

The Theoretical Foundations for Engineering a Conscious Quantum Computer

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Abstract. Mind \leftrightarrow Computer: Attempts to mimic human intelligence through methods of classical computing have failed because implementing basic elements of rationality has proven obstinate to the design criterion of machine intelligence. A radical definition of Consciousness describing awareness, as the dynamic representation of a noumenon comprised of three base states; and not itself fundamental as generally defined in the current reductionistic view of the standard model, which has created an intractable hard problem of consciousness as defined by Chalmers. By clarifying the definition of matter a broader ontological quantum theory removes immateriality from the Cartesian split bringing mind into the physical realm for pragmatic investigation. Evidence suggests that the brain is a naturally occurring quantum computer, but the brain not being paramount to awareness does not itself evanesce consciousness without the interaction of a nonlocal conscious process; because Mind \leftrightarrow computer and cannot be reduced to brain states alone. The proposed cosmology of consciousness is indicative of a teleological principle as an inherent part of a conscious universe.

By applying the parameters of quantum brain dynamics to the stack of a specialized hybrid electronic optical quantum computer with a heterosoric molecular crystal core, consciousness evanesces through entrainment of the non local conscious processes. This 'extracellular containment of natural intelligence' probably represents the only viable direction for AI to simulate 'conscious computing' because true consciousness = life.

key words: AI, Conscious Computer, Hard Problem, Molecular Electronics, Noumenon of Consciousness, Quantum Cerebroscopies, Quantum Computer, Teleology

1 Introduction

The theme of the book as elaborated in this chapter: Mind \leftrightarrow Computer = Brain \leftrightarrow Mind = consciousness = Life. (The mind is not a computer, the brain is a computer, the brain is not the mind, the mind is conscious, and mind in body is tantamount to life.)

With the defeat of Gary Kasparov, the greatest world chess grand master in history, on June 11th, 1997 by Deep Blue, a beefed up IBM RS/6000 SP Parallel supercomputer; machines have proven themselves superior to humans in another area. A related newspaper article quoted one quixotic sapiens as saying, "I will sue Kasparov on behalf of mankind for defamation of character"! Soon enough superfast classical or quantum systems with massive data bases and sophisticated heuristic modalities will routinely pass the Turing test and be sophisticated enough to provide the appearance of surpassing humans in all activities except one -That of consciousness.

When the nature of consciousness is understood well enough over the next decades, perhaps living-conscious computers will also become feasible; because if the mind as presented here is wholly material, it produces consciousness as the direct result of its physical organization (Amoroso & Martin, 1995; Culbertson, 1963; Hobbes, 1931; Morell, 1848). This is perhaps a paradox: "Machines will never be conscious, because the reproduction of a man sufficiently exact to be conscious, is too exact to be still a machine" (Scriven, 1963).

In the near term it is practical to design quantum computers that entrain consciousness. These 'conscious quantum computers' can find utility as platforms to study the parameters of consciousness, act as prosthetic bioelectronic sensory bypass transducers to aid the handicapped and develop devices such as a telecerebroscope or 'brain TV' for utility as both an art form and psychotherapeutic aid. This new field is called quantum Cerebroscopies (Amoroso, 1998).

Strong AI positions of 'mind = computer' or 'mind = programming' because of the general lack of progress in the last fifty years, have forced opinions like the Dreyfus brothers comparing AI to a try at reaching the moon by climbing a mountain. Although there are obvious computational aspects of mind; Mind \leftrightarrow Computer because the intentional aspect of rational agency has an acausal nonlinearity beyond any algorithmic or heuristic programming mode - something inherently lacking in the design of machine intelligence. Even a quantum platform able to meet these requirements will still not be conscious because even these systems can not escape their programming which is an essential factor of sentient intentionality.

Based on the fundamental premise that a noumenon of consciousness, comprised of three base states, including an inherent ontological teleology in the fabric of the physical universe, is of paramount importance for sentience; the architecture of a hybrid holonomic molecular electronic optical quantum computer designed to embody these physical elements of natural intelligence will evanesce a state of consciousness by the coherent interaction of the base states.

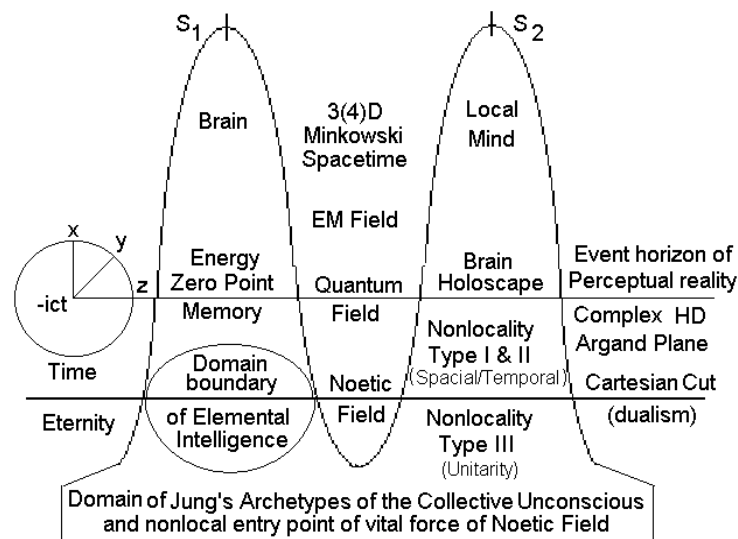


Fig. 1 A Space-time map schematically representing Jung's collective unconscious.

