.il> (Unit of Molecular Virology, Kimron Veterinary Institute, Bet Dagan, Israel)

The human episodic (biographical) memory including remembrance, storage and retrieval can be represented as a spatial-temporal arrangement of neural correlates of a current stream of perceived and memorized events accumulated in the brain during an individual's lifetime and constituting the bulk of an individual's 'I'. While the spatial part of the arrangement is in principle conceivable, any hypothetical mechanism of the temporal part is unimaginable, yet during recollection we know what occurred earlier and what occurred later. The existing theories of neural correlates of memorization are based on two analytical levels: the level of circuits of inter-neuronal connections and the level of intracellular molecular substrate of the brain cortex neuronal massifs. The former looks incompatible with the idea of temporal arrangement of memorized events: any current temporal 'assortment' of such events in principle cannot correlate with combinations of rigid anatomical inter-neuronal connections. As to the molecular level, the idea of both the spatial and temporal organizations of the episodic memory does not seem inconceivable. Hence, the temporal chain of currently memorized events, each one interconnecting with the previously memorized events to be further connected with those to be memorized in future, must relate to an integral continuum of the brain intracellular molecular substrate. However, the mechanism of such temporal arrangement remains obscure:

What ('Where') on the intracellular level is that 'magic' time axis, according to which the multiple currently memorized events are 'strung' (threaded, saved, stored)? Within the existing physical-chemical concepts, the problem seems to be unsolvable. The situation could lead to the assumption that the apprehended temporal succession of memorized events results merely from their mental confrontation and systematization, suggesting that any existence of a genuine temporal arrangement of the currently memorized events is an illusion. The suggested way out of the deadlock is based on the idea of an integral field as a carrier of the memorization. Since the concept of field is compatible with the time parameter, it can be employed as a competent dynamic correlate of the current temporal memorization. Accordingly, memorization of any particular event is correlated with respective change of the field 'configuration' expressed as a dynamic state determined by the field parameters' values. However, if the postulated field is grounded on any known physical fields, e.g. electromagnetic, it must originate from the physical-chemical properties of the brain molecular substrate as its source. Since such 'circular', evidently tautological conclusion has no causal value, a concept of an autonomous field irreducible to the established physical fundamentals is suggested as a correlate of memorization. Published models of the autonomous fields as carriers of consciousness (Libet, Searle, Sheldrake) were criticized as tautological, metaphoric, or esoteric (Lipkind, 2005). The suggested theory of memorization based on the theory of irreducible biological field by Gurwitsch (1944) was elaborated (Lipkind, 2003, 2007), the present communication being its further development. Thus, the episodic memory (biographical events) and semantic memory (individual's store of knowledge) are represented by molecular 'traces' left by afferent to-be-perceived stimuli projected upon the brain's autonomous field-determined intracellular molecular continuum. **C**

**56 Cortical Based Model of Object-recognition: Quantum Hebbian Processing with neurally shaped Gabor wavelets.** Chu Kiong Loo, Mitja Perus <ckloo@mmu.edu.my> (Faculty of Engineering and Technology, Multimedia University, Bukit Beruang, Melaka, Malaysia)

This paper presents a computationally implementable of cortical based model of object recognition using quantum associative memory. The neuro-quantum hybrid model incorporates neural processing up to V1 of the visual cortex, which input arrives from the retina with the intermediation of the Lateral Geniculate Nucleus. The initial image is lifted by the simple cells of V1 to a surface in the rototraslation group followed by quantum associative processing in V1, achieving together an object-recognition result in V2 and ITC. Results of our simulation of the central quantum-like parts of the bio-model, receiving neurally pre-processed inputs, are presented.

This part contains our original simulated storage by multiple quantum interference of image-encoding Gabor Wavelets done in a Hebbian way. **C**

**57 Why panpsychism falls into dualistic metaphysical framework?** Jaison A. Manjaly <jmanjaly@gmail.com> (Centre for Behavioral and Cognitive Sciences, University of Allahabad, Allahabad, UP, India)

Galen Strawson (2006) claims that real physicalism entails panpsychism. This paper aims to assess the ontological merits and demerits of this claim. I argue that although there are certain explanatory advantages for pansychism over emergentism, it does not contribute anything novel to strengthen the physicalistic thesis. For, the concept of panpsychism is rooted in a metaphysical misconception of 'experience'. I further show that, because of this misconception, panpsychism cannot be held without falling into a dualistic metaphysical framework. Moreover, Strawson's version of panpsychism brings back the burdens of causal interaction and non-Cartesian substance dualism. **C**

**58 The Subject of Physics** Donald Mender, NA <solzitsky@aol.com> (Psychiatry, Yale University, Rhinebeck, NY)

Physicists today embrace theoretical parsimony and experimental accuracy as guides toward progress in the understanding of natural objects. Yet, beyond these criteria, it is also historically true that large paradigmatic leaps forward at the foundations of physics have repeatedly entailed reevaluations of the human subject's place within nature. In particular, revolutionaries have transformed the physical sciences by knocking the subjective center of orthodox perspectives off balance in some unexpected new way, rather than by merely altering the objects under scrutiny. Copernicus simplified astronomy by uprooting Ptolemaic astronomers from their geocentric ground; Einstein relativized the motion of a light source by democratizing the sensorium of the physical observer; Heisenberg captured the phenomenology of the subatomic microcosm by injecting jitter into an experimenter's act of measurement. Hence it may make sense to look for future foundational advances, for example in the quest to unify quantum mechanics and general relativity, via even more radically "decentered" shifts of the scientific subject's anchor within nature, rather than in more and more baroque revisions of yet undetected physical objects, such as transformations of particles into strings and branes, of classical space-time into a topological weave of "loops," of bosons and fermions into bosinos and sfermions, and of phase transitions into Higgs fields. Instead, a more productive route toward the next synthetic breakthrough in physics may be to decenter the very plurality of the physical observer, beyond the statistical influence of second quantization on connections merely among wavefunctional objects.

Specifically, the structure of quantum gravitational operators may morph to include not only linearly independent individual acts of measurement implied by the superpositional probabilities of path integration, but also fungibly collective and frangibly fragmented measuring agencies instantiated respectively through Bose-Einstein and Fermi-Dirac statistics embedded intrinsically within relationships among the operators themselves. Such a "decentered" perspective on quantum gravitational measurement could offer several potential advantages. First, its locus on the observer's side of the measurement "cut" could replace supersymmetrical partners in the objective domain, offering an explanation if bosons and fermions are not found in future high-energy accelerator experiments. Second, provision of differing statistically "inertial" (i. e. equilibrated) reference frames for a diverse multiplicity of observing subjects could obviate any need for spontaneous symmetry breaking as an explanation for departures from invariance should Higgs particles fail to manifest themselves. Third, nonlinearizing effects on the probability sums of perturbative series could serve as a natural improvement upon renormalization procedures. Fourth and finally, a "decentering" of pluralities applicable to the quantum-gravitational observer might offer new ways of understanding scientific subjectivity per se in terms of polysemy across a range of collective, individual, and component properties relevant to gravitonic processes in the measuring agent's brain. A hermeneutic expansion of the Penrose-Hameroff hypothesis might thus ensue. Empirical testing of such an enhanced theoretical perspective might follow from detailed predictions of emergent resonances among multiple acts of quantum gravitational measurement. **C**

**59 The origin of non-locality in consciousness** Ken Mogi <kenmogi@csl.sony.co.jp> (Fundamental Research Laboratory, Sony Computer Science Laboratories, Shinagawa-ku, Tokyo, Japan)

Quantum mechanics, being an inseparable element of reality, naturally enters into the consideration of every phenomenon that occurs in the physical universe. As far as consciousness is an integral part of the reality as we understand it, quantum mechanics needs to be ultimately involved either directly or indirectly in its origin. In particular, the apparent non-locality and integrity in the phenomenology of consciousness and its physical correlates is suggestive of a quantum involvement. Here I examine the nature of non-locality in the physical correlates of consciousness and its relation to quantum mechanics. The concept of the neural correlates of consciousness (Crick and Koch 2003), when pursued beyond the currently prevalent role as a practical framework in which to analyze neuropsychological data, logically necessitates a non-trivial emergence through the mutual relation between physical entities and events that constitute cognitive processes in the brain (Mach's principle in percep-

tion, Mogi 1999). Since from this standpoint the spatio-temporal histories sustaining the cognitive processes, including, but not necessarily restricted to, the action potentials of the neurons are the essential correlates of consciousness, non-locality becomes a logical necessity in the ingredients of consciousness. Non-locality has been known to be an essential property of quantum mechanics since its early period (e.g., Einstein, Podolsky, & Rosen 1935). However, the combination of high temperature and large number of degrees of freedom involved in brain activities are usually regarded as definitely precluding any possible quantum effects. However, there exists possible routes of quantum involvement in macroscopic and "warm" phenomena such as brain processes. The key is in the fact that macroscopic objects, although ostensibly obeying equations of Newtonian dynamics, rely on quantum effects for the very stability that makes them classic objects in the beginning. Analysis of an information processing system usually starts from the assumption that its essence can be captured by following those parameters explicitly covarying with the information the system supposedly handles. Quantum mechanical effects hardly enter the picture when only explicitly varying parameters are considered. On the other hand, the implicitly sustaining structures that do not covary with the processed information can contribute to the phenomenal aspects of information, such as qualia and self-awareness. The ubiquitous role of metacognition, the origin of subjective time, and the way spatio-temporally distributed activities are "compressed" into percepts in conscious experience, are discussed in the context of the implicit and explicit in cortical information processing. References Einstein, A., Podolsky, B., and Rosen, N. (1935) Can quantum-mechanical description of physical reality be considered complete? *Phys. Rev.* 47 777-780. Mogi, K. (1999) Response Selectivity, Neuron Doctrine, and Mach's Principle. in Riegler, A. & Peschl, M. (eds.) *Understanding Representation in the Cognitive Sciences*. New York: Plenum Press. 127-134. Crick, F. and Koch, C. (2003) A framework for consciousness. *Nat. Neurosci.*, 6, 119-126. Taya, F. and Mogi, K. (2004) The variant and invariant in perception. *Forma*, 19, pp.25-37. **C**

**60 Teleological mechanism for the simulation argument** James Nystrom <jnystrom@shepherd.edu> (Computer Science, Math and Engineering, Shepherd University, Shepherdstown, WV)

I begin the talk by providing an overview of Bostrom's now seminal 2003 paper 'Are You Living in a Computer Simulation?'. Herein I summarize Bostrom's simulation argument (where one possibility is that we are living in a simulation "" specifically as part of an ancestor simulation created by a posthuman society). I take issue with Bostrom's functionalist position on Mind and present a modified simulation disjunction (MSD) wherein I utilize a dualism close in concept to a fundamentalism of the

Penrose-Hameroff variety. Here I eschew Bostrom's ancestor simulations as a type of functionalist masquerade. However, I do maintain the possibility that we are living in a (complete Universe) simulation, created by posthuman simulators (PHS). I note that if we are in a simulation without a functionalist model of Mind, we need structures in the simulation that can support and/or capture Mind activities (e.g., a brain). Here Mind takes on a Gnostic characteristic, in that Mind itself would need to fall down (if you will) from some non-spatio-temporal habitation (a Richard Rorty term) as in the supposed doings of a Gnostic Demiurge. This model of Mind is similar to Plato's Divine Mind or Huxley's Mind-at-Large, and similar to Penrose's use of an underlying Platonic reality (a so-called basic level of Universe). In the third (and last) part of the talk I take the assumption that we are living in a complete Universe simulation. I posit a query concerning how our supposed PHS could implement algorithmic control of a Universe. I need provide background asides before I answer this query. The first aside is (I) a discussion of Universe as a computation in terms energy interactions which take fundamental activity of Universe to be operating near Planck lengths and Planck time. I introduce the terms Negative Universe (a R. Buckminster Fuller term) and reality flux. Here Negative Universe is akin to Penrose's Platonic and Mental worlds, and reality flux describes the ensembles of virtual photons and anti-particles, some of which seemingly pass in and out of existence. Another aside (II) compares casual and teleological effects. I use physically-based arguments, and suggest that the typically arbitrary adoption of the causal viewpoint for most process in Universe is in fact an observation selection effect resulting from an immersion in a forward progression of time. I also (III) review the classic dualism (of mind and matter) and compare this to Penrose-Hameroff fundamentalism. As a result of this aside, I take Mind as something that resides partially in Negative Universe. The last aside (IV) presents Gravity as an instantaneous most economical relationship of all energy events (as R. Buckminster Fuller did), and this then places the Gravity (calculation/update) in Negative Universe. I can now answer the query and propose mechanisms with which PHS could computationally steer a Universe (such as ours). Since Gravity and Mind have both been surmised to contain a non-spatio-temporal essence (in Negative Universe), I suggest that PHS could in fact use both Gravity and Mind as teleological control mechanisms for a Universe simulation. **C**

**61 Entropy Reversal and Quantum-Like Coherence in the Brain** Alfredo Pereira Jr., Polli, Roberson S. <apj@ibb.unesp.br> (State University of São Paulo (UNESP), Botucatu, São Paulo, Brasil)

Quantum-like macro-state coherence can be generated in the living brain by means of molecular mechanisms that induce local entropy reversal (at the cost of increas-

ing environmental entropy). The idea that entropy reversal can locally increase (bio)physical organization derives from conjectures by Maxwell, Schrödinger and Monod. Contemporary models of the Ion-Trap Quantum Computer (ITQC) can be viewed as belonging to the "Maxwell Demon" family of systems, since: a) the movements of the ions are controlled to produce physical organization; b) external energy (the laser) is used to transfer information to the system; and c) the system's activity (phonon modes related to spin values of different electronic configurations) support the performance of reversible operations. Analogously, in the living brain, biological mechanisms - as neuronal membrane channel gating - control the movement of ions. Astroglial cells, being responsible for the distribution of free energy (in the form of glucose) from arterial blood to neurons, and actively participating in tripartite synapses, may also be involved in an entropy reversal process. We propose that calcium ion populations trapped in the astrocytic syncytium, while interacting with neuronal electric fields, operate as a large-scale ITQC, with an architecture similar to the model presented by Kielpinski, Monroe and Wineland (2002). On the one hand, contemporary schemes for ITQC with hot ions (Poyatos, Cirac and Zoller, 1998; Molmer and Sorensen, 1999; Milburn, Schneider and James, 2000; Kielpinski et al., 2000) reveal that multimodal phonon patterns compose complex coherent states. On the other hand, empirical results from brain science indicate that astrocytes participate in the sustaining of neuronal excitation (Haydon and Carmignoto, 2006) and onset of oscillatory synchrony (Fellin et al., 2004), both functions closely related to conscious processing. Calcium waves in the syncytium are also a medium for large-scale integration (Robertson, 2002). This integration possibly includes inter-hemispheric communication by means of cerebrospinal fluid (a possibility based on the proposal made by Glassey, 2001). In conclusion, we suggest that the brain's hot, wet and noisy ITQC, composed of a calcium ion population trapped in astrocytes and interacting with neuronal electric fields, can embody complex patterns that compose the contents of consciousness. FELLIN T et al.(2004) Neuronal Synchrony Mediated by Astrocytic Glutamate Through Activation of Extrasynaptic NMDA Receptors. *Neuron* 43(5): 729-43. GLASSEY G(2001) The Neuroglial Cell-Neuropeptide Highway. Published online: <http://www.healtouch.com/csft/highway.html> HAYDON PG CARMIGNOTO G(2006) Astrocyte Control of Synaptic Transmission and Neurovascular Coupling. *Physiol Rev.* 86(3): 1009-31. KIELPINSKI D et al.(2000) Sympathetic Cooling of Trapped Ions for Quantum Logic. *Physical Review A* 61, 032310, p. 1-8. KIELPINSKI D MONROE C WINELAND DJ(2002) Architecture for a Large-Scale Ion-Trap Quantum Computer. *Nature* 417: 709-711. MILBURN GJ SCHNEIDER S JAMES DFV(2000) Ion Trap Quantum Computing With Warm Ions. *Fortschritte der Physik* 48: 801-810. MOLMER K SORENSEN A(1999) Multiparticle Entanglement of Hot

