When we start to study ‘non-physical’ phenomena, we will progress more in ten years than we have for centuries.
Nikola Tesla (1919)
**ABSTRACT.** Quantum bases of consciousness & free will are considered with implications of two cognitive modes of consciousness (direct religious/creative, in quantum-coherent transitional & altered states, & indirect perceptually/rationally mediated, in classically-reduced normal states). Implications for local & global psychosomatics, religious & transpersonal phenomena, are considered too. Conditions for observation of (quantum-coherent quantum-holographic) implicate order & (classically-reduced) explicate order are also discussed.

**KEYWORDS.** Quantum & Classical Hopfield-like Neural Networks; Free Will; Two Cognitive Modes of Consciousness: Quantum (Altered/Transitional States) & Classical (Normal States); Quantum Holography & Quantum Decoherence; Local & Global Psychosomatics; Religious & Transpersonal Implications; Implicate & Explicate Orders.
INTRODUCTION

In Talbot’s excellent book *The Holographic Universe*, he refers to renown quantum physicist David Bohm and neurophysiologist Karl Pribram, whose investigations imply that the *Universe* might be a *giant quantum hologram*, a kind of *mind construct on the subject/object interface* – thus relativising a question whether objective reality exists or *fluctuate between implicate & explicate order*!? In his book, Talbot (himself extrasense!) argues that most of well documented *mysterious phenomena*:

- synchronicity, lucid dreams, eidetic pictures, multiple personalities;
- viewing & therapy of aura, visualizing, hypnotic & miraculous healings;
- mystical religious, out-of-body & near-death experiences;
- psychometry, precognition, extrasensory perception;
- psychokinesis, materialization, teleportation;

might be presumably explained in the framework of (still controversial) *quantum-holographic paradigm*.

Reading of the book provided me a great pleasure, because of my own explorations of quantum-holographic bases of consciousness and their fundamental cognitive-epistemological & psychosomatic-religious implications (with numerous empirical/rational confirmations I recognized by reading the book).
QUANTUM AND CLASSICAL NEURAL NETWORKS & TWO COGNITIVE MODES OF CONSCIOUSNESS

So, association of individual consciousness to (manifestly-macroscopic-quantum) acupuncture system, and application of theoretical methods of associative neural networks & quantum neural holography & quantum decoherence theory, imply two cognitive modes, according to the coupling strength consciousness-body-environment: weakly-coupled quantum-coherent direct one (in religious/creative transitional & altered states of consciousness, like prayer, meditation, creative dozes, lucid dreams...) & strongly-coupled classically-reduced indirect one (in perceptively/rationally mediated normal states of consciousness, like sensory perception, logical and scientific thinking...) – with conditions for mutual transformations - and significant religious & epistemological implications related to re-gained strong coupling of quantum-holographic contents of consciousness with bodily-environment, classically-reducing directly obtained quantum-coherent informational content – thus explaining in principal non-adequate informational rationalization of any direct quantum-holographic spiritual/religious mystical experience (as a general problem of the quantum theory of measurement, of reduction of implicate order of quantum-coherent (quantum-holographic) superpositions into explicate order of measured projective quantum and mixed classical states!).
The mentioned analogy between mathematical formalisms of Hopfield’s associative neural network & Feynman’s propagator version of the Schrödinger equation implies that collective consciousness is possible ontological property of the physical field itself with various micro-quantum and macro-quantum (both non-biological and biological) excitations, which is widely spread thesis of Eastern esoteric/religious traditions - and then memory attractors of the quantum-holographic space-time network of collective consciousness can be treated as psychosomatic global disorders representing (quantum)holistic field records (including interpersonal hesychastic-prayer finally-reprogrammable loads).

So it seems that the whole psychosomatics is quantum hologram, both on the level of individual and collective consciousness, which resembles on Hinduistic relationship Brahman/Atman (‘Atman is Brahman’), as cosmic/individual consciousness where an individual bears information about wholeness. The mentioned quantum-holographic picture (Fig. 1) also implies that quantum-holographic hierarchical parts carry information on wholeness, enabling subtle quantum-holographic fractal coupling of hierarchical levels in Nature:
(i) **acupuncture-based-quantum-informational control of morphogenesis** (from the first fertilized cell division which initializes differentiation of the **acupuncture system of (electrical synaptic) ‘gap-junctions’**);

(ii) **meridian (psycho-energetic) therapies** (with very fast removing of persistent phobias, allergies & other psychosomatic disorders, demonstrating **closest relationship of consciousness & acupuncture system**);

(iii) **quantum-holographic language-influence on the genes expression** (with implications of **great psychosomatic significance of thought-emotional contents**);

(iv) **global fractal-information coupling of hierarchical levels in Nature** (out of which the most fascinating is mathematical discovery of ‘**Bible Code**’ on the level of **preferences of collective & Individual history** coded within The Old Testament – which might be interpreted as a consequence of **global quantum-holographic coupling of cosmic collective consciousness (God!?)** and its every original manifestation (including **The Old Testament**, as well as every individual consciousness (**Tesla & Mozart** as examples of **miraculous deep creativities!**) - which still does not mean the strict determinism of the History by the existing state of collective consciousness, whose memory attractors could be (and should be!) **reprogrammed by hesychastic prayer for the others** thus removing interpersonal loads of the quantum-holographic Hopfield-like neural network of collective consciousness - so **leaving room for free will and influence on future preferences**).
Figure 1. Schematic presentation of memory attractors in energy-state hypersurface ($E_{S_k} (\phi^k_i)$) of quantum-holographic memory/propagator cellular quantum-ensemble ligand-proteins/target-receptors biomolecular macroscopic open quantum system: $G^{(k)}(r_2,t_2,r_1,t_1) = \sum_{i=0}^{P_1-1} \phi^{(k_i)}(r_2,t_2) \phi^{(k_i)}(r_1,t_1)^* = \sum_{i=0}^{P_1-1} A_{k_i}(r_2,t_2) A_{k_i}(r_1,t_1) \ e^{i(\alpha_{k_i}(r_2,t_2) - \alpha_{k_i}(r_1,t_1))}$ – and the same holds true for higher quantum-holographic hierarchical level of acupuncture system/consiousness! It should be pointed out that quantum decoherence evidently plays fundamental role in biological quantum-holographic neural networks, through presented shape adaptation of energy-state hypersurface (in contrast to artificial qubit quantum computers where quantum decoherence must be avoided until the final read-out act of quantum computation) – which implies that Nature has chosen elegant room-temperature solution for biological quantum-holographic information processing, continuously fluctuating between quantum-coherent state $|\phi^k(t)\rangle_{S_k} = \sum_i c_{k_i}(t) |\phi^{k_i}\rangle_{S_k}$ and classically reduced state $\tilde{\rho}^{k}_{S_k}(t) = \sum_i |c_{k_i}(t)|^2 |\phi^{k_i}\rangle_{S_k} \langle \phi^{k_i}|$ of acupuncture system/ consciousness, through nonstationary interactions with out-of-body far-environment and through decoherence by body near-environment. Hence, quantum neural holography combined with quantum decoherence might be very significant element of feedback bioinformatics, from the level of cell to the level of organism!
It should be pointed out that on both cellular and acupuncture levels, there exist two (interacting) macroscopic quantum subsystems – first with modifying many-electron hypersurface $E_e(\phi^{(k)}_e)$ and second with modifying EM multi-phonon hypersurface $E_v(\phi^{(k)}_v)$.

