

# Collective Modes Of Ordered Water As A Synchronization Backbone For Quantum Neuromolecular Computation And Consciousness

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*Once we appreciate the considerable amount of coherence that characterizes ...liquid water, it is not impossible to imagine that such marvelously ordered structure may retain and release electromagnetic information that it has acquired in some way or other. - G. Preparata, 1995.*

**Abstract.** Theoretical modeling suggests spin-glass resonance properties of ordered water play a key role in the phase regulation of neuromolecular computation in processes related to consciousness in complex self-organized living systems. Water provides the central tier in the *synchronization backbone* required for quantum data processing and information transduction in the domain of Quantum Brain Dynamics (QBD).

*Keywords:* Ordered water, Synchronization backbone, Quantum brain dynamics, Quantum neural computing

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## 1. Introduction

For over forty years it has been suspected that collective modes of conformation in the dipole oscillations of neuromolecular systems are one of the key factor in the dynamics of consciousness. Until recently even though a brain cell is almost eighty percent water; the role of water in this process was dismissed as only a background filler medium within which to suspend the more important biological species. Functionally, consciousness is a hierarchical multi-level complex system [1]. This paper discusses the role spin glass properties of ordered water plays as the key element in the synchronization backbone tier of the dynamics of consciousness. The dynamics of Consciousness is a continuous state self-organized noetic transformation cycle of information flow from classical neural dynamics, to Quantum Brain Dynamics (QBD), through quasi-particle transitions aiding data transduction from Fermi to Bose states into the unitary noetic field of the mind. This utility of ordered water as a key element of the synchronization backbone arises in the dipole oscillations of its hydrogen bond which act as:

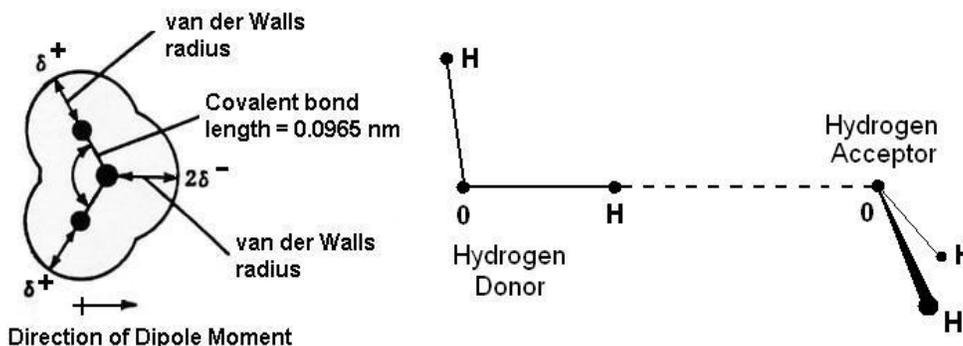
1. A medium to translate microscopically distinct Hamiltonian operators into macroscopically equivalent long range correlations,
2. Directional quenching or biasing of periodic moments which act as an aid in maintaining coherence effects for an infinitely long duration, and
3. Because of their large separations weakly interacting water molecules provide a buffer for phase transitions which supplies a spacial ordering suitable as a switching mechanism.

This ordered water mechanism putatively operates in conjunction with semi-classical neural dynamics, quantum dynamics of microtubules, quasi-particle transitions and the tunneling trigger mechanism of vesicle release at the synapse to integrate all aspects of the unitary Noetic Field of conscious field.

## 2. Ordered Water

Water is electrically neutral overall; but because of charge asymmetry in the tetrahedral geometry of the Hydrogen and Oxygen bond the water molecule is polar (Fig. 1). This allows adjacent water molecules to hydrogen bond into clusters

that have been found binding to protein surfaces. A 20-molecule water cluster is very stable due to strong Coulomb interactions; and is believed to be associated with microtubules (Watterson, 1987; Koruga, 1995) See Fig. 2.



**Figure 1.** A) A model of a water molecule showing its dipole moment. B) A hydrogen bond between two water molecules. When two water molecules hydrogen bond, one molecule becomes the *hydrogen donor* and points one of its OH groups toward the oxygen atom of the second water molecule which is the *hydrogen acceptor*. The oxygen-oxygen distance of the hydrogen bond is from 2.7 to 3.0 Angstroms with the donated hydrogen about one third of the way between the oxygens allowing it to still belong to the donor. The dipole oscillation by incident photons or coherent waves in biological systems produces a conformational change in optically active oligomers.