Trapped Ions. Physical Review Letters 82 (9): 1835-1838. POYATOS JF CIRAC JI ZOLLER P(1998) Quantum Gates With 'Hot' Trapped Ions. Physical Review Letters 81, 1322-1325. ROBERTSON JM(2002) The Astrocentric Hypothesis: proposed role of astrocytes in consciousness and memory formation. Journal of Physiology-Paris 96: 251-255. **C**

**62 Neurons react to ultraweak electromagnetic fields** Rita Pizzi, D. Rossetti; G. Cino; A.L. Vescovi; W. Baer <pizzi@dti.unimi.it> (Department of Information Technologies, University of Milan, Crema, CR, Italy)

Since 2002 our group has been concerned with the direct acquisition of signals from cultured neurons. During the first experiments we noticed anomalies in the electrical signals coming from separate and isolated neural cultures that suggested that either neurons were extremely sensitive to classical electromagnetic stimulation or some form non-classical communication between isolated systems was occurring. We improved our experimental setup in order to further explore this phenomenon and eliminate possible experimental errors that might bias our results. Our last experiment was consisted of three MEA (Microelectrode Arrays) basins, one filled with human neurons and the others with control liquids. Each basin was in turn irradiated with a laser beam while the other basins were shielded by means of a double opaque Faraday cage. In all cases we found a sharp spike in the electrical activity coming from the neural basin simultaneous to the laser emission, but no activity was present in the two control basins with or without shieldings. To eliminate the possibility of electromagnetic coupling the hardware system was designed with special electronic devices and photo-couplers to avoid any kind of interference between circuits and MEAs. Several tests were performed by means of both oscilloscope and spectrum analyzer to ascertain the absence of cross-talk and induction phenomena. During one of the experiments we substituted the laser with a dummy load in order to simulate the current absorption equivalent to the one generated by the laser and we found the same peak was present. Upon further investigation we concluded that the phenomenon could be due to an electromagnetic field coming from the laser supply circuit that was too weak to be detectable with our measure instruments. Neurons appear to receive and amplify an electromagnetic spike whose value through the air, before reaching the Faraday shielding, is less than 70 microGauss and under the sensitivity of our oscilloscope (2 mV). It must be stressed that in order to cause a neuron spike using a direct electrical stimulation inside the cell, a 30 mV pulse is necessary. The value of the electric and magnetic field under the double Faraday cage is under the sensitivity of our instrumentation but is estimated to be at least one order of magnitude less. We believe the neurons are the active receiving element because the MEA control circuit and the activation circuit

are completely separated, the MEA basins are connected to the ground, their shape is not suitable to act as antenna and the spikes observed in the neural basin are never present in the other control basins. Though the exact mechanism for the observed neural response has not been identified we can at the moment hypothesize that neurons act as antennas for extremely weak electromagnetic fields. The neural reactivity may be due to the presence of microtubules in their cellular structure. Microtubules are structurally similar to carbon nanotubes, whose tubular shape makes them natural cavity antennas. New analyses with more sensitive instruments, and a mu-metal cage to avoid magnetic fields, are underway to further investigate the nature of this extreme neural sensitivity. **C**

**63 The Mind's Image of the World, the Classical Physics of Motion, and the Quantum Physics of the Brain** Arkady Plotnitsky <plotnits@purdue.edu> (Theory and Cultural Studies, Purdue University, W. Lafayette, Indiana)

This paper takes as its point of departure Alain Berthoz' argument for the significance of physical movement in our understanding of the brain's functioning. According to Berthoz, perception is not only an interpretation of sensory messages but also an internal simulation of action, thereby making perception and action irreducibly intertwined. The fact that every moving body must follow the laws of classical mechanics compels the brain to invent strategies to make complex mechanical calculations, and, hence, to internalize the basic laws of geometry and kinematics. Indeed, the whole conceptual structure of, first, Euclidean geometry and then of classical physics (including kinematics), or our physical-mathematical image of the world, may be seen as arising from this classical-like phenomenal image (a thought image) created by the brain and its capacities of both remembering the past and predicting the future. Berthoz also links the brain's functioning, as grounded in motion, to the Bayesian theory of probability. The latter deals with predictions concerning the outcome of individual events on the basis of the available information and, hence, conceptually memory, rather than on statistical inferences based on frequencies of repeated events. Berthoz speaks of 'a memory for prediction.' Thus, our interaction with the world is defined by taking chances and our success in the world by taking our chances well. Berthoz argues that, by focusing primarily on the connectivities within the brain, current neurobiological and neurophysiological theories by and large fail to take into account these, motion and environment oriented, workings of the brain, which he believes to be primary and fundamental to its development and functioning, or evolutionary emergence. Our biological constitution appears to be especially suited for creating the classical image of the world and succeeds in the world by working with this image. This, however, does not

mean that either the world or the brain need themselves be seen as classical physical systems. The ultimate aim of this paper is to explore potential interconnections between Berthoz's theory and Umezawa's and Vitiello's quantum-theoretical approaches to the brain, based on the understanding of the brain as a dissipative quantum system, continuously interactive with environment"the world. Although along somewhat different lines, both Berthoz and Vitiello argue that the brain creates a certain image of the world in our mind. By so doing, the brain enables the body to interact with and to live in the actual world, whose ultimate constitution appears to be quantum and may, ultimately, be beyond the brain's (classical) image of it and possibly beyond any conception our mind can form. The question broached by this paper is why the physical machinery of the brain that creates the classical physical image of the world in order to interact, most especially probabilistically or by taking our chances well, with the actual world might need to be physically quantum. In other words, the question is why the physically quantum doubling of the world and the brain may be necessary to create the classical image of the world and of the mind itself. **C**

**64 Human Biocatalysis and Human Entanglement. How to Fill the Gap between Quantum and Social Sciences?** Massimo Pregnotato, Paola Zizzi <maxp@pbl.unipv.it> (Pharmaceutical Chemistry, University of Pavia, Pavia, Italy)

In complexity science, entanglement is what exists before order emerges. The role of quantum entanglement as the precursor to emergent order is much discussed in physics [1]. For instance, Gell-Mann [2] defines an entanglement field as a 'fine-grained structure of paired histories among quantum states'. The notion of the primordial pool which existed before the origin of life is also much discussed in biology [3]. According to Christopher Davia [4] the evolution of life is the evolution of catalysis. Indeed, the biosphere, taken as a whole, may be considered a macroscopic process of catalysis. From the evolution of catalysis, from specific to non-specific, Man has emerged, the most non-specific catalyst on Earth. McKelvey has found that an understanding of entanglement from quantum theory can throw useful light on the nature of ties among people [5,6] and their impact on emergent order in organisations. In terms of human behaviour, he explained that a high correlation between the paired histories of people would mean they think in similar ways; a low correlation would mean they go in different directions. We define Human Biocatalyst (HB) a human being able to catalyze human relationships in a selective way. A HB selects people with high relative affinity and catalyzes reactions between them through the communication. The products of these interactions could be a tangible human-human like-entanglement. Dean Radin has done extensive work on the idea of Human Entanglement. He describes experi-

ments that shown a non-local connection between human beings when they "think' of each other [7]. Entanglement, when included in quantum games [8], makes (somehow) everybody win. Entangled quantum strategies are such that all players cooperate, and classical egoism (destructive) is replaced by quantum altruism (constructive). Entanglement might explain some forms of telepathy, actually quantum pseudo-telepathy [9] between 'quantum-minded' players who play a quantum game. We think that Basic logic [10] could be a good starting point towards a deeper understanding of the Quantum world also because it is the only logic which can accommodate the new logical connective @ = 'entanglement'[11]. One of our dearest hopes is that Basic logic, once applied to the study of the deepest levels of the unconscious, might be useful for the care of some mental diseases, like schizophrenia, which are still wayward with respect to usual psychotherapy. The Quantumbionet will be presented. The network will include well-known intellectuals, teachers and laboratories supporting the development of sciences and aimed to play an active role on the international stage for human health and wellness enhancement. The network will be the bridge between science and human behaviour. **C**

**65 Whitehead's tri-modal theory of perception in the light of empirical research** Franz Riffert, <Franz.Riffert@sbg.ac.at> (Education, University of Salzburg, Salzburg, Austria)

Whitehead has developed a bold theory of perception based on the concepts of his process philosophy (Whitehead 1978). According to him it is one of the shortcomings of modern philosophy not to shed any light on the sciences. In elaborating his theory of perception he showed how such a fertile interchange between sciences (psychology) and philosophy (process metaphysics) might be possible and what new perspectives follow from it. Whitehead's theory of perception is tri-modal i.e. there are three different modes of perception which are related 'genetically'. The most basic and most primitive of these three modes is "causal efficacy' which is a form of immediate and rich albeit vague grasping of one's surrounding. It is best conceived in neuro-physiological and/or sensory-motor terms and is connecting the perceiver directly with his/her environment. Based on this primitive mode and elaborated by abstraction and attention the second mode of perception is developed: the mode of "presentational immediacy'. In this more advanced mode of perception certain aspects of the rich content of the mode of "causal efficacy' are abstracted and highlighted. These specific aspects are given in a clear and distinct way as *sensa* such as exact spatial and temporal relations, distinct forms and colours. The most advanced mode of perception, the mode of our everyday perception, is generated by integrating the two more primitive perceptive modes; one of these two more primitive modes acts as symbol while the other one

takes the role of the designate; therefore Whitehead termed this mode 'symbolic reference'. In this mode the feature of consciousness is introduced since according to Whitehead it is the subjective feeling of the contrast of what might be (symbol) and what is in fact the case (designate). Some of the features of Whitehead's philosophical theory of perception can be tested empirically: First one may look for evidence in the neuro-sciences as well as in psychology in favour of its tri-modal character. Second the general tendency of perception from to distinct apprehension which finally is accompanied by consciousness can be tested against the body of research results in psychology of perception. Finally Whitehead's claim that a primitive mode of perception does exist can be examined because he has described the characteristics of this perceptive mode; they can be compared with psychological evidence. Micro genetic (Werner 1956; Bachmann 2001) and percept genetic research (Smith 2000) is dealing with perception much in the same way as Whitehead. Results confirm Whitehead's position concerning a general tendency from vague to distinct information processing in perception. The tri-modal character of Whitehead's theory finds support in Anthony Marcel's well-known tachistoscope experiments which are presented in his paper 'Conscious and Unconscious Perception: Experiments on Visual Masking and Word Recognition' (1983). Victor Rosenthal in a micro genetic experiment on reading (2005) speculates about two distinct neuronal pathways in the brain: one processing available information quickly but in a crude way, while the other one processes information in a detailed way but much slower. This also to some extent supports Whitehead's position. **C**

**66 Dynamic Geometry, Bayesian approach to Brain function and Computability** Sisir Roy <sisir@isical.ac.in> (physics and applied mathematics, indian statistical institute, kolkata, w.b., india)

Recently, the present author along with his collaborators introduced the concept of dynamic geometry towards understanding brain function. This is based on the idea of functional geometry as proposed by Pellionisz and Llinas. This interpretation assumes that the relation between the brain and the external world is determined by the ability of the Central Nervous System (CNS) to construct an internal model of the external world using an interactive geometrical relationship between sensory and motor expression. This approach opened new vistas not only in brain research but also in understanding the foundations of geometry itself. The approach named tensor network theory is sufficiently rich to allow specific computational modelling and addressed the issue of prediction, based on Taylor series expansion properties of the system, at the neuronal level, as a basic property of brain function. It was actually proposed that the evolutionary realm is the backbone for the development of an internal functional space that, while being purely repre-

sentational, can interact successfully with the totally different world of the so called 'external reality'. Now if the internal space or functional space is endowed with stochastic metric tensor properties, then there will be a dynamic correspondence between events in the external world and their specification in the internal space. We shall call this dynamic geometry since the minimal time resolution of the brain, associated with 40 Hz oscillations of neurons and their network dynamics is considered to be responsible for recognizing external events and generating the concept of simultaneity. In this framework, mindness is considered as one of the several global physiological computational states (functional states) that the brain can generate. Since, computation and information processing are accepted terms in neuroscience, it is necessary to clarify the meaning of computation and information measure. The functional states are considered to be internal states related to the metric property associated to CNS. In fact they are being generated due to intrinsic properties of neurons. It indicates that Bayesian decision theory and Fisher information might play significant roles in understanding brain function. It is found that CNS does not compute rather optimizes the behaviours. This optimization of behaviours is similar to 'computation capacity' for digital machine as proposed by Toffoli. This perspective will shed new light on the issue of computability vs. non-computability of brain. **C**

**67 Neural Correlates and Advanced Physics** David Scharf <dscharf108@gmail.com> (Physics, Maharishi University of Management, Fairfield, IA)

Although researchers are daily uncovering new information about the brain "from an increasingly exhaustive mapping of its neural pathways to a more thorough and detailed understanding of the correlations with conscious experience and cognitive faculties" still, at its current stage of development, neuroscience is not yet in a position to provide a comprehensive analysis of the micro-physical underpinnings of conscious experience. The program for the neural correlates of consciousness does not claim to provide such a comprehensive microanalysis; instead, it offers to outline a global view of both the broad features and logical constraints of such a microanalysis. This program embodies two explicit assumptions: (1) that conscious experience supervenes on its neural basis, where supervenience implies that if the physical basis is present, then the corresponding conscious experience will occur, and (2) that the conscious experience is dependent on the physical. This second assumption casts the neural correlates program in expressly physicalistic terms. Also, a third, usually unstated, assumption is not harmless: Discussions of the neural correlates of consciousness take for granted that (3) these correlates are governed by classical physics "that any effects of advanced physics will be insignificant, will average out, or will otherwise not affect the brain's de-



termination of conscious experience. Unfortunately for those who take this route, assumptions (2) and (3) lock the researcher in a pernicious dilemma. Let's suppose for a moment that these radical physicalists were right. Then a particular configuration of neurons firing (or other correlates) would determine any given conscious experience or mental activity. Naturally, this presents a burden of explanation: Given the dependency on the physical, how is it that mental content is internally coherent and intelligible, and how is it that (ordinarily) our mental representations accurately reflect the external world? A pointed way to frame the dilemma is to note that the logical and scientific train of reasoning leading to the neural correlates program itself would be determined by the underlying neural correlates, thus calling into question its own justification. This is a similar bind that Hilary Putnam and others identified as arising from the brain-in-a-vat scenarios, and which led to Putnam's wholesale rejection of the neural correlates program with its mind-brain dependence relation. But, as we see things, there are better alternatives to be had than Putnam's conclusion. Successfully explaining or at the very least allowing for the internal coherence and external reliability of consciousness, in the context of a neural correlates program, fundamentally depends on the parameters of the specific type of physicalism we adopt. This is where advanced physics may come to the rescue. Indeed, certain aspects of consciousness that are incompatible with a physicalism based on classical physics may be not only consistent with, but explainable in terms of, a physicalism grounded in advanced physics. **C**

