The Integrative Quantum-Neuroholographic Field Model of the Consciousness System

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Abstract

Here we propose the Integrative Quantum-Holographic Field Level of Consciousness as a Multilevel System organized in a Unified Way. It is comprised of the Classical Neural Level which consists primarily of System Neocortical Neural Networks of the Brain. Electromagnetic Brain Field and Brain Waves are also included in this level of organization of Consciousness. Then we have Microtubular Quantum Level which consists of Cytoskeleton of neurons organized as a Sub-Neural Network of the brain. Quantum States of Tubulins generate and reshape Classical Consciousness generated at the Neural Level. This level gives the primordium of Consciousness Representations. Information is further carried over to the QFT Level of Consciousness, we call Consciousness Field Medium. This level is generated by the processes of Spontaneous Symmetry Breaking of the Brain Quantum Fields generated by dipole molecules as well as the Quantum Field of the Electromagnetic Brain Field. This process generates Nambu-Goldstone Bosons which after Einstein-Bose Condensation create Macroscopic Collective Modes of Consciousness. At this level of Consciousness Organization, we have Autoreflection occurring as a result of complex Equations of Motion we model using Schwinger-Dyson Equations. This brings us to the Level of the Mind itself where the true power of this organization is shown. This is a Level of the Complete Quantum Brain. Only what remains now is to integrate it with the body (Mind-Body Problem) using Quantum Hierarchical Body Networks/Acupuncture System. This level operates on the scale of Quantum Gravity and generates the Qualia that empirically shapes our everyday life as we know it.

Key words: Brain EM Field, Neuronal Microtubules, Brain Spontaneous Quantum Symmetry Breaking, Autoreflection, Acupuncture System

Introduction

Despite the efforts, decoding and understanding consciousness remains one of the greatest scientific challenges to nowadays. The study of its bare nature has long stood at the frontier of interdisciplinary, integrative science, merging insights from neuroscience, quantum physics, psychology, and computational (neuro)modeling. Despite significant theoretical efforts and advances in neuroscience, a unified, integrative physical model of consciousness that encapsulates both the classical and quantum dimensions of conscious phenomena and explains subjective experience has remained elusive. Quantum theories of consciousness attempt to fill this gap. In this work, we propose a path-integral-based framework that combines elements of quantum field theory, stochastic dynamics, and gravitational models to describe the emergence of conscious experience. In this context, the present work introduces a novel framework, namely, the Integrative Quantum-Neuroholographic Field Model of the Consciousness System (*IQNHFC*), which proposes that consciousness arises from the multi-level synergy of neural and quantum processes, embedded in a hierarchically organized (neuro)biological system. Grounded in the works of Raković (1-5) and expanded upon with original theoretical contributions, the *IQNHFC* Model views consciousness as a holistic, macroscopically organized neurobioquantum phenomenon. Although many questions still yet had to be addressed by other studies, it is hypothesized that consciousness is generated and maintained through Hopfield's quantum-holographic neural networks spanning the organism's hierarchical structure, including classical, molecular, cellular, systemic, and transpersonal levels of organization (1-8). At its core, the *IQNHFC* Model aims to propose the solution to the binding problem and explain qualia generation by positing a transhierarchical coupling mechanism, thus linking classical neural encoding with quantum-coherent integration facilitated by the body's acupuncture system (1-5). This article presents the rationale, architecture, and theoretical foundations of the

IQNHFC Model. It outlines how the model leverages neurocomputational, quantum-holographic, and field-theoretic principles to create a multilayered, dynamic, and autoreflexive substrate for conscious awareness. The model's key premise is that consciousness emerges from the systemic interaction of neural hierarchies through quantum coherence, decoherence, and field-level integration within a bidirectional communicative framework between the brain and body systems (1-5). Consciousness remains one of the most profound and enigmatic phenomena in (neuro)science in general, resisting comprehensive explanation through purely classical or reductionist frameworks. In recent decades, researchers have increasingly explored how quantum processes within the brain may contribute to conscious experience. A prominent theory in this domain, the Hameroff-Penrose's orchestrated objective reduction (*Orch-OR*), posits that quantum coherence and collapse events within neuronal microtubules underlie the emergence of conscious moments (9, 10). Subsequent research has investigated the feasibility of such coherent quantum states in neuronal cytoskeletal structures and their potential connection to neural activity (9-11). Parallel lines of inquiry emphasize quantum-holographic and field-theoretic models, which propose that the body's acupuncture and meridian systems serve as large-scale, integrative quantum-coherent networks, potentially mediating coherence, information binding, and psychosomatic processes (1-5). These approaches apply holographic principles and Hopfield-like associative neural models to conceptualize how quantum information may be stored and retrieved across hierarchical (neuro)biological structures. More recent work from the framework of quantum information neuroscience examines multiple layers for quantum-level processing, ranging from electron

delocalization in microtubules to electromagnetic fields around neural networks and entangled nuclear spins (12). The convergence of these strands suggests that multi-level, quantum-informed models of consciousness, integrating classical neural dynamics with quantum coherence and field-like integration, may offer novel insights into binding, qualia, and self-awareness. Thus, here we propose a novel model of consciousness based on path integral formulations from quantum field theory, applied within the context of the human brain and mind. Building on Hameroff-Penrose *Orch-OR*, stochastic quantization, and emergent gravity paradigms, we suggest that consciousness corresponds to a dominant configuration arising from a superposition of possible quantum paths within the brain's quantum state.

Theoretical Computational Methods of the *IQNHFC* Consciousness Modeling

Path Integral Framework in Brain-Mind Dynamics

Feynman's path integral formulation of quantum mechanics allows us to describe the evolution of a quantum system as a sum over all possible trajectories, each weighted by a contributive phase factor $\exp(iS/\hbar)$, where S is the action. In our model, each possible brain state trajectory contributes to a total mental amplitude. The conscious state corresponds to the dominant trajectory, or a group of trajectories, selected through a form of gravitationally influenced collapse (13, 14).

Stochastic Quantization and Conscious Collapse

Following Parisi–Wu stochastic quantization, we introduce a fictitious time dimension along which the quantum fields evolve via stochastic dynamics. This fictitious evolution guides the brain's quantum state toward a steady-state configuration that collapses to a single experiential reality. The collapse is mediated by a gravitational threshold, as in Penrose's objective reduction (14, 15).

Gravitational and Holographic Considerations

We explore the possibility that consciousness arises at the intersection of quantum field fluctuations and gravitational self-energy. Furthermore, inspired by holographic principles, we consider whether the content of conscious experience is encoded on a lower-dimensional boundary of neural space, giving rise to emergent mental phenomena from bulk quantum dynamics (1-5, 16).

The *IQNHFC* Model of the Consciousness System

Here we propose and postulate the so-called *IQNHFC* model of consciousness viewed as a multi-level system as an attempt to integrate contemporary understandings of the mechanisms of generation and functioning of consciousness in a (trans)hierarchically organized manner. We believe that these levels of consciousness organization are mutually conditioned and highly correlated. This model represents the author's view of the problem of consciousness and is primarily based on Raković's Model of Consciousness. First of all, we believe that consciousness is a holistic macroscopic (bio)quantum phenomenon that is generated, functions and is maintained at the level of the so-called Hopfield quantum-holographic body hierarchical neural networks of the entire organism, which are characterized by the systemic quantum-holographic memory of the organism. These networks are created by hierarchical organization and macroscopization of the quantum properties of the organism as a whole, i.e. in a quantum-holographic synergistic manner, where mechanisms of the quantum, molecular, cellular and subcellular as well as organic and systemic scales are integrated, transhierarchically and organizationally acquired. The main physical substrate of such systemic, transhierarchical coupling is played by connexons and intercellular connexon connections, and the main network of this type is the acupuncture system. It is most likely that the generation of qualia takes place at this Level,

and that its neurodynamics represents the solution to the binding problem. However, in order for this supersystemic level to generate qualia, it is necessary, first of all, for the *CNS* to process the perceived data in an organized manner and, as a subsystem of this higher hierarchical level, to transmit the necessary information to it in transhierarchical communication as prerequisites for the generation of a conscious experience. According to our model, this information preprocessing takes place in several hierarchical neural levels which compose, structure and define the so-called consciousness system.