In particular, dynamic modification of the many-electron energy-state hypersurface of the cell’s $N$-particle protein/substrate macroscopic quantum system, might be appropriately represented in the second quantization formalism, which treats all $N$ protein-substrate complexes of the same type as noninteracting but dynamically coupled system of $N$ indistinguishable quantum particles (which is an alternative to their standard treatment as an quantum ensemble of $N$ noninteracting independent distinguishable particles – but this automatically provides a plausible picture of quantum-holistic biological cell, and especially phenomenologically approved quantum-holographic coupling of various hierarchical levels, from biological cell-to-acupuncture system & consciousness-to-collective consciousness).
This considers such cell’s protein-substrate N-particle-quantum state in quantum-mechanical occupational basis (generally bosonic, because of protein-substrate integer spin due to even number of their covalent bonded electrons!), describing number of protein-substrate complexes occupying complete set of single-particle protein-substrate isomeric/conformational states: \( \left| n_0n_1n_2\ldots \right>_e \), with conditions \( N = n_0 + n_1 + n_2 + \ldots \) and \( E_{ske} = n_0E_e^{(0)} + n_1E_e^{(1)} + n_2E_e^{(2)} + \ldots \) (where \( E_{ske} \) is the many-electron energy of the total cell’s protein-substrate N-particle-isomeric/conformational state, while \( E_e^{(0)} \), \( E_e^{(1)} \), \( E_e^{(2)} \) ... are the many-electron energies of the protein-substrate single-particle quantum isomeric/ conformational states 0, 1, 2, ...). An energy hypersurface of such protein-substrate N-particle-isomeric/conformational state has a schematic representation of Fig. 1, where internal surface of every minimum is proportional to the partial energy \( n_iE_e^{(i)} \) of the \( i \)-th protein-substrate single-particle-isomeric/conformational state occupied by \( n_i \) isomers of the same form \( (i = 0, 1, 2, \ldots) \), so that total energy \( E_{ske} \) of the cell’s protein-substrate N-particle-isomeric/conformational state is proportional to the sum of internal surfaces of the all minima of the hypersurface.
Ragarding of **multi-phonon energy-state hypersurface** of the all possible protein-substrate isomeric/conformational states requires their consideration in quantum-mechanical **occupational basis** (also bosonic, because of phonon’s integer spin!) – describing number of phonons occupying complete set of single-particle phonon states of protein-substrate isomers/conformations:

\[
\left| n_1^{(0)} n_2^{(0)} ... n_{3N-6}^{(0)} n_1^{(1)} n_2^{(1)} ... n_{3N-6}^{(1)} n_1^{(2)} n_2^{(2)} ... n_{3N-6}^{(2)} \right>_v
\]

where every isomeric protein-substrate complex composed of \( N \) atoms has generally \( 3N-6 \) vibrational degrees of freedom (phonon types), out of which every phonon state can be occupied by unlimitted number of phonons (which is characteristic of all bosons, i.e. particles of integer spin). It should be pointed out that an **energy hypersurface** of multi-dimensional phonon quantum state has also a schematic representation of Fig. 1, with potentially unlimited number of phonons in every single-phonon state. This energy hypersurface of multi-phonon quantum state might also include low-energy long-range **coherent microwave Frohlich excitations** (created as a result of interaction of electronic and phonon isomorphic subsystems – of particular significance in **microwave resonance therapy** (MRT) of a dynamic modification of the EM multi-phonon (and related many-electron) acupuncture macroscopic quantum subsystem!).
For instance, on the cellular level of the $N$-particle protein-substrate macroscopic quantum system, there would exist two (interacting) cell’s protein-substrate macroscopic quantum subsystems – first with modifying many-electron protein-substrate hypersurface $E_e(\phi^{(k)}_e)$ and second with modifying EM multi-phonon protein-substrate hypersurface $E_v(\phi^{(k)}_v)$ – described by the second quantization model Hamiltonian:

$$\hat{H} = \hat{H}^{(0)}_{is} + \hat{H}^{(0)}_{ph} + \hat{H}^{is-E}_{int} + \hat{H}^{ph-E}_{int} + \hat{H}^{is-ph}_{int} = \sum_i E^{(i)}_{is} a^{+}_i a_i + \sum_i \sum_{j=1}^{3N-6} E^{(i,j)}_{ph} b^{+}_i b_{i,j} + H^{is-E}_{int} + H^{ph-E}_{int} + H^{is-ph}_{int}$$

in which $a^{+}_i, a_i$ are creation & annihilation operators of the various many-electron protein-substrate isomeric/conformational states, $b^{+}_i, b_{i,j}$ are creation & annihilation operators of the various phonon states in all many-electron protein-substrate isomeric/conformational states, and $\hat{H}^{is-E}_{int}$ is a model-dependent Hamiltonian of the many-electron protein-substrate isomeric-environment interactions, $\hat{H}^{ph-E}_{int}$ is a model-dependent Hamiltonian of the many-electron protein-substrate isomeric phonon-environment interactions, and $\hat{H}^{is-ph}_{int}$ is a model-dependent Hamiltonian of the many-electron protein-substrate isomeric-phonon interactions.
QUANTUM-HOLOGRAPHIC RELIGIOUS & TRANSPERSONAL IMPLICATIONS