**68 Quantum Theory, the Dream Metaphor and the Meta-Brain Model**

Thomas Schumann  
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We argue from the quantum double-slit experiment, from the evolution of emotions and other issues that the mental world influences the physical just as the physical influences the mental. From analogy with electromagnetism (changing electric field produces changing magnetic field and vice-versa) that the mental and physical worlds are really one entity. From this comes the dream metaphor in which the mental and the physical are the same; this fits the quantum theory of measurement in which an observable of a system becomes "real" only when it is observed (the system is no longer in a superposition of possible values for the observable). With the associated model of the "meta-brain" we derive intuitively the disturbance of a system when it is observed, the non-commutation of observables and, using the Einstein-Podolsky-Rosen situation, we derive the observer dependent nature of the wave function. The wave function is mental and thus physical as well. We discuss, in the context of the dream metaphor the "filling in of history by observation" associated with Wheeler's "delayed choice" thought experiment. We require a "recursion

principle" by which the meta-brain produces the dreams or streams of consciousness which produce brains which produce the streams of consciousness. The meta-brain contains the non-local hidden variables which determine the content of the "dreams" or streams of consciousness. We discuss the anthropic principle within the "recursion principle" and eliminate from the multi-verse all (dream) universes which cannot produce a brain. We also consider the concept of a wave function for an entire universe to be meaningless in this context as an individual cannot observe the whole universe. That results, at least in part, because of the limit on the speed of information transfer (the speed of light). **C**

**69 Overlap with the different QUA** Francis Schwanauer  
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ABSTRACT: Renewed efforts to gauge the informative aspect in quantum effects has finally identified graviton and photon as the lowest promulgative degree of aboutness in quantum-interference. What makes the 'built-in proof' of these rest-mass-less particles convincingly informative, is the fact of their being shared by overlapping parent particles. This most recently detected shortcut between presentation and representation, quantum-interference and quantum-causation, or sameness between showing and telling, reduces the new grammar of quantum interaction to such elemental laws as acceptable proximity, limits to collapse, and/or expansion, between the sufficiently 'different' qua the other, and the elegant sharing and seamless transference of energy between spatial and temporal neighborhoods respectively. This, however, turns inertial frames into the axiomatic monopoly of consciousness, which not only dominates what implies in quantum-interference, but also what conditions in quantum-causation. If, therefore, conscious quantum-interference (qua quantum-information, transfer, etc.) holds, then the grip of consciousness becomes no less pervasive than that of a gravitational field on both the included and the neighboring phenomena. Though still proportional or restricted to its inertial frame as parent particle or self-inclusive superposition, it becomes the active agent behind the manipulation of its representational apparatus and the authentic origin of synchrony. This is shown both by its capacity to hurl never less than 2 such items as positive mass particles in the form of classical waves in different directions within the two halves of its very brain at the speed of light (cp. the Yang-Mills theory), and its ability to coordinate unheard-of extremes, notwithstanding contrary alternatives (cp. Feynman's quantum weirdness), for a final choice and decision procedure on the promulgation of matter and/or anti-matter to suit its long run purposes. In short, if quantum-coherence between the sufficiently 'different' by way of overlap holds, so will quantum-interference together with its more or less distant echo, the synthetic nature of quantum effects. **C**

**70 Causality, Randomness, and Free Will** Richard Shoup <shoup@boundary.org> (Boundary Institute, Saratoga, CA)

The experience of free will has often been regarded as a hallmark of consciousness, yet its meaning and very existence have been debated for millenia. In this talk, we explore the complex relationship between free will, determinism, causality (both forward and backward), and quantum randomness. The latter, a deep and central assumption in quantum theory, is associated with measurement interactions. From an analysis based on quantum entropy, it is proposed that quantum measurement is properly understood as a unitary three-way interaction, with no collapse, no fundamental randomness, and no barrier to backward influence. Experiments with quantum-random devices suggest that retro-causal effects are seen frequently in various forms, and can be shown to explain some anomalous phenomena such as clairvoyance and precognition. It is argued that all interactions are indeed unitary, reversible, and thus deterministic, but that large-number effects give a persistent illusion nearly equivalent to free will. **C**

**71 Can a Computer have a Mind?: Non-computability of Consciousness** Daegene Song <dsong@kias.re.kr> (School of Computational Sciences, Korea Institute for Advanced Study, Seoul, Korea)

Penrose has suggested that there may be a non-computable aspect in consciousness at the fundamental level as in Godel's incompleteness theorem or Turing's halting problem. It is shown that, as in Penrose's suggestion, consciousness in the frame work of quantum computation yields a physical example of the non-computable halting problem. The assumption of the existence of the quantum halting machine leads into a contradiction when a vector representing the observer's reference frame is also the system which is to be unitarily evolved, i.e. consciousness in quantum language, in both the Schrodinger and Heisenberg pictures. **C**

**72 Fundamental Biological Quantum Measurement Processes** Michael Steiner, Uzi Awret, R. W. Rendell, Sisir Roy, <mjsasdf@yahoo.com> (Center for Quantum Studies, George Mason University, Fairfax, VA)

Wigner, Von Neumann and others believed that consciousness and quantum state evolution are related. While this is a difficult open question, a simpler question is whether or not a process other than Schrödinger's equation is involved in basic biological processes. It is well known that use of Schrödinger's equation alone to treat interactions generally results in non-classical superpositions. Yet nature has managed to provide recognition processes as well as store information that appears to be completely classical, that is without superposition. Hence it seems reasonable to examine whether or not certain biological processes are somehow associated with the measurement process. We will

explore the nature of the dynamic transition from Schrodinger only, i.e. wave only to where one gets measurement or collapse. We are supposing that the biological domain is where the collapse occurs. We examine biological macromolecules which enables the creation of biological records and the finalizing of biological recognition processes. We will be especially interested in biological macromolecules and systems that were designed to function close to the border separating the two domains. We calculate the threshold for several basic biological processes and compare this to the lower bound TL calculated by canvassing current quantum experiments on mesoscopic systems. It is argued that most fundamental biological process require recognition processes that must be inherently based on the measurement process. That is, nature has designed its systems taking into account the size or energy needed for measurement to occur. If this is the case, then we should be able to learn about the characteristics of measurement by examining biological systems. We will examine whether there is biological evidence that a threshold exists in  $(\Delta E)(\Delta X) > T$ . Several biological fundamental processes are examined. The first is the manner in which protein chains are recognized. One of the basic and ancient elements that is common in all three domains of life "the Eukarya, Bacteria, and Archae is the signal recognition particle (SRP). The SRP has basic functionality that would be consistent with the measurement process. The SRP recognizes and binds to a signal sequence carried by the ribosome and then guides it to the rough endoplasmic reticulum (ER). These binding energies usually have three types of contributions, i.e. electrostatic, hydrogen bonds and induced dipole-dipole interactions or Van der Waals' interactions. Other processes examined include high affinity protein interactions and protein RNA complexes that are crucial to biological recognition and record creation. Antibody substrate, P-MHC TCR complexes, hormone and their corresponding receptors and interaction hotspots will also be examined. We will also review the current status of mesoscopic physics, and show where experiments that have verified Schrödinger evolution lie in terms of T. We will see that most experiments that have been conducted actually have a small  $(\Delta E)(\Delta X)$ . For example, superconducting squid systems typically have a large  $\Delta X$  but very small  $(\Delta E)$ . Such experiments give us a lower bound TL on the threshold. Based on the most up-to-date experiments, we will provide an estimate of TL. We will see that a given threshold can describe quite well very different physical situations such as ionization and the Rydberg atom, and nuclear processes. **C**

**73 Why meaning is the harder matter: a Boh(e)mian anthropology** Koen Stroeken <koen.stroeken@ant.kuleuven.be> (Anthropology, University of Leuven, Huldenberg, Belgium)

Mainstream anthropology has kept itself outside the mind/matter debate, just as most neuroscientists have, albeit for the opposite reason. Students of culture feel hopelessly dualistic when confronted with the dominant materialism that recasts the debate as a mechanistic challenge, that of neurocomputation, which attributes to the brain a sort of "immaculate conception" of consciousness. If a hundred years of research of cultures taught us anything it is that the principle of natural selection can describe the function and survival of ideas (Atran, Sperber) but not their content and origin, that is, the semantic stuff selected. Meanings appear to be universally shared despite our brains being unique individual constellations of absolutely separate matter. That is why, in practice, ethnographers treat human minds as selections from a common consciousness. Defying both materialism and Cartesian dualism, the implication is that subjective experience arises not from 'mother nature' alone, but from interacting with another source of causation, 'father culture' so to speak. This is another way of saying, with Bohm, that matter does not equal consciousness and that we need meaning, a second, moulding (hence harder) type of matter, to bridge both. From an anthropologist's perspective the best candidate for an interdisciplinary paradigm of thought indeed seems Bohm's solution to the quantum riddle: our classical spacetime, the explicate order, selects from an implicate order of potentialities. A cultural selection from the quantum multiverse constitutes the particular spacetime that is our universe, and thus consistently determines what humans can be conscious of and measure. This measured content of consciousness has been experimentally proven to be non-local and quantum entangled (Aspect, Wheeler). What does this mean in a cultural reading of experiments? The fact of our conscious perception knowing the future betrays our physical belonging to a more encompassing reality, the multiverse, for which our (Einsteinian) spacetime is a selection, entirely completed as selections are. Our mind stands as it were at the edge of spacetime, itself unfortunately (as Bohm remarked) the only world we can think. Humans are bohemians in their world. I conclude more concretely with data on spirit possession which illustrate the exceptional parasympathetic nervous system of the human species. Naturally selected to suspend homeostatic reactions and to stand emotions, our body (not just the brain) managed to use the binary principle of meaning systems (inclusion/ exclusion) to further control homeostasis (intrusion/ synchrony) and become conscious of more. In biological terms consciousness would thus be the by-product arising during this suspension and control, for which I tentatively consider a number of macro-neural correlates. **C**

**74 Consciousness and the measurement problem: A possible objective resolution** Fred Thaheld  
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A recent mathematical analysis of the measurement problem by Adler (1), from the standpoint of Ghirardi's (2,3) Continuous Spontaneous Localization (CSL) theory, reveals that collapse of the wave function takes place in the rod cells of the retina in an objective fashion following amplification of the signal, rather than in a subjective fashion (as had been proposed by Ghirardi et al) in the brain, mind or consciousness. This analysis is in agreement with the positions taken by Shimony (4) and Thaheld (5), that this event takes place in the rod cells of the retina but, at an earlier stage prior to amplification, involving the conformational change of the rhodopsin molecule. It is of historical interest to note here that both Wigner (6) (later in life) and Dirac (7) also espoused an objective process. Additional supporting evidence for an objective approach can be found in the persual of rhodopsin molecule and retinal rod cell schematics (8), which graphically illustrate why collapse has to take place in this fashion. This can also be subjected to 2 different empirical approaches, one involving excised retinal tissue mounted on a microelectrode array and superposed photon states (9) or, through molecular interferometry (10,11) involving matter-wave diffraction, where a "collapsing" wave packet will lead to a suppression of interference. This proposed solution to the 7 decades-old dilemma of the measurement problem, calling for an actual collapse mechanism, requires a modification of the Schroedinger equation to include nonlinear discontinuous changes. This will then allow one to address one or more related issues such as the Heisenberg 'cut' between the quantum and classical worlds, the validity of Everett's 'many worlds' theory (12), raises the possibility for controllable superluminal communication (13), that any living system with or without eyes might possess this same collapse ability, the maintenance of entanglement after repeated measurements, with interesting implications for the Schroedinger's 'cat' concept, finally leading to a new approach to the SETI issue via astrobiological nonlocality at the cosmological level (14).  
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C

**75 A New Theory About Time** Jeff Tollaksen, Yakir Aharonov and Sandu Popescu <jtollaks@gmu.edu> (Dept of Physics & Dept of Computational Sciences, GMU, Fairfax, va, usa)

We present a fundamentally new approach to time evolution within Quantum Theory. Several advantages of this new picture over the standard formulation of Quantum Theory are 1) it can represent multi-time correlations which are similar to Einstein-Podolsky-Rosen/Bohm entanglement but instead of being between two particles in space, they are correlations for a single particle between two different times, 2) dynamics and kinematics can be unified within the same language, and 3) it introduces a new, more fundamental form of complementarity (namely between dynamics and kinematics), 4) it suggests a new approach to time-transience or subjective becoming, one of the most fundamental aspects of conscious experience. The last item is significant given Einstein's reflection that becoming or the subjective-now does not and cannot occur within physics. As a consequence, to date, physics does not incorporate time-transience, i.e. space-time does not evolve or have dynamics. As an analogy, in a geographic map, nothing indicates that one mountain vanishes and another appears, they all co-exist. Similarly, the passage of time has no fundamental or dynamical importance, it is merely an illusion. The new approach to time evolution incorporates becoming by utilizing the new Hilbert spaces introduced for each instant of time. (In contrast, traditionally one Hilbert space is used to represent the entire universe.) We then define a Super-Hamiltonian, which has as its ground state one entire history for the universe. Using another fundamental discovery we call internal and external reality, we associate the time of this Super-Hamiltonian with both awareness variables and processes related to wavefunction collapse. The evolution of awareness or consciousness is then associated with an adiabatic evolution of the Super-Hamiltonian. Because a single Now requires integration over all of the Super-Hamiltonian time, this new approach also illuminates the common phrase (e.g. by Bohm): now is the intersection of eternity and time. C

**76 Gravity minds? Parallels between the basic characters of the consciousness and the gravity.** Imre András Török, Gábor Vincze <torokia@freemail.hu> (Department of Psychology, University of Szeged, Szentes, Hungary)

Our discourse consists of two parts. First we draw an epistemological and phenomenological parallel between two, seemingly remote and the most overall phenomena of the world. With this our aim is to help people understand the mind deeper. At the moment neither the gravity (the missing link from the Grand Unified Theory) nor

the conscious experience are explained in their origins. The extreme manifestations of the gravity produce such phenomena that correspond to the criteria of the consciousness determined by Hussler. In case of the black holes we can observe such closeness on the level of the phenomenon that is obvious in case of the subject. That is, the subjective experience of the individual is not accessible on the level of the experience, similarly to this, the inaccessibility of the space of the black hole is obvious in case of the physical phenomena, only their effects can be shown. Beside the phenomenological similarity of the features of the two basic phenomena, their explanation attempts are also similar in the mainstream natural science. In one hand the subjective experiences are considered to be the consequences of other basic phenomena, while the gravity itself seems to be on independent physical phenomenon. In the second part of the discourse we give provocatively and tentatively such a contesting explanation to the gravity and subjectivity that in the first case makes the origin of the gravity possible on mathematical and physical basic (as the consequences of a complex phenomenon), in the second case we give contesting explanations related to the materialistic reduction of the consciousness relying on biological evidences. The biological firmament of the reasoning will prove the fact that the phenomenon of ipseity cannot be reduced into a materialist level yet it can be placed in the scientific psychology. C

**77 Quantum information theory and the human brain: The special role for human unconscious information processing** Maurits Van den Noort, Peggy Bosch; Kenneth Hugdahl <Maurits.Noort@psybp.uib.no> (Dept. of Biological and Medical Psychology, Division of Cognitive Neuroscience, University of Bergen, Bergen, Hordaland, Norway)

Concepts like entanglement, randomness, and complementarity have become the core principles of newly emerging quantum information technologies: quantum teleportation, quantum computation and quantum cryptography (Zeilinger, 2005). Although quantum computation promises to be a dominant form of information technology (e.g. Childress et al., 2006; Duan, Cirac, & Zoller, 2001), we do not know very much about the interaction between humans and quantum computers and the relation between quantum mechanics and (higher) brain functions yet (e.g. Koch & Hepp, 2006; Van den Noort & Bosch, 2006). In this presentation, behavioral studies and studies that focus on the peripheral- and the cortical level will be discussed that suggest a special role for unconscious (emotional) information processing in human computer interaction (Van den Noort, Hugdahl, & Bosch, 2005). The implications of these results both for human conventional computer and for human quantum computer interaction will be discussed. References: Childress, L., Gurudev Dutt, M. V., Taylor, J. M., Zibrov, A. S., Jelezko, F., Wrachtrup, J., Hemmer, P. R., &