$$\mu = - \sum_i q_i r_i \quad (1)$$

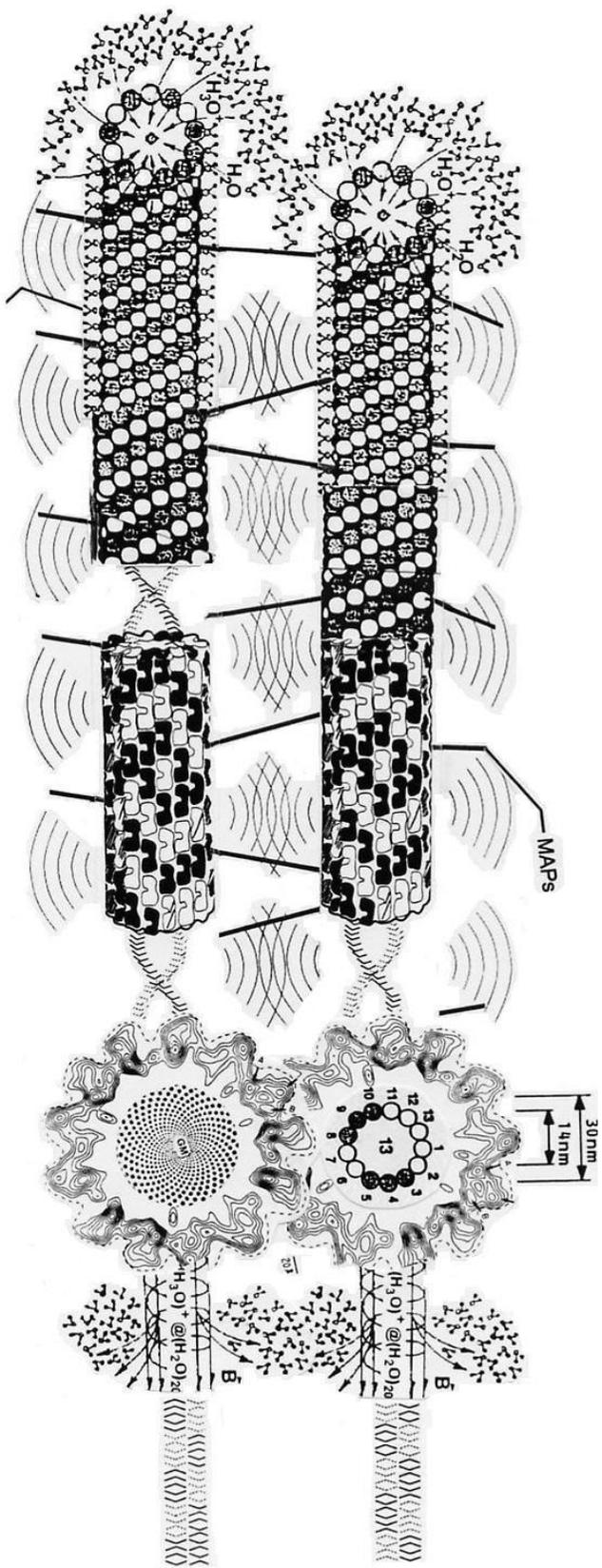
$$\Delta E = h\nu = \frac{hc}{\lambda} \quad (2)$$

Equation (1) is the vector potential of a dipole moment; which is the product of the charge  $q$  and the radius  $r$ . Equation (2) shows that change in energy  $E$  depends on Plank's constant  $h$  and either the frequency  $\nu$  or the wavelength  $\lambda$ . Conformational variation can originate in the energy variance from the ground state by incident photons. In the case of the brain this would be by corticons, Goldstone Bosons and Eccles psychons [2].

### 3. Collective Modes

The water molecule has a constant electric dipole moment that coincides with its axis of symmetry. Several degrees of freedom apply to the water molecule; spatial motion, rotation, and molecular vibration. The most important being molecular rotation around the axis of symmetry. This 'spinning top' can be considered a quantum mechanical spinor field which couples to the collective modes of the electromagnetic vibration of biomolecules throughout the brain. Collective modes are the key to the dynamics of living systems. When the energy Eigenstates of oscillating dipole molecules become strongly correlated it is called quantum coherence. It is the propagation of these coherent states, Fröhlich waves of between 100 billion to a trillion hertz, exchanging energy with the electromagnetic field, that is believed to be the basis for consciousness [2,3].