Our theoretical investigations imply real origin of religious/transpersonal experiences of various traditions of East and West – and according to our elaborated theoretical relationship consciousness/acupuncture EM-ionic quantum-holographic Hopfield-like associative neural network, esoteric notions like astral body (manomaya, lingasarira, manovijnana, ka, psyche, subtle body, psychic body, soul...) and mental body (vijnanamaya, suksmasarira, manas, ba, thymos, noetic body, spiritual body, spirit...) – might be biophysically related to out-of-body displaced ionic part (connected with the body by miniature ’wormhole’ tunnel) of acupuncture system, and with embedded EM field of ionic MW ULF-modulated currents, respectively. Then, biophysical nature of ionic part of consciousness (qi, prana, pneuma...) might be sought in ions (positive with exciting yang-influence, and negative with relaxing yin-influence) with embedded ionic/EM MW ULF centers of consciousness (acupuncture points, chakras...).
Then, transpersonal interactions might be interpreted by collapse-related consciousness-channeled quantum-gravitational tunneling of operator’s individual consciousness - mentally addressed on the target’s content of collective consciousness in operator’s (short-lasting) transitional states of consciousness - thus intentionally channeling composite state of the 'field' of target-under-influence-of-operator part of collective consciousness, $|\Phi\rangle_S \rightarrow |\Phi_j\rangle_S$, and automatically influencing complement 'particle' output $|\Psi\rangle_E \rightarrow |\Psi_j\rangle_E$ in quantum-gravitationally-induced and consciousness-channeled collapse:

$$|\Phi\rangle_S |\Psi\rangle_E = \sum_i c_i |\Phi_i\rangle_S |\Psi_i\rangle_E \rightarrow |\Phi_j\rangle_S |\Psi_j\rangle_E .$$

It should be also pointed out, that in the context of necessary conditions for decoherence, defining of open quantum system & environment is simultaneous process – so that in the context of universal validity of quantum mechanics consciousness is relative concept, non-locally also influenced by farther parts of existing observing universe (and vice versa!), simultaneously creating conditions for the process of decoherence in the context of existing relative borderline:

$$|\Phi\rangle_S |\Psi\rangle_E \equiv |(\text{partial})\text{individual/collective consciousness}\rangle_S |(\text{complement})\text{environment}\rangle_E .$$
This is fully in accordance with the idea of **collective consciousness** as a possible **ontological property of the physical field itself**, with different **micro-quantum & macro-quantum excitations** (non-biological and biological, real and virtual...). Then, as **cosmic collective consciousness** $|\Phi\rangle_S \sim \prod_k |\phi^k\rangle_{S_k} = \sum_i c_i |\Phi_i\rangle_S$, coincident with the 'field' of Universe, has its **complement 'particle' cosmic environment** $|\Psi\rangle_E = \sum_i c_i |\Psi_i\rangle_E$, their **strong-interaction-coupling** affects **decoherence of the 'field' of cosmic collective consciousness** into stationary **classically-reduced (observing) stochastic state**, $\hat{\rho}_S = \sum_i |c_i|^2 |\Phi_i\rangle_S \langle \Phi_i|$, with probabilities $|c_i|^2$ of realizations of corresponding classically-decoherent states of cosmic collective consciousness; however, **cosmic composite quantum state** $|\Phi\rangle_S |\Psi\rangle_E$ **evolves without collapse** (**due to absence of the complement outside-cosmic environment!**), which implies that **Universe as a whole is quantum hologram** subject to **deterministic Schrödinger evolution**!
However, *prayer-induced hypothetical macroscopic vacuum non-loaded spiritual excitations* (whose *exciting by prayers arises associations on Holy Grace as in-deterministic intervention* in otherwise deterministic evolution of the quantum-holographic cosmic (and embedded human) History, which thus *provide essentially new boundary conditions!*) might *modify* cosmic collective consciousness $|\Phi'\rangle_S \sim \prod_k |\phi'^k\rangle_{S_k}$ and thus *cosmic composite quantum state* $|\Phi'\rangle_S |\Psi'\rangle_E$, i.e. *classically-reduced stochastic state of cosmic collective consciousness* $\hat{\rho}_S = \sum_i |c'_i|^2 |\Phi'_i\rangle_S \langle \Phi'_i |$, so implying possibility of *prayer-optimized preferences of cosmic collective consciousness* (and conversely, on modification of *cosmic-consciousness-observable* classically-reduced stochastic state of the complement "particle" cosmic environment $\hat{\rho}'_S = \sum_i |c'_i|^2 |\Psi'_i\rangle_E \langle \Psi'_i |$, implying possibility of *prayer-optimized preferences of future cosmic alternatives!*).
IMPLICIT & EXPLICIT ORDERS OF QUANTUM-HOLOGRAM & THEIR OBSERVATIONS

From the above there appears that classically-reduced level of quantum system/consciousness $\rho_S(t)$ or environment $\rho_E(t)$, is permanently emerging-from-and-dissolving-into quantum-holographic level $|\Phi(t)\rangle_S|\Psi(t)\rangle_E$ (cf. Fig. 1), and this permanent pulsating is going on extremely fast with possibilities of:

(i) observing Bohm’s explicate order of either average classical mixtures (of quantum system/consciousness $\rho_S(t)$ or environment $\rho_E(t)$) of quantum-holographic reality via classical measuring devices/senses, or classically-reduced stationary quantum states (quantum system/consciousness $|\Phi_i\rangle_S$ and environment $|\Psi_i\rangle_E$) via macroscopic semi-quantum measuring devices;

(ii) observing Bohm’s implicate order of non-stationary quantum-holographic reality $|\Phi(t)\rangle_S|\Psi(t)\rangle_E \sim \prod_k |\phi^k(t)\rangle_{S_k}|\Psi(t)\rangle_E = \sum_i c_i |\Phi_i(t)\rangle_S |\Psi_i(t)\rangle_E$ exclusively via non-stationary quantum-coherent superpositions of creative-religious altered & transitional states of consciousness (individual $|\phi^k(t)\rangle_{S_k} = \sum_i c_{ki} |\phi^{ki}(t)\rangle_{S_k}$ or collective $|\Phi(t)\rangle_S = \sum_i c_i |\Phi_i(t)\rangle_S$).
This viewpoint is close to experiences of all **shamanistic tribal traditions**, claiming that (quantum-holographic!) **genuine reality** is represented by **dreams**, while (classically-reduced!) **awake state** is **lie/illusion (maya)** in **Eastern traditions**.