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**78 Mental causation, common sense and quantum mechanics** Vadim Vasilyev <edm@rol.ru> (Philosophy, Moscow State University, Moscow, Russia)

Many authors who try to comprehend the nature of connection of consciousness with quantum processes believe that presence of consciousness in measurement procedures leads to the collapse of the wave function. In other words, they admit the causal efficacy of consciousness or qualia. It is quite obvious, however, that quantum events, taken as such, don't reveal the causal efficacy of consciousness, and some well-known interpretations of quantum mechanics have no need for any assumption as regards the role of consciousness in quantum phenomena. Hence the importance of the quest for independent arguments in favor of reality of mental causation and refutation of epiphenomenalism. In the near past there were many interesting attempts to destroy epiphenomenalism "" Eilitzur (1989), Hasker (1999), Kirk (2005), among others. Their arguments are very sophisticated, but, as a rule, such arguments can be blocked with no less sophisticated counter arguments. The simplest refutation of epiphenomenalism would have taken place in the case of contradiction of this doctrine with intuitions of common sense. Most philosophers, however, believe this is not our case. Indeed, while common sense assures us that, for example, our desires, considered as qualia, have an influence on our behavior, in fact it only assures us about a kind of correlation between desires and behavior, correlation that might be an epiphenomenon of some basic neuronal processes. Nevertheless "" and this is my main point "" it is possible to show that common sense convictions presuppose causal efficacy of consciousness after all. That's because without such an assumption I simply couldn't believe that other people have conscious states. I believe they have these states or qualia like I have because of their physical and behavioral similarity with myself. My conclusion is based on simplicity considerations. But if I consider the conscious states as epiphenomena, the world in which only myself is conscious (perhaps due to some peculiar property of my brain) is much simpler than a world where others are encumbered with qualia

as well. Indeed, in the first world there is no multiplying of entities which were truly unnecessary and useless for explanation of the reality given in my experience (Jackson (1982), Chalmers (1996) and Robinson (2007) missed this point). Thus, if I assume that consciousness is epiphenomenal, I would hardly believe other people have consciousness at all. But common sense dictates me to believe they have conscious minds. Hence, my common sense comprises an implicit denial of epiphenomenality of conscious states. So we see that in some cases our common sense may even favor quantum mechanics, or, to be more exact, may support one of its most radical interpretations. References. Chalmers, D. 1996. *The Conscious Mind*. New York: Oxford University Press. Eilitzur, A. 1989. *Consciousness and the incompleteness of the physical explanation of behavior*. *Journal of Mind and Behavior* 10: 1""20. Hasker, W. 1999. *The Emergent Self*. Ithaca, N.Y. : Cornell University Press, 1999. Jackson, F. 1982. *Epiphenomenal qualia*. *Philosophical Quarterly* 32: 127""136. Kirk, R. 2005. *Zombies and Consciousness*. New York: Oxford University Press. Robinson, W. 2007. *Epiphenomenalism*. Entry in the *Stanford Encyclopedia of Philosophy*. **C**

**79 Spinoza, Leibniz and Quantum Cosmology** Laura Weed <weedl@strose.edu> (Philosophy, The College of St. Rose, Albany, NY)

During the Scientific Revolution, the mechanism of Isaac Newton and Rene Descartes triumphed over the more complex epistemological and metaphysical systems of Baruch Spinoza and G.W. Leibniz because the Spinozistic and Leibnizian systems seemed to speculate about unnecessary entities and forces, violating Ockham's simplicity rule for scientific theories. In light of contemporary quantum mechanics, however, it may now be time to revisit some of the metaphysical and epistemological proposals of these two authors. I will propose three general metaphysical and epistemological positions espoused by one or both of these authors that may appear less speculative and extraneous to present day scientists than they did to their counterparts of the past. The general positions are 1) that parts and wholes interrelate forming an organic cosmos, rather than a congeries of compounded components; 2) that the totality of what exists exceeds human faculties and methodologies for acquiring knowledge; and 3) that the relationships among the varieties of temporal scales in the universe precludes a meaningful conception of universal mechanical causation. First, Leibniz, Spinoza and quantum mechanics agree that the world is not a computational result of adding parts. Rather, the cosmos is an organic system in which parts and wholes are mutually determining of one another. The paper will explore ways in which Leibnizian monads, Spinozistic modes and the electrons in the Bell experiment reflect a holistic and inter-relational cosmos, rather than a compositional world. Second, while Newton and Descartes were both optimis-

tic about the capacity of human knowledge to comprehend all there is, and to ultimately result in a grand unification of science, Spinoza and Leibniz both proposed perspectival and methodological limits on the human potential for knowledge. These limits are reflected, I shall argue, in the role of the observer in quantum theory, and in the Everett many-worlds hypothesis. Third, the concept of global mechanical causation proposed by Newton and Descartes presupposes a uniform global space-time, across which these causes might unfold. Both Spinoza and Leibniz understood time as a multi-layered phenomena, distinguishing among multiple local, regional and eternal conceptions of time. I will suggest that their paradigms might be more useful for interpreting Feynman's proton and electron graphs metaphysically. Clearly, much of what Spinoza and Leibniz wrote is simply out of date and insufficiently prescient to be of any help with contemporary quantum understandings of reality. But I would like to propose that at least the three ideas articulated in this paper would be helpful in constructing a metaphysics and epistemology for the weirdness of the quantum world. Popular scientific conceptions of knowledge and reality have been wedded to Newtonian mechanistic materialism in ways that have become unhelpful for science. This new, although recycled, direction might be more productive. **C**

**80 Towards a Quantum Paradigm: An Integrated View of Matter and Mind** George Weissmann <georgeweis@aol.com> (Berkeley, CA)

A fundamental paradigm is the set of conditioned structuring tendencies that shape our experience existentially, conceptually and perceptually. It is based on a set of embodied assumptions or presuppositions. We call the specific fundamental paradigm which grounds our culture's common sense and scientific views and which structures our existential reality, the Classical Paradigm (CP). A critical examination and analysis of relativistic and quantum phenomena reveals that the assumptions which define the CP break down in large parts of the total phenomenal domain. Remarkably, a century since the relativity and quantum revolutions, we have not yet succeeded in developing a new fundamental paradigm, a Quantum Paradigm, that could naturally ground relativity and quantum physics ontologically.. The mainstream Copenhagen Interpretation of QT is instrumentalist and yields the procedures we so successfully use to calculate the probabilities of the various possible outcomes of an experiment, given its preparation. But it does not provide an account of what is actually occurring in an experiment. In fact, when one tries to interpret it ontologically, it suffers from inner inconsistencies (measurement problem). The Copenhagen interpretation suggests that the topic of QT is not the world itself, but our knowledge of the world, the structure of experience. Various alternative interpretations have been proposed over the years in an attempt to remedy QT's lack of an

ontology. Most of them remained attached to core CP assumptions, including objective realism, which imply banishing consideration of consciousness. Some of these attempts were shown to be incompatible with the predictions and the structure of QT itself, while others survived but suffer from significant shortcomings. As a result, we are still navigating science, our own lives and society on the basis of a fundamentally flawed world view. Our claim is: we cannot ground quantum theory in the CP. In particular, we can no longer banish experience/consciousness from the picture and still hope to understand what QT is telling us about the nature of the world. We report on some promising progress towards the development of a Quantum Paradigm which provides an ontology for QT and inextricably integrates matter and mind. Henry Stapp, building on foundations offered by Whitehead and Heisenberg, has proposed an ontological model which builds on the Copenhagen interpretation and describes an unfolding world process, consisting of events that are - in human terms - moments of our experience. The probabilistic dynamics (tendencies) of this process are described by quantum theory. We propose integrating into this framework the relational postulate of Carlo Rovelli, which states that there are no facts or occurrences in an absolute sense, that these are always relative to a measuring or perceiving system. We further take into account insights gained by consideration of experimentally observed anomalies which suggest that quantum events are not fundamentally random but more like 'decisions'. Proceeding thus, we arrive at a rudimentary and preliminary but heuristically useful version of a QP which could ground QT as well as human experience including its observed 'anomalies', and which encounters no 'hard problem of consciousness'. **C**

**Posters**

**81 A Model of Human Consciousness (Global Cultural Evolution)** Marcus Abundis <marcus@cruzio.com> (unaffiliated, Santa Cruz, CA)

Evolutionary efficaciousness is measured in how well a given species adapts itself to its environment. In applying this premise to humanity, a model of global human cultural evolution is hypothesized. This exploration of Human Creativity focuses on: - emergence of humanity's direct conscious sense (personal ego), - the field of reasoning from which this conscious sense arises (imagination), - the field of reasoning that follows (knowledge), - and the system in which all is bound together (evolution). All else is derivative - a litany of subsequent emergent events (worship, war, work) endlessly folding back upon themselves, revealed as "civilization." This study begins with the organism that originally births humanity, Earth. Earth's geologic record shows at least five episodes of mass extinction followed by recovery. From these episodic cycles of Earthly death and rebirth, five evolutionary dynamics are named. The millennia-long interplay of these five dynamics brings greater diversity and com-

plexity of life, until we arrive at the species of our epoch; including humankind with its challenges of consciousness. Earth's overarching evolutionary dynamics set the stage upon which human consciousness awakens. These dynamics organically stress (test) all organisms for viability, and trigger within humanity's adaptive psychology an "adverse relationship" with environment. A central focus of evolutionary fitness (rivalry with Nature's adversity) mars humanity's psyche with a sacred wound, as it appears "Mother wants to kill us?!" This sense of adversity provides evolutionary catalyst (bootstraps consciousness) and draws us to move expansively from discomfort to comfort. We are thus physically and psychologically charged to create adaptive responses, cultivating our "experience of consciousness." The sacred wound presents a paradox central to humanity's continued expansion of consciousness. It lives in all intellectual and spiritual questions of unity vs. diversity (Earth-Mother vs. humanity) as the mythologizing of Natural adversity. Resolution of paradox begins in primal innocence at The Great Leap Forward (a state of unconscious unity) and evolves towards fully-manifest awareness (god-self, unity consciousness), prompting many states of consciousness along the way. But it is adversity that awakens humanity's unique creative spirit-dynamo to birth successive states of consciousness as a principal adaptive response. Our struggle with paradox fluoresce human consciousness towards diversity and complexity, following Earth's own metabolic trend. Humanity's mirroring of Earth's evolutionary tendency (diversity and complexity) suggests functional means for human expressiveness. This expressiveness is mapped to Earth's five evolutionary dynamics, using five gender-paired archetypes. Our mirroring of Earth's evolutionary dynamics via these five archetypes (bio-culturalism) propels human consciousness across time. Humanity's bio-culturalism is amplified in these gender-paired archetypes and the mythic devices they enable. At a first level, "high/middle/low dreaming" archetypes reflect the hopes of humanity (creativity) set against Nature's adversity, also seen in humanity's triune psyche: id, ego, superego, and other important triads. Deepening interoperation of this triune psyche completes two more of the five archetypes to create actualized archetypes. Actualized archetypes latently emerge as diverse but interdependent "realities" for individuals, communities, social enterprises, nation-states, etc. (civilization). **P**

**82 Quantum spaces of human thinking** Valentin Ageyev <ageyev@mail.kz> (psychology, Kazakh National University, Almaty, Almaty, Kazakhstan)

Thinking is ability to transform objective relations of nature in the purposes of human actions. Objective relations are quantized relations and divided into four types: casual, regular, system and relations of genesis. The human thinking has quantized character too as it is determined by quantized objective relations. Random rela-

tions are displayed by magic (sensual) type of thinking. Regular relations are displayed by mythological (intuitive) type of thinking. System relations are displayed by rational (logic) type of thinking. Relations of genesis are displayed by creative (historical) type of thinking. Magic (sensual) thinking is the way of transformation of objective random relations in the sensory purposes of spontaneous actions. The man operating spontaneous way, recreates probable space of nature. Spontaneous action is determined by the sensory purpose which is a product of magic (sensual) thinking. Mythological (intuitive) thinking is the way of transformation of objective regular relations in the perception purposes of regular actions. The man operating in the regular way, recreates the ordered space of nature. Ordering action is determined by the perception purpose which is a product of mythological (intuitive) thinking. Rational (logic) thinking is the way of transformation of objective system relations in the symbolical purposes of system actions. The man operating in the system way, recreates holistic type of nature. System action is determined by the symbolical purpose which is a product of rational (logic) thinking. Historical (creative) thinking is the way of transformation of objective relations of genesis in the sign purposes of creative actions. The man operating in the creative way, recreates historical space of nature development. Creative action is determined by the sign purpose which is a product of historical (creative) thinking. Magic (sensual) thinking is the way of "cutting" in the nature of its first quantum space – probable. Products of magic (sensual) thinking are the "states" ("probability") which are representing themselves as the purposes of spontaneous actions. As the result of spontaneous actions their purposes turn to the "magic" (sensual) knowledge expressing random character of nature. Mythological (intuitive) thinking is the way of "cutting" in nature of its second quantum space – regular. Products of mythological (intuitive) thinking are «object structures» ("orders") which are representing themselves as the purposes of regular actions. As the result of regular actions their purposes turn to the "mythological" (intuitive) knowledge expressing ordered character of nature. Rational (logic) thinking is the way of "cutting" in nature of its third quantum space – holistic. Products of rational (logic) thinking are «object forms» («formal logic»), representing themselves as the purposes of system actions. As the result of system actions their purposes turn to the rational (conscious) knowledge expressing holistic character of nature. Historical (creative) thinking is the way of "cutting" in the nature of its fourth quantum space – historical. Products of historical (creative) thinking are «genesis forms» («genesis logic»), representing themselves as the purposes of creative actions. As the result of creative actions their purposes turn to the historical (sensible) knowledge expressing historical character of nature **P**

**83 Concurrency, Quantum and Consciousness** Francisco Assis <fmarassis@gmail.com> (Electrical Engineering, Universidade Federal de Campina Grande, Brasil, Campina Grande, Brasil)

In this paper we review facts on theory of consciousness due to three authors: Tononi, Sun and Petri. In [1] Tononi proposes that consciousness level of a system can be measured capacity to integrate information and that quality of consciousness is given basically by the topology of the system. The "system" in the Tononi's theory is modeled by a graph  $G = (V, A, P)$ , where  $V = \{1, 2, \dots, n\}$  is the set of vertices,  $A$  subset of  $V \times V$ , is the set of edges and  $P$  is a probability distribution on the vertices  $V$ . In the Tononi's approach,  $A$  stand for causal relation between vertices connected, i.e. an edge means existence of a causal relation between its vertices. Following this setup the "amount of consciousness" of the system was associated with the minimum information bipartition. The first contribution of this paper is repositioning the measure proposed by Tononi in the framework of concurrency theory due to Petri [2]. One very remarkable issue of the Petri's theory is its physical motivation, it was sought to determine fundamental concepts of causality, concurrency, etc. in a language independent fashion. Also for insiders it is easy to see that concepts of line, cuts and process unfolding of a marked net correspond respectively to physical concepts of time-like causal flow, space-like regions and solution trajectories of a differential equation. For example, in paradigm of concurrency theory and its developments, e.g., Savari [3], the graph proposed by Tononi is a noncommutation graph. The new point of view we develop is consistent with Sun [4] applications of the idea of that success of physical theories settles on a hierarchy of descriptions similar to the modular hierarchy found in computer and electronic systems. For example, it is well known that unconscious processes cannot generate a complex verbal report while conscious activation can do it. Access to consciousness and phenomenal consciousness are taken into consideration and related to other detailed levels of perception, memory. However Sun is clearly interested in constructing a computational machinery able to behave like a conscious being. At this point, we change the gear to treat more fundamental ontological aspects of the conscious experience itself and its relationship with quantum physics. The main remark is that concurrency theory with support of an ontological status can offer a consistent start to a theory of consciousness. [1] Giulio Tononi, "An Information Integration Theory of Consciousness", *BMC Neuroscience*, 5:42:1-22, 2004 [2] Carl Adam Petri, "Concurrency Theory", In *Lecture Notes in Computer Science*, pages 2-4, 1987 [3] S A Savari, "Compression of Words Over a Partially Commutative Alphabet", *IEEE Trans. on Information Theory*, 50(7):1425-1441, July 2005 [4] L. Andrew and Ron Sun, "Criteria for an Effective Theory of Consciousness and Some Preliminary Attempts", *Consciousness and Cognition*, 13:268-301, 2004 **P**