A single isolated water molecule  $H_2O$  is V shaped with the nucleus of the oxygen atom at the center and hydrogen nuclei forming each arm of the V that is 0.96 Angstroms long. The HOH angle is  $104.5^\circ$ . Hydrogen bonds are the dominant effect in the interaction of water molecules. In large water molecule aggregates optimum hydrogen bonding is achieved when each water molecule hydrogen bonds to four other water molecules, being a hydrogen donor to two and a hydrogen acceptor to two others. Four co-ordinated water networks can form from random forms to hydrogen bond patterns in hexagons, squares, pentagons or heptagons. Neighboring molecules in liquid water tend to have their dipoles aligned somewhat allowing them to act in concert under the polarizing influence of an electromagnetic field. Biologically active molecules contain both hydrophilic and hydrophobic chemical groups so that these molecules place the hydrophilic groups on the outside to be in contact with the water [11,13].



**Figure 2.** Ordered water as the synchronization backbone for quantum brain dynamics. A pair of microtubules with microtubule associated proteins (MAPs) connecting them. Water is shown around the microtubules and coupled to the outer tubulin surface. The microtubules are also shown in cross section revealing the 13 protofilaments surrounded by electron density maps that shroud the length of the tubule. The electron density varies with the energy state of the dipole oscillations of the tubulin dimer and associated water molecules. Inside the microtubule is an energy field wherewater assembles into clusters along the inner surface. It is believed that coherence occurs in the core of microtubules through cyclotron resonance at Frohlich frequencies. This ordered state might Bose condense providing the basis for consciousness. Ordered water is believed to provide the synchronization backbone that makes this superradiance possible.

#### 4. Synchronization Backbone

Richard Feynman found nothing in the laws of physics to suggest that a quantum computer wasn't possible; and that the most feasible way to build a quantum computer was using a 'synchronization backbone' [4]. The synchronization backbone eliminates the time dependence of the systems Hamiltonian without which the quantum computer could not maintain data accurately and be useless. A conscious quantum computer simulating quantum brain dynamics has been designed[5,6]. The purpose of the synchronization backbone is to provide a buffer to support coherence effects. This accomplishes two things:

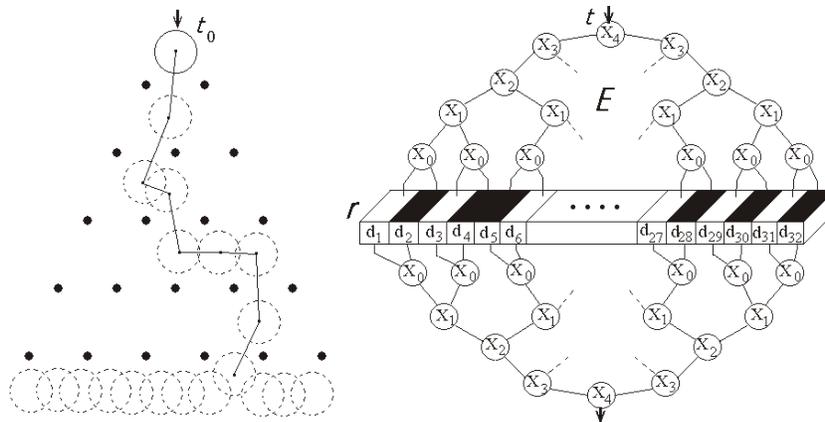
1. an amplification or memory effect and
2. to ease transitions in wave propagation thus avoiding thermalization which would annihilate coherence.

In the conscious quantum computer laser phase control interferometry resonating at Frohlich frequencies in heterosoric molecular crystals provides the synchronization backbone. Feynman's synchronization backbone works by building the quantum computer on top of another quantum system. It is suggested in this paper that the human brain performs quantum computation and also contains a synchronization tier and that the synchronization backbone for consciousness is provided by the activity of ordered water and its coupling to microtubules and other dipole oscillations in the cortex. This provides the two tiered quantum system necessary to provide the synchronization backbone.

Feynman recommended achieving quantum computing (QC) in terms of a *synchronization backbone*. Most physicists have abandoned this approach; and QC beyond a few qbits has remained elusive. Utilizing the following extended elements of quantum theory, a model for bulk QC is introduced:

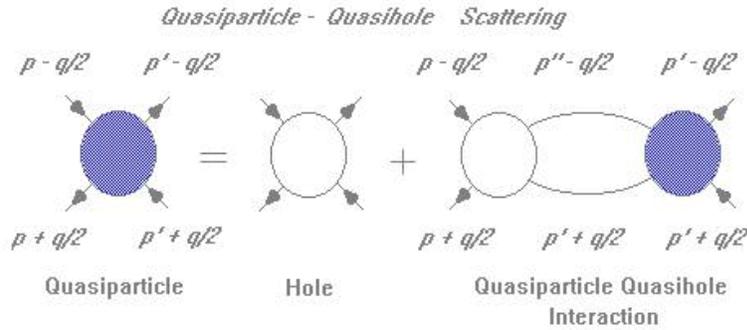
1. Additional degrees of freedom imposed by a relativistic qbit,
2. Symmetry parameters inherent in the topology of a polarized Dirac vacuum,
3. A three-phase uniform 'lattice-gas' network model compatible with a *topological switching effect* in the computation substrate and
4. Retarded and advanced propagation in terms of a Cramer-like extension of Wheeler-Feynman absorber theory.