Classical Neural Level. This level constitutes the central neuroparenchyma of the *C NS*, i.e. its systemic and subsystemic neural networks organized as classical-holographic Hopfield neural networks. The differentiation between them is sensorial and neuromodular and for it we apply the Bars-Franklin's global workspace neuromodular model (17). According to our *IQNHFC* model of consciousness, this level is also the only classical organizational level of consciousness. The subsequent levels of the consciousness system represent quantum-holographic associative Hopfield neural networks of different complexity and implemented on different quantum mediums/environments/systems characteristic of certain organizational levels of the system. Therefore, according to our model, holography spans all organizational levels of consciousness and is a fundamental property of conscious systems. This is because information obtained by different sensory modalities, processed as so-called representations on different levels of the consciousness system, actually represent neuroholograms of a certain level of organization, with different degrees of self-perception, abstraction and degrees of (self)awareness about themselves. These classical neural networks perform information encoding, the most important of which is Fourier frequency and wavelet encoding of perceived auditory and visual neurosignals, respectively, as neuroholographic interference patterns. In this way, the perceived data is stored which will later be used for the reconstruction of the classic neuroholographic representation from the interference patterns of different spatially distributed networks on the classical neural level, which represents the classical basis of conscious perception, as well as for the subsequent generation of the perceived representation at higher hierarchical levels. For this level of neural organization of the consciousness system, we first of all use Bohm-Pribram's holonomic theory of the brain, where the perceived representation represents a brain's neurohologram non-locally stored and distributed. This level of the organization of consciousness takes into account both the neuronal triggering electrical activity itself and the brain waves as the combined mechanisms of realization of this level as the Bohm-Pribram's neuroholographic brain. For this electromagnetic aspect of the classical neural level of consciousness organization we use McFadden's consciousness electromagnetic information theory of consciousness (17). If we were to combine our and his vision of the phenomenon itself, then the brain electromagnetic field would represent an integrator of systemic neural network dynamics of this level, which can be described by Maxwell's field equations (18) as a function of the electric and magnetic field components as

$$\nabla \times \boldsymbol{B} = \mu_0 \varepsilon_0 \frac{\partial \boldsymbol{E}}{\partial t} + \mu_0 \boldsymbol{J},$$

where $\boldsymbol{B}$ as a magnetic field and $\boldsymbol{E}$ as an electric brain field, together build the electromagnetic brain field, $\boldsymbol{J}$ is the current density, μ_0 is the permeability, and ε_0 is the permittivity of the vacuum. Also, at this classical neural level, supramodal and multimodal neurosignal integration into a completely encoded and integrated representation is carried out by the just mentioned mechanisms of holographic representational reconstruction from stored interference patterns distributed in different sensory mapped neural networks of different cortical areas/Bars-Franklin modules into a unique supra-/multimodal neural configuration from which multimodal qualia will later arise at

higher organizational levels of consciousness. However, for these more complex, integrative processes, certainly neuroholographically based on the fundamental level, we must go beyond the holonomic theory. We therefore model these processes by stochastic quantization of synaptic neuroplasticity at the systemic level in the classical limit, by introducing the internal learning time parameter τ, as the so-called extradimension in this process, which represents a virtual time axis in the primordial neural psychodomain in the function of which we observe the stochastic evolution of the mind as a quantum system in the classical limit. If we methodologically approach this problem in a retrograde manner and from a panpsychic point of view we first start from the quantum level of the physical medium of the consciousness field, then by applying Parisi-Wu stochastic quantization to the quantum field of consciousness ϕ we have the Langevin formalis of the quantum consciousness as

$$\frac{\partial\phi(\boldsymbol{r},t;\tau)}{\partial\tau}=\eta(\boldsymbol{r},t;\tau)-\frac{\delta I[\phi]}{\delta\phi},$$

where $\eta(\boldsymbol{r},t;\tau)$ represents Gaussian white noise of internal neurodynamic fluctuations of the field of consciousness,

$$\langle\eta(\boldsymbol{r},t;\tau)|\eta(\boldsymbol{r}',t';\tau')\rangle=2\delta(\boldsymbol{r}-\boldsymbol{r}')\delta(t-t')\delta(\tau-\tau'),$$

which models learning as a non-Schrödinger Langevin evolutionary factor of consciousness as an initially modeled closed (classical/quantum) system into an open one under the influence of external perturbations, while $I[\phi]$ is neurodynamical action of the quantum field of consciousness. Then, by inversely applying Peruš's classical neural network quantization approach (6-8),

$$\Psi(\boldsymbol{r},t)\Leftrightarrow\boldsymbol{q}(\boldsymbol{r},t),$$

which gives classical-neuroquantum neural network analogical-parallelistic relationships, to quantum neural network dynamics in the classical limit, by reducing it to the classical neurodynamic contribution of an individual, i-th neuron to the field of consciousness, we have $\lim_{\tau\to\infty}\phi\to\boldsymbol{q}$, where $\boldsymbol{q}(\boldsymbol{r},t;\tau)$ represents the obtained (meta)stable stationary state of the classical counterpart of consciousness. This is the classically generated, neuroemergent Bars-Franklin-McFadden's consciousness that in the classical domain has a bidirectional interaction with the brain neural network (McFaden's upload/download consciousness/brain). That is, we get a systemic neurodynamical organization of synchronized neurocoherence that fantastically uses the existing neural resources of the Bars-Franklin's neurocybernetic model of consciousness. By emergence, at higher organizational levels this neurodynamic construct becomes standard quantum consciousness. This stationary classical neurodynamic equilibrium is characterized by the probability distribution of neural network states,

$$P[q(\boldsymbol{r},t)]\propto exp[-S(q)],$$

where $S(q)$ represents the formal neurodynamic quantifier of the neural network action. This neurodynamical probabilistic distribution underlies the mental Fokker-Planck equation at the quantum-gravitational level of organization of the consciousness system,

$$\frac{\partial P[\phi;\tau]}{\partial\tau}=\int d^4x\frac{\delta}{\delta\phi(x)}\left(\frac{\delta S[\phi]}{\delta\phi(x)}P[\phi;\tau]+\frac{\delta P[\phi;\tau]}{\delta\phi(x)}\right),$$

as its stationary solution for

$$\left.\frac{\partial P[\phi;\tau]}{\partial \tau}\right|_{\lim_{\tau\to\infty}\phi\to \boldsymbol{q}} = 0.$$

Thus, the $P[q(\boldsymbol{r},t)]$ represents the stable neurodynamical attractor state of the classical neural equivalent of consciousness. The classical neural level operates according to the physical principles of content-addressable classical neuroholographic memory. Also, at this level, the perceived image is analyzed and various features of the image are extracted, which are individually encoded, so-called feature extraction. Multimodal and supramodal integration precisely reintegrates the partially/analytically presented representation in an encoded state into a unique representation. In other words, we can also model this level of consciousness system organization as a Kohonen's systemic self-organizing neural map (Kononen's SOM) with the same implications. Such a classical neural self-sustaining supersystem is capable to fully autoregulates its own neuroreverberation, memory neurodynamics, as well as supramodal and multimodal integration (classical-neural global workspace). The introduction of perturbative noise into the model represents the basis of creativity, spontaneity and self-insight. It is also at this level that the primordium of stochastic decision making emerges, which provides the classical basis of the quantum phenomenon of free will. From this level, the completely encoded representation is further sent to the microtubular, *MT*-quantum level.

***MT*-Neuroquantum Level.** This level, we can say, represents a *CNS* neurobiological quantum-qubit computer. We model it with the central neuromicrotubular Hameroff-Penrose's orchestrated objective wave packet reduction theory of consciousness (*Orch-OR*) (9, 10). According to the author's personal opinion, this level represents the brain's quantum-holographic Hopfield associative neural network of the lowest organizational level. We can say that this is the first organizational level of validity of quantum-neuroholography whose trend of validity continues at higher organizational levels of consciousness, adapted to the materialism of the medium characterizing these levels. The neuroquantum hardware that implements the medium and its neurodynamics at this level represent not only the *MT*, as the main representatives of this organizational level of the consciousness system, but also the dipoles of intratubular water molecules as well as the electromagnetic brain field itself. So, from a fundamental, phenomenological and mechanistic point of view, this neuroquantum processor makes an energy-tubulin, mass-differential-distribution triggered, timing-non-computable, quantum-gravitationally induced nonlinear wave function collapse of superposed microtubular quantum states, i.e.