**84 Consciously 'chosen' Quantum Design** Gerard Blommesteijn <gblomm@gmail.com> (Amstelveen, Netherlands)

This presentation is based on the view that the self as 'I' experiences the outcome of the quantum mechanical (QM) reduction process related to the ultimate step of perception in the brain and this is the subjective perception. In the same way the self chooses the outcome of a QM reduction process that forms the initial step of a motor activity in the brain and this is the subjective choice. This thesis proposes that these QM reduction processes are not only connecting consciousness to perception and choice in humans, but also in all other life-forms (with or without brains) and even in the most primordial (bio)chemical compounds leading to the evolution of life. Compared to the standard scientific way of understanding nature, an essence of consciousness is added, this being totally subjective, experiencing and choosing 'I'. So, the 'subjectiveness' of a molecule 'chooses' the outcomes of reduction processes that determine the actions of this molecule (all according to the quantum mechanical probabilities). For instance, at the start of the evolution of life, a molecule 'chooses' outcomes that are moving towards being an essential part of the beginning of the first 'proto-cell'. Here the same principle may be at work as we see when light passes through a succession of many slightly tilted polarizing filters; repeated quantum measurements of the polarization of the photons 'guide' it in a more and more tilted direction. In the same way the continuous conscious perception and 'choice' of biomolecules may quantum mechanically 'guide' (beginning) living systems through their 'design' steps. This principle of consciously 'chosen' Quantum Design will be explained, as well as its application to the processes shaping life and evolution, largely according to the ideas of John Joe McFadden documented in the book 'Quantum Evolution' (ed. Flamingo 2000). **P**

**85 Two Gedanken, One Answer; Cloudy weather on the Mind/Body Front** Michael Cloud; Sisir Roy; Jim Olds <mcloud1@gmu.edu> (Krasnow Institute, George Mason University, Centreville, Virginia)

We consider approaches whose purpose is to investigate the relationship between consciousness/mind and matter/brain hardware in the context of testable theories. If consciousness is to be resolved as strictly arising from matter in a testable manner it would follow that one of two strategies should be pursued: importing objective data into consciousness, or exporting of subjective conscious experience out to the objective world. We therefore investigate two gedankenexperiments. One involves feeding objective brain state information (e.g. MRI-like data) to the subject of that data in real time, and subsequently asking the same subject to make experimental observations of that data. The second experiment is to consider the issues arising from a calculation (or testable Prediction Engine) attempting to predict its own future



behavior. We suggest that both questions involve significant practical difficulties, and raise the question of whether they can be completed in the general case. We conclude with the question of whether under very basic requirements on hardware, the issue of subjective vs. objective can be testably resolved. **P**

**86 Reassessing the Relationship between Time and Consciousness** Erik Douglas <erik@temporality.org> (Philosophy (Science, Physics, Time...), Independent Scholar, Portland, OR)

I begin with a review of the key empirical results and ideas forwarded concerning the relationship between time and consciousness over the past twelve years. Time is, of course, a fundamental variable and background notion in most theories, and this is no less the case with explanations about the origin of consciousness. However, our understanding of time is itself heavily dependent of our interpretation of mind and human experience, and herein we find the kind of circular semantic relationship between key notions that suggests itself as a potentially fruitful approach to disclosing elements of the Hard Problem of consciousness to genuine scientific investigation. Following an overview of the general problem space as it is at present, I will turn to my own research into making one very important facet – perhaps the essential feature – of time explicable: the so-called passage of time. Making temporal transience explicit means finding a way to articulate its properties so as to avail them to scientific and physical inquiry. I undertake this through the construction of models which distinguish the qualities ascribed to time in its many applications and contexts, with special attention given to two classes of temporal models: Rheological and Chronological. I will use Smythies (2003) JCS article as a point of departure, but significant parts of this talk will draw from my recent published work (cf. Douglas, 2006) and will incorporate material from an forthcoming article to be submitted to the JCS. As a philosopher, my intent is less to answer ill-conceived questions than to repose them in the first place so that they may be properly subject to empirical study. As such, it is my hope to engender a new direction to pursue in how we think engage the study of consciousness. **P**

**87 The Affect is all at once cognition, motivation and behaviour** Veronique Elefant-Yanni, Maria-Pia Victoria Feser Susanne Kaiser <veronique.elefant-yanni@pse.unige.ch> (Affective sciences, University of Geneva, Geneva, Geneva, Switzerland)

We commonly perceive semantic terms, which characterize the affect a person feels, on a bipolar continuum, going from merry to sad for example. However in affective sciences, there is a persistent controversy about the number, the nature and the definition of the affect structure dimensions. We consider the affect as the momentary feeling a person has at any time that is induced by

the situation as a whole, including internal and external stimuli. Responding to the methodological criticisms addressed to the preceding studies, we conciliated the principal theories regarding the affect structure with the same experimental setting. In particular, using the semantic items all around the circumplex we found three bipolar independent dimensions and using only the PANAS semantic items, we found two unipolar dimensions. Finally, we propose a heuristic theorization of affect based on a current firmly established in social sciences, coherent from semantics to sociology, but largely ignored by researchers in affective sciences, that allows to postulate that affect is all at once cognition, motivation and behaviour. The affect is an ever-present unconscious monitoring process of our environment, but it is also as a summation the first conscious source of knowledge that disposes us, mind and body, to respond to this situation. As the affect aggregates and makes the summation of all those many informations of our situation in no time, we should consider its relation with the quantum consciousness hypothesis. **P**

**88 Imagine consciousness as a single internal analog language formed of ordered water forged during respiration in concert with experience.** Ralph Frost <refrost@isp.com> (Model Development, Frost Low Energy Physics, Brookston, IN)

Common sense tells us that all of the abstract math symbols and expressions are secondary, and thus arise from some primary, internal "analog math". That is, that the abstract stuff is wildly secondary and that only the analog-energetic stuff is primary. Cutting our layered cake in this new manner lets us focus on the stuff that's not in the streetlight's intense glare. Pawing around out beyond the paradigmatic shadows, fumbling through the debris, searching for the right analog math then becomes some sort of quest for a new imagery that's somehow related to our baseline energetics. Keeping things simple, that means that we're looking first at the respiration reaction: organics + oxygen -> carbon dioxide + water + new parts + some energy flow This reaction, recycling carbon back from the flip-side of photosynthesis, powers the down-gradient neurology and everything else. Thus, that entire nervous segment must also be sort of secondary or just more involved in output/communications functions. Plus this view says that where ever there is high oxygen consumption there ought to be a high, stoichiometric formation and flow of newly formed/forming water molecules -- a.k.a., a highly rational, wildly repeatable internal analog math process, influenced by the "vibrations" passing through each site where the reaction is taking place. Since a water molecule generally is a tetrahedral-shaped unit with two plus, and two minus vertices, within any enfolding field there are at least six ways each molecule can form or emerge. Considering n-units forming in a sequence, this leads directly to a highly rational  $6^n$  internal analog math. Set-

ting  $n=12$ ,  $6^{*}12$  gives us 2,176,782,336 different ways to scribble these 12 units together.  $n=8$ , or  $n=13$ , or  $n=16$ , gives us different sorts and sets of associative/logical patternings -- more variations on the same theme. Allowing that the repeating patterns of vibrations in the surroundings play THE big role in which patterns keep repeating in the sequences of water molecules that keep emerging, we arrive rather quickly at a moderately logical feel for the common internal analog math "language" that runs in the unconscious, subconscious, and conscious regions, plus the senses, memory storage (short-term, and when water patterns are bound with organics, longer-term), plus imagination-creativity, "feelings and impressions", and provides one way to hook fight-flight impulse-momentum directly to motility. That is, we get a quick and dirty introductory view of our common "wave mechanics". Is this THE internal analog math? You tell me. Put it to the experimental test. Stop breathing and find out what happens to your consciousness. P

**89 The sum over history interpretation of neural signals applied to orientation sensitive cortical maps.** Roman Fuchs, Gustav Bernroider <Roman.Fuchs@sbg.ac.at> (Organismic Biology, Neurosignaling Unit, Salzburg, Austria)

Higher level brain functions correlate with the spatio-temporal signal dynamics behind ensembles of nerve cells. The overall situation can be figured as a mapping of the history of membrane currents to the absence or presence of a nerve impulse at a given time and location. This general frame includes all possible signal amplitudes including the quantum scale that causally precede the stimulus sensitive activity of engaged nerve cells. Neural activities along this view can be considered as complex projection amplitudes that do not have to follow a single unique path, but can comprise a large set of alternatives in coherent superposition. The physics behind this concept goes back to the sum over history interpretation, originally proposed in the diagrammatic perturbation theory of R. Feynman. In a previous paper we have applied Feynmans perturbation theory to phase dependent coding mechanism in the brain (Bernroider et al 1996). Here we demonstrate its applicability in the analysis of layer 2 iso-orientation sensitive cortical activity maps (\*). The theoretical background and, in particular, the relation to studies of neural correlates of consciousness (NCC) will be given in a separate paper (Roy and Bernroider, this issue). Bernroider G, F. Ritt and EWN Bernroider (1996), *Forma*, 11, 141-159 Roy S and Bernroider G, this issue (\*) Images of cortical activity maps were generously supplied by T. Bonhoeffer, MPI Munich P

**90 Consciousness as a black hole: perceptory cell and dissociated quantum** Johann Ge Moll <Johanngmoll@gmail.com> (Department of Psychiatry, Hospital Karlucovo, Medical Academy Sofia, Bulgaria)

ia, Sofia, Bulgaria)  
1) Unlike the traditional opinion Consciousness doesn't participates into the Reduction of Wave Function, but is responsible for the reverse procedure of the "Restoration of the Wave Function", retransforming back the Perception Function into Wave Function. 1,1) Similar to a Black Hole, the Consciousness swallows matter and energy, and radiates back Information 2) The Consciousness is an ontological mechanism for de-materialization and de-temporalization: Consciousness dematerializes the body. Here it plays the role of a cosmological machine for re-transformation of the Macroscopic Present into Quantum Future. This re-transformation of the Present into the Future occurs as a transformation of the Present into Memory. 3) The transformation of the Actualistic Energy into Possibilistic Information occurs as a transformation of the Forgetting Fantasizing Energy into Remembering Form, or – briefly – transformation of Time-Oblivion into Memory. 4) The transformation of the Macroscopic Present into Quantum Future has the following consequences: Transformation of the Actualistic Universe into Possibilistic Universe. 5) The transformation of Actualistic ontology into Possibilistic ontology is equal to Transformation of Asymmetry into Symmetry. 6) Symmetry is a logical equivalent of Objective Memory = Objective Memory = Omni-Order = Omni-Arrangement = Chaos = Pseudo-Entropy = Quantum Future = Kingdom of Possibility = Objective Knowledge = Information. 7) As a Black Hole, Consciousness curves time in perpendicular direction and forms Perpendicular Simultaneous Instantaneous Time. 8) By gathering together all Past, Present and Future, Consciousness performs Contraction of Time. 9) As "Time Contraction," Consciousness verticalizes the Epochs. 2. We described the human organism as a system of two contrary ontological simultaneous movements: the Movement of "Materialization" and the movement of "De-materialization." The act of transformation of Possibilistic Objective Knowledge into Actualistic Subjective Matter, which takes place as transformation of Possibilistic Quantum Future into Actualistic Macroscopic Present (insofar as the Possibilistic Quantum Future is the kingdom of Knowledge and the Actualistic Macroscopic Present is the kingdom of Matter), are responsible for the movement of "Materialization." That transformation of Quantum Future into Macro-present occurs as the notorious act of reduction of the Wave Function. It is precisely that reduction of the Wave Function, which transforms the Wave Functions of Information into the Perception Functions of matter and the body, and these Perception Functions, in turn, build the Perception organs and the personal perception cell structures and organs of the body. The Force and the Impulse standing behind the above-mentioned movement of transformation of the Possibilistic future into Actualistic present, and performing the act of reduction of the Wave Function (and actually streaming from the Spirit – Matter) is the World Asymmetric Anti-gravity Force, which is realized subjectively as an act of Fanta-

sy, and the analytically working Consecutive Temporal Intellect, and is objectively presented as an act of "Objective Chance-Fantasy." The reverse process of reverse Re-transformation of Actualistic Subjective Matter into Possibilistic Objective Knowledge is responsible for the reverse movement of de-materialization, which occurs as reverse transformation of the Actualistic Macroscopic Present into Possibilistic Quantum Future. This reverse re-transformation of the macroscopic Present into Quantum Future occurs as an act of "Restoration of the Wave Function." The Restoration of the Wave Function is realized as re-transforming back of the Perception function of matter and body into a Wave Function of Information. Consciousness is the organ, which performs this reverse process of "Dematerialization" of the body and Matter.

