Fröhlich references

Herbert Fröhlich introduced the idea that some sort of collective vibration was responsible for getting proteins to cooperate and carry out instructions of DNA. He predicted that certain frequencies (now called " Fröhlich
frequencies") are generated in cell membranes. He had shown that once energy reaches a certain level, molecules begin to vibrate in unison, until they reach a high level of coherence. they exhibit the "non-locality" of quantum particles

Living systems, although highly complex, are also highly organized. In 1968, physicist Herbert Fröhlich, who had helped science to understand superconductors, proposed that coherent vibrations of energy are a key feature of the organization of living systems. While these vibrations have a quantum mechanical origin, they can, as in the case of superconductors and superfluids, in Fröhlich's view, extend over regions of centimeters, and are the basis of all life.

Research on the millimeter -wave spectroscopy of many biological systems was published by Devyatkov in 1974. This data showed effects that were strongly frequency dependent, little dependent on power, but very dependent on the duration of radiation. All of these factors are consistent with coherent excitations.

Although according to conventional biophysics there should be no significant magnetic field interactions with biological dialectrics or water, a large anomalous magnetic effect was found in enzyme systems. Fröhlich

concluded that this magnetic effect could only arise from the equivalent of a superconducting ring present in biological systems, and that this implied long range correlations and order

Seek5 /human energy field/subtle energy
Quantum Biologist Glen Rein observes that Fröhlich, Popp, and Smith in the 1980s demonstrated that EM fields emanating from the human body are coherent in nature.

Seek5/humsn energy field
Bioelectrodynamics and Biocommunication edited by Mae-Wan HO, Fritz-Albert Popp and Ulrich Warnke World Scientific Pubishing 1994. ($349) p 431 f (referencing Chapter 8 of the book)
Google books frolich

fundamental_reality\pitkanen.doc

Internet references to Matti Pitkanen and his theory. and PSN commentary

Matti Pitkanen, John Wheeler, Christopher Isham, Jeremy Butterfield, Herbert Fröhlich, Fritz Popp, Cyril Smith,

nanopoulos
Theory of Brain Function, Quantum Mechanics and Superstrings **by D.V. Nanopoulos**

Notes: fundamental_reality\nanopoulos.doc

Original paper: fundamental_reality\9505374v1.pdf
Stewart Hameroff, Roger Penrose, Donald O. Hebb, Stephen Hawking, Herbert Fröhlich, Del Giudice,
Sir John Eccles, Sigmund Freud

7. Microtubules (MTs) II The physical profile (p. 38)
The basic physical framework for understanding the high degree of biological order was put forward by Herbert Fröhlich. Fröhlich conjectured that quantum level events, such as the movement of an electron, act as a trigger for changing the conformational state of an entire protein. He conjectured that if biochemical energy such as ATP or GTP hydrolysis were supplied to a dipolar biological system, long range macroscopic coherence would result. He provided evidence that coherent excitation frequencies in the range 10^{9} to 10^{10} were possible. The MTs provide a structure that allows Fröhlich's excitations to be realized. There is contemporary physical evidence for these global frequency excitations, including the demonstration of propagating signals in the MTs.

Nanopoulos notes that the basic physical framework for understanding the high degree of order in biological systems was put forward by Herbert Fröhlich, who conjectured that a supply of biochemical energy would result in long range macroscopic coherence. He provided evidence that coherent excitation frequencies in the range 10^{9} to 10^{10} were possible. The MTs provide a structure that allows Fröhlich's excitations to be realized. There is contemporary physical evidence for these global frequency excitations, including the demonstration of propagating signals in the MTs.