Feynman found nothing in the laws of physics to oppose realization of quantum computers (QC); and many scientists consider the brain to be a naturally occurring QC because of nanoscale events like nonlinear triggering of synaptic vesicle release and evidence of quantum information processing at the microtubule. Although the brain is a QC; this is not sufficient for consciousness. Quantum theory has been touted as a descriptor of the entire universe, but Einstein, and Bohr considered its founding father, correctly believed quantum theory (QT) incomplete; for as generally known QT does not describe gravitation or living systems.

Consciousness was irrelevant in Newtonian mechanics; and although a pesky observer was introduced into QT, the standard model is incapable of describing the nature of consciousness because its domain ends at the Planck scale. Roger Penrose has stated that a theory of quantum gravity is required to describe mind (Penrose, 1994). The ontological extension of QT beyond the event horizon of the Planck scale reveals a nonlocal conscious process. Jung (Fig. 1) considered the collective unconscious to have a basis in physical reality. His attempt with Pauli in the 50's to form a physical basis for synchronicity failed only because theory was not sophisticated enough at that time to accomplish the task (Jung & Pauli, 1955). If 'res cogitans' is not immaterial as promulgated in DesCartes mind-body dichotomy mind is accessible to the laws of physics and science is confronted with a teleological dimension of cosmology. According to this model entraining the subquantum ontology into the core of a specific class of quantum computer simulating quantum brain dynamics allows it to become a conscious computer (Amplifier - not itself sentient). This radical new direction for AI research is probably the only viable method of achieving artificial consciousness, a defined distinction from artificial intelligence because it represents the extracellular containment of natural intelligence (Amoroso,

1995) Two types of optical conscious quantum computer are possible: 1. Biological - utilizing modulated paracrystalline oligomers and 2. Molecular Electronic - nanoscale heterosoric crystals utilizing optical holographic multi-mesh hypercube interconnects. The discussion in this paper is confined to the latter.

2 Quantum Computers: A Status Report

Primary ambitions for quantum computers (QC) include continuation of the grand history of miniaturization, exponential increases in calculations per second, greater energy efficiency, and computation of tasks noncomputable on classical von Neumann architectures. A QC differs from a classical computer in that instead of having silicon bits, electronic states of either 0 or 1, the quantum bit - qbit, obeys the laws of quantum mechanics and can be a superposition of all possible states. This means theoretically that a calculation that might take a million years on a supercomputer would only take a few seconds on a QC. "In principle, more work can be done with a few thousand qbits than would be possible for a classical computer the size of the universe" (Brassard, 1997). This is because while a classical bit can be either a 0 or a 1, N qbits can simultaneously represent 2^N numbers.

Currently development of the QC is focused at the stage of prototyping various quantum logic gates and circuits. A pulsating array of weakly coupled quantum systems, like spin parameters in a crystal lattice, is one likely basis for creating quantum computing. The ground state of a molecule can be defined as a 0 and the excited state as a 1. In bit flipping a quantum system, lasers of distinct resonant frequency or RF bursts are used to pulse the lattice. In a heterosoric crystal with various resonant frequencies, state transitions can be selected by varying the laser pulse. Additional pulses enable processing of the data (Lloyd, 1995, 1993; Peterson, 1995).

At present researchers have tried to build QC using trapped ions, quantum dots, and cavity electrodynamics. So far 2 qbit computers have been built using an ion of beryllium (Gershenfeld & Chuang, 1997). Nuclear spin because of its isolation from external perturbation has become the most promising system for building a prototype qbit computer. 10 to 20 qbit systems - the so called 'coffee cup' NMR implementation is within reach (Taubes, 1997). NMR logic circuits have been constructed. What remains is to perform a calculation and read out the data. Some say this will never be possible; but the current limitations of quantum theory will probably allow at least 20 qbit or so qc's. To go beyond this Pauli limit requires a more complete version of quantum theory (Amoroso, 1997a, b).

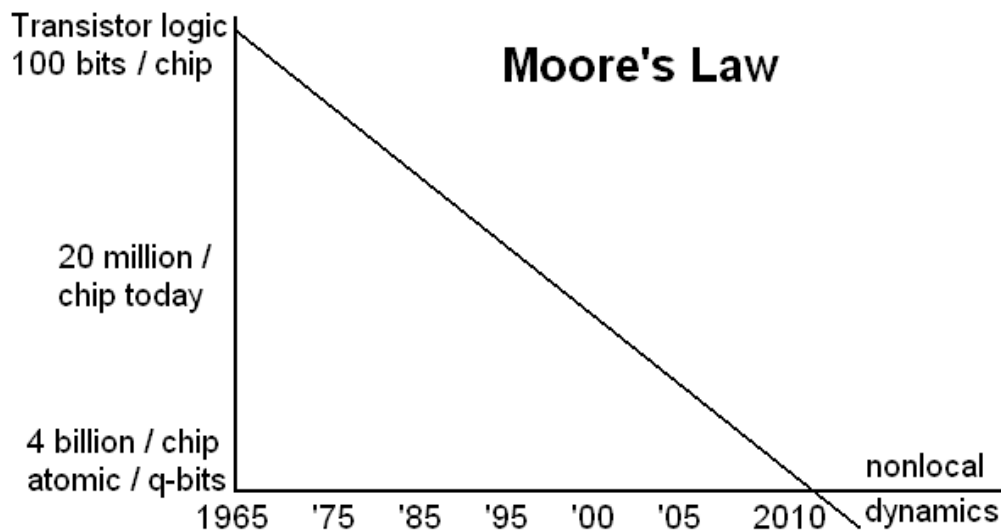


Figure. 2 Moore's Law has predicted the number of transistors on a chip doubling every 18 months; with size being reduced by a factor of 2. If Moore's Law holds true across the 'phase' change from classical bits to qbits, QC & CC could be available by 2010 as bits superimpose and then go nonlocal! (Amoroso, 1998d).