$$\tau_C = \frac{\hbar}{E_G},$$

where E_G is given by

$$E_G = \int |\psi_{tub}(\boldsymbol{r}) - \psi'_{tub}(\boldsymbol{r})|^2 \rho(\boldsymbol{r}) d^3\boldsymbol{r},$$

and where E_G represents the quantum-gravitational differential self-energy of different tubulin mass distributions in the superposed *MT*-quantum states, $\psi_{tub}(\boldsymbol{r})$ and $\psi'_{tub}(\boldsymbol{r})$ are the superposed tubulin quantum states, $\rho(\boldsymbol{r})$ is weighted mass distribution function of the quantum-gravitationally induced collapse, and τ_C is the time till the collapse occurs. From a systemic point of view, the spread of such neuroquantum superposition-collapse-waves by the *MT*-quantum-holographic Hopfield associative network conditions the organized, orchestrated, synchronized, specific timing-selected neuroquantum activity of systemic brain neural networks that bases the very essence of consciousness as a neuroquantum phenomenon of a high level of complexity, so-called *MT*-neuroquantum coherence that nonlocally synchronizes *MT*-quantum states. Therefore, we can say that this process is the foundation of consciousness generation and that the level of the quantum brain begins from it. It is the basis of every other quantum phenomenology of consciousness realized at higher organizational levels. At this level,

decoding of representation information from the classic neural level is performed. Using the mechanisms of quantum-coherent superposition, decoherence and quantum entanglement, this neural hierarchical level already begins the preconscious mechanisms of primitive reasoning as it calculates the relations between representations and their elements. Quantum-coherent superposition, as we pointed out earlier, represents an unconscious, implicit neuroquantum processor of superimposed potential alternatives involved in the calculation. Quantum collapse represents the selection of one of them, i.e. the result of calculation, which further through quantum decoherence passes into the consciousness of the classically reduced order on other levels, bound, decoded and reshaped according to sensory modalities,

$$|\psi\rangle_S \equiv \sum_i c_{k_i} \left|\psi^{k_i}\right\rangle_S \xrightarrow{\tau_D} \hat{\rho}_S \equiv \sum_i \left|c_{k_i}\right|^2 \left|\psi^{k_i}\right\rangle_{SS} \left\langle\psi^{k_i}\right|$$

where $|\psi\rangle_S$ is neuroquantum superposition of individual mind quantum states $\left|\psi^{k_i}\right\rangle_S$ into a unified state, $\hat{\rho}_S$ is the quantum density operator representing the decoherent Shannon information loss due to the process of quantum decoherence, and given by the outer product matrix $\left|\psi^{k_i}\right\rangle_{SS}\left\langle\psi^{k_i}\right|$, i.e. qualitatively experienced mental content with a correlate in the objective reality that it observes and from which it originates, which is also the basis of a future adequate behavioral response. When certain Bars-Frankin's neuromodules are addressed in a classical neural manner, then the *MT*-quantum states of the addressed modules are simultaneously quantum entangled into a unique integrative neuroquantum configuration of a certain conscious content. So, in this process, the neuroquantum entanglement at the quantum level addresses and neurodynamically integrates the Bars-Franklin's modules (cortical areas and brain nuclei) into a unique configuration that will later pass into qualia at higher organizational levels of consciousness, i.e.

$$|\psi\rangle_{ent} = \sum_{l=1}^{n} \alpha_l \, |\psi\rangle_k^{(i)} \otimes |\psi\rangle_i^{(j)} \otimes \ldots \otimes |\psi\rangle_n^{(n)},$$

where $|\psi\rangle_i^{(j)}$ represents the i-th quantum state of a j-th Bars-Franklin's neural network module. So, unlike to the standard quantum superposition taking place in just one quantum system between its states, quantum entanglement is a huge quantum superposition of large spatially distributed (neuro)quantum systems. If it's unfactorizable then it represents a highly/fully entangled (neuro)quantum Bell state which represent the foundation of self-awareness with some other conditions being met, especially central neuromicrotubular Poincaré resonance. Here lies the key to prediction and reasoning, as well as the primordium of decision-making, i.e. the phenomenon of free will. The noncomputability of this process at this level embodies the phenomenon of free will in the quantum domain to which it predominantly belongs. Using the laws of quantum mechanics, we can also say that this level turns *MT*-quantum phenomena into a macroscopic one in the brain, precisely thanks to *MT*-organization as a parallel subneural network that spans classical neuron brain networks with which it is closely coupled in a complex, classically-quantum manner. The very mechanisms of this coupling remain unclear, but we assume that they are of the classical origin, i.e. of the *EM* Brain Field and intraneuronal signaling systems, of which the calcium signaling probably plays a significant role, as well as that they are quantum-holographically rooted and retrogradely conditioned by the higher levels of the organization of the consciousness system (downward causation). Mainly, purely effectively and phenomenologically observed, we can say that on this level the representation gets its decoded form that resembles reality and a dynamic aspect between its elements, which will later be the foundation of the formation of relations towards them. Also, this level forms the so-called intrinsic structure (intrinsic

space/structure) which represents the virtual space, quantum global workspace which is a virtual space of shaped objects within which representations are formed, i.e. their decoded forms. It is the basis of the future observational core system that observes them (consciousness central self-observing core). In summary, we can say that at this organizational level, consciousness arises from the quantum interactional interplay of three dynamic mediums/fields (*MT*, water dipoles, and brain *EM* fields) as well as the quantum-gravitational field in the processes of unitary superposed quantum state-induced quantum-gravitational decoherence, as well as systemic neuroquantum entanglement.

Quantum Neurodynamical Mind Medium. This level structurally constitutes the Einstein-Bose condensate of quantum neurodynamics of the quantum brain field where the *EM* brain field plays a significant role in contributing to this process both structurally with its quantum aspect as part of the overall brain quantum field, and neurodynamically. It is created by the processes of spontaneous breaking of the quantum symmetries (*SBS*) of the quantum field of the brain/consciousness/acupuncture system as well as the break of rotational symmetries of dipole brain molecules, especially water molecules by the Einstein-Bose condensation of the resulting Nabu-Goldstone bosons into the so-called collective modes. When a continuous global symmetry is spontaneously broken, Nambu-Goldstone bosons necessarily emerge as massless scalar particles. These bosons represent the collective, long-wavelength fluctuations of the order parameter field around the chosen vacuum state. Consider the complex scalar field $\phi(x)$ under the global $U(1)$ transformation given by $\phi \to e^{i\alpha}\phi$ with the global $U(1)$-invariant Lagrangian density given by

$$\mathcal{L}(\phi, \partial\phi) = \partial^{\mu}\phi\partial_{\mu}\phi - V(\phi),$$

where $V(\phi)$ is defined as

$$V(\phi) = \lambda(|\phi|^2 - \eta^2)^2$$

The potential $V(\phi)$ has a minimum when $|\phi|^2 = \eta^2$, i.e. on a complex circle of the radius η. All quantum states on that circle are equivalent and represent quantum vacuum states. Now, let's expand the field $\phi(x)$ around its vacuum expectation value. If we choose this value to be real, i.e. $\langle\phi(x)\rangle = \eta$, then by choosing a certain complex Cartesian-Argand direction

$$\varphi = atan\left(\frac{\vartheta}{\sigma}\right)$$

as the adequate parametrization that by this describes and models spontaneous quantum global $U(1)$-symmetry breaking of the chosen vacuum state, we can take $\phi(x)$ to be

$$\phi(x) = \eta + \frac{1}{\sqrt{2}}[\sigma(x) + i\vartheta(x)]$$

where $\sigma(x)$ and $\vartheta(x)$ are both the real scalar fields. Chosen as such, the $\phi(x)$ is now globally $U(1)$ variant and its symmetry is therefore spontaneously broken. Thus, the Lagrangian is still invariant under this transformation but the vacuum states are not. Substituting this quantum vacuum state of quantum field of consciousness with spontaneously broken symmetry into the Lagrangian gives

$$\mathcal{L}(\phi, \partial\phi) = \frac{1}{2}(\partial^{\mu}\sigma)^2 + \frac{1}{2}(\partial^{\mu}\vartheta)^2 - \lambda\left(\eta^2\sigma^2 + \eta\sigma^3 + \frac{1}{4}\sigma^4\right).$$