Fund/Photons and Phonons Electromagnetic Bio-information Transmission
fundamental_reality\Photons and Phonons Electromagnetic Bio-information Transmission.doc

Herbert Fröhlich, Elizabeth B. Bauer, Veljko Veljkovic, Irena Cosic, D.V. Nanopoulos, Mae Wan Ho,
Fritz Popp,

Fröhlich's coherent pumped phonons

In addition to linking protein conformation to hydrophobic quantum events, Herbert Fröhlich, an early contributor to the understanding of superconductivity, also predicted quantum coherence in living cells (based on earlier work by Oliver Penrose and Lars Onsager, 1956). Fröhlich theorized that sets of protein dipoles in a common electromagnetic field (e.g. proteins within a polarized membrane, subunits within an electret polymer like microtubules) undergo coherent conformational excitations if energy is supplied. Fröhlich postulated that biochemical and thermal energy from the surrounding "heat bath"provides such energy. Cooperative, organized processes leading to coherent excitations emerged, according to Fröhlich, because of structural coherence of hydrophobic dipoles in a common voltage gradient.

Coherent excitation frequencies on the order of 10^9 to 10^{11} Hz (identical to the time domain for functional protein conformational changes, and in the microwave or gigaHz spectral region) were deduced by Fröhlich who termed them acousto-conformational transitions, or coherent (pumped) phonons. Such coherent states are termed Bose-Einstein condensates in quantum physics and have been suggested by Marshall (1989; this Volume) to provide macroscopic quantum states which support the unitary binding of consciousness.

Experimental evidence for Fröhlich-like coherent excitations in biological systems includes observation of giga Hz-range phonons in proteins (Genberg et al, 1991), sharp-resonant non-thermal effects of microwave irradiation on living cells (Grundler and Keilman, 1983), giga Hz induced activation of microtubule pinocytosis in rat brain (Neubauer et al, 1990) and Raman spectroscopy detection of Fröhlich frequency energy (Genzel et al, 1983).

http://www.quantumconsciousness.org/penrose-hameroff/orchOR.html

No longer posted, however, the above comes from *Toward a Science of Consciousness: The First Tucson Discussions* ..., Volume 1

By Stuart R. Hameroff, Alfred W. Kaszniak (google books)

Toward a Science of Consciousness: The First Tucson Discussions p.517 (Google Books)

Frohlich(23) argued that as organisms are made up of str ongly dipolar molecules packed rather densely together (c.f. the 'solid state' cell), electric and elastic forces will constantly interact. Metabolic pumping will excite macromolecules such as proteins and nucleic acids as well as cellular membranes (which typically have an enormous electric field of some 10^7V/m across them). The excited molecules/membranes will vibrate at various characteristic frequencies resulting from the coupling of electrical displacements to mechanical deformations. This eventually builds up into collective modes (coherent excitations) of both electromechanical oscillations (phonons, or sound waves in solid medium) and electromagnetic radiations (photons) that extend over macroscopic distances within the organism and perhaps also outside the organism. The emission of electromagnetic radiation from coherent lattice vibrations in a solid-state semi-conductor has recently been experimentally observed for the first time.(24) The possibility arises that organisms may actually use electromagnetic radiations to communicate between cells or between different organisms.(25)

… Fröhlich's theory is far from generally accepted

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Beverly Rubik, David Bohm, Gerald Edelman, Roger Penrose, Karl Pribram, Sir John Eccles, Herbert Froehlich, Larry Dossey, Robert Jahn, Martin Gardner, Richard J. Fox,

Seek5/hef/Validation of hef

The Biological Coherence Model

This model maintains that all parts of the living matrix create vibrations that propagate within an organism and radiate into the environment at different frequencies, including visible light. Each molecule, cell, tissue, and organ has a resonant frequency that coordinates its activities. Living matter is highly sensitive to the information conveyed by these signals, which may integrate processes such as growth, defense, injury repair, and the function of the organism as a whole. [i]

From 1973, Herbert Fröhlich was professor of solid state Physics at the University of Salford. He was among the first researchers to suggest that waves or vibration allow proteins to cooperate with one another and carry out instructions from DNA. [ii]

Frohlich proposed that metabolic energy is not being lost as heat but stored in the form of coherent electromechanical vibrations called coherent excitations. These vibrations, now known as Frohlich Oscillations occur at the microwave and visible light frequency range of the electromagnetic spectrum. [iii]