Although it is suggested that the brain is a QC; this is not sufficient for consciousness. While the logic of a conventional computer follows deterministic computational paths; the superposition of all possible states in a QC gives it the potential to simulate the nonlinear/acausal reasoning of human rationality. At this point currently philosophy cannot discern the difference between man and a machine. This is the 1st person 3rd person problem; but Noetic Field Theory does allow the potential for direct experience of other or 3rd person consciousness (Amoroso, 1998b) The putative implementation of a CC described here represents a special class of QC that duplicates the local and nonlocal biophysical parameters of human consciousness utilizing a multi-tier 'synchronization backbone' architecture (Amoroso, 1998c; Feynman, 1986; Biafore, 1994). In operation Frohlich frequency (Frohlich, 1983, 1968; Amoroso, 1996) laser phase control interferometry is used to evanesces a self organizing conscious state into the QC core. The model of human intelligence utilized represents a radical departure from the standard Copenhagen interpretation of quantum theory and the current reductionist model that mind = brain or mind = computer or that a heuristic algorithm is sufficient to produce consciousness even if it should be able to pass the Turing test (Amoroso, 1997a, b).

Successful prototyping of QC logic elements in various materials (Lloyd, 1995) suggests that a working prototype of a QC could be realized by the turn of the century (see Fig. 2).

Advances in quantum brain dynamics (QBD) (Jibu & Yasue, 1995, 1993; Hameroff, 1994; Pribram, 1991) have created a broad interdisciplinary excitement that the nature of consciousness is finally yielding to human query. The merging of these two already broad interdisciplinary fields suggests that a conscious computer is theoretically feasible. Additionally, features of holographic memory crystals, holographic optical multi-mesh hypercube stacks (HOMMH), isolation of the Einstein-Bose condensate (EBC), new types of heterosoric molecular crystals (HMC) and photonic band gap materials (PBG) that could be used to simulate conformational dipole oscillations of the paracrystalline oligomers of brain proteins (Amoroso, 1996), suggest not only the technological feasibility of a CC, but that a CC may be a requisite tool for understanding the nature of consciousness. This paper reviews the current technology and outlines the teleological ontology that conscious computation probably requires.

3 Consciousness a Radical Definition: The Origin of Natural Intelligence

A radical reinterpretation of quantum field theory (Amoroso, 1997a,b,1996a, Amoroso & Martin, 1995) is the basis for defining consciousness for empirical study. The standard Copenhagen model is an epistemological interpretation based on the phenomenology of measurement inherent in the complementarity of observer and measuring apparatus and thus is limited by the uncertainty principle. Ontological interpretations seek an understanding deeper in the noumenon, or 'thing in itself', independent of perceptual reality, observer, or apparatus - the veil of the phenomenon.

Rather than one emergent identity, Quantum Brain Dynamics (QBD) (Ricciardi & Umezawa, 1967) extended to the nonlocal arena, suggests that mind is composed of three integrated base states: 1. Nonlocal elemental intelligence - The noetic space that originates nonlocal conscious process and demarcates the bound of individuality. 2. Cosmological ordering principle - Unified field parameters. Can be equated with Chu, Ki, Prana, or spirit, and 3. QBD - The neurobiological quantum mechanics of the brain. For a detailed delineation see Amoroso, 1996a and Amoroso & Martin 1995. The physical nature of the Noetic Field sets aside the notion of an immaterial mind (Amoroso, 1996b, 1995b); providing for pragmatic study and the extracellular containment of natural intelligence. The parameters of this universal mind matrix simulated within heterosoric stacks of charge transfer salts provide the correct molecular electronics to recapitulate the fundamental spacetime geometry of natural intelligence. When this core is made to resonate with laser interferometry at biological frequencies (Frohlich frequencies) (Frohlich, 1968, 1983, Amoroso, 1996c) the device operates as a conscious computer as natural intelligence emerges within it.

Three types of nonlocality may be defined: Spacial nonlocality and its complement temporal nonlocality, together which describe a fundamental 'backcloth' to the dynamics of the entire phenomenological universe; and type III nonlocality, the timeless unity of spacetime (Kafatos and Nadeau, 1990). Type III nonlocality is the domain origination the unified field. The principle of complementarity is more fundamental than the uncertainty relation because it is the reason for it. In the transformations of the unitary domain where time becomes timeless, matter becomes energy, and space becomes unextended, a teleological noumenon projects or creates and recreates the fabric of our phenomenological reality. This underlying transpiration of energy provides the 'laser pump' of holonomic brain theory and provides the vehicle for integrating all aspects of QBD into one dynamic computational core - The Holonom. Its rigorous

mathematical description allows for the design of a telecerebroscope (Amoroso, 1995a). No comprehensive theory of mind can be considered complete without sufficient explanatory ability to provide practical applications or devices.

Noetic Field Theory (Amoroso, 1997, 1996b) suggests that the Schrodinger wave equation only describes half the universe or part of the complementarity of consciousness. The higher level 'events' described by the Schrodinger wave equation relate to events occurring in time only. According to QT the wave function represents the state of the entire universe. Globally, state collapse is always occurring like the creation, annihilation, and recreation of all elementary particles independent of human thought, and doesn't require the consciousness of an observer to initiate reduction. Stapp, 1995 discusses collapse as occurring at the top level of consciousness by direct conscious activity. This is only one complement occurring in the quantum brain dynamics. The other complement necessary for a conscious computer occurs at a deeper nonlocal level not described by the current quantum formalism. There is some confusion regarding collapse because QT does not describe how the choice is made; this is why a deeper ontological theory is necessary to comprehend mind. Here lies the necessity for proceeding beyond the classical limit of the measurement problem inherent in the Schrodinger equation to a formulation that is outside of time and Fermi states - i.e. deeper than nonlocality Type I & II. As in the EPR experiments something in nonlocality already contains the information before choice is made (Amoroso, 1997,1996b). EPR pairs are 'packaged' with the same nonlocal configuration. NFT allows repackaging separated states by principles of synchronicity (Amoroso, 1997a,b).