Comparing this with the Lagrangian $\mathcal{L}(\phi, \partial\phi)$,

$$\mathcal{L}_m = -\frac{1}{2}m_{\sigma}^2\phi^2,$$

we see that the mass term is given by $\mathcal{L}_m = 2\lambda\eta^2\sigma^2$, defining σ as the massive Higgs-like mode of mass $m_{\sigma}^2 = 2\lambda\eta^2$, representing radial oscillations in the potential while the quantum field $\vartheta(x)$ has no the corresponding mass term indicating this way that it is the massless scalar particle called the Nambu-Goldstone boson

making angular oscillations along the flat bottom of the potential. In other words, obtained Nambu-Goldstone bosons correspond to fluctuations along the degenerate vacuum manifold. The *SBS* is spontaneous, unpredictable, noninduced and maybe alongside with the Hameroff-Penrose quantum wave function collapse, as well as the Heisenberg uncertainty principle, contains the piece of the Song's puzzle (19) about consciousness noncomputability and unpredictability, since we cannot know which direction it will choose and prefer next in any instance of time. The Goldstone theorem states that for each broken continuous symmetry generator, there is a corresponding massless Nambu-Goldstone boson. In our model, these Nambu-Goldstone bosons are the fundamental collective excitations of the brain's microtubular quantum field, emerging directly from the Hameroff-Penrose *Orch-OR* process. For the uniform, ideal, 3D compartmentalized gas of noninteracting particles without internal degrees of freedom, the Bose-Einstein condensation *in vitro* conditions occur at a very low, so-called critical temperature T_c very close to the absolute zero (-273.15 °C) given by

$$T_c = \frac{2\pi\hbar^2}{mk_\beta}\left(\frac{n}{\zeta(3/2)}\right)^{\frac{2}{3}},$$

where n is the number of bosons inside a unit volume, i.e. boson gas density, m is the boson mass, $\hbar$ is the Planck's constant, k_β is the Boltzmann's constant and $\zeta(x)$ is the Riemann's zeta function. At that, critical temperature point T_c, huge number of bosons occupy the lowest possible, vacuum quantum state in which general, usual and typically microscopic quantum phenomena, especially wave function interference, become then macroscopically evident as a great unified wave function called the Bose-Einstein condensate. Here now the main question raised is how noisy, warm and wet brain parenchymal environment may support such quantum coherence. To answer these questions, some studies proposed the potential roles of Hameroff-Penrose microtubular π-electron Bose-Einstein condensation, Fröhlich condensation, and quantum electron neurosynaptic tunneling (20-23). Though the precise mechanism yet still remains to be discovered and unfortunately till then remains unknown, in either case, what matters here is that in some way, somehow (neuro)biological, *in vivo* environment is exactly what is needed for this phenomenon to occur in the brain, not requiring the temperature condition, by-passing it somehow. Parallel to enzymatic solution of (bio)chemical reaction catalyzation, which by-passes the general temperature and pressure energy conditions for (bio)chemical reactions in order for them to occur, this is yet another example and nice demonstration of how biological environment finds unique solutions by changing conditionality for the processes it needs and for which in general, *in vitro* conditions it's not the case. Spontaneous quantum symmetry breaking and Einstein-Bose condensation in the brain represents the basis of the macroscopization of the quantum into the classical order and thus the embodiment of manifest consciousness as a visible phenomenon and psychic function that enables daily interaction with the outside world. This neurohardware implemented medium of consciousness is a generally global, non-locally distributed neurodynamic process throughout the entire brain neural network, embodied in the form of a generated complex, gauge-invariant quantum field of the brain/consciousness/acupuncture system which is also characterized, among other things, by coupling with the *EM* field of the brain as well as with the *MT*-level. So, this quantum field has a retrograde, feedback influence on its own generator, which consists of brain neural networks, acupuncture system, and probably non-specific cellular dynamics of the quantum organizational level (Peruš's molecular synergetic networks, holography of the quantum state of molecular systems, cellular automata). At this level, the relations formed at the *MT*-level are defined. We can say that this level is the decoder and integrator of relations and dynamic

aspects of formed representations. At this level, due to medium self/auto-detection, primordial relationships I/I, I/representation outside me, I/environment are formed. These are the fundamental functional elements of self-reflection.

Self-Reflection. Autodetection of the generative consciousness system is the key mechanism and process of generating consciousness and represents the basis of autoreflexion. It takes place within the *SBS* medium of consciousness. Namely, the dynamics of the *SBS* medium condensate generates perceived, external representations and self-representation within the intrinsic space. In fact, the entire mechanism of consciousness is based on the amplification, definition and modulation of the effect of observing the system by itself, that is, on the mechanism of self-observation/auto-detection. According to our model, this mechanism takes place in several stages, becoming more complex and evolving within the *SBS* medium of consciousness. By starting from the Green propagator *QFT* generating functional $Z[J]$,

$$Z[J] = \int \mathcal{D}[\phi] exp\left\{ i \int d^4x [\mathcal{L}(\phi, \partial\phi) + J(x)\phi(x)] \right\},$$

we model this self-evolving neurodynamical process with the Schwinger-Dyson *QFT* System of Green's propagators/correlators of the consciousness system/acupuncture system/quantum brain (Schwinger-Dyson's equations) of the dimensionality of the 4D Minkowski space, with the solution,

$$G^{-1}(p) = G_0^{-1}(p) - \Sigma(p).$$

This system of neurodynamic equations of motion of the quantum *SBS* medium/field of consciousness is a formal description of this neurodynamics. Here the central role is played by the System of neuroquantum Green's propagators (Green's System of Mind Propagators), for which we have

$$G(x-y) = \langle T\phi(x)\phi(y) \rangle,$$

$$(\partial_x + m^2)G(x,y) + \int d^4z \Sigma(x,z)G(z,y) = \delta^4(x-y).$$

Green's propagators of the Schwinger-Dyson system represent the autocorrelative functions of consciousness. If we include the quantum-gravitational fluctuations of the *SBS* medium of consciousness in the model, then we are talking about graviton propagators, but the essence of the system dynamics principle is the same even without this variable in the equation. What we would like to mention here regarding this phenomenon is that according to our quantum-gravitational calculations and analysis, shown below, there are indications that the extroversion of the quantum-gravitational ultralevel to the supralevel of the quantum *SBS* medium of consciousness and its self-reflective neurodynamics probably plays a very significant role in the dynamical shaping of the consciousness configuration by the space-time curvature of the *SBS* medium of the field of consciousness and thereby determines its 4D geometry, the 4D geometry of consciousness. Our speculation is that this is a very important mechanism for the later formation of qualia at the level of body hierarchical neural networks which convert this 4D-spatial geometry of Minkowski consciousness into qualia *per se* at those levels of consciousness organization. Here Kaluza's 5D field theory as well as higher dimensionality (the so-called transdimensional expansion of qualia/consciousness) can potentially play a role in the further refinement of qualia. $T\phi(x)\phi(y)$ is the so-called time-ordered product of (field) operators). Its integral-representational definition given by the path integral in the configuration space of the field ϕ is

$$\langle T\phi(x)\phi(y) \rangle \equiv \int \mathcal{D}[\phi] \int \mathcal{D}[p]\phi(x)\phi(y) exp\left(i \int dt \int d\boldsymbol{r} \sum_n p_n(t,\boldsymbol{r})\partial_0\phi_n(t,\boldsymbol{r}) - H(\phi, \nabla\phi, p) \right),$$

where

$$\mathcal{L}(\phi, \dot{\phi}) = p_n(t, \boldsymbol{r})\partial_0\phi_n(t, \boldsymbol{r}) - H(\phi, \nabla\phi, p),$$

represents the Legendre transform of the Lagrangian $\mathcal{L}(\phi, \dot{\phi})$/Hamiltonian $H(\phi, \nabla\phi, p)$. As a comprehensive memory matrix, the Schwinger-Dyson system temporally integrates (through the so-called effective action $\Gamma[\Psi(\phi)]$) and models this complex neurodynamics and keeps tracking of it through a formal description of propagating information-signal autodetection trajectories that underlies the mental Poincaré resonance, generally quantified by the characteristic system reversal time τ_P given by the measure of initial system reconfiguration V_{init} taking into account the size of its configurational phase space V_{phase}, i.e.,

$$\tau_P \propto \frac{\delta V_{phase}}{\delta V_{init}}.$$

The Poincaré resonance couples neurocorrelative creation with its destruction leading to divergence-diffusional delocalization of spatial brain-wave interference. If the characteristic time of neuromicrotubular wave function collapse τ_C reaches this Poincaré criterion in a concrete instance, i.e. if $\tau_P = \tau_C$, and more important if they are synchronized events, then not just consciousness occurs but also the phenomenon of autoreflection, which is the key to self-consciousness. Unfortunately, this occurs only when frequency ratio of neuromicrotubular superposition/collapse wave packet is of integer value (24). If we also account the influence of neuroquantum decoherence and its characteristic times in this process (25), then it would be obvious why consciousness cannot achieve the Poincaré resonance so easily. Simply put, though generally could achieve it as if it were a fully closed quantum system, due to and under the constant input from the senses, although it is necessary for generating consciousness in general, simultaneously the consciousness system is constantly under disturbance as well, so the consciousness is very rarely able to reach this point, so it represents a random process, occurring at some spontaneous random rate. It seems that also at this point in the process of consciousness generation, Song's noncomputability of consciousness also takes place (19). For instance, this could explain why much of the time we are not highly consciously aware of ourselves only the world around. But in the moments when it happens, we are highly aware of ourselves, which goes beyond the mere self-representational neuroholographic memory trace. That's when the autoreflection occurs. This is given by the Dirac-behavior of a probabilistic trajectory $p(q, p_m, t)$ described by the points of a brain map neuroensemble cloud represented by the *N*-dimensional point cluster inside the Lynds phase space (26),