He showed that once energy reaches a certain level, molecules begin to vibrate in unison, until they reach a high level of coherence, when they may take on certain properties of quantum mechanics.[iv]

Work on biophotonic frequencies dovetails with the biological coherence model. French scientist Jacques Benveniste learned how vibrations of Popp's biophotons could cause new molecules to vibrate and create their own signature frequency, even in the absence of physical molecules. His studies were widely regarded as making a valid case for homeopathy. [v] If water were able to imprint and store information from molecules, this would have an impact on our understanding of molecules and how they "talk" to one another in the body. The conventional theory of how molecules communicate in the body requires direct contact, a process which is too slow and too dependent on chance. According to Benveniste's theory, which has been supported by experiment, molecules rely on electromagnetic signaling at low frequencies (between 20hz and 20 khz). Each molecule has its own signature frequency, and can resonate with other molecules.

Seek5/hef/Vo hef electromagnetic models

Biological Coherence model

Originally, Biological Coherence referred specifically to the work of Herbert Fröhlich, professor of Solid State Physics at the University of Salford in the 1970's, He was among the first researchers to suggest that waves or vibration allow proteins to cooperate with one another and carry out instructions from DNA. [vi]

Observing that millivolt electrical potentials maintained across cell membranes ~10 nm thick give rise to huge fields ~10^7 volts/m, Fröhlich proposed that membrane molecules must be highly electrically polarized and thus could interact to produce coherent surface acoustic vibrational modes in the 10-100 GHz (microwave) frequency range. [vii]

According to Stuart Hameroff and Roger Penrose, Fröhlich termed these modes acousto-conformational transitions, or coherent (pumped) phonons, and noted such coherent states are termed Bose-Einstein condensates in quantum physics. [viii]

Fröhlich proposed that metabolic energy is not being lost as heat but is stored in these vibrations, now known as Fröhlich Oscillations. [ix] This storage of energy is analogous to the non-dissipative storage of magnetic energy in inductors in electric circuits.

He showed that once energy reaches a certain level, molecules begin to vibrate in unison, until they reach a high level of coherence, when they may take on certain properties of quantum

Seek5/hef/photon ultra weak photon emission

Thunderbolts forum

Fröhlich proposed that collective modes of both electromechanical oscillations (phonons) and electromagnetic radiations (photons) extend over macroscopic distances within the organism and perhaps also outside the organism

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[i] http://www.thefreelibrary.com/Energy+Medicine%3A+The+Scientific+Basis-a0163336257

[ii] http://en.wikipedia.org/wiki/Herbert_Fr%C3%B6hlich

[iii] http://elizabethbauerconsults.com/motion.html

[iv] http://en.wikipedia.org/wiki/Herbert_Fr%C3%B6hlich also see *The Intention Experiment* Lynne Mc Taggart p. 49 f
The following reference states the biological system could also take on the specific quantum property of non-locality: http://nonlocal.com/hbar/frohlich.html

[v] While Benveniste was director at INSERM, he found that if solutions of antibodies were diluted repeatedly until they no longer contained a single molecule of the antibody, they still produced a response from immune cells. These effects were replicated by five different labs in four countries: France, Israel, Italy, and Canada. Although strongly contested, the results were published in a 1988 edition of Nature magazine.

These researchers concluded that: "specific information must have been transmitted during the dilution/shaking process. Water could act as a template for the molecule, for example, by an infinite hydrogen-bonded network, or electric and magnetic fields.. the precise nature of this phenomenon remains unexplained." *The Field* pp 39-71

[vi] http://en.wikipedia.org/wiki/Herbert_Fr%C3%B6hlich

[vii] http://www.howstuffworks.com/framed.htm?parent=human-body-make-electricity.htm&url=http://www.nanomedicine.com/NMI/4.7.1.htm

[viii] http://www.quantumconsciousness.org/penrose-hameroff/orchOR.html

[ix] http://elizabethbauerconsults.com/motion.html