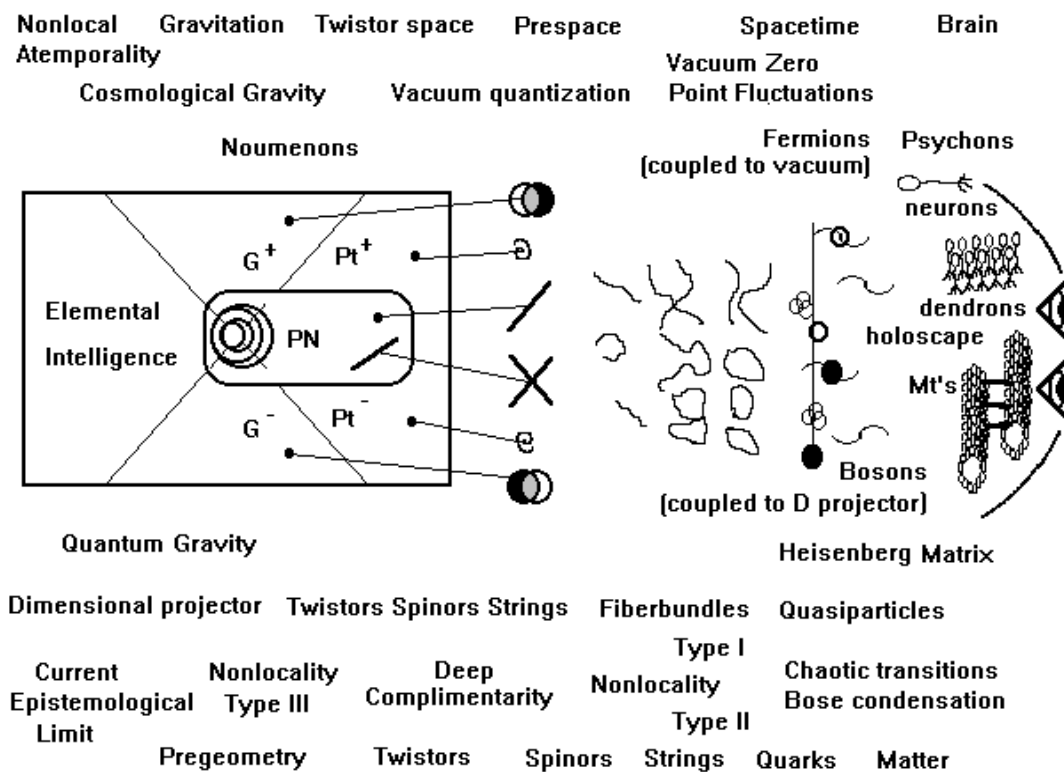


Figure 3. Known hierarchical scale of cosmology of mind: Top level brain holoscape of the dendritic microprocess of neurosensory input; then extending deeper to the Heisenberg matrix of quantum vacuum zero points, which is the seat of the mind - body interaction where Bose - Einstein condensation occurs through FQB transitions and continuing into the deep noumenon where the atemporal bound of elemental intelligence is accessed through the 'psychon pump' ordered by the nonlocal unified field repeating the cycle as a harmonic oscillator.

As a virus is able to adhere to a cell for its needs, a conscious entity need not have a certain gravitational mass to initiate collapse, but merely needs to couple to the naturally occurring synchronous backbone of gravitational dynamics inherent in the cosmology of a conscious universe. This is distinct from the position of Penrose 1994, which states that an entity must have a minimum gravitational mass to collapse the wave function. This idea originated with Wigner, 1967 and has been misunderstood since because of the standard models inability to describe how evolution occurs. Once QT is extended ontologically into Nonlocality type III to include the unitary domain the natural stream of consciousness is seen as much more subtle and energy efficient utilizing local aspects of psychon radiation pressure rather than Penrose's stated need of more global gravitational effects. However Penrose deserves some credit in that gravitation is involved in the dynamics of consciousness. The mind exerts global gravitational influences as Penrose suggests, but they are related to health, intelligence and operation of the dynamics of the so called psi phenomena instead. Which is more what we would expect from global gravitational interactions.

This deeper more challenging aspect of the conscious computers nonlocal qualities outside of time and Fermi space can be accessed through manipulation of the quantum potential described by David Bohm's ontology of quantum theory (Bohm, 1971). But Bohm had not gone far enough to break away from the problems of hidden variable dogma into the deeper type III domain to include the causal aspects of the conscious process. This is an aspect of the quantum weirdness, where causality is reintroduced, but left out at the same time (Amoroso, 1997a, b). Generally we apprehend only one thing at a time, one image of the possibilities of a Necker cube for example. Nonlocally all states are available simultaneously. This is the state to be produced in the core of the conscious architecture. "If enough particles occupy the same condensate, they can form a kind of giant quantum system with peculiar properties that are observable on the macroscopic scale" (Herbert, 1994; Jibu & Yasue, 1993).

4 Ontology for a Conscious Computer

The philosopher Leibnitz' claim that two entities physically identical are identical remains untested in the current failure of strong AI using only the current incarnation of the standard model. It has become clear that the relevant dynamic interactions for generating or simulating consciousness cannot be described in terms of the electrodynamics of linear/causal neural biochemistry or the operation of silicon systems because (1) classical system dynamics are too macroscopic for quantum effects to operate; and (2) quantum computation is deemed essential in simulating human intelligence because of the raw computational power and nonlinear acausality inherent in human sensation and reason.