In the same context, **necessity of direct quantum-holographic coupling** of individual & cosmic collective consciousness in observing **implicate order** needs **weak out-of-body quantum-communication coupling** consciousness-environment, i.e. **previous reprogramming of all psychosomatic loads** (cleansing of possesive/hedonistic emotional-mental sin/karmic connections with the world – which as loading ‘mental adresses’ would **otherwise affect quantum projections** of mentally-channeled tunneled consciousness on corresponding **out-of-body environment**, and thus to classically-reduced out-of-body **extrasensory observing** of mentally-addressed environment!) – and so **efforts of mystics** of all traditions to **clean consciousness/soul** through spiritual practice (prayer, meditation, ...) and thus to **reach eschatological goal** (Kingdom of God, nirvana, ...), i.e. **post-mortem salvation** (of sin-free/karmic-free non-bounded soul) **appear reasonable**.

These results suggest **necessity of great sinthesis of two cognitive modes**, rationally-scientific (classically-reduced, in normal states) & creative-religious (quantum-coherent, in altered & transitional states), **within quantum-holographic paradigm** – where **personal role becomes morally indispensiable** due to **fundamental influence & care for collective consciousness & mental health of Civilization**!
CONCLUSIONS

In this lecture, quantum bases of consciousness & free will are considered with implications of two cognitive modes of individual consciousness (the quantum-coherent direct one & the classically-reduced indirect one) - to which theoretical methods of associative neural networks & quantum neural holography & quantum decoherence theory might be applied.

The direct cognitive mode of consciousness might be related to weakly coupled consciousness-environment communication, within the nonlocal quantum-holographic/quantum-gravitational Hopfield-like space-time network of collective consciousness (characteristic of quantum-coherent transitional & altered states in religious-esoteric transpersonal communications, including anticipation in intuition, precognition, deep creative insights), while the indirect cognitive mode of consciousness might be related to strongly coupled consciousness-body-environment communication via space-time limited perceptual sensations, further processed by classical/electrochemical hierarchical neural networks and rationally filtered in conscious content by approximate empirical/ artistic/scientific concepts dependent of cultural/scientific tradition and education of the inhabitants of some society (characteristic of classically-reduced normal states in sensory communications - being generally informationally poorer than full quantum-holographic awareness (cf. Patanjali’s ‘Yoga Sutras’ of superb spiritual-religious extrasensory experiences!).
On these lines, **conditions of transformations of two cognitive modes** in the context of **quantum-holographic quantum-coherent implicite order & classically-reduced explicate order** are also discussed, as well as the **model of perceptually/rationally induced intentional classical nervous / quantum acupuncture / classical nervous hierarchical interactions** - i.e. **model of free will**.

Implications for **local & global psychosomatics** are considered too, implying that **whole psychosomatics is quantum hologram**, both on the level of individual & collective consciousness, which resembles on Hinduistic relationship Brahman/Atman (**‘Atman is Brahman’**) and implies that quantum-holographic hierarchical parts carry information on wholeness, enabling subtle **fractal hierarchical biological & non-biological coupling**: (i) acupuncture/consciousness-based quantum-holographic control of morphogenesis (via acupuncture & meridian therapies), (ii) quantum-holographic coupling of hierarchical levels in Nature (revealing the origins of **miraculous deep creativities & determinism of History** via coupling to existing evolving state of collective consciousness – whose memory attractors could be **reprogrammed by hesychastic prayer** thus removing interpersonal loads of quantum-holographic Hopfield-like neural network of collective consciousness – **leaving room for free will & influence on future preferences**, via fundamental personal care for collective mental environment!
APPENDIX

QUANTUM DECOHERENCE & QUANTUM NEURAL HOLOGRAPHY AS INFORMATION BASIS OF QUANTUM MEDICINE & INFORMATICS
Two unresolved issues of the (semi)classically addressed problems in molecular biophysics are unreasonably long time necessary for change of biopolymer conformations and long-range directivness of selective biomolecular recognition processes - implying their essential quantum nature.

The quantum biomolecular conformational transitions can be supported by experimentally observed poorly dimensionally-sensitive dispersion laws (which is generally the case of any internal more or less delocalized quasiparticle excitations in any condensed-state quantum system: electrons, optical phonons, conformones etc.). On the contrary, (semi)classical kinetic (nonstationary) predictions imply the continuous map/conformation change ($k_i \rightarrow k_f$) which requires a sequence of $n$ local non-commuting successive elementary transformations (local rotations of characteristic time $\tau_o$), with the time necessary for the net transformation much longer than characteristic time necessary for a local rotation ($\tau_n \sim n\tau_o >> \tau_o$) and the frequency of corresponding global transition much lower than the frequency of a local rotation ($f_n \sim 1/n\tau_o \sim f_o/n << f_o$) - strongly dependent on a degree of polymerization $n$ (in contradistinction with experiments).
The **quantum biomolecular recognition** can be supported by high efficacy of the **Resonant Recognition Model (RRM)** confirmed on more than 1000 proteins from more than 30 functional groups (with numerous potential practical advantages in the fields of molecular biology, biotechnology, medicine, agriculture and nanotechnology) - based on findings that there is **significant correlation** between **spectra of the numerical presentation** of constitutive elements of **primary sequences** (amino acids, nucleotides) and their biological activity or interaction in corresponding biomolecules (proteins, DNAs). The RRM model interprets this linear information by assigning the electron-ion interaction potential (EIIP) value to each constitutive element of primary sequence thus describing their average energy states of valence electrons, with subsequent using signal analysis methods in FFT transforming this numerical series into single-electron wavenumber/RRM frequency domain and determining the common frequency components as **peak frequencies** in the multiple cross-spectral function for a group of primary sequences.