**P**

**91 The enhanced perceptual state** Catarina Geoghan <cgeoghan@ntlworld.com> (Brighton, England)

In the early stages of psychosis, the prepsychotic phase, and also during meditation, individuals frequently experience enhanced perceptual sensitivity, whereby sights and sounds appear brighter and louder than usual. It will be argued that this is due to increased facilitation of a coherent reference frequency. This is based on a holographic model for perception according to which increased coherence results in increased response to perceptual stimuli. **P**

**92 Reveals the core secret of mind and it's mechanism** Sanjay Ghosh, Papia Ghosh <yogainstruments@yahoo.co.in> (NA, Spectrum Consultants, Howrah, West Bengal, India)

Our world needs a singular answer which can satisfy entirely the quest about mind and it's mechanism. Now, the question is, can we expect to get such an answer by following the conventional process of observation? Certainly not. Then what should we do? We need to follow a completely new method of observation. What could be the necessary feature for such an observation technique? It must be a process based on new nature of instruments and the act of observation will be of three folds in nature, as like, a) first, we have to learn the art of extracting energy or apparent consciousness from all sorts of instruments b) second, we have to enter into the network of our dormant nervous system, the other name of which is finer part of mind c) finally, we need to know the technique of contemplation on natural objects, like, huge celestial and various earthly bodies. The accumulated power and the quantum of consciousness as to be earned by said succession, will boost one to enter into the causal start of manifestation, so of mind. There the number of active elements to be seen have been reduced into one and that itself will pronounce as the answer of 'what mind is'! By the time, the mechanism of working of mind to be fully known, because, one will cross the entire track---starting

from super gross artificial instruments to bio-physiological instruments and lastly the natural instruments. In fact, our urge towards manifesting ourselves in the name of nature, creates tremendous resistance within ourselves and therefore, we become complex or opaque in nature. So, on the other side, if by adoption of some method, we can be able to reduce our resistance, we will start becoming simple, so almost transparent. The said transparency is actually the universal nervous body with unlimited quantum of power. The whole purpose of human being is to realize that condition by uniting with real consciousness. Our new package consisting of 236 instruments will lead you to attain such condition in quickest possible time. In Quantum Mind 2007, we propose to give live demonstration for a set of 3 instruments for immediate understanding. These instruments are 1) Near Vision Instrument: This will unveil the secret of conversion from transparent to opaque object and vice versa without using any chemical reagent or applied electricity. 2) Net Metallic Lens Instrument: The metallic ingredients of our body how largely affects our vision and creates tremendous illusion that is to be seen physically by this instrument. 3) Eye Electricity Instrument: The most sensitive as well as vital organ "eye" how produces a variety of unknown nature of power, one will be able to experience from this instrument. Finally, this paper in actual term, is a live demonstration of the mechanism of our Mental Syndrome. **P**

**93 A soul mind body medicine - a complete soul healing system using the power of soul** Peter Hudoba, Zhi Gang Sha, MD (China) <sharesearchfoundation@yahoo.ca> (Sha Research Foundation, Burnaby, British Columbia, Canada)

In recent decades, there has been an upsurge of new concepts of treatment. Words like "integrative," "complementary," "alternative" and "holistic" now permeate not only the healthcare field, but also everyday discussion. Various forms of mind-body medicine have become more and more popular, to the point of being widely accepted. These modalities emphasize the mind-body connection, which encompasses the effect of our psychological and emotional states on our physical well-being and the power of conscious intent, relaxation, belief, expectation and emotions to affect the health. Authors of this paper discuss the Soul Mind Body Medicine as an adjunct healing modality to conventional standard medical treatment. Mind over matter is powerful, but it is not enough. Soul over matter is the ultimate power. The healing power of the mind and soul can be used in conjunction with any and all other treatment modalities. Dr. Hudoba and Dr. Sha present techniques utilizing mind and soul power with special body postures that are very simple, powerful and effective. Positive results can be achieved relatively quickly. These simple healing practices can be easily taught to patients to support and enhance their healing process. Authors support their

presentation with examples of their clinical research using the power of mind and soul in the healing of cancer and in development of human being. P

**94 Unified Theory of Bivacuum, the Matter, Fields & Time. New Fundamental Bivacuum - Mediated Interaction and Paranormal Phenomena.** Alex Kaivarainen <H2o@karelia.ru> (Dept. of Physics, University of Turku, Turku, Finland)

The coherent physical theory of Psi phenomena, like remote vision, telepathy, telekinesis, remote healing, clairvoyance - is absent till now due to its high complexity and multilateral character. The mechanism of Bivacuum mediated Psi - phenomena is proposed in this work. It is based on number of stages of long term efforts, including creation of few new theories: 1) Unified theory of Bivacuum, rest mass and charge origination, fusion of elementary particles (electrons, protons, neutrons, photons, etc.) from certain number of sub-elementary fermions and dynamic mechanism of their corpuscle-wave [C - W] duality (<http://arxiv.org/abs/physics/0207027>); 2) Quantitative Hierarchic theory of liquids and solids, verified on examples of water and ice by special, theory based, computer program <http://arxiv.org/abs/physics/0102086>); 3) Hierarchic model of consciousness: from mesoscopic Bose condensation (mBC) to synaptic reorganization, including the distant and nonlocal interaction between water clusters in microtubules (<http://arxiv.org/abs/physics/0003045>); 4) Theory of primary Virtual Replica (VR) of any object and its multiplication. The Virtual Replica (VR) of the object, multiplying in space and evolving in time VRM(r,t) can be subdivided on surface VR and volume VR. It represents a three-dimensional (3D) superposition of Bivacuum virtual standing virtual pressure waves (VPWm) and virtual spin waves (VirSWm), modulated by [C-W] pulsation of elementary particles and translational and librational de Broglie waves of molecules of macroscopic object (<http://arxiv.org/abs/physics/0207027>). The infinitive multiplication of primary VR in space in form of 3D packets of virtual standing waves: VRM(r), is a result of interference of all pervading external coherent basic reference waves - Bivacuum Virtual Pressure Waves (VPW+/-) and Virtual Spin Waves (VirSW) with similar waves, forming primary VR. This phenomena may stand for remote vision of psychic. The ability of enough complex system of VRM(r,t) to self-organization in nonequilibrium conditions, make it possible multiplication of VR not only in space but as well, in time in both time direction - positive (evolution) and negative (devolution). The feedback reaction between most probable/stable VRM(t) and nerve system of psychic, including visual centers of brain, can be responsible for clairvoyance; 5) Theory of nonlocal Virtual Guides (VirG) of spin, momentum and energy, representing virtual microtubules with properties of quasi one-dimensional virtual Bose condensate, con-

structed from 'head-to-tail' polymerized Bivacuum bosons (BVB) or Cooper pairs of Bivacuum fermions (BVF+BVF) with opposite spin. The bundles of VirG, connecting coherent nucleons of atoms of Sender (S) and Receiver (R) in state of mesoscopic Bose condensation, as well as nonlocal component of VRM(r,t), determined by interference pattern of Virtual Spin Waves (VirSW), are responsible for nonlocal interaction, like telekinesis, telepathy and remote healing; 6) Theory of Bivacuum Mediated Interaction (BMI) as a new fundamental interaction due to superposition of Virtual replicas of Sender and Receiver, because of VRM(r,t) mechanism, and connection of the remote coherent nucleons with opposite spins via VirG bundles. For example VirG may connect the nucleons of water molecules, composing coherent clusters in remote microtubules of the same or different 'tuned' organisms. Just BMI is responsible for macroscopic nonlocal interaction and different psi-phenomena. The system: [S + R] should be in nonequilibrium state for interaction. The correctness of our approach follows from its ability to explain a lot of unconventional experimental data, like Kozyrev ones, remote genetic transmutation, remote vision, mind-matter interaction, etc. without contradictions with fundamental laws of nature. For details see: <http://arxiv.org/abs/physics/0103031>. P

**95 Sequences of combinations of energy levels that describe instances of self and invoke a current instance of self** Iwama Kenzo <iwama@whatisthis.co.jp> (z\_a corp., Hirakata, Osaka, Japan)

This paper describes a summary of a robotic program, and puts forth a hypothesis of a brain structure by getting hints from the robotic program as well as the psychophysical results. The robotic program has the following functions: 1) forming sequences of assemblies of components in such a way that the sequences of assemblies of components match inputs from its outside world, 2) keeping and retrieving sequences of assemblies of components in / out of its memory, 3) generalization, and 4) specialization. The generalization process finds common features and relations among various cases of the sequences, and the specialization process makes generalized sequences match a new instance of inputs. The paper explains that the robotic program acquires concepts about its world; the program describes the concepts in sequences of assemblies of components. Our hypothesis of a brain structure is the following: The brain forms sequences of combinations of energy levels. Combinations of energy levels are like  $E_1+E_2 = E = E_3+E_4+E_5$ . When a brain receives inputs from its outside including motor activities, energy generated by the inputs change molecular fine structures and their energy levels. Combinations of changed energy levels make quantum entanglements occur and energy flow. Molecular (and biological) changes of a bit larger scale (Hebbian learning level) are invoked when the en-

ergy flow does not go further. The molecular changes of a bit larger scale make the energy flow further and do not occur again when the brain receives the same inputs in the next time since the changed molecular structure become a path of the energy flow invoked by the same inputs. Thus the molecular changes of a bit larger scale encapsulate the changes in the molecular fine structures. The quantum entanglements with molecular structural changes form paths of energy flow, and this explains memory function of the brain. After a large number of combinations of energy levels are encapsulated, Combinations of Energy Levels that are Common to various cases (CELC) are invoked when entanglements occur upon receiving inputs. Energy kept in the combinations of the energy levels (CELC) generate molecular changes of a bit larger scale and encapsulate the combinations of the energy levels (CELC) in the same way as described above. Time sequence in the inputs is also represented in time dependent quantum entanglements among combinations of energy levels encapsulated by molecular changes of a bit larger scale. Sequences of combinations of energy levels match sequences of energy levels invoked by sequences of inputs, but time scales are different from those of the inputs. Combinations of energy levels represent roughly two types of properties: one type represents those specific to certain inputs (including motor activities), and the other type (or CELC) represents generalized properties. Given a set of new inputs at time T, quantum entanglements occur among energy levels encapsulated (both specific and generalized) as well as energy levels of working area of the brain. Temporary entanglements among combinations of energy levels in the working area match the new inputs (specialization), and the next sequence describes inputs that the brain will probably receive at time T + delta T. Entanglements that describe the probable next inputs generate motor activities if no inputs are given from its outside world at time T + delta T. Since quantum entanglements among combinations of energy levels encapsulated represent past and generalized activities, the past and generalized activities make current motors active. Then one can claim that consciousness occurs because past and very general activities described in the combinations of the energy levels invoke activities in a working area that generate a current motor activity. In other words, a described self invokes an instance of self at the next moment. P

96 **Why I'm not an "Orch Or"ian?** Mohammadreza(Shahram) Khoshbin-e-Khoshnazar <khoshbin@talif.sch.ir> ( , Tehran, Iran)

In my opinion "Orch OR" model 1.violates conservation of energy and 2.does not match with experience. 1.Let us look at the following problem: Just after child-birth, a mammal can recognize her young. However, a mom can not. Actually, she accepts any infant as her child! If a mom looks at her "false" infant, then she'll feel

a "false" subjective experience. Please note that this situation is more complex than previously assumed!! "Orch OR" can solve one part of this problem. There are zillion universes for humans and the number of possible space-time configurations is enormous, so the number of combination of states is quite large. These choices for human can be thought of as consciousness. Notice, however, there is only one real universe and all other possible universes are false universe. The false (virtual) universe allowed by the uncertainty principle and therefore, similar virtual particles" exist for only so short time. But a mom can create a virtual universe. This violates the law of conservation of energy. While, for mammal that consciousness is meaningless, there is no conservation of energy problem, since all of the parallel universes are the same (and actual). 2. "Orch OR" model face at least two important obstacles: first, quantum computation requires isolation (decoherence) and second it is unclear how quantum state isolated within individuals neurons could extent across membranes. To overcome the first problem, it assumes acetylcholine binding to muscarinic receptors act through second messengers to phosphorylate MAP-2 , thereby decoupling microtubules from outside environment, and to overcome second problem it assumes quantum state or field could extend across membranes by quantum tunneling across gap junction. Therefore, if we block muscarinic receptors (with atropine), or impair gap junctions, we'll expect abnormality in cognitive behaviors. I have not checked first idea, but in 2001, Guldengel et al. produced a mouse with no gap junctions, but apparently normal behavior. In addition, in the X chromosome-linked form of Charcot-Marie-Tooth disease, mutations in one of the connexin genes (connexin 32) prevent this connexin from forming functional gap junction channels. However, apparently , there is no reported abnormality in cognitive behaviors. P

97 **An Operational Treatment of Mind as Physical Information: Conceptual Analogies with Quantum Mechanics** Sean Lee <seanlee@bu.edu> (Office of Technology Development, Boston University, Boston, MA)

A novel approach to consciousness as an operationally definable natural phenomenon within the framework of physical information is explored. Any meaningful connection of consciousness to the physical requires an unambiguous mapping of a space of subjective states onto information bearing elements of a physical theory, independently of the former's final ontological, causal and semantic status. At the same time, any such operational definition requires, by the definition of the phenomenon in question, that the mapping be performed by the experiencing subject. I argue that such a 'self-measuring' act leads unavoidably to an 'uncertainty principle' that is analogous in some intriguing ways to Heisenberg's principle for quantum mechanics. If we

choose to ignore this uncertainty, then with the help of a thought experiment we can define what I call the 'r-equivalence' classes and 'E theory' of consciousness; essentially addressing what Chalmers refers to as the Easy problem. If we instead address this uncertainty and seek an 'H theory' of the Hard problem, we are led to an account of subjectivity that exhibits two features strongly reminiscent of quantum theory: incomputability (randomness) and what we may think of as violations of local reality. While no direct connection between consciousness and quantum theory is postulated, the conceptual analogy may be made quite deep, perhaps with utility towards a future theory of consciousness. **P**

**98 How Quantum Entanglement Provides Evidence for the Existence of Phenomenal Consciousness** Reza Maleeh, Afshin Shafiee; Mariano Bianca <smaleeh@uos.de> (Cognitive Science, University of Osnabrueck, Osnabrueck, Niedersachsen, Germany)

We believe that the rise of consciousness has to do with the concept "information." So, we discuss a new concept of information, called "pragmatic information," in a way put forward by Roederer (2005) according to which information and information processing are exclusive attributes of living systems, related to the very definition of life. Thus, in the abiotic world, according to this attitude, information plays no role; physical interactions just happen; they are driven by direct energy exchange between the interacting parts and do not require any operations of information processing. Informational systems are open, that is, the energy needed for information processing must be provided by another source other than sender or recipient. We show that such a characteristic has to do with a specific interpretation of "intentionality" which, again, is the exclusive attribute of living systems. We use the concept of pragmatic information to explain hypothetically many phenomena such as perception, long and short term memory, thinking, imagination and anticipation as well as what happens in the living cells. But there is more to this. We argue that when the complexity of a system exceeds a certain minimum degree, in certain conditions, to be discussed in detail, the mechanical and non-mechanical aspects of information are realized. The former happens with matter and energy exchange while the latter does not. The existence of the latter, to be considered as the prototype giving rise to phenomenal consciousness, can be characterized by preparing the entangled states of quantum particles. The idea is that the correlation between two entangled particles shows the intention of a living being who prepares an entangled state with an informational content which cannot be reduced to separated fragments. In this sense, we say that two entangled particles have an information-based relation without energy-matter signaling. This is a non-mechanical relation between the remote components of a composite system which is due to a non-reducible information content prepared by a pur-

poseful setup provider. So, planned systems (to be called derived informational systems versus original ones) will be categorized as informational systems (mechanically or non-mechanically) just as they show the intention of a living system. To sum up, the phenomenon "entanglement" can be viewed from two different aspects: Firstly, the aspect which deals with the causal part of entanglement. From such a perspective, entanglement is, at least in principle, causally explainable in a contextual manner. Secondly, the aspect which has to do with the intentionality of the setup organizer. The purpose of the one who prepares an entangled state makes the phenomenon informational. Such a phenomenon will not happen in nature, because it needs an intentional living agent to separate the particles in a space-like manner. So, if we accept that there exists a non-mechanical informational relation between two entangled particles, it would be just because of the intention of a setup organizer, otherwise it could also have happened in nature. The existence of such a non-mechanical informational relation can be considered as evidence for the existence of phenomenal consciousness. **P**

**99 Model of Mind & Matter: The Second Person** Marty Monteiro <j.monteiro1@chello.nl> (Fnd.Int'l.Inst.Interdisc.Integr., Amsterdam, Netherlands)