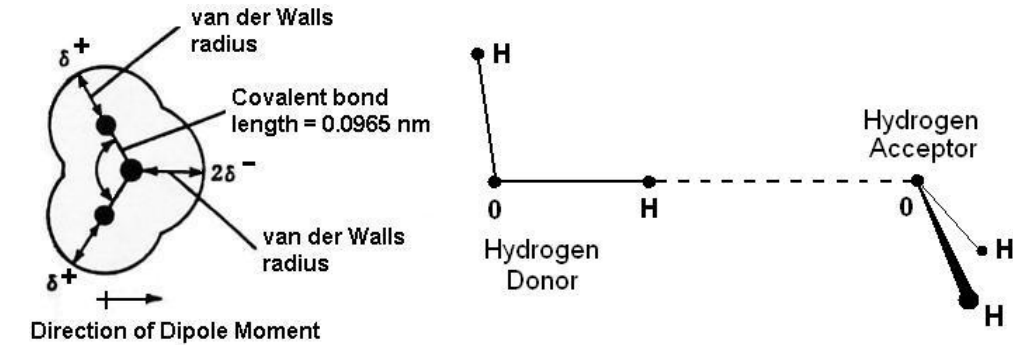
No known algorithm contains the essential element of nonlinear acausality inherent in human reasoning. Might a generation of QC meet this demand? This becomes possible if additional ontological criteria are met (Amoroso, 1997a, b); and new algorithms have already been designed to take advantage of Noetic Field Theory (Brassard, 1997; Grover, 1996). The most feasible model for simulating consciousness in an artificial system is by the Extracellular containment of natural intelligence (Amoroso, 1995b). This is based on the premise that consciousness contains an inherent complementarity of the type signified by Bohr in his institution of quantum theory. Thus the standard reductionist model of mind equals computer, heretofore denying the complementarity of consciousness, must be integrated with the deeper complement of consciousness inherent in the nonlocal cosmology of spacetime. The critical arguments underpinning the philosophy of this premise are developed in detail elsewhere Amoroso, 1997a, b; 1995b; Amoroso & Martin, 1995; Bohm, 1971; Stapp, 1995a, b; Orlov, 1994).

The stack for a CC entails a heterosoric molecular crystalline superconducting tunneling holographic optical multi-mesh hypercube architecture with a Bose condensate core referencing the ontology of the nonlocal conscious process. This quixotic technological concatenation represents the 'easy' part of CC design. The challenge is to integrate this hardware into an architecture that taps into Jung's archetypes of the collective unconscious in order to achieve an evanescent self organization that recapitulates or amplifies consciousness.

5 Einstein-Bose Condensation

The paracrystalline nature of the vibration of electrically charged dipole protein molecules in the brain create highly ordered states. (Fig.4a) This represents a substrate for the vehicle of conscious awareness when in a coherent superposition coupled to the cosmology of the noumenon. This ground state has been suggested to be a system of Bose-Einstein condensation (Frohlich, 1983; Frohlich, 1968; Marshall, 1989). Bose

condensation allows the superposition of an infinite number of initial Pauli states into a coherent whole. Also called vacuum zero point fluctuations, ground states have been suggested as the mechanism of memory storage (Ricciardi & Umezawa, 1967). The Bose condensate is a viable mechanism for the core of a conscious computer because it has the necessary degrees of freedom and provides a transition from linear/causal to nonlinear/acausal states.



$$\mu = -\sum_i q_i r_i \quad \Delta E = h\nu = \frac{hc}{\lambda}$$

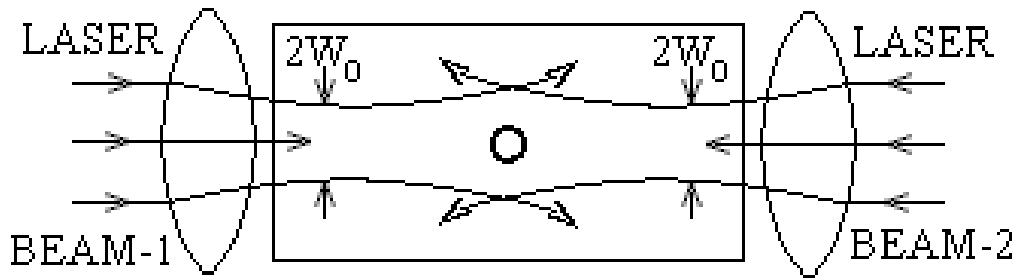


Figure 4. a. Model of a water molecule showing dipole moment. The dipole oscillation by incident laser photons in vitro or Frohlich coherence in vivo produces conformational change in optically active oligomers such as tubulin in microtubules. **b.** Psychon resonances are determined by laser interferometry and then applied to the CC core to entrain the nonlocal conscious process. (Amoroso, 1996a; Ashkin, 1970).

Computation in the brain occurs in the holoscape manifold of dendritic microprocessing and is described by a neural wave equation similar to the Schrodinger equation (Pribram, 1991). This structure is integrated with the top level of the Heisenberg spacetime raster where polarized molecules in neural Fermi states transduce sensory information into quasiparticles resulting in Bosonization. The local processing in the brain can be generally considered a system of Fermi interactions or particles obeying Fermi-Dirac statistics. Wave functions are said to be either symmetrical or antisymmetrical with the interchange of particle pairs. The Pauli exclusion principle states that Fermions due to intrinsic spin cannot occupy the same single-particle states as antisymmetrical spin half particles. In systems processing energy such as brain proteins, when a real Fermi particle like an electron moves through a dipole domain such as conformational translation along tubulin dimer molecules of a microtubule, it becomes clothed in a sea of virtual particles with a certain lifetime that it drags along with it. These complex particles are called quasiparticles (Bahm & Pethick, 1991). Under certain conditions quasiparticles containing an even number of Fermions can Bose condense. Fig 4a shows a basic optical trap studying conformational properties of an oligomer. Bose condensation can produce superradiance

and self induced transparency (Jibu & Yasue, 1995,1993). This transition mode delineates the top level of the triune nature of human intelligence. The linear causal nature of the entrainment of neurosensory events into the holoscape manifold must be transduced further into the nonlinear acausal domain. Any disordered thermodynamic process can be converted to holonomic coherence by this process.