The presence of peak with significant signal-to-noise ratio in a multiple cross-spectral function of a **group of sequences with the same biological function** means that all of the analysed sequences within the group have this **single-electron RRM frequency component in common**, with the following general conclusions: (i) such a peak exists only for the group of biomolecules with the same function; (ii) no significant peak exists for biologically unrelated biomolecules; (iii) peak frequencies are different for different biological function; (iv) ligand-proteins and their biomolecular target-receptors have the same characteristic frequency in common but almost opposite phase - providing also novel theoretical possibilities for **protein de novo design** with desired functions.
The quantum nature of biomolecular transitional processes can be also supported by the Theory of Non-radiative Resonant Transitions in mono-molecular and bi-molecular reactions, realized through intermediate quantum-coherent superpositions of the externally activated electronic-vibrational states of the participating biomolecules. Within the framework of general quantum-chemical Hamiltonian (including kinetic energies and Coulomb interactions of all biomolecular electrons and nuclei) and Born-Openheimer adiabatic approximation (of separated biomolecular electronic and vibrational degrees of freedom), the (quasi)classical problem of many-electron hypersurface \( E_e(\phi_e^{(k)}) \), not adiabatically well-defined when traversing between two adjacent local minima, is replaced by better defined problem of two (virtually intersecting) isomeric many-electron hypersurfaces (hyperparaboloids) serving as potential hypersurfaces for two vibrational (isomeric) problems (cf. Fig. 2).

In this approach, by external perturbation of the isomers, at this very intersection the conditions for electronic-vibrational non-radiative resonant transitions between isomers \((i, f)\) are achieved: these resonance electronic-vibrational states of two isomers are transformed from the corresponding (nonperturbed) products of electronic and vibrational wavefunctions \((\phi_e^{(i)}, \phi_v^{(i)}; \phi_e^{(f)}, \phi_v^{(f)})\) into (perturbed) symmetrized superpositions \((\phi_e^{(i)} \phi_v^{(i)} \pm \phi_e^{(f)} \phi_v^{(f)})/\sqrt{2}\), and their (nonperturbed) energies from resonating (equal) superpositions of the ground electronic energies of corresponding minima of many-electron hypersurface and vibrational energies of higher excited states \((E_e^{(i)} + E_v^{(i)}) = (E_e^{(f)} + E_v^{(f)})\) into (perturbed) split energy doublet \((E_e^{(i)} + E_v^{(i)} \pm 1/2\Delta E)\), with \(\Delta E = (E_e^{(i)} + E_v^{(i)}) S_{ev}^{(i,f)}\) (where electronic-vibrational overlap integral between the two resonating isomeric states \((i, f)\) is \(S_{ev}^{(i,f)} = \int \int \phi_e^{(f)} \phi_v^{(f)} \phi_e^{(i)} \phi_v^{(i)} * * dV_e dV_v \approx S_v^{(i,f)} S_{e}^{(i,f)}\), while \(S_{e}^{(i,f)}\) and \(S_{v}^{(i,f)}\) are corresponding overlap integrals of vibrational and electronic components).
Figure 2. The (quasi)classical problem of many-electron hypersurface $E_e(\phi_e^{(k)})$, as a potential energy for adiabatically decoupled Q1D vibrational and conformational system (with local minima as semi-classical ‘positions’, i.e. many-atomic isomer configurations on many-electron hypersurface (broken line in the figure)) - not adiabatically well-defined when traversing between two adjacent local minima - is replaced in the Theory of Non-radiative Resonant Transitions by better defined problem of two (virtually intersecting) isomeric many-electron hypersurfaces (hyperparaboloids) serving as potential hypersurfaces for two vibrational (isomeric) problems (full line in the figure). In this approach, by external perturbation of the isomers, at this very intersection the conditions for electronic-vibrational non-radiative resonant transitions between the two isomers ($i$, $f$) are achieved: in the first approximation, the matrix element of dipole transition from $i$-th to $f$-th isomer is given by $\mu^{(i,f)} = \mu_e^{(i,f)} S_v^{(i,f)} + \mu_v^{(i,f)} S_e^{(i,f)}$, so that allowed transitions between isomeric states ($i$, $f$) are possible only for close states with nonvanishing electronic and vibrational dipole moments, $\mu_e^{(i,f)}$ and $\mu_v^{(i,f)}$, and electronic and vibrational overlap integrals, $S_v^{(i,f)}$ i $S_e^{(i,f)}$, or in cascade resonant soliton-like transitions (cf. Fig.2) between close intermediate participating isomeric states! Also, during these resonant transitions the perturbed biomolecular system is shortly described by quantum-coherent superposition $(\phi_e^{(i)} \phi_v^{(i)} \pm \phi_e^{(f)} \phi_v^{(f)})/\sqrt{2}$, before its quantum decoherence into final electronic state $\phi_e^{(f)}$ or into initial electronic state $\phi_e^{(i)}$ (with subsequent deexcitations into lower vibrational states).
Figure 3. The phase diagrams of coupling constant \( S \sim E_B / \hbar \omega_B \) vs. adiabaticity parameter \( B \sim E_{ex} / \hbar \omega_B \) in Q1D exciton-phonon system, for exciton coupling with: (a) longitudinal acoustic phonons (ADP-model), and (b) optical phonons (MCM-model).
Various structural transformations of Q1D-molecular chains are characterized by local rearrangements of atoms between neighbor unit cells, with supposed significant role of low-frequency skeletal vibrations and their higher overtones. Namely, neighbor atoms are approaching each other thus increasing probability for finding charged particles within chemical bonds, which might result in migrations of conjugated chemical bonds along Q1D-molecular chain as well as proton transfer from a carbon atom to its second neighbor, as it is the case for linear conjugated hydrocarbons. However, a mechanism of directive transport of charged particles (electrons and protons) is sought for, as excited double CC bond migrates gradually along conjugated chain, which passes through corresponding isomeric forms. The mentioned explanation on atomic interactions via low-frequency skeletal vibrations seems to be incomplete, suggesting that the chain is deformed in the presence of local excitation during its transport through conjugated chain, and this very self-trapped autolocalized excitation (polaron/soliton) might be the sought mechanism for directive energy and charge transport along Q1D-(bio)molecular chains.