A general social model of human being is launched, focusing on the relation between mind and body. In constructing the human being's mental and bodily architecture, the other human being is incorporated. From the point of view of the 1st person "I", and the 2nd person "You", the model pertains to the physical, mental and social process levels. From a growth-dynamic or evolutionary point of view, the physical reality is axiomatic to deduct the mental and social process level. "Interaction" is the key concept modelling all process levels of human functioning. The model is built up in the reference frame of two thinking tools, namely 'finality' as well as 'causality'. The design of the mind-matter model centres on the phenomenon of 'interaction' between object- and between subject systems. Interaction is a simultaneous occurrence between events on physical, mental and social levels. By applying a rule to deduct the mental and social process levels from the physical level, departs from the question of 'how' the processes emerge and how their relationships to each other are established. In the reference frame of finality and causality, the process architecture on all levels provides a general basic social model of the human being. From an integrated point of view of the relation between the 1st and 2nd person, it is tried to unveil the mechanism of mind and matter. Recording of and acting upon environmental events of objects/subjects operates on physical, mental, and social levels. The physical level of stimuli is basic for the mental level. Through stimuli-interaction, mental cognition emerges. Cognition is primary social directed to get feed-back by perception extracting information from ob-

jects and subjects. The social level of re-corded norms in particular, are prerequisite for the formation and development of personality (long-term memory) and the emergence of new values from personality for building up a cul-ture. Attitude (short-term memory) mediates attuning communication and matching of values to create culture. Personality and culture are the end-results of human functioning. Modelling the architecture on physical, mental, and social levels, and the formation of personality and attitude-mediated culture, gives an answer to the question of 'how' these processes and systems emerge. It says nothing concerning the question of 'why' the human being performs his behaviour in that specific way. This issue refers to the household of energy flow in the reference frame of relative 'shortage-surplus'. From an imbalanced state, 'energy transaction' originates within a person, in order to bring about an energy balance in the framework of other objects/subjects. Through the exchange of psychophysical matter/energy of 'cost-benefit', subjective experience of 'pain-pleasure' takes place through 'energy transformation' – an operation of 'fusion-fission' between mind and matter. The hierarchical built up of personality and attitude-mediated culture is respectively a contra-evolutionary and evolutionary development. This development of personality towards mentalization on the one hand, and materialization of common culture on the other is not a linear event, but a discontinuous state transition. The human being is aware afterwards of the results of these transformational operations, but he is not able to know what happens within the 'gap', the discontinuous transitional evolution of the mind as well as matter. Therefore, personality development and natural/cultural evolution raises the ultimate problem concerning the question whether or not a universal force exists as a "unifying-creating force". **P**

**100 Spreading culture on quantum entanglement and consciousness** Gloria Nobili, Teodorani Massimo <gloria.nobili@fastwebnet.it> (Physics, University of Bologna, Castel San Pietro Terme, Italy)

The subject of "quantum entanglement" in general doesn't seem to be particularly considered in Europe in the form of popularizing books or of educational physics projects. These authors have started to spread out this kind of scientific culture in both forms, including popularizing seminars too. Concerning the entanglement phenomenon, recently, new thought experiments have been outlined, new laboratory results have come out in the form of real discoveries in quantum optics, new studies on "bio-entanglement" and "global consciousness effects" have been carried out, and very sophisticated new ideas have been developed in the fields of quantum physics, biophysics, cosmology and epistemology. These authors intend to show their effort of diffusing widely this growing scientific knowledge. Beyond all this there is a long-term strategy aimed at inculcating new concepts in physics in order to trigger the interest of scholars at all

levels, in that which is probably the most innovative and interdisciplinary subject of the human knowledge of this new millennium. In order to accomplish this difficult task, these authors are acting in the following ways: A) explain, using intuitive examples, the basic physical mechanism (1, 2, 3, 4) of entanglement at the particle level; B) explain all the possible ways in which entanglement may involve quantum or "quantum-like" non-local effects occurring also in the macro scale (2, 3, 4) represented by biological (DNA bio-computing, microtubules), psychophysical (consciousness, synchronicity and Psi effects), astrobiological (neural spin entanglement), and cosmological (Bit Bang) environments; C) study and spread the scientific knowledge concerning alternative ways for the Search for Extraterrestrial Intelligence (5) and – specifically – prepare research projects regarding possible non-local aspects of SETI (NLSETI) and their applicability (4) on the basis of our physics knowledge and technology; D) prepare extensive plans for post-graduate courses in physics (6) with a special address to "anomalous physics", brain biophysics and mathematics; E) train persons and students to reach optimal concentration states – by using well experimented techniques – in order to permit them to exploit at the maximum level their intellectual and consciousness potential. All of these educational and promotional actions are aimed at training people in understanding the strict link existing between physics and consciousness in all of its aspects, in the light of a probable general phenomenon that occurs at all scales by involving (micro and macro) matter, mind and consciousness. A strategy plan containing in a self-consistent way all of these aspects will be schematically illustrated. REFERENCES. BOOKS ( <http://www.macrolibrarsi.it/autore.php?aid=4428> ) 1) Teodorani, M. (2006) "Bohm – La Fisica dell'Infinito". MACRO Edizioni. 2) Teodorani, M. (2006) "Sincronicità". MACRO Edizioni. 3) Teodorani, M. (2007) "Teletrasporto". MACRO Edizioni. 4) Teodorani, M. (2007) "Entanglement". MACRO Edizioni. ARTICLES 5) Teodorani M. (2006) "An Alternative Method for the Scientific Search for Extraterrestrial Intelligent Life: 'The Local SETI'". In: J. Seckbach (ed.) "Life as We Know It", Springer, COLE Books, Vol. 10, pp. 487-503. 6) Teodorani, M. & Nobili, G. (2006) "Project for the Institution of an Advanced Course in Physics" (in Italian). E-School of Physics and Mathematics by Dr. Arrigo Amadori. [http://www.arrigoamadori.com/lezioni/CorsiEConferenze/MasterFisica/Master\\_Fisica\\_MTGN\\_e-school.pdf](http://www.arrigoamadori.com/lezioni/CorsiEConferenze/MasterFisica/Master_Fisica_MTGN_e-school.pdf) **P**

**101 The Golden Section: Nature's Greatest Secret** Scott Olsen <olsens@cf.edu> (Philosophy & Comarative Religion, Central Florida Community College, Ocala, Florida)  
"Resonance and Consciousness: buddhas, shamans and microtubules" -- Consciousness is one of the great mysteries of humanity. Like life itself, it may result from a

resonance between the Divine (whole) and nature (the parts) exquisitely tuned by the amazing fractal properties of the golden ratio, allowing for more inclusive states of awareness. Penrose and Hameroff provocatively suggest that consciousness emerges through the quantum mechanics of microtubules. It is therefore a real possibility that consciousness may reside in the geometry itself, in the golden ratios of DNA, microtubules, and clathrins. Microtubules are composed of 13 tubulin, and exhibit 8:5 phyllotaxis. Clathrins, located at the tips of microtubules, are truncated icosahedra, abuzz with golden ratios. Perhaps they are the geometric jewels seen near the mouths of serpents by shamans in deep sacramental states of consciousness. Even DNA exhibits a PHI (golden ratio) resonance, in its 34:21 angstrom Fibonacci ratio, and the cross-section through a molecule is decagonal (a double-pentagon with associated golden ratios). Buddha said, "The body is an eye." In a state of PHI-induced quantum coherence, one may experience samadhi, cosmic conscious identification with the awareness of the Universe Itself. **P**

**102 Data reserve and recreating the memory in brain and the experimental witnesses suggesting it** Mojtaba Omid <mjtb\_omid@yahoo.com> (Tabriz, Iran)

In this hypothesis, at first the digital system is familiarized and then the concept of zero and one or existence or not existence as the digital base is generalized to two kinds of the electromagnetic waves spectrum from the body especially the brain and its cortex and it is indicated that the radio waves of the brain can be considered zero and the lack of radio waves as the result of the replacing infrared waves relating to the metabolism and high temperature of the brain, one ; since according to the rules of specially relativity and the difference of light speed (EM waves) in different environments, in the certain spectrum of the radio waves, the time passing equal zero but it is not zero in the infrared waves, then the data obtained from the sensory organs to the brain and cortex are ciphered and are reserved as zero and increasing the speed of time passing as the result of the reciprocity of two radio and infrared spectrums and the recreation of these codes is accomplished according to the same processes which is described in the paper. Finally, in the second part of the article some witnesses are represented through the images provided by the equipments PET and f MRI from the brains of the patients with different mental and functional problems. In these patients the normal metabolism of the brain is destroyed which disorders the 0 and 1 system to form the codes and their reserve and recreation; these experimental observations prove the hypothesis. **P**

**103 Embryological embodiment of protopsychism and Wave Function** Jean Ratte <jean.ratte@holoener.com> (Centre Holoénergétique,

Montreal, Quebec, Canada)  
According to Goethe the human body is the most sensitive tool to detect subtle process that technological devices cannot. It is still true 200 years later. Despite all the interesting data, neurobiological imagery is invasive and alters the subtle aspects of Mind process. For the last 20 years we use a clinical in vivo non invasive procedure that bridges this Incommensurability between physical correlates and the consciousness This Vascular Semantic Resonance (VSR),3D spectrometer, brings quantum microtubular level to macroscopic clinical detection, and shows symmetry or entangled resonance between map and territory, between molecule and the entangled memory or name of the molecule, between syntax and semantics. The Cardiovascular network is a harmonic oscillator manifold bringing the quantum microtubular level to macroscopic clinical detection Vascular system and microtubule are coupled harmonic oscillators (Abstract #330 Tucson 2 and # 977 Tucson 3). There is Amplification of microtubules and receptor canals vibrations by the cardiovascular system which works as a resonant cavity, an interferometer, a multiplexing waveguide, a manifold. (See Roger Penrose; Road to Reality). Resonance between micro-oscillators such as pericorporeal pigments and cellular pigments is the physical basis of VSR. . The vibratory equivalence, of micro-oscillator pigments and ideograms, of phonemes and morphemes, is the biophysical basis of V S R, a complex biological spectrogram, accessing directly the meaning of signs, the qualia of quanta, resonating not only to the molecule but also to the entangled memory or functional signature of the molecule, detecting symmetry between Implicate and Explicate order. This method shows the human body as radar, an interferometer not only for EM waves, but for the 4 fundamental interactions in their matter and antimatter aspects. VSR shows a Vibratory Parallelism between embryological stages and the 4 fundamental interactions. Operative or vibratory identity is not ontological identity. The first undifferentiated stage or Morula resonates to Gravitation. The second stage, Blastula, differentiates in Ectoderm and Endoderm with polarization of space in inside and outside. Ectoderm resonates to EM field. Endoderm, polarisation of anterior and posterior, resonates to Weak Nuclear field. The third stage or Gastrula gives rise to the multiplexing mesoderm manifold, polarisation of time with bilateral symmetry, which resonates to Strong Nuclear Field. This clinical tool gives new insights in the puzzle of consciousness by showing a multilevel vibratory commonality between Protopsyshism, Wave function, Non Locality, Curvature Tensor and Gravitational field and Degeneracy. These concepts resonate like the undifferentiated or prelogical stage or Morula. There is a vibratory scale resonance between quantum level and molecular, cellular and organism levels. DNA shares a vibratory identity with Wave Function (W.F) or Protopsyshism. Transcriptase implements a W.F collapse on RNA. Reverse Transcriptase brings back to DNA wave function,



or Degeneracy. Gametes Proliferation vibrates like W. F and Fecundation like Collapse of the W.F. Potentialization or Non Local vibrate like W. F and Actualization or Local vibrate like Collapse of W F These clinical results indicate that W F is not only a mathematical device but a true subtle biophysical process like Protopsyshism. The Understanding of Vibratory commonality between quanta and qualia, between cosmogenesis and ontogenesis, between matter and antimatter fields such as Vitiello's double, requires a quantum leap from « neuroectodermic » geometry to « mesodermic » Riemann hypergeometry (see Roger Penrose). Morula is Prelogic. Ectoderm is Logic of non contradiction, wave or particle. Endoderm is Logic of contradiction, wave and particle. Mesoderm is Logic of crossed double contradiction, hypersymmetry matter-antimatter.

**P**

**104 Life and Consciousness** Michael Shatnev <mshatnev@yahoo.com> (Akhiezer Institute for Theoretical Physics, NSC KIPT, Kharkov, Ukraine)

We first consider the observational problem in quantum mechanics and the notion of complementarity. Then, following Niels Bohr, we discuss the complementary approach to problems of quantum mechanics, biology, sociology, and psychology in more detail. In general philosophical perspective, it is very important that, as regards analysis and synthesis in these fields of knowledge, we are confronted with situations reminding us of the situation in quantum physics. Although, in the present case, we can be concerned only with more or less fitting analogies, yet we can hardly escape the conviction that in the facts which are revealed to us by the quantum theory and lie outside the domain of our ordinary forms of perception we have acquired a means of elucidating general philosophical problems. Next we shortly discuss that quantum mechanics is not complete and therefore may be completed. For this purpose a new mathematical carcass of physics is needed, and, we try to show how to find it. Finally, using these approaches, Deutsch's, Dyson's and Penrose's attitudes, we show how the notions of life and consciousness are connected. **P**

**105 Visions as special form of an altered state of consciousness** Josiah Shindi

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The paper reviews Biblical accounts of visions. Several persons who claimed to have seen visions in the last five years were interviewed using structured questions. Results indicate that there are some similarities between the visions reported in the Bible and those of the participants in the study. Precipitating and exasperating factors in vision are discussed together with the visions' content. Evidence point to the notion of special altered state of consciousness during the period of visions, specifically during the hypnagogic and hypnopompic states. **P**

**106 Metacognitive awareness: adopting new tasks for the remediation program for dyslexics** Malini Shukla, Jaison A. Manjaly <malini.shukla1@gmail.com>

(Centre for Behavioral and Cognitive Sciences, University of Allahabad, Allahabad, Uttar Pradesh, India)

In this paper we aim to evaluate the role of metacognitive awareness in remediation programs adopted for Dyslexics. The remediation program PREP (PASS Reading Enhancement Program) focuses on cognitive remediation of reading problems by improving the information processing strategies that underlie reading, while at the same time avoiding the direct teaching of word reading skills. It also includes a self comparison of children with dyslexia between their training course experience and the new strategies employed by them after being consciously aware about their deficits. It was observed that Dyslexics were using self learning strategies which motivated them for independent learning. This new self learning techniques were adopted in comparison to the metacognitive awareness of their disability and also initiated a comparative assessment of their disabilities with the peer group. This shows that PREP has helped them in enhancing their metacognitive skills by enabling them in controlling and manipulating cognitive processes; and giving them the knowledge about the regulatory skills; and how to utilize these skills on the basis of being consciously aware about their deficit in reading. Thus their monitoring ability on their own performance has given an impetus to their overall performance. Researches (Tuner and Chapman, 1996) have shown that metacognitive regulation improves the performance in number of ways, which make use of better attentional resources, better use of existing strategies and a greater awareness of comprehension breakdown. The remediation program showed that formation of self helps Dyslexics to perform better. The awareness that I am disabled encourages them to employ better learning techniques. In the light of these observations, we propose that the current structure of the remediation program PREP can be improved by including more tasks to enhance metacognitive awareness and tasks based on this newly evolved metacognitive awareness. We argue that addition of these new tasks can improve the remediation program PREP. **P**

**107 A New Approach to the Problems of Consciousness & Mind** Avtar Singh

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Consciousness issues within the context of modern neuroscience and related problems in contemporary physics are addressed. Current theories of consciousness look towards information theory, information integration theory, complexity theory, neural Darwinism, reentrant neural networks, quantum holism etc. to provide some hints. These theories fall short of the rigors and quantitative measures that are normally required of

a scientific theory. The most perplexing philosophical conundrums of the "hard problem" and "qualia" that afflict modern neuroscience can be resolved by a deeper understanding of the physics of the very small (below Planck scale) and very large (at the boundaries of the universe) scales. The modern philosophy of mind proposes that consciousness is a higher-order mental state that monitors the first or base state possibly generated by the brain. This paper builds upon the early approaches to consciousness wherein it was proposed that the state of self-consciousness is not a separate, higher-order consciousness of a conscious experience, but represents a continuum of the lower order states generated by the brain experience. In such a larger context, many of the mysteries of physics and neuroscience can be explained with an integrated model. This paper proposes such an integrated model that provides a direct relationship between the physics concepts of space, time, mass, and energy, and the consciousness concepts of spontaneity and awareness. The observed spontaneity in natural phenomena, which include human mind, is modeled as the higher order or universal consciousness. The integrated model explains the recent observations of the universe and demonstrates that the higher order consciousness is a universal rather than a biologically induced phenomenon. The neurobiological mind is shown to represent a subset of the complimentary states of the prevailing higher order universal consciousness in the form of the continuum of space-time-mass-energy. The proposed approach integrates spontaneity or consciousness into the existing and widely-accepted theories of science to provide a cohesive model of the universe as one wholesome continuum. The model represents the essential reality of different levels and dimensions of experience, both implicit and explicit, consciousness and matter, to be seen as equivalent and complimentary states of the same mass-energy known as the zero-point energy. The universal consciousness is shown to represent the spontaneous kinetic energy of the extreme kind, which is the ultimate complimentary state wherein everything in the universe is experienced as the zero-point energy field in a fully dilated space and time continuum. **P**