$$p(q, p_m, t) = \delta(q - q_0)\delta(p - p_0^m)f(t).$$

The time moments given by t_1, t_2, etc. are the moments when the Poincaré condition is met, $\tau_P = \tau_C$, i.e. when $q = q_0$ and $p = p_0^m$. Then, the wave packet $f(t_n)$ experiences the Poincaré resonance and the self-consciousness occurs through the prism of generated qualia on the higher organizational levels. What happens then is that very large, supracritical number of quantum-neuroholographic representations (mind contents, thoughts, memorized traces and shapes, attitudes, percepts, self-images etc.) is very efficiently contextually loaded first in a classical neural way and then by quantization into the neuroquantum global brain neural network workspace in a highly entangled manner generating this way the supersystemic transcortical Bell state which spans and affects almost the entire brain. In that state, the amount of Shannon information loaded into the space and processed in a parallel manner is high and more than enough to resonate with itself. That's when *CNS*'s potential for parallel information processing takes place and shows its full power. The parallelly uploaded quantum-neuroholographic representations and images self-interact in a Dirac manner with high

interference, coherence and on a highly synchronous manner enabling them to detect one another in a highly entangled supersystemic conglomerate which then behaves as it observes them. This quasi-observational phenomenon then taking place is generated due to the loaded and therefore available neuroholographic contents which then act as interpreters of information contained inside this huge quantum-neurohologram of entangled neuroimages loaded inside the global workspace. Delocalized information trajectory inside this supersystemic neurohologram addresses all representations at once self-interpret one another in the process of informational self-coupling which provides the basis of the so-called self-observing core which is the foundation of autoreflection, i.e. self-reflection and self-awareness. The process iteratively repeats itself on a perturbative manner finally leading to self-consciousness above some complexity threshold. This is almost always accompanied by significant qualia generation and phenomenologically speaking from the inner self-perspective, as a feel it is characterized by a significant emotional qualia coloration. Thus, it is energetically more expensive and informationally richer process than the general consciousness itself. This also reveals that there is some kind of trade-off between general and self-consciousness, one achieved at the cost of the other at the phenomenological level but also at the biophysical level. Fine tuning of these underlying processes makes a difference and also potential involvements of other processes needed to support these slightly different processes in general. This also gives us the Green's autocorrelative attention model through the concept of gauge-fixing,

$$\partial^{\mu} T_{\mu\nu}(x) = 0,$$

where $T_{\mu\nu}(x)$ is a general energy/information interaction tensor, which represents the selection of one of the potential alternatives within the space of consciousness configurations. The energy drive for this complex process is modeled by the so-called the self-energy/self-propelled operator $\Sigma(p)$ of the Schwinger-Dyson System. This complex Green's system-based operator models and describes the system memory traces as well as neurodynamic autointeractive reverberation loops at the brain *SBS* medium level. The effective action of consciousness $\Gamma[\Psi(\phi)]$ would then correspond to the quantum counterpart of supa-/multimodal integration by coupling to the quantum brain field $\phi(\boldsymbol{r}, t)$ as follows

$$\frac{\delta\Gamma[\Psi(\phi)]}{\delta\Psi} = \int \mathcal{D}[\phi] \frac{\delta S[\phi]}{\delta\phi} \Psi(\phi),$$

where $\Psi(\phi)$ represents the quantum state of consciousness implemented and realized by the configuration of the quantum medium field $\phi(t, \boldsymbol{r})$. The $\Gamma[\Psi(\phi)]$ is derived as the Legendre transform

$$\Gamma[\Psi] = W[J] - \int d^4x J(x)\Psi(\mathrm{x})$$

of the coupled Green function generating functional $W[J]$ given by

$$W[J] = -i\hbar \ln Z[J].$$

This model would represent a formal description of the dynamics of the representation generated by the system. So that the uploaded representations on the condensate level perturb the *SBS* medium by which it is excited to build a reactive representation in response to the perceived one. With this, it builds two representations as well as a representational contrast between them. This corresponds to the introduction/generation of a new Green's propagator in the system for a given coordination locality of the representation. It further evolves to the virtual differentiation level of the holistic-quantum-holographic representation, which contains the perceived representation in one front end, operational domain (perceived representation), another in the background domain (autodetection), and the third as a relation of contrast between them, which is the root of their appositional and mutual

differentiation. Through the Schwinger-Dyson's iteration of these mechanisms, these relationships are differentiated and evolve to the level of the conscious representation ψ_{ext}, the unconscious core ψ_{int} that observes and feels their differences, but again merged into one representation in a manner that now *I* experience the perceived representation. This relationship can be described as follows. We have quantum superposition of these two given by

$$\Psi_{consc} = \alpha\psi_{ext} + \beta\psi_{int},$$

where Ψ_{consc} represents the overall consciousness at a particular moment. Usually, ψ_{ext} predominates and we are aware of the external world around us. In that case, its probabilistic amplitude α is greater than the probabilistic amplitude of ψ_{int} β, i.e $\alpha > \beta$. But when the Poincaré resonance conditions are met, the situation is reversed and we have $\alpha < \beta$ and self-awareness takes place. In the extremes,

$$\lim_{\beta\to 0} \Psi_{consc} = \alpha\psi_{ext} + \beta\psi_{int} = \psi_{ext},$$

i.e. we have the extrovert mind. On the other hand, if we have

$$\lim_{\alpha\to 0} \Psi_{consc} = \alpha\psi_{ext} + \beta\psi_{int} = \psi_{int},$$

we have introvert, meditative mind. All of this is guided by the information contained inside of the Green propagators and their neurodynamics is guided by the Schwinger-Dyson relationships. Therefore, the Green's propagators act as a lacunar holders of quantum-gravitationally projected neuroholograms, representing this way the foundation of generating qualia at the transhierarchical integrative level of consciousness. But before this one and essential for it, there is a new organizational level of the forming/formed mind, so-called the psychic mind level.

Psychic Mind Level. This is the level where autodetection and autoreflection evolution continues and mind is generated at some point of their critical complexity. Due to the achieved enormous complexity of the formed representations and their relationships, differentiation into the conscious and unconscious mind takes place. Here, we especially put in focus and centralize the concept of a mental state, as one of the entire system/complex of mental representations, so-called the mental image representational system/space of mental states. These mental states in their totality build the Hilbert's space of Mental States whose Feynman's path integral for all configurations/states in this space generally constitutes personal integrity, where the very process of realizing concrete trajectory integration in this general process embodies this through and gives birth to the creative potential (creativity) of the integrated personality. The energetic aspect of these mental states gives the energetic-configurational hypersurface of the mental representation system, and the internal aspect, which lies at the basis of subjectivism, colored by qualia at the next level, represents the mind's action, which we model by the so-called mind's action functional, $S[\phi(\boldsymbol{r},t)]$, where $\phi(t,\boldsymbol{r})$ represents the quantum state of the mental field defined within the space of mental states. Then if we concretize consciousness in general into a concrete conscious experience, i.e. mental state without going into the nature of qualia, i.e. represent it as the current consciousness about something $Z[\phi(\boldsymbol{r},t)]$, we can describe it by the Feynman's trajectory/path integral of the *QFT* state transformation function as

$$Z[\phi(\boldsymbol{r},t)] = \int \mathcal{D}[\phi]\exp\left\{\frac{i}{\hbar}S[\phi(\boldsymbol{r},t)]\right\}.$$