Theoretical basis for energy and charge transport phenomena in Q1D-molecular chains is the Frohlich Hamiltonian, most frequently presented in the form:

\[
H = \Delta \sum_n \hat{a}_n^+ \hat{a}_n - J \sum_n \hat{a}_n^+ (\hat{a}_{n+1} + \hat{a}_{n-1}) + \frac{1}{\sqrt{N}} \sum_{n,q} F_q e^{i\kappa n R_0} \hat{a}_n^+ \hat{a}_n (\hat{b}_q + \hat{b}_q^+) + \sum_q \hbar \omega_q \hat{b}_q^+ \hat{b}_q ,
\]

where \( \Delta \) is the molecular energy of exciton (in general electron, vibron, hole, ...), \( \hat{a}_n^+ \) and \( \hat{a}_n \) are creation and anihilation exciton operators on the \( n \)-th molecular lattice site respectively, \( J \) is the energy of dipole-dipole coupling of neighbor dipoles, \( \hat{b}_q^+ \) and \( \hat{b}_q \) are creation and anihilation phonon operators of frequency \( \omega_q \) respectively, \( F_q = 2i\chi(\hbar/2M\omega_q)^{1/2} qR_0 \) are exciton-phonon coupling parameters, while \( R_0 \) is lattice constant.
The above Hamiltonian in the adiabatic region leads to the wave function of the exciton subsystem: 

$$\phi(x, t) = \sqrt{\mu/2} \exp[i(k_s(x-x_0)-\omega_st)]/\cosh[\mu(x-x_0-\nu t)/R_0]$$

where $\mu$ represents inverse width of the soliton, $k_s = \hbar \nu / 2JR_0^2$ is the soliton quasi-momentum, while $\omega_s$ is a phase factor. **Soliton**, as non-linear excitation propagates through the polymer chain in the form of an entity created by autolocalized exciton and lattice deformation: 

$$u(x, t) = u_0 \tanh[\mu(x-x_0-\nu t)/R_0]$$

where $u_0$ represents the soliton amplitude (width), which depends on the exciton-phonon coupling strength $\chi$, the chain elasticity constant $k$, and the soliton velocity $\nu$. The autolocalized exciton is ‘dragging’ the chain deformation, with enlarged effective mass of soliton: $m_s^* = m_{ex}^*(1 + 3\pi^2S^2/2)$ (holding true for exciton coupling with longitudinal acoustic phonons). The conditions for creation of soliton are fulfilled when its energy state is lower than energy of the free exciton ($\Delta$): 

$$E_s = \Delta - E_B^2/3J + m_s^*\nu^2/2$$

The positive coupling constant $S \sim E_B/\hbar \omega_B$ (being $S \gg 1$ for adiabatic small polaron concentrated on one site only, or $S \ll 1$ for adiabatic large polaron – soliton spread over the large number of lattice sites; where $E_B = \sum_q |F_q|^2/N\hbar \omega_q$ is the binding energy of small polaron) and adiabaticity parameter $B \sim E_{ex}/\hbar \omega_B$ (being $B \gg 1$ in the adiabatic limit, when exciton energy $E_{ex} \sim 2J$ largely exceeds maximal phonon energy $\hbar \omega_B$, or covering other values in nonadiabatic regime) define the parametric space of autolocalized states which may lead, but not in all cases, to creation of solitons. The satisfactory description of classification and existence of autolocalized states in the parametric space of Q1D-molecular chains was solved by Ivić et al, and presented in phase diagrams of Fig. 3. So, it is possible to explore the relevance of the polaron/soliton mechanisms in energy and charge transport phenomena within various Q1D-materials, by calculating corresponding $S$ and $B$ parameters and finding their points in phase diagram of Fig. 3.
This picture fully approves our previous approach, of employing the fundamentals of the **quantum decoherence theory**, to reproduce both, **existence and stability** of (stationary) key/lock nonmatching and matching **conformations**, and the short time scales for quantum-mechanical (nonstationary) nonmatching-to-matching **conformational transitions** in selective key/lock cellular biomolecular recognition processes.