**108 Does attention mediate the apparent continuity of Consciousness? : A change detection Perspective** Meera Mary Sunny, Jaison A. Manjaly <meeramary1@gmail.com> (Center for Behavioural And Cognitive Sciences, Allahabad University, Allahabad, Uttar Pradesh, India)

Dennett (1991) argues that most of the theories of mind, irrespective of their ontological commitment, presuppose a Cartesian theater and continuity of consciousness. He claims there is no such theater where everything is re-presented. In other words, there is no boundary line which decides the onset of consciousness. He proposes multiple draft model of consciousness as

an alternative to Cartesian theater and to minimize the problem of continuity of consciousness. Multiple drafts model claims to show that the apparent continuity of consciousness results from the brain's ignoring of irrelevant or unavailable information and not 'filling in' as suggested by other theorists. This paper shows the inherent problems with this claim. We argue that if one can convincingly claim that attention is a continuous process, it can also be shown that the apparent continuity of consciousness results from this feature of attention. Dennett apparently down plays the role of attention in this unification. He looks at consciousness as a continuously edited draft, without a final published material and accounts this as the dynamicity of consciousness. This paper shows the dynamicity of attention and eventually the possibility that the apparent continuity of consciousness is a feature of the underlying attentional mechanisms using results from an experiment that makes use of the change detection paradigm with hierarchical stimuli. **P**

**109 Implicit activities in auditory magnetoencephalography (MEG)** Yoshi Tamori, Noriyuki Tomita <yo@his.kanazawa-it.ac.jp> (Human Information System Laboratory, Kanazawa Institute of Technology, Hakusan-shi, Ishikawa, JAPAN)

It is well known that unimodal peak responses exist at only the beginning of MEG waves. Despite of the existence of continuous base tone (CBT: A4=440[Hz] pure tone), the magnetoencephalographic (MEG) responses look to have been gone to the background noise later than the onset peaks (N1m and P2m). Even if there might continue introspective perception after the onset responses, the amplitude of MEG response to the secondary tone stimuli generally decreases. It is unknown what kind of neural processing exists in such silent activity period in terms that MEG activity has been gone. Although such silent activity period might be showing perceptual acclimatization, corresponding representation or activity should exist in the brain as long as the existence of introspective perception. In order to investigate the feature of such silent activity period, we added to the continuous base sound (or switched from the continuous base sound to) an extra pure tone of another frequency five hundred millisecond after the onset of continuous base tone. All the sound stimuli in the present experiment were presented to the left ear. In the present study, unimodal response was appeared in the MEG waves one hundred millisecond after the onset of the secondarily applied base tone. This peak is considered to be N100m counterpart of secondarily applied base tone. Current dipoles were estimated by the algorithm based on Savas law. The values of GOF (goodness of fit) for the adopted dipoles were larger than 95% fit. All the estimated current dipoles (ECDs) for N100m are located in the right primary auditory cortex (A1). The amplitude of the secondary peaks during the silent activity period appeared to be depending on the distance, in terms of

wave frequency, of the secondary tone from the continuous base tone. In the present study, the cosine component of fixed A1 dipole for the overlapped secondary tone was decreasing, as the frequency approaches to CBT's. We choose several frequencies (e.g. A4#=466[Hz]; D4#=311[Hz]; G4#=415[Hz]) for the secondarily applied tones. The latency of the secondary applied A4# sound was always larger than the one for the other secondary sounds. Our whole-head type MEG system consists of 160 axial gradiometers with SQUID sensors. The gradiometers have 15 mm diameter and 50 mm baseline. The gradiometers are arranged in a radial manner around the helmet. All the subjects are right handed and they can discriminate the frequency difference of the presented sounds. The loudness of the presented sounds are all calibrated/flattened by 70[dB(A)] considering the property of the perceptual loudness curve in ISO 226:2003. Contained noise in the measured magnetic fields was reduced by averaging techniques over several sessions. It has been suggested that some kind of implicit activity exists in the silent activity period in MEG responses. This frequency dependent depression could be qualitatively explained by a tonotopically aligned inhibitory neural network model. The underlining mechanisms are, however, remaining still unknown matter for the implicit activity. Relation to the consonant feature in the frequency dependent depression will be discussed in the presentation. **P**

**110 Anomalous light phenomena vs bioelectric brain activity** Massimo Teodorani, Gloria Nobili <mlteodorani@alice.it> (Cesena (FC), Italy)

We present a research proposal concerning the instrumented investigation of anomalous light phenomena that are apparently correlated with particular mind states, such as prayer, meditation or psi. Previous research by these authors (1, 2) demonstrate that such light phenomena can be monitored and measured quite efficiently in areas of the world where they are reported in a recurrent way. Instruments such as optical equipment for photography and spectroscopy, VLF spectrometers, magnetometers, radar and IR viewers were deployed and used massively in several areas of the world. Results allowed us to develop physical models concerning the structural and time-variable behaviour of light phenomena, and their kinematics. Recent insights and witnesses have suggested to us that a sort of "synchronous connection" seems to exist between plasma-like phenomena and particular mind states of experiencers who seem to trigger a light manifestation which is very similar to the one previously investigated. The main goal of these authors is now aimed at the search for a concrete "entanglement effect" between the experiencer's mind and the light phenomena, in such a way that both aspects are intended to be monitored and measured using appropriate instrumentation. In order to reach this task the test subject would be checked by using portable neurophysiologic

instruments such as an interactive brain visual analyzer (IBVA), a brain holotester and a skin conductance detector. These measurements are intended to be carried out in optimal simultaneity with a high-resolution digital camera for photometry and photography, a videocamera, a low-resolution holographic grating for spectroscopy, a VLF-ELF computer-assisted spectrometer, a triaxial magnetometer, and a computer controlled random event generator (REG). At the same time a high-precision timing is intended to be set up in order to check the level of simultaneity of both the brain phenomenon and the light phenomenon, and the temporal and morphologic evolution of both phenomena. In both cases redundant calibrations and background noise extraction procedures are planned. This is a quantitative research project in the field of both photonic/plasma physics and biophysics, and it is based on very well tested previous experimental research on plasma light-phenomena and on a theoretical biophysics background concerning the brain electric activity. Of most importance, a correlation between VLF-ELF data and bioelectric activity is searched. This group has already at their disposal at least one "test subject" who is very willing to participate to this kind of experiments. The goal of this research project is twofold: a) to verify quantitatively the existence of one very particular kind of mind-matter interaction and to study in real time its physical and biophysical manifestations; b) to repeat the same kind of experiment using the same test-subject in different locations and under various conditions of geomagnetic activity. REFERENCES. 1. Nobili G. (2002) "Possible bio-physical interference of the electromagnetic field produced by Hessdalen-like lights with human beings". Workshop on Future Research on the Hessdalen Project, Hessdalen, August 10, 2002 : [http://hessdalen.hiof.no/reports/Workshop2002\\_Gloria\\_A\\_BSTRACT.pdf](http://hessdalen.hiof.no/reports/Workshop2002_Gloria_A_BSTRACT.pdf) 2. Teodorani M. (2004) "A Long-Term Scientific Survey of the Hessdalen Phenomenon". Journal of Scientific Exploration, 18, 2, 217-251. [http://www.scientificexploration.org/jse/articles/pdf/18.2\\_teodorani.pdf](http://www.scientificexploration.org/jse/articles/pdf/18.2_teodorani.pdf) **P**

**111 Proto-experiences and Subjective Experiences** Ram Laxhan Pandey Vimal <rlpvimal@yahoo.co.in> (Neuroscience, Vision Research Institute, Acton, MA)

We present an argument for proto-experiences without extending physics. We define elemental proto-experiences (PEs) as the properties of elemental interactions. For example, a negative charge experiences attraction towards a positive charge; this "experience" is defined to be the PE of opposite charges during interaction. Similarly, PEs related to the four fundamental interactions (gravitation, electromagnetism, weak, and strong) can be defined. Thus we introduce experiential entities in elements in terms of characteristics of elemental interactions, which are already present in physics. We are simply interpreting these properties of interaction as PEs. One could argue that there is no shred of

evidence for "what it's like" to being an electron being "attracted" to (say) a single proton. However, it is unclear what else electron will "feel" towards proton other than a force of attraction, and we define it as the PE of an electron for a proton. The experience (such as attraction/repulsion) by ions that rush across neural-membrane during spike-generation is called neural-PE. Neural-PEs interact in a neural-net, and neural-net PEs somehow emerge and get embedded in the neural-net during development and sensorimotor tuning with external stimuli. A specific subjective experience (SE), for example, redness is selected out of embedded neural-net color PEs in visual V4/V8-red-green-neural-net when a long wavelength light is presented to our visual system. Similarly, when signals related to neural-PEs travel along the auditory pathway and interact in auditory neural-net, auditory SEs emerge. Thus, the emergence of a specific SE depends on the context, stimuli, and the specific neural-net. What way is our hypothesis different from the straight-forward physicalist view (SEs are emerged entities in neural-nets from the interaction of non-experiential physical entities, such as neural signals)? [This has led to explanatory gap or 'hard problem'.] The difference is that we acknowledge the existence of experiential entities in physics, where the emergence of SE from experiential entity such as PEs is less 'brute' than that from non-experiential matter. What way is our hypothesis different from panpsychism [1]? Panpsychism requires extending physics by adding experiential property to elements, which lacks evidence. Our hypothesis does not require extending physics; it simply interprets the existing and well accepted properties of elemental interactions, which have significant amount of evidence and are the building blocks of physical universe. Our hypothesis implies that non-experiential matter (mass, charge, and space-time) and related elemental proto-experiences (PEs) co-evolved and co-developed, leading to neural-nets and related PEs, respectively. Furthermore, there could be three types of explanatory gaps, namely the gap between (i) SE and the object of SE, (ii) SE and the subject of SE, and (iii) subject and object, where 'object' is internal representation. The hypothesis is that SE, its subject and its object are the same neural activity in a neural-net, where a neural activity is an experiential entity in our framework. These gaps are actually closed if the above hypothesis is not rejected; this trio appears distinct in our daily lives, but it is a sort of illusion because internally they are same neural-activity; when information related to 'subject experiencing objects' projected outside, objects in 3D appear with respect to reference subject. Moreover, SE cannot be objectively measured; it requires subjective research; however, the relative effect of SEs, such as that in color discrimination, can be measured objectively. Our hypothesis (a) contributes in bridging the explanatory gaps because experiential entities are introduced, (b) minimizes the problem of causation because our framework is in within the scope of

physicalism, and (c) does not require extending physics.

**P**

**112 Disorders of consciousness in schizophrenia: a reverse look at consciousness nature** Serge Volovyk <sv3@duke.edu> (Department of Medicine, Duke University Medical Center, Durham, North Carolina)

Schizophrenia and consciousness represent the most challenging, mysterious and enigmatic interwoven phenomena. Despite of clinical pattern of schizophrenia since Kraepelin traditionally is assumed to spare consciousness problem, recent neurocognitive research have shown that certain functions of consciousness (sense of agency, self, memory, executive functions, insight, monitoring) could be impaired in schizophrenia and that this may account for symptoms such as depersonalisation, hallucinations, self fragmentation, disorders of memory, delusions of control, etc. Cognitive deficits are considered as specific symptom domains of schizophrenia. These at the first glance unrelated traits have common molecular dynamic nature and mechanisms. Cognitive impairments specific to schizophrenia in generalized sense of information processing reflect continuum of subtle dynamic molecular pathways ranging from perturbation in free radicals redox spatiotemporal homeodynamics with changing hemispheric biochemical dominance/accentuation including alteration of nitric oxide-superoxide complementarity, responsive redox signaling networks, concomitant alterations in genes expression and transcription, redox control of neurotransmission pattern, synaptic circuitry and plasticity to changes in neurogenesis and functional hemispheric asymmetry. Free radicals, primordial "sea" for life origin, evolution and existence, induced by cosmic and terrestrial background radiation, are evolutionally archetypal, ubiquitous, and omnipotent in physiological-pathophysiological dichotomy in brain / CNS. Free radicals dual immanent nature and functions in brain are based on their quantum-chemical dynamic charge transfer / redox ambivalence (interactional nucleo-, electro-, and amphiphilicity spectrum); corresponding spectrum of reactivity and selectivity; subtle borderline norm-pathology dichotomy with discontinuity threshold, physiological functional ambivalence and complementarity, and dynamic free radicals homeostasis. In given generalized framework global stable average incidents rates of "core" schizophrenia (and consciousness disorders as opposite side of phenomenon) at the molecular level may be considered as quantum-chemical stochastic phenomenon originally based on perturbation of free-radical redox brain signaling networks and disorder of information processing connected with effects of natural radiation background, seasonal variation in geomagnetic field, and solar cycles terrestrial activity superimposed upon individual's immanent developmental trajectory. **P**

**113 New quantum approach to qualia, consciousness and the brain.** John Yates <uv@busi8.freemove.co.uk> (London, United Kingdom)

In this paper I do not rule out the possibility of including the consideration of results such as those of Jahn, Walach, Radin and others, in the spirit that I feel that, unlike much early USA scientific and technical opinion, I would not have effectively ruled out the possibility of the Wright Brothers as having discovered aviation. At the same time such results are certainly not paramount in considerations at this time. My approach uses category theory and a McTaggart A series as well as the conventional B series effectively used by Deutsch, Bohm and Penrose. This sounds philosophically and physically more realistic but at the present state of the art it may be required that the A series is a proper class. My theory will relatively easily link with any physically meaningful and duplicable NDE results which may be provided for example, by NDE experiments like those of Fenwick and Grayson and has many other advantages. Dream precognition results and ESP are very much denied by sceptics and on the whole by physicists. On dreams I certainly have not obtained precognition as such but noted apparent peculiar effects not dissimilar in superficial appearance. In psychology it is necessary to remember that many conclusions have been drawn and are repeatable from work like that of Strogatz. I favour dynamical systems psychology somewhat along the lines of Lange, but requiring an A series philosophy. By adding some ideas due to Stickgold and Hobson, I have already obtained preliminary surprising results. Presently I am proceeding to look at a structure somewhat along the lines of the Sprott work on psychology. I believe that through ignoring the McTaggart A series or trying to subsume the A series to within the B series, important opportunities are being lost and that early calls on quantum theory may be being made, when complex system theory could be more directly appropriate. <http://ttjohn.blogspot.com/> presents the entire blog to date, including more work than that required here. The simplest appreciation of the situation may be that the present approach contains a past, a present and a future without further ad hoc additions and so in a sense exhibits qualities, generally recognised as certainly existing in human consciousness, but which are not obvious in theories which do not. Also it allows the existence of a God or Gods and free will (or indeed hypothetical gods or freewill) within its bounds, though does not insist on their existence a priori and in this sense it is more appropriate to consciousness theory than a conventional physics theory would be which almost excludes these factors or a theological theory which a priori insists on them. The absence of the possibility of freewill in a physical theory suggests solipsism or incompleteness rather than some disproof of free will and this is carefully avoided with the present approach, which yet contains much mathematics including all of quantum theory and high energy physics,

together with chaos and catastrophe theories where relevant. P