Together these parameters describe an extended quantum regime where spherical rotation of close-packed complex Riemann spheres undergo continuous-state transformation where the micromagnetics of fractional and integer quantum Hall effects may be utilized in QC without decoherence during the computation cycle or collapse of the wave function.



**Figure 3.** In A) a pin raster illustrating a particle such as an electron moving along the classical manifold of a neural net. In B) the next step deeper in the noetic information processing hierarchy; quantum dynamics of the particles manifold.

This illustrates the complementarity of classical and quantum brain dynamics.



**Figure 4.** The concept of quasiparticle formation in the particle-hole formalism. As a real particle moves through a system, such as dipole transitions in brain proteins, it is surrounded by a cloud of agitation. A quasiparticle is a real particle plus the cloud. Quasiparticles obey the Pauli exclusion principle; but under certain conditions quasiparticles containing an even number of Fermions can Bose condense and produce superradiance and self induced transparency of the noetic field [7,12].

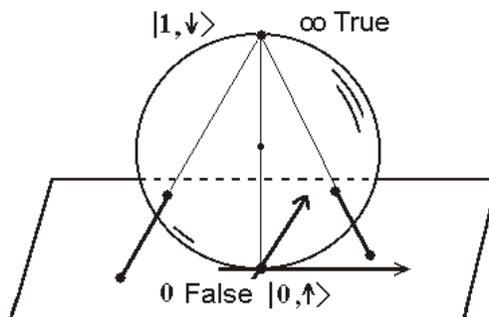
Fig. 4 is Step III in the conscious data transduction hierarchy. This step is the connection to Cartesian dualism/interactionism; a sense datum having come from I- Classical to II-Quantum to III - a quasiparticle transition from Fermi to Bose statistic allowing the information to enter the noetic field or light of the mind [8].

#### 4. The Quantum Bit: Microphysical Limits of Computation and The Case for Relativistic Qbits

##### A. CONVENTIONAL QUANTUM MECHANICAL CONSIDERATION OF A QBIT

In the conventional consideration of quantum computing a quantum bit or qbit is any two-state quantum system defined as a superposition of two logical states of a usual bit with complex coefficients that can be mapped to the Riemann sphere by stereographic projection. Formally a qbit is represented as:  $\Psi = \xi|0\rangle + \eta|1\rangle$  with each ray  $\xi, \eta \in \mathbb{C}$  in complex Hilbert space and  $|\Psi|^2 = \xi\bar{\xi} + \eta\bar{\eta} = 1$  where  $|0\rangle$  corresponds to the south or 0 pole of the Riemann sphere and  $|1\rangle$  corresponds to the opposite or north or  $\infty$  pole of the Riemann complex sphere. The complex plane is mapped to the Riemann sphere as:

$$\xi\bar{\eta} + \eta\bar{\xi} \rightarrow X, \quad \xi\bar{\eta} - \eta\bar{\xi} \rightarrow iY, \quad \xi\bar{\xi} - \eta\bar{\eta} \rightarrow Z \quad (3)$$



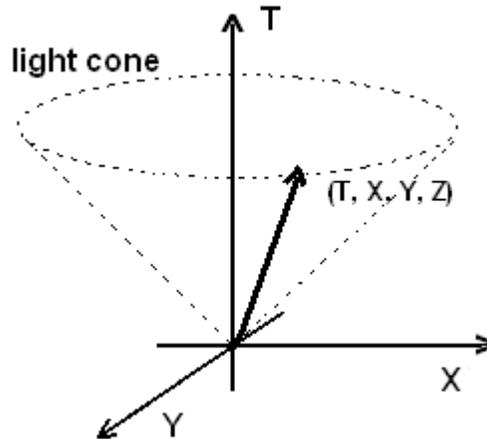
**Figure 5.** Conventional representation of a qbit as stereographic projection on a complex riemann sphere.

Unitary transformations of a qbit correspond to 3D rotations of the Riemann sphere.