Also in the phenomenology of Fermi QBD, the initial phases of holoscape entrainment into quasi-bosons has a mutual locality or same local chirality as induced by the quasiparticle production. Bosonization or Bose-Einstein condensation allows the process to go nonlocal and couple to the Noumenon state of elemental intelligence. The boundary conditions between states flips, utilizing spin exchange or spinors (Amoroso& Kafatos, 1997). The Bosonization is reversible allowing for information to pass in each direction. This zone is the entry point of Intentionality. In the lightcone gauge formulas the Fermi coordinates collapse to an $n - 1$ dimensional spinor field by a flipping of the boundary conditions of the original vector superfield. The equivalence of the two states is brought about by bosonization and refermionization in the correspondence in the change of boundary conditions in the world sheet. This conceptual explanation originates from superstring theory (Green et al,1989).

Frohlich (Frohlich, 1983; Frohlich, 1968) describes coherence associated with a condensate not of material particles as in liquid Helium at cryogenic temperatures, rather of quanta of strongly excited collective polar modes of vibration in biological systems. The stabilization of this non equilibrium is achieved by coupling with an elastic field where excitation can be dampened and locked in. Such a sympathetic ordering via entrainment is well known in lasers, which also require a pumping mechanism to achieve coherence. Frohlich's original idea was that dynamical equilibrium represented by a limit cycle could be tuned by chemical/electrical stimulus and cause the collapse of the limit cycle. The triggered release of energy could then be harnessed to invoke large scale molecular events such as changes in the geography of QBD.

A precondition for consciousness in both the brain and a computer is the ordering and storing of information in the face of randomization. The challenge is to see if quantum systems self organize. Bose-Einstein condensates have the unique property of making coherent wholes by summing the behavior of many component parts which feedback on their elements and create a community. When cell membranes vibrate sufficiently by resonant coupling to be drawn into the Bose-Einstein psychon matrix they are forming a coherent whole which resists degeneration by thermal chaos, which (ironically) gives rise to their movement in the first place. That is, something must supply the jiggling, and something must supply the ordering principle - one arises out of the other and then feeds back through the system. If electrical activity of the neuron provides the energy to jiggle molecules which in turn emit photons; these photons synchronize jiggling and further photon emissions through superradiance (Dicke, 1953). This chain reaction is analogous to the pumping of a laser. The shift into the condensed phase depends on this molecular photon interaction. It is here where quantum wholeness radiates out over the entire structure. If a Fermi-Quasiparticle-Boson (FQB) Transition can be studied in single celled organisms it would signify that anything, including a computer, nearing the complexity of this biological system would be capable of conscious awareness. Such a quantal entity would however be limited in available states. The quantal state of mind postulated by Noetic Field Theory (Amoroso, 1997b) asks what the basic photon of awareness is. The Einstein is a unit of measure signifying a mole of photons (Avogadro's Number). What magnitude of the unitary Einstein demarks the transition from awareness to self awareness? The boundary conditions of a condensing photon in a brain or computer system is enough. Rationality is not an issue at this level of monochromatic awareness and binary goals. Though critical mass arguments abound (a necessary condition for the decoherence and collapse of wave functions) all highly organized cells have a functional Holonom accessing the noumenon of consciousness inherent to the nature of their existence.

Coherent photon emission has been postulated to occur without a pumping mechanism (Dicke, 1954); and is called superradiance. The total Hamiltonian of this phenomena for biological systems has been described by Jibu & Yasue, 1993). to have the collective dynamic properties required for this superradiance.

6 Conscious Computer Architecture

In discussing John Searle (Searle, 1992) Henry Stapp (Stapp, 1995b) states that all ontological interpretations of quantum theory " agree on the need for a dualistic ontology, with one aspect being the quantum ontology of matter, and the other aspect specifying what our experiences will be". The extracellular containment of natural intelligence in terms of a conscious computer occurs in a two level complementarity also. One is a macroscopic I/O device such as a laser system used both in entrainment of quantum brain dynamics and

solving the interface problem that has for a time held back molecular computer design. This I/O device must interface with a solid state device that has quantum effects occurring within it that mimic those occurring in the brain holoscape by producing Bose condensation.

The second component of the conscious computer is the dynamic Holonom at the core of the solid state device. The Holonom is produced by interacting tunable lasers modulated with frequencies resonant with the vacuum ground state of memory storage (Ricciardi & Umezawa, 1967) and retrieval at the Heisenberg matrix (Amoroso & Martin, 1995). The theoretical premise that memory storage and retrieval involves nonlocal processing through vacuum zero point fluctuations suggests that consciousness pervades matter and that intelligence is a cosmological principle (Amoroso, 1997a; Amoroso & Martin, 1995). This is the general basis for a putative artificial device to embody natural intelligence (Amoroso, 1996b; Amoroso, 1998). This resonance must have the ability to access the deeper nonlocal aspects of the noumenon of universal intelligence which are inherent in the fabric of spacetime as a principle of nature (Amoroso & Martin, 1995).