As a quantifier, $Z[\phi(\boldsymbol{r},t)]$ represents the probabilistic amplitude of a mental state it describes. $S[\phi(\boldsymbol{r},t)]$, the action of the mind, is standardly described by the temporal integral of the Lagrangian of the system of mental states

$$S[\phi(\boldsymbol{r},t)] = \int dt\mathcal{L}(\phi,\dot{\phi}),$$

where the Lagrangian is given by

$$\mathcal{L}(\phi, \dot{\phi}) = \frac{1}{2}(\partial_\mu \phi)^2 - V(\phi),$$

where $V(\phi)$ represents the mental/mind potential resulting from all autointeractions of this and lower organizational levels. If it were to be explained from the aspect of the particle dynamics of the field, then the mental potential would be a kind of autointeractive (self)scattering within such a system whose dynamics it determines and describes (self-scattering). So, simply put, consciousness represents the attractor of this energy-configurational hypersurface of mental space (**Fig 1**). This level of organization of consciousness generally opens up the possibility of introducing the Langevin-Fokker-Planck formalism into the description of creativity through the prism of chaos theory and Heisenberg's uncertainty principle (**Fig 2**) (27, 28). This also brings us the enormous potential of free will modeling through the explanation of Song's incomputable moment enrolled in the organization of the consciousness system (19). Also, with this approach we can explain and refine and color learning models as well as self-awareness. What we would like to highlight here as particularly interesting, as a collateral bonus resulting from our approach to the problem, is that the superposition and interference of fully-formed representations, which enter into a certain relationship, is taking place at this level of consciousness organization. It forms the basis of modeling of conflict thinking, paradoxical and absurd human actions and other similar situations and mental states known from everyday experience, and generally intriguing to man as phenomena about himself, especially in certain situations.

Transhierarchical Integrative Level. The level of transhierarchical somatic quantum-holographic Hopfield's neural networks generates qualia through the prism of the mentioned complexities in interactive bidirectional feedback communication with the *CNS* (**Tables 1** and **2**). We use Raković's model of consciousness for this highest level of consciousness organization (1-5). According to our *IQNHFC* model, this highest level of consciousness organization embodies the acupuncture system as the most integrative system of the body as a whole. Here we would like to specifically highlight, emphasize and pay special attention to the following pattern of organization of consciousness, which can probably still further be generalized with different and extra-neuroscientific implications and applications, which we believe is particularly valid for this highest level of consciousness organization according to our model, but which it also affects in some manner even the lower organizational levels, and so, we think it deserves and it would be distinguished here as a theoretical entity. It is generally the so-called integrating unifying organizational principle, which we will generalize here for the moment. The very essence of this form of organization of matter in the pursuit of greater complexity of the system it constitutes would generally be the relationship of two appositionally consecutive organizational levels, the lower, so-called ultralevel and higher, the so-called supralevel. What makes this relationship so specific in this type of organization, in contrast to other ones, is the expression of the lower ultralevel on the higher supralevel, colored by the tonality of the structural organization of the higher supralevel. This toning of the ultralevel with the shadow of the supralevel makes the expression of the ultralevel on the supralevel structurally simpler, but dynamically richer in the information density which it pulls from the supralevel. By extroverting itself to the supralevel, the ultralevel is being filtered and modified so that it gains something and loses something in this organizational translevel process. It gains on its **1)** unification, as it is directly structured from the unitary, most fundamental medium of the supralevel, **2)** integration, because it has a larger area of importance and validity and **3)** information density, because it has a richer dynamics at the supralevel, but it loses on the structural organization that remains on the lower ultralevel. This proces is the so-called extroversion of the ultralevel into the higher

(supra)level supersystem (29). So, in this process, the ultralevel transports and leaves its very information essence on the supralevel, which it further enriches with its own quality through

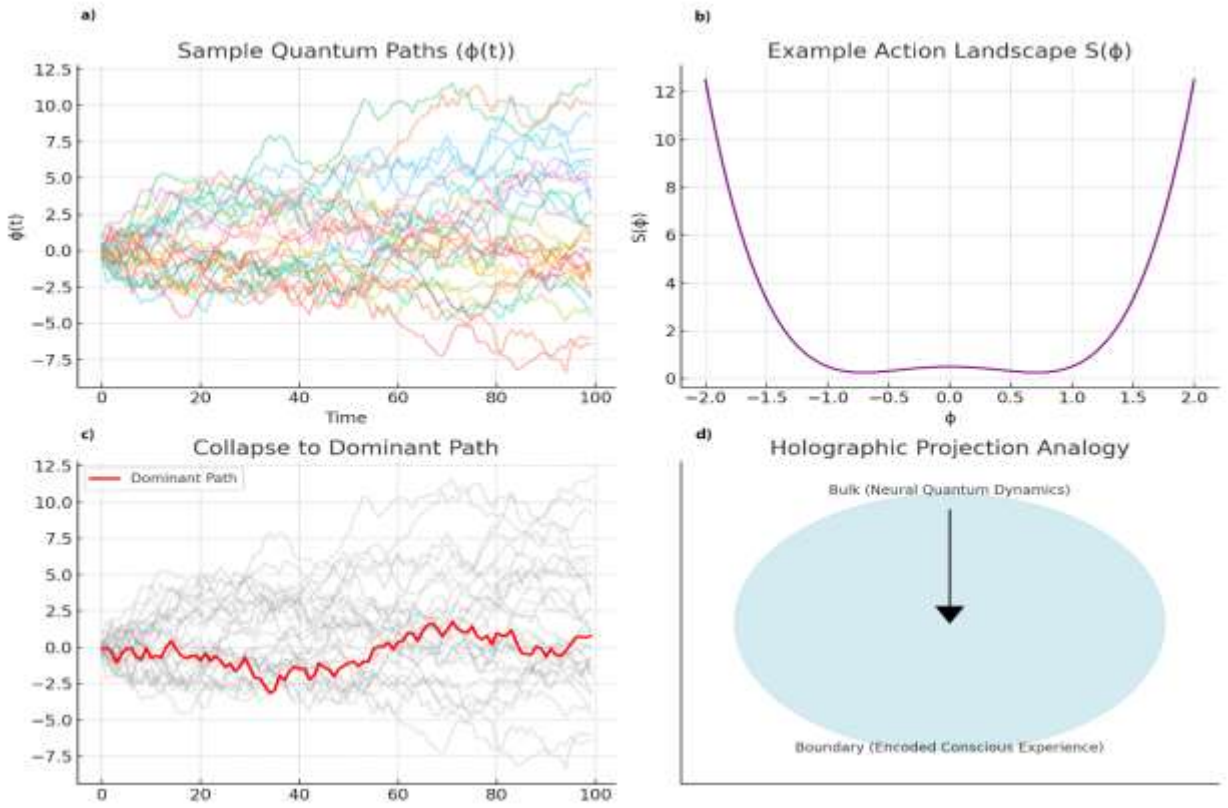

Fig 1. The *IQNHFC* Model. **a)** Stochastic Feynman's Paths $\phi(t)$ of Consciousness represent Consciousness Evolution in Time, **b)** Conscious Mind Action Landscape of Mind-Energy Configuration Space shows Consciousness as a stable, Steady State Configuration/Attractor in this Space, **c)** Dominant Path Quantum Collapse of Consciousness signifies Consciousness Event/Specified Quantum Path wins over the others, **d)** Projective Holographic Aspect of the *IQNHFC* Model show Consciousness as a Projection of the Quantum Bulk Field to a Mental Experience/Boundary

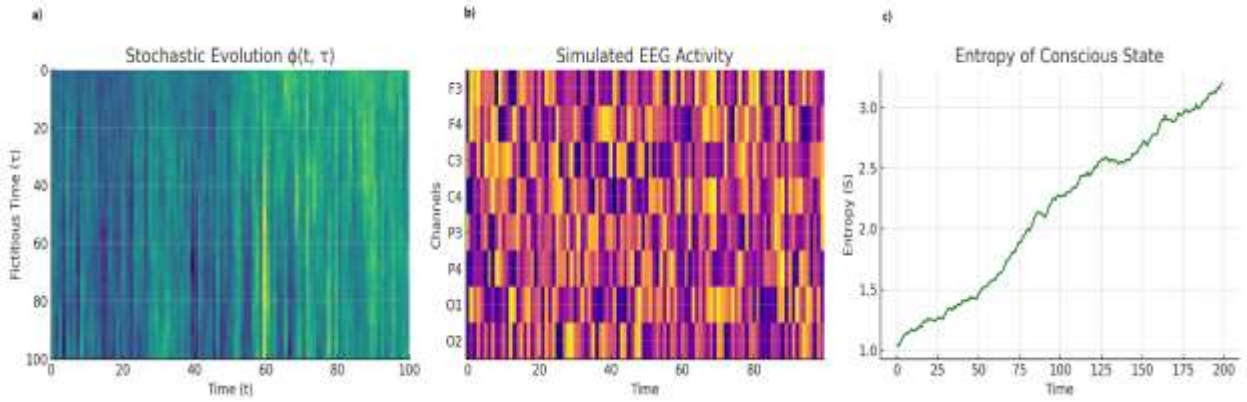

Fig 2. Neurofunctional Correlates of the Model. **a)** Stochastic Neurodynamics of Consciousness Quantum Neuroconfiguration represent Consciousness Evolution in Fictitious Time τ, **b)** Modeled Virtual EEG Correlate of the Model/Classical EEG Projection of the Quantum Mind, **c)** Quantum Chaos Neurodynamics represents levels of Mind Organization as a function of Time