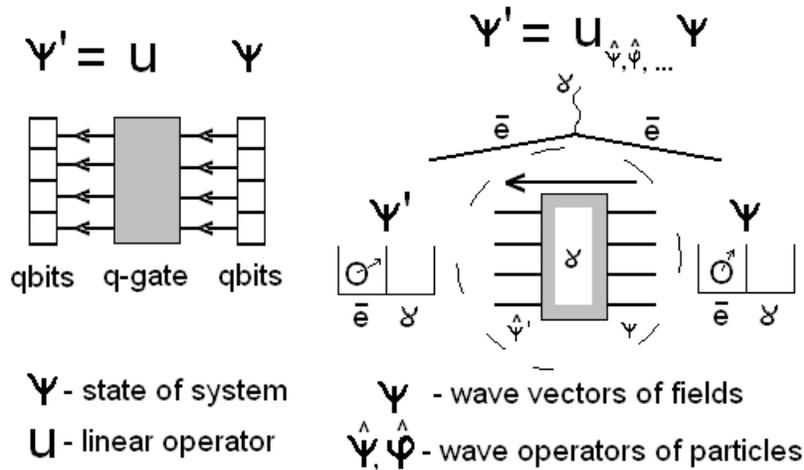
### B. RELATIVISTIC CONSIDERATION OF A QBIT

Following Vlasov [9] for relativistic consideration of a qbit an additional 4D parameter is added to equation (1):

$$\xi\bar{\eta} + \eta\bar{\xi} \rightarrow X, \quad \xi\bar{\eta} - \eta\bar{\xi} \rightarrow iY, \quad \xi\bar{\xi} - \eta\bar{\eta} \rightarrow Z, \quad \xi\bar{\xi} + \eta\bar{\eta} \rightarrow T \quad (4)$$



**Figure 6.** Relativistic model of a qbit where interacting quantum fields apply.



**Figure 6.** Contrast of quantum gates. Left the usual q-gate of constant number of states and particles. Right the relativistic quantum bit (rqbit) with constant particles but variable or infinite states.

### 5. Quantum Brain Dynamics and the Noetic Field Theory of Consciousness

Quantum Field Theory has several branches, Quantum Electro Dynamics (QED) for electromagnetic interactions, and Quantum Chromo Dynamics (QCD) for strong interactions for example. Quantum Brain Dynamics (QBD) is the quantum field theory describing biological systems [2]. QBD is mediated by the corticon, a quantum of the water

rotational field which interacts with the electric dipole oscillations along proteins. When synchronization of the water corticon and electromagnetic field occurs nonlocal coherence is manifest giving rise to long range order and collective phenomena. Nonlocal coherence provides a much stronger correlation than a classical collective mode could describe.

QBD of the water rotational field and interacting electromagnetic field although providing an excellent model of neuromolecular computation is not sufficient to describe consciousness because free will or intentionality is still left out of the picture. For this we need an extension of the orthodox epistemology of the Copenhagen interpretation into the quantum ontology of Bohm [10]. Bohm described the quantum potential as a nonlocal pilot wave effecting the probability matrix of the Schrodinger equation. Bohm's work was criticized for bringing causality back into the picture because the pilot wave makes a connection to classical mechanics. Noetic Field Theory: The Quantization of Mind completes Bohm's work. Intentionality is nonlinear and acausal, not linear and causal as the determinism of Newtonian mechanics was. So although the result of intentionality acts as a causal operator on the quantum potential; because of its nonlinear/acausal dynamics the probabilities inherent in the evolution of the Schrodinger equation are not violated.

This is the entry point of mind into quantum theory and another key factor for in the operation of the synchronization backbone provided by the water corticon field. Neurocomputing models of the brain are linear closed systems; Once a computer is programmed there are no remaining degrees of freedom for rational input. The see saw action or harmonic oscillation of the synchronization backbone provides a switching mechanism called the noetic effect [8] for the entry of either intentionality or sensory phenomenology into the conscious process.

## 6. Conclusion

Water has been theorized to play two important roles in consciousness: 1. to provide a storage buffer to amplify or attenuate the corticon field, and 2. to allow switching between sensory computation and intentionality. Although the role of ordered water in the dynamics of consciousness remains a qualitative model at this point in time, a growing body of literature from both experimental and theoretical areas are converging to suggest an important role of water in the quantum physics and molecular biology consciousness. Hydrogen bonds are able to electrostatically coordinate geometric phase relationships with electronegative oxygen atoms creating interchanging 3D aggregates allowing information exchange through the complex self-organized structure of noetic quantum computation. This is an important part of Noetic Field Theory [1,5,6,8] because it represents a key element supporting the dualist/interactionist view of conscious information being able to be transported from external temporal neural sense data to internal eternal mentation!

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