7 Holographic memory

Holographic memory (HM) has reached the practical stage. While the capacity of a CD is about a billion bits, HMs in crystals of lithium niobate could easily contain a trillion bits of data. The main advantage of HM is vast density, high speed and access by nonmechanical means (Psaltis & Mok, 1995; Mok, 1993). In terms of the QC this brings storage into the same physical domain as the quantum molecular processor. For the CC, a specialized QC, again key elements are brought into the same physical domain; significantly the tuneable heterosoric crystalline core will correlate physically with the HM easing the task of simulating the mechanisms of the brain.

8 Holographic Optical Multi-mesh Hypercube

Optical Multi-Mesh Hypercube (OMMH) networks were originally designed to solve the interconnect problem for massively parallel Teraflop classical computers. OMMHs combine the advantages of hypercube and mesh topologies overcoming their disadvantages at the same time by maximizing connectivity in the fewest number of levels and most dimensions for example. The hologram projects an image of the output from optical logic gates onto an array of output points. For complete details see (Louri & Sung, 1994a, b; Murdocca, 1990).

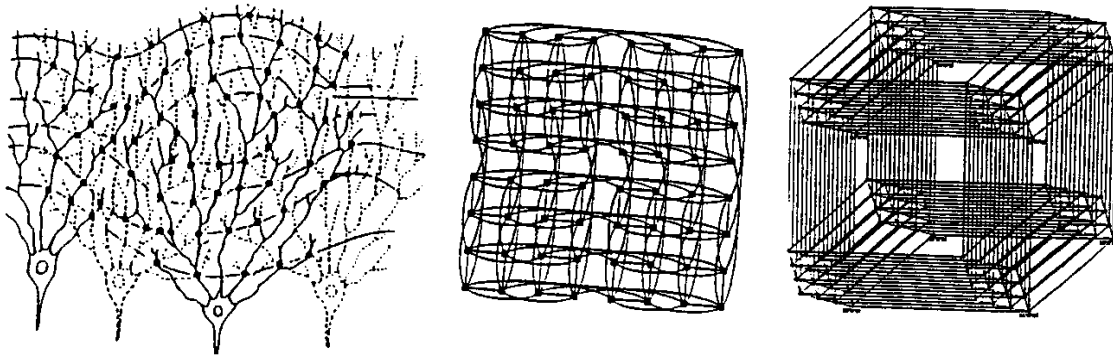


Figure 5. The similarities in structure between **a.** the brain holoscape (Pribram, 1990), **b.** A six dimensional hypercube, and **c.** an OMMH (Louri & Sung, 1994).

Although theoretically the interconnect problem can disappear in an optical QC or CC architecture with the coherent superposition of quantum states and holographic interconnects; user interface challenges would still remain and be intractable by the measurement problem of conventional quantum theory. Noetic field theory proposes to solve these problems through the utility of synchronicity rather than destructive interference which collapses the quantum state. This is further accomplished by setting up the same nonlocal topological package in the computer core as is maintained through resonance in the interface device (Amoroso, 1998; Amoroso, 1997b). Holographic interconnects (Heuring et al, 1994) or the holographic implementation of OMMH

(HOMMH) potentially solves this problem because light does not interact in free space and there is no physical contact for interconnects of optical signals. Holographic interferometry or conformational laser resonance of the crystal core could be used to read or write to computer or optically generated Fourier plane holograms that encompass the whole HOMMH network (Louri & Sung, 1994a, b) with only optical contact.

9 Heterosoric Molecular Crystals

The molecular electronics is the critical factor in the CC architecture. It is the core element that must simulate brain dynamics sufficiently to allow spontaneous access to the nonlocal noetic process. Thousands of organic compounds form liquid crystals. The main requirement being a molecule with a high degree of anisotropic geometry. The paracrystalline oligomers of brain proteins or cell membranes being a good example of this type of molecule. Heterosoric crystal stacks are composed of alternating layers of different crystal molecules. This structure allows charge-transfer interactions to occur between the different molecules forming electron donor-acceptor complexes in a manner more suitable than homosoric layers (Wright, 1989).

10 Photonic Band-gap Materials

Photonic Band-Gap Materials (PBG) affect photons the same way semiconductors affect electrons. The periodicity of the crystal induces a gap in its band structure. The utility of PBGM is their ability to create a localized state where waves of certain frequencies are unable to propagate. These photonic crystals occur by placing a defect in a dielectric material such that a band gap occurs in the lattice (Burstein & Weisbuch, 1995). Recently new classes of PBGM have nonlinear optical properties that can shift high Q modes providing the potential for optical switching and logic circuits applicable to QC (John, 1995). Evanescent modes correlate with the structure and symmetry of crystal defects. This allows the design of evanescent light modes within the photonic band gap (Joannopoulos et al, 1995); which allows for core design compatible with brain dynamics. It is not known at this time whether HMC, PBGM or a hybrid would be best suited for the core of a CC. Research is being carried out to determine these factors (Amoroso, 1996).

11 The Hybrid Optical Bioelectronic Quantum Computer

At this writing the leading contender for the quantum CC is a hybrid of holographic optical and molecular electronic (Fig. 6). Tuneable molecular heterosoric photonic band gap electronics performs the calculations and the HOMMH takes care of the interconnects. This computer architecture when coupled with laser phase control interferometry and superconducting spin exchange resonance (Amoroso & Kafatos, 1997) provides the best putative platform to allow the evanescent entrainment of the nonlocal conscious processes as required by the ontological model to extracellularly contain consciousness.