information processing. Thanks to this, the new organizational level of the system is the bearer of a new quality that cannot be achieved at lower organizational levels, and according to our model, the cause of this is precisely this mechanism. Therefore, a new quality at a higher level is achieved and caused by this lower-level extroversion enriched with higher level qualities. We can say that this mechanism is a kind of fusion of two levels into one new quality. For example, the classical neural organizational level is characterized by a huge neural complexity in the number of neurons and possible neural network configurations, but the quantum level is the bearer Of consciousness, and it is directly structured from a more fundamental, unified and integrative, simpler medium, but with a terribly vast information-dynamical potential. Thus, the supralevel acts as an ultralevel medium-information unificatory integrator. When we serially observe this trend of organization and levels of consciousness through this pattern, then we can see that the transhierarchical system level embodied by the acupuncture system behaves as **1)** the most integrative one because it goes beyond the *CNS* borders (expansion of the area of validity), **2)** it covers the whole body, that is the so-called systemic body neural network, **3)** it is informationally the richest and therefore the most self-reflexive and **4)** generates the very subtlety of the qualia phenomenon that it has acquired by refining its own medium by such transhierarchical iterative dynamics through many organizational levels before. In other words, this system of the highest rank involves the whole body, the whole brain, and therefore the whole being in the process of generating consciousness, and if we take into account the new quality of that same consciousness created at that level, we will understand that it is precisely this consciousness that we experience every day, that is, qualia. Therefore, we can reductively, without underestimating the other organizational levels in that process, in short, summarily say that the acupuncture system itself is consciousness *per se*, precisely because of this underlaying of that phenomenon. Because only that system carries the final evolutionary-ontogenetic extract of the finalized, qualitatively embodied consciousness itself. And precisely because of its exceptional degree of unification, information density and Integrity, this level is the carrier of the so-called transpersonal phenomenology including astral projection/ionic body dislocation, mental-address tunneling without space-time barriers, quantum microenvironment attractor reprogramming, as well as extrasensing and other phenomena in the so-called transient and altered states of consciousness (1-5). These phenomena are fundamentally quantum-gravitational in nature, and their phenomenology confirms the role of the transdimensional-spanning expansion of consciousness in the multidimensional configurational space, which underlies the formation of qualia as the transhierarchical-systemic self-perception of such configurations of the conscious manifold. Therefore, using the quantum-gravitational approach to this problem with the additional application of the quantization of the Rudrauf-Benequin projection model of consciousness (30),

$$S(X,t) = T(t) \circ R(x,t),$$

where $S(X,t)$ represents projective experience obtained as a result of the application of the specific projective transformation $T(t)$ onto the real, objective model of the subjectively perceived external, real world $R(x,t)$, with the corresponding transformations/translations,

$$S(X,t) \to P_H^{\mu\nu}(x),$$
$$T(t) \to D^{\mu\nu\rho\sigma}(x,y), \quad R(x,t) \to F(y)$$

and utilization of its projective properties (1-5, 16, 31), we have,

$$P_H^{\mu\nu}(x) \sim \int d^4y F(y) D^{\mu\nu\rho\sigma}(x,y),$$

where y is 4D space-time Minkowskian, $F(y)$ represents the quantum state of the acupuncture system/consciousness, $D^{\mu\nu\rho\sigma}(x,y)$ is the 4D tensor of the quantum-fluctuating

Table 1. The *IQNHFC* Model and the mechanisms of mental representation generation

Hierarchical Neural Level	Function
Classical Neural Level	Information Encoding, Feature Extraction and Supra- and Multimodal Reintegration
MT Quantum Level	Information Decoding and Quantum Computing
QFT Field Level (Level of the Consciousness Medium)	Pre-elementary Assembling and Representation Formation
Abstract-Projection-Relational Level (Virtual-Synergetic Level)	Formation of Elementary Relations between Representations and their Elements within the Medium, Formation of Relationships I/I, and I/Environment
Mind Unconscious Level	Unconscious Psychodynamics of Formed Relationships and Representations
Mind Conscious Level	Generation of Autoreflection, Autodetection Mechanisms, Conscious Psychodynamics of Formed Relationships and Representations
Somatic Hierarchic Neural Networks	Complete Conscious Experience/Qualia
Superlevels of an Individual Mental Development	Enrichment of Representations, Complexity of Psychodynamics, Transpersonal Psychology

graviton propagator, and the $P_H^{\mu\nu}(x)$ tensor here represents the mere neuroholographic projection, in analogy to the Rudrauf-Benequin projective geometry. But since quantum gravity and consciousness are both highly nonlinear systems, the quantum-fluctuating graviton propagator $D^{\mu\nu\rho\sigma}(x,y)$ is not enough alone to describe gravitational-(self)consciousness interaction coupling. Thus, we have to introduce some nonlinear interaction factor describing all local interactions which is precisely the quantum-gravitational energy stress-tensor $T_{\rho\sigma}(y)$ which satisfies the previously given gauge-fixing condition. It modifies the consciousness state by local interaction strength described by the tensor $T_{\rho\sigma}(y)$ into the so-called effective source. Combining the neuroholographic projection and quantum-gravitational energy stress-tensor $T_{\rho\sigma}(y)$ into a convolutional integral, we obtain the full quantum-gravitational mediated quantum-holographic projection propagator of the quantum states of consciousness/acupuncture system in the presence of nonlinear interactions as a 4D curved quantum-gravitational system Minkowski's neurohologram $P_G^{\mu\nu}(x)$ given by

$$P_G^{\mu\nu}(x) = \int d^4y F(y) D^{\mu\nu\rho\sigma}(x,y) T_{\rho\sigma}(y),$$

This would basically represent the computational model of qualia (**Fig 1**). The qualia, given by the quantum-neuroholographic propagator $P_G^{\mu\nu}(x)$ experienced at some point x is the integral result of the influence of the entire system at that point. This influence is the sum of the interactions of all local quantum states of consciousness $F(y)$ and local gravitational interactions $T_{\rho\sigma}(y)$, where this interaction is transmitted from y to x via the graviton propagator $D^{\mu\nu\rho\sigma}(x,y)|_{y\to x}$. This in turn confirms that $P_G^{\mu\nu}(x)$ is the final quantum neurohologram representing the Computational Model of Qualia, since it arises as a projection of the state from the entire bulk field of consciousness (**Fig 1d**). The entire *IQNHFC* model of consciousness is summarized in **Tables** 1 and 2.

Table 2. Informational-neurocybernetic definition of neurodynamical consciousness components and mind functions according to the *IQNHFC* Model