In the context of **Resonant Recognition Model**, the same characteristic single-electron RRM frequency, and almost opposite phase, presumably characterises not only biomolecular protein and target general function, but also their **macroscopic quantum biomolecular recognition/ interaction** on the level of biological cell - possibly by **externally activated** [compositionally/chemically, through avaraged closing of protein and target biomolecules necessary for non-vanishing overlap integrals of corresponding electronic and vibrational wave functions, or thermally/optically, through providing vibrational/optical energy necessary for electronic-vibrational non-radiative resonant transitions between two isomers (i, f) in ground electronic states, Fig. 2, or in excited electronic states, not presented in Fig. 2] ligand-proteins/target-receptors (high-energy) RRM quantum-resonant electron-electron coupling **accompanied** by $\phi_e^{(i)}$-annihilation and $\phi_e^{(f)}$-creation conformones' quanta in two-conformational transitions $\phi_e^{(i)} \rightarrow \phi_e^{(f)}$ (giving rise to (energy-favourable) protein/target many-electron energy-deepening of the final state $\phi_e^{(f)}$ and ligand-proteins/target-receptors many-electron energy-shallowing of the initial state $\phi_e^{(i)}$ on the macroscopic quantum level of cell. As these electron-conformational coupling processes in **second quantization occupational basis** give rise to **dynamic modification** of energy-state hypersurface $E_e(\phi_e^{(k)})$ of the cellular quantum-ensemble ligand-proteins/target-receptors biomolecular macroscopic open quantum system, this reveals possibility to consider cellular biomolecular recognition as **Hopfield-like quantum-holographic associative neural network** (cf. Fig. 1).
Figure 1. Schematic presentation of memory attractors in energy-state hypersurface \( (E_{Sk}(\phi^k)) \) of quantum-holographic memory/propagator cellular quantum-ensemble ligand-proteins/target-receptors biomolecular macroscopic open quantum system: \( G^{(k)}(r_2,t_2,r_1,t_1) = \sum_{i=0}^{P_i-1} \phi^{(k_i)}(r_2,t_2) \phi^{(k_i)}(r_1,t_1)^* = \sum_{i=0}^{P_i-1} A_{k_i}(r_2,t_2) A_{k_i}(r_1,t_1) e^{i(\alpha_{k_i}(r_2,t_2) - \alpha_{k_i}(r_1,t_1))} \) – and the same holds true for higher quantum-holographic hierarchical level of acupuncture system/consciousness! It should be pointed out that quantum decoherence evidently plays fundamental role in biological quantum-holographic neural networks, through presented shape adaptation of energy-state hypersurface (in contrast to artificial qubit quantum computers where quantum decoherence must be avoided until the final read-out act of quantum computation) – which implies that Nature has chosen elegant room-temperature solution for biological quantum-holographic information processing, continuously fluctuating between quantum-coherent state \( \left| \phi^k(t) \right\rangle_{Sk} = \sum_i c_{k_i}(t) \left| \phi^{k_i} \right\rangle_{Sk} \) and classically reduced state \( \tilde{\rho}^k_{Sk}(t) = \sum_i \left| c_{k_i}(t) \right|^2 \left| \phi^{k_i} \right\rangle_{Sk} \left\langle \phi^{k_i} \right| \) of acupuncture system/ consciousness, through nonstationary interactions with out-of-body far-environment and through decoherence by body near-environment. Hence, quantum neural holography combined with quantum decoherence might be very significant element of feedback bioinformatics, from the level of cell to the level of organism!
More concretely, in occupational basis of second quantization the time evolution of the quantum-coherent state $|\phi^{(k)}(t)\rangle_K$ of the all cellular ligand-proteins/target-receptors key/lock nonmatching and matching conformations ($\phi^{(k)}$) might be described in Feynman's representation by quantum-holographic Hopfield-like neural network, while the time evolution of the classically-reduced stochastic state $\hat{\rho}_K(t)$ of the all cellular ligand-proteins/target-receptors key/lock nonmatching and matching conformations might be described by classical Hopfield-like neural network, represented by the shape changes of cellular many-electron hypersurface $E_e(\phi^{(k)})$ of ligand-proteins/target-receptors biomolecular macroscopic quantum system - achieved by exciting cell's ligand-proteins/target-receptors biomolecular macroscopic quantum system from initial stationary classically-reduced state

$$ \hat{\rho}_K = \sum |C_k|^2 |\phi^{(k)}\rangle_K \langle \phi^{(k)}| $$

via intermediate nonstationary excitation (during $T_{ext}$) quantum-coherent superposition

$$ |\phi^{(k)}'(t)\rangle_K = \sum C_k'(t) |\phi^{(k)}\rangle_K $$

and nonstationary relaxation (during $T_{rel}$) quantum-coherent superposition

$$ |\phi^{(k)}''(t)\rangle_K = \sum C_k''(t) |\phi^{(k)}\rangle_K $$

into subsequent (during nonstationary decoherence transition $\tau_D$) final stationary classically-reduced state

$$ \hat{\rho}_K'''' = \sum |C_k'''|^2 |\phi^{(k)}\rangle_K \langle \phi^{(k)}| $$

with the relative number (concentration) of conformations likely to be different, $|C_k'''|^2 \neq |C_k|^2$.

In effect, during the time $T \approx T_{ext} + T_{rel} >> \tau_D$ there has occurred a nonmatching-to-matching conformation change - which is exactly the effect we search for!
The underlying quantum coherent nonlocality mentioned above seems to be even extended on the macroscopic quantum level of biological organism, as supported by macroscopic quantum-like microwave resonance therapy (MRT) of the acupuncture system. In the context of the general quantum-chemical considerations applied above on the level of biomolecular transitions, when extending many-electron system from the level of cell to the level of acupuncture system - it can be concluded that allowed transitions between many-electron acupuncture states \((i, f)\) are also possible only for close states with nonvanishing overlap integrals \(S_v^{(i,f)}\) and \(S_e^{(i,f)}\), or in a cascade resonant transitions between close intermediate acupuncture states - based on long-range coherent microwave Frohlich excitations of strongly polarized molecular subunits in cell membranes and cytoskeleton proteins.

Also, during these resonant transitions the perturbed acupuncture system is shortly described by quantum-coherent superposition, before its quantum decoherence into final electronic state \(\phi_e^{(f)}\) or into initial electronic state \(\phi_e^{(i)}\) (with subsequent deexcitation into lower microwave energies). As these electron-microwave coupling processes give rise to dynamic modification of the many-electron energy-state hypersurface of the acupuncture macroscopic quantum system, this also reveals possibility to consider acupuncture system as a macroscopic Hopfield-like quantum-holographic associative neural network. This is also supported by necessary conditions for decoherence process, which point out that defining of open quantum system and its (complementary) environment is a simultaneous process - providing also conditions for decoherence process in the context of relative borderline: \(|\text{open quantum system}\rangle_S \langle|\text{(complementary) environment}\rangle_E|\).
So, we can re-define **open quantum system** $S$ (to include **acupuncture system**) and its (complementary) **environment** $E$. Therefore, by applying **quantum decoherence theory**, the **quantum-coherent state of the acupuncture system** $S_k$, 

$$|\phi^k\rangle_{S_k} = \sum_i c_{ki}(t) |\phi^{ki}\rangle_{S_k}$$

might be described by **superposition** of its all possible states ($\phi^{ki}$), which **after quantum collapsing into classically-reduced state** gives rise to stochastic state described by **density matrix**

$$\tilde{\rho}^k_{S_k} = \sum_i |c_{ki}|^2 |\phi^{ki}\rangle_{S_k}\langle\phi^{ki}|$$

with probabilities $|c_{ki}|^2$ of the realization of one of the classically decoherent states $|\phi^{ki}\rangle_{S_k}$ - in quantum measurement-like process upon the initial quantum-coherent state $|\phi^k\rangle_{S_k}$.