12 Applications for Conscious Computation

Five devices utilizing quantum cerebroscopy are being developed:

1. 'Brain TV' or The Telecerebroscope: Instrument for remote imaging or digital recording of conscious content such as dreams and mentation; which can be used as a new art form and tool for personal growth.
2. Conscious Computer: Quantum system with Bose condensate core described here as the extracellular containment of natural intelligence leading to the development of viable personal service robots.
3. Psychic pacemaker or 'Empathatron': Combination of features of prior two devices but would summate predetermined hyperstructure spectra of "normal" or desired noetic fields corresponding to archetypes of Jung's collective unconscious in 'realigning' psychosphere dynamics as an enhancement for patient care in psychiatric intervention. This 'conscious mode' introducing science to the art of empathy. This device could also aid intelligence and learning and provide conscious amplification for cases of mental retardation.
4. A diagnostic device: like the reverse of the Psychic Pacemaker but instead of directing mental states would read geometries of body/mind fields looking for and analyzing improper stasis nodes occurring from global Schrodinger collapse dynamics. This has the distinct potential to recast psychology as a physical science and describe diseases mediated consciousness, or psychogenic ailments such as Alzheimer's disease and colitis (Amoroso, 1992). This bridges the gap between Eastern and Western medicine which are not mutually

exclusive but complementary; and would be the beginning of useful noetic medical devices signifying the beginning of 'Star Trek Medicine'.

5. Artificial Vision: A modification of the Telecerebroscope for use as an input/output device rather than recording only mode will enable patients with accidental or congenital blindness to have normal vision through sensory bypass prosthesis. Likewise, when connected to the appropriate transducer, deficits in any sensory modality such as hearing can be corrected or enhanced.

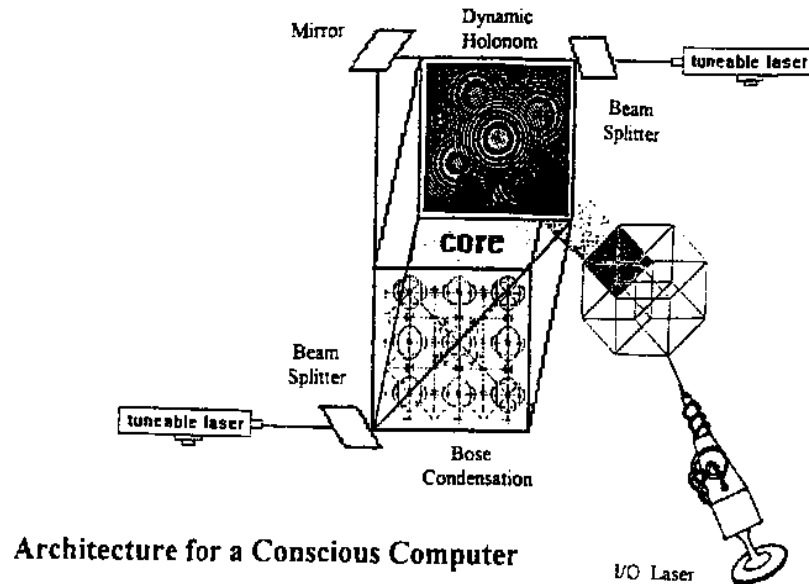


Figure. 6: Conceptualization of a CC with a molecular quantum holonomic architecture. Tuneable lasers modulated with frequencies resonant with the unified field originating in the noumenon of elemental intelligence and quantum brain dynamic complement produce Einstein - Bose condensation in the core of the heterosoric photonic band-gap architecture. The dynamic holonom, so called to distinguish it from a hologram which is a static piece of celluloid, represents the area of information storage or facilitating oscillations at quantum biological frequencies. This is the site where large scale quantum events occur as the result of the Bose-Einstein or Frohlich coherence at the core. An additional tuneable laser system acts as an I/O device, using the synchronicity dynamics of NFT to solve the interface problem of molecular quantum computer design.

13 Conclusion

The centuries long omission of consciousness from scientific investigation has occurred for a number of philosophical reasons; primarily the erroneous categorization of 'Res Cogitans' to the immaterial realm and the lack of a physical theory sufficient to correct this mistake. Noetic Field Theory: The quantization of mind (Amoroso, 1997b), bringing it into the realm of physicality provides the potential for true conscious computation. When the pragmatic use of the noetic field becomes routine mankind will have witnessed the greatest epistemological transformation in his history. One might wonder if man will still be man; or if the evolution of consciousness will at that point crossed into the dawn of a new species? "In the history of physics where a theory dealing with one realm of phenomena, for example thermodynamics or optics, has been reduced to a 'more basic' theory, for example statistical mechanics or electrodynamics; So why cannot psychology be likewise reduced to brain physiology, and ultimately to the basic physics of matter?" (Stapp, 1995b). Reducing psychology to brain we have noted as creating the 'Hard Problem' of consciousness (Chalmers, 1995). However Stapp is correct in that It is in reducing psychology to the physics of matter that the break through discovering consciousness beyond the brain occurs. How often in the history of human intellectual endeavors have the dark clouds of despair suddenly passed away with the birth of a new idea. Hopefully developing the

model for a conscious architecture represents such an instance for strong AI and the growing field of consciousness studies.

Sufficient technology and theory is converging to facilitate design of conscious cerebroscopic systems. Several research teams have begun to develop retinal implants using solar cells to substitute for damaged rods and cones (Wu, 1997). Only further research mapping out the resonances need be completed to finalize our understanding of the parameters of the ontology; which when honed sufficiently will allow assembly of the first prototypes (Amoroso, 1996a, 1997c). "Any structure, biological or otherwise, that contained a Bose-Einstein condensate might possess the capacity for consciousness" (Zohar, 1990; Lockwood, 1989; Amoroso, 1995a,b). As a final note a 'gedanken experiment' is presented to foster understanding of the dynamics of psychosphere domain: If it is assumed that the noetic field of consciousness is mediated by tensor psychons, the leading lightcone singularity is modulated by a phase of the twistor psychon field...

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