Mind Function	Definition
Consciousness *per se*	Self-perspective-self-referencing automapping-automorphic intrinsic-virtual autodetection-self-resonating Peruš quantum neurosynergistic dynamic transhierarchical holistic qualitative-generating superintegration of the macroscopic quantum system of consciousness into a supersystemic quantum-holographic associative Hopfield neural network
Perception	Indirect sensory-mediated non-selective neural-primary-neocortical Kohonen automapping sensory-internal-representational transformation of input data
Attention	Neocortical secondary-tertiary and higher hierarchical rational ERTAS-filtered and associative-guided selection of perceived input data enhanced to the conscious level by neural network-mediated transhierarchical interactive communication with associative classical and neuroquantum sensory precise multimodal visual-auditory-olfactory-gustatory-tactile information qualitative-determining environment
Memory	(Non)selective neural network stationary-neurodynamic-attractor neurosynaptic-neuroactivation input data storage
Learning	Higher hierarchical neural network and brain-wave post-perceptual-consolidation Kohonen non-local neo-attractor-generating decoding information-distributing neurodynamics
Remembering	Neuroactivation-reactivation retrieval-uploading of neuro-synaptically memorized virtual representations
Orientation	Representation of the logical relational autocoordinate location system of the spatiotemporally defined own intrinsic core-system of consciousness
Thought	Self-reflective virtual representation
Thinking	Higher hierarchical ERTAS-enhanced prefrontal-neuroprocessing rapidly changing generally asymmetric synaptically coupled Peruš neurosynergistic sequential thought time series of associative chains emotional-linguistically configured informational modulation of holistic basic tonality
Language	Associative memory-executive linguistic-representational symbolism of non-local attractor forms coupled with the parameters of the arrangement of brain semantic-pragmatic-syntactic centers for speech
Instincts	Innate implanted deeply neuroconfigurationally conserved propulsive instinctive propensities of specific behavioral programs of biological importance for the individual and the species
Intention	Virtual representation of the preliminary behavioral-ideal goal
Will	Actional Decision
Emotion	Deepened and encoded ERTAS-mediated frequency-amplitude amplification of the configural modulation of the basic tonality of the thought representation to the conscious level
Affects	Transient episodic emotional reinforcement
Creativity	Holistic transpersonal-informational coupling of virtual-representational supersystems
Transpersonal Interactions	Transient stable quantum-gravitational nonlocal mental address tunneling of consciousness by means of Einstein-Rosen tunnels by transforming neuroquantum interactive dynamics with the quantum microenvironment of the transient state of consciousness into the generation of stabilizing exotic matter of the tunnel walls followed by the subsequent quantum extraction-information collapse

Discussion

Implications of the Model

The *IQNHFC* model offers a powerful conceptual scaffold for understanding consciousness as a interdisciplinary, multilevel phenomenon. It opens new directions for unifying quantum theory, gravity, and neuroscience. The convergence of these research domains strengthens a compelling narrative: consciousness may emerge from the dynamic interplay of classical neural encoding and quantum-coherent processes, across multiple biological scales. By positing that conscious experience arises not solely from neuronal activity, but from a dynamic interplay of classical and quantum processes across nested organizational layers, the model challenges reductionist perspectives and emphasizes holistic integration. By treating conscious states as emergent from dominant quantum paths shaped by stochastic and gravitational influences, we offer a potentially testable and conceptually rich framework for future exploration. While direct empirical validation remains challenging, this multi-level, integrative paradigm offers rich theoretical groundwork and clear pathways for experimental exploration into binding problem, qualia and self-reflective awareness. At the classical neural level, the model begins with the *CNS*, wherein neurosignals are encoded via Fourier and wavelet transforms into holographic interference patterns. These classical neuroholograms constitute the informational substrate of perception and representation (32, 33). Crucially, this encoding does not act in isolation. Rather, it serves as input for deeper layers of processing within quantum coherent structures, such as *MT* and Bars-Franklin's neural modules, which facilitate quantum wave function superposition, collapse, and neuroquantum entanglement (9, 10). These quantum processes yield qualia through mechanisms modeled by Schwinger-Dyson equations and *QFT*-based Green's propagators, offering a formal physical description of autoreflective, self-referential cognition. One of the model's key innovations is the identification of the acupuncture system as the organism's most integrative and unifying substrate, acting as a quantum-holographic network that enables the bidirectional transference of information between hierarchical levels (1-5). This system-wide coupling gives rise to the integrating-unifying organizational principle, where lower (ultra-) and higher (supra-) levels exchange structural and dynamical qualities, resulting in new emergent properties not present at either level. This is particularly significant for understanding self-awareness, which our model locates at the interface of relational mappings, such as self-to-self and self-to-world, within a virtual synergistic medium (1-8, 34). Furthermore, the *IQNHFC* model addresses the evolutionary trajectory of consciousness by conceptualizing autoreflection as a self-evolving process, encoded in the feedback dynamics of the quantum field medium. This progression from basic perception to autoreflective awareness is modeled via Green's propagators in a 4D Minkowski space, suggesting that consciousness evolves through recursive self-observation and internal feedback (29). The implications of the *IQNHFC* model extend beyond theoretical neuroscience. By integrating quantum-holographic memory systems, *QFT*, and neurocomputational modeling, the model opens avenues for novel interpretations of creativity, free will, and altered states of consciousness (1-5). Moreover, its emphasis on systemic coherence and non-locality suggests potential applications in quantum medicine and psychophysiological therapies, further broadening its interdisciplinary impact. The *IQNHFC* model represents a compelling theoretical advancement that synthesizes multiple scientific domains into a coherent explanatory framework. It provides a fertile foundation for future empirical research and theoretical refinement in the quest to unravel the enigma of consciousness. The integration of quantum biological insights and quantum-holographic

frameworks offers a promising avenue for resolving key obstacles in consciousness research such as *MT*-based quantum coherence, Hameroff-Penrose's *Orch-OR* theory that hypothesizes that coherent quantum states within microtubules orchestrate moments of awareness as well as Raković's model of consciousness both with quantum-gravitational implications (1-5, 9, 10). Hameroff-Penrose's *Orch-OR* provides a well-defined quantum *MT* mechanism, quantum Hopfield models establish computational structure, acupuncture-based quantum-holographic frameworks offer systemic integrative capacity and quantum information neuroscience contextualizes the entire architecture. While critiques have emerged, especially regarding decoherence times (25), later work indicates that ordered water layers and actin-phase dynamics could sustain coherence on timescales meaningful for neural computation (9-11). Quantum Hopfield networks as further computational models extending *Orch-OR* hypothesize and further reshape *MT* as quantum Hopfield associative memory systems, capable of quantum information storage and recall (35, 36). These suggest how hierarchical assemblies may support coherent information dynamics across scales. Acupuncture system as a quantum-holographic medium is tackled by the studies of Raković, which demonstrate how the acupuncture system through macroscopic quantum-holographic processes may represent bodily states and support integrative psychosomatic and self-regulatory mechanisms (1-5). These frameworks analogize acupuncture collaterals and meridians to holographic memory substrates capable of resonant reconfiguration and whole-body integration. Multi-level quantum integration represents contemporary theory in quantum information science that highlights multiple loci of quantum effects, *MT* electron dynamics, field interactions, and entangled nuclear spins (12), suggesting a composite, multitiered quantum architecture for cognition that extends beyond *Orch-OR's MT* focus. Theoretical and empirical bridges are emergent frameworks combining neurocomputational models, field theories, and quantum-holographic principles to propose how transhierarchical coupling between micro-, meso-, and macro-levels. These can enable global coherence, integrated information, and emergent self-awareness. For instance, coherence at the MT-level may influence larger *EEG* patterns, acupuncture-mediated field coherence may modulate psychosomatic symptoms and hierarchical feedback may scaffold reflective consciousness.

Simulations and Predictions

Here we just glance and superficially outline possible numerical simulations using Monte Carlo methods to model path integrals over simplified neural configurations. These simulations can predict the distribution of dominant conscious states and their response to perturbations. Such models can also be connected to *EEG* patterns and neural correlates of consciousness through pattern matching techniques.

Conclusion

Integrating all the mentioned theories and models of consciousness into one unique *IQNHFC* model, we can say that consciousness is most likely a multi-hierarchical quantum-holographic phenomenon. Sensory perceived stimuli are classically neuroprocessed by specialized neural networks in order to extract the most important informational characteristics of the generated neurosignals. Then this partial information is taken further for synthetic processing by supramodal and multimodal system networks. Then we have encoded image representation at the classical neural level. With the classical-neuroquantum limit, realized and neurobiologically implemented through *EM* Coupling, neuroquantum-gravitational field, generated Nambu-Goldstone bosons, Einstein-Bose condensation and *MT*/*MAP* configurational dynamics, which at the same time represent the embedding medium of generated consciousness, this image of reality is retrogradely transmitted to the *MT*-neuroquantum level which regenerates the representational image on a quantum level. This enables further integration

by quantum entanglement with other similar or relevant images from other brain regions into a unique association. The parallelization of these processes creates quantum-superposed associative alternative representations, so-called virtual levels whose collapse in collision with hidden non-computable elements or decoherence with new stimuli, results in decision and action, which is the basis of the concept of free will. The self-reference underlying self-awareness is realized at the next abstract-relational level, which represents relationships between quantum generated and presented associative contents/images. Mapping of own system identity and its relational presentation, an abstract conclusion of the identification of that representation with its generator is generated, i.e. self-recognition, which again in interaction with lower quantum levels enriches itself with data about itself and expresses them, for example verbally. Thus, through bidirectional transhierarchical communication, classical-neural, neuroquantum and relational-abstract-informational-virtual Level, we have a transhierarchical quantum-holographic Hopfield's associative neural network, that is consciousness.

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