The **time evolution** $|\phi^k(t)\rangle_{S_k}$ (nonperturbed by the environment) of the **quantum-coherent state of the acupuncture system** might be described in Feynman's representation by quantum-holographic Hopfield-like neural network via **dynamic equation for quantum-holographic memory/propagator**, while the **time evolution** $\tilde{\rho}^k_{S_k}(t)$ of the **classically-reduced stochastic state of the acupuncture system** might be described by classical Hopfield-like neural network, represented by **shape changes of acupuncture many-electron hypersurface** $E_{S_k}(\phi^{ki})$ - under external stimuli (cf. Fig. 1).
It should be noted that on both cellular and acupuncture levels, there exist two (interacting) macroscopic quantum systems – one with modified many-electron hypersurface $E_e(\phi_e^{(k)})$ and other with modified EM multi-phonon hypersurface $E_y(\phi_y^{(k)})$, the second one including also low-energy long-range coherent microwave Frohlich excitations (created as a result of interaction of electronic and phonon subsystems, of particular significance in microwave resonance therapy (MRT) of dynamic modification of the EM multi-phonon (and related many-electron) acupuncture macroscopic quantum system).

The mentioned quantum-holographic picture of cellular biomolecular recognition processes and acupuncture system, implies that quantum-holographic hierarchical parts carry information on wholeness, enabling subtle quantum-holographic fractal coupling between different hierarchical biophysical levels - including various acupuncture projection zones and corresponding organs and cells, with underlying macroscopic quantum-informational control mechanisms of embryogenesis/ontogenesis and morphogenesis and their backward influence on the expression of genes, starting from the first fertilized cell division which initializes differentiation of the acupuncture system of (electrical synaptic) "gap-junctions". This underlying quantum-coherent nonlocality might be of fundamental importance in understanding macroscopic (quantum)holistic very nature of psychosomatic health and diseases as well - implying a fuzzy borderline between quantum coherent (nonstationary) and semi-classical decoherent (stationary) manifestations of acupuncture (as well as any other) macroscopic quantum condensed-state system.

On the same line, in the framework of two cognitive modes of consciousness (Hopfield-like quantum-holographic quantum-coherent direct unconscious and classically-reduced indirect conscious ones), conditions of transformations of one mode into another can be considered, with significant epistemologic and religious implications.
It should be noted that using relation for density matrix of acupuncture system/consciousness

\[ \hat{\rho}^{(k)}_{S_{kv}} = \sum_i |c_i|^2 |\phi_v^{(k_i)}\rangle_{S_{kv}} \langle \phi_v^{(k_i)}| \equiv \sum_i p_{k_i} |\phi_v^{(k_i)}\rangle_{S_{kv}} \langle \phi_v^{(k_i)}|, \]

the von Neumann quantum mechanical entropy can be expressed in the form

\[ S = -k Tr(\hat{\rho}^{(k)}_{S_{kv}} \ln \hat{\rho}^{(k)}_{S_{kv}}), \]

reduced after tracing out to Shannon entropy

\[ S = -k \sum_i p_{k_i} \ln p_{k_i} \]

(where \( p_{k_i} \) are probabilities of realization of \( k_i \)-th state). So, **entropy of pure-healthy state** of the acupuncture system/consciousness (described by single term in the sum: \( \hat{\rho}^{(k_0)}_{S_{kv}} = |\phi_v^{(k_0)}\rangle_{S_{kv}} \langle \phi_v^{(k_0)}| \), of probability \( p_{k_0} = 1 \), equals \( S_{k_0} = 0 \) (as a consequence that pure quantum state \( \hat{\rho}^{(k_0)}_{S_{kv}} \) provides maximal possible information about quantum acupuncture system/consciousness), while **entropy of mixed-disordered state** of the acupuncture system/consciousness (described by the sum: \( \hat{\rho}^{(k)}_{S_{kv}} = \sum_i p_{k_i} |\phi_v^{(k_i)}\rangle_{S_{kv}} \langle \phi_v^{(k_i)}| \), with sum of probabilities \( \sum_i p_{k_i} = 1 \), equals \( S_{\hat{\rho}} > 0 \) (as a consequence that mixed stochastic state \( \hat{\rho}^{(k)}_{S_{kv}} \) gives non-complete information about quantum acupuncture system/consciousness).

Hence, **psychosomatic health** is the state of minimal entropy \( (S_{k_0} = 0) \), while **psychosomatic disease** is the state of increased entropy \( (S_{\hat{\rho}} > 0) \) of the acupuncture system/consciousness: In this contest, the psychosomatic therapy gives rise to decrease of entropy (degradation) i.e. to increase of information (organization) of the acupuncture system/consciousness. The similar information-parallel can be drawn between the quantum-coherent altered/transitional states \( (S_{\psi} = 0) \) and quantum-decoherent normal states \( (S_{\hat{\rho}} > 0) \) of consciousness.
The above dynamical change of multi-phonon hypersurface of the acupuncture system/consciousness can be also generalized to EM quantum-holographic collective consciousness, with religious/social implications on necessity of transpersonal spiritual quantum-holographic cleansing of all non-desired side-memory attractors (which non-reprogramed by prayer would otherwise give rise to development of psychosomatic diseases or inter-personal conflicts in this and/or further generations, to which they are transpersonally unconsciously transfered on the level of collective consciousness). Namely, in approximation of nearly non-interacting individual consciousnesses, the state of collective consciousness is \( |\Phi(t)\rangle_S \sim \prod_k |\phi^k(t)\rangle_{S_k} \), where quantum-coherent state of k-th individual consciousness is described by superposition \( |\phi^k(t)\rangle_{S_k} = \sum_i c_{ki}(t) |\phi^{ki}\rangle_{S_k} \) of all its possible states \( |\phi^{ki}\rangle_{S_k} \), which afterwards collapses under the influence of closer/farther environment into classically-reduced stochastic state of k-th individual consciousness described by density matrix \( \hat{\rho}^k_{S_k}(t) = \sum_i |c_{ki}(t)|^2 |\phi^{ki}\rangle_{S_k} \langle \phi^{ki}| \).

It should be pointed out that due to continuously present interaction of electronic and phonon subsystems – the mentioned dynamic modifications of EM multi-phonon hypersurface is backward reflected to dynamical modification of many-electron hypersurface – from acupuncture down to cellular level!