

Article

From Quantum Universe to Holographic Brain: The Spiritual Nature of Mankind

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Abstract

We are living a special moment in the scientific evolution of our civilization, with the emergence of a fantastic integral holoinformational quantum-holographic cosmivision [3]. The foundation of this new paradigmatic transformation connecting all levels of the universe is the phenomenon of non-local information [1] interconnecting all self-organizing universal systems in this cosmos. This holoinformational intelligent self-organizing field is continuously emerging from a plenum (not a vacuum) that permeates all the cosmos, full of quantum information and energy popping out of nothing every billion of trillionth of a second. This quantum field plenum is a kind of cosmic DNA scattering “in-formation” (active information with meaning that forms the reality) through all the universe, creating galaxies and supernovas with thermonuclear furnaces generating atoms of carbon, nitrogen, and oxygen the basis of all life forms. The fine-tuned biosignature of this non-local informational field is so fundamental for the cosmic evolution and the emergence of life that it must be seen as a cosmic organizational principle with a “status” equal to matter, energy and space-time, and as we shall see, also consciousness.

Keywords: Unified field, consciousness, universe, quantum field, holoinformation, cosmivision, non-local, quantum information, DNA.

1. Introduction

We are living a special moment in human history of emergence of a fantastic integral quantum-holographic cosmivision [3], developing a “*magic*” world, as Arthur Clark said, where we will not differentiate technology from magic. Our civilization is discovering and making reverse engineering from everything that evolved in this Cosmos. We will be creators not only of stem-cells and nanobots but also of stars and galaxies.

This new integral cosmivision is more wide than the quantum-relativistic paradigm that emerged in the beginning of the XX century. The foundation of this new paradigmatic transformation connecting all levels of the universe is the phenomenon of **non-local information** [1] interconnecting all self-organizing universal systems in this cosmos. The Quantum Field Theory developed by Umesawa [1] with its concept of non-local information connecting everything in the universe from quantum physics-chemistry, quantum biology and

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quantum mind, through quantum consciousness and quantum cosmology fine-tuned [2] for the emergence of life show us that human evolution and the emergence of mind and consciousness are the inevitable consequence of a intelligent informational universe. This holoinformational intelligent self-organizing field is continuously emerging from a *plenum* (not a *vacuum*) that permeates all the cosmos, full of quantum information and energy popping out of nothing every billion of trillionth of a second.

This quantum field *plenum* is a kind of cosmic DNA scattering “*in-formation*” (active information with meaning that forms the reality)) through all the universe, creating galaxies and supernovas with thermonuclear furnaces generating atoms of carbon, nitrogen, and oxygen the basis of all life forms. The fine-tuned biosignature of this non-local informational field is so fundamental for the cosmic evolution and the emergence of life that it must be seen as a cosmic organizational principle with a “*status*” equal to matter, energy and space-time, and as we shall see, also consciousness.

2. Information Self-Organization and Negentropy

Chalmers [4] states that information is an essential property of reality, as matter and energy, and that “*conscious experience must be considered a fundamental feature, irreducible to anything more basic*”. He argues that each informational state has two different aspects, one as conscious experience, and the other as a physical process in the brain, that is, one internal/intentional and the other external/physical. This view finds support in the present developments of the so-called “Information Physics”, developed by the physicist Wojciech Zurek [5] and others. This Information Physics developed in the first years of the 90’s have demonstrated that beyond the Law of Conservation of Energy there is a more fundamental Law of Conservation of Information.

In the process of developing a new Quantum Information Theory, Zurek propose that the **physical entropy** would be a combination of two magnitudes that compensate each other: the observer’s ignorance, measured by Shannon’s **statistical entropy**, and the disorder degree of the observed system, measured by the **algorithmic entropy** which is the smallest number of bits needed to register it in the memory. During the measurement, the observer’s ignorance is reduced, as a result of the increase in bit numbers in its memory, remaining, however, constant the sum of these two magnitudes, that is, the physical entropy.

In this context the equivalence/identity between order, negentropy and information, is the way that allows us to build upon and understand the whole irreducible and natural flow of order transmission in the universe, organized in a meaningful and intelligent informational mode. In the classical thermodynamic theory, the definition of order is probabilistic and dependent on the entropy concept, which measures the degree of disorder of a system, reducing to uncertainty the immense dimension of natural meanings. For Atlan [6,7], and for us, Di Biase [8,9,10,11,12], “*entropy shouldn’t be understood as a disorder measure, but much more as a measure of complexity*”. To make this, it is necessary to consider that information implies a certain ambiguity, meaning the bit capacity of a physical system as Shannon [13] put it, or the semantic content (meaning) conducted by the bits during a communication. In the information theory, the organization, the order expressed by the

amount of information in the system (Shannon's H function) is the information measure that is missing to us, the uncertainty about the system.

Relating this uncertainty, this ambiguity to the variety and the non-homogeneity of the system, Atlan [7] could solve certain logical paradoxes of self-organization and complexity, widening Shannon's theory and defining organization in a quantitatively formal mode. Atlan showed that the system's order corresponds to a commitment between the maximum informational content (i.e. the maximum variety) and the maximum redundancy, and showed also that the ambiguity can be described as a noise function, or even a time one, if we consider the time effects as related to the random factors accumulated by the environment's action. Such ambiguity, peculiar to biological self-organizing systems, can be manifested in a negative way ("*destructive ambiguity*") with the classical meaning of disorganizing effect, or in a positive way ("*autonomy producer ambiguity*") that acts by increasing the relative autonomy of a part of the system in relation to the others, reducing the system's natural redundancy and increasing its informational content.

Atlan developed this self-organizing theory of complexity for biological systems. Jantsch [14] has shown that cosmological evolution is also a self-organizing process, with the microevolution of the individual systems (holons) co-evolving towards macrosystemic collective structures better organized, with a big reduction in the amount of these collective systems. This whole self-organizing process represents, actually, a universal expression of a bigger acquisition of variety or informational content that is a consequence of a reduction of redundancy in the totality of the system.

Seager [15] states that consciousness, self-organization and information are connected at the level of semantic significance, not at the level of bit capacity, and that "*as the classical theory of information is situated at the level of "bit capacity" it would seem unable to provide the proper connection to consciousness*"...and "*we can begin to move towards a more radical view of the fundamental nature of consciousness with a move towards a more radical view of information*". Seager still reminds us that in the famous two-slit experiment, and in the quantum eraser experiment, what is at stake is not the bit capacity, but the semantically significant correlation of *information laden* distinct physical systems, in a non-causal mode.

3. Linking quantum information to consciousness and physics

Wheeler [16] realized how important information is in such context. With his genius, Wheeler describes an elegant **information-participatory universe** that is the most brilliant and fundamental model of interaction brain-mind and Cosmos ever described in the science of consciousness. With his famous "**the it from bit**" concept he unites quantum information theory to consciousness and physics:

...every it - every particle, every field of force, even the space-time continuum itself - derives its function, its very existence, entirely - even if in some contexts, indirectly - from the apparatus-elicited answers to yes-or-no questions, binary choices, bits". "It from bit symbolizes the idea that every item of the physical world has at bottom - at a very deep bottom, in most instances - an immaterial source and explanation; that which we call reality arises in the last analysis from the posing of yes-no question and the registering of

*equipment-evoked responses; in short, that all things physical are information-theoretic in origin and **this is a participatory universe.***

In the same paper Wheeler [16] gives the example of a photon being detected by a photodetector under watch, when we ask the yes-or-no question:

“Did the counter register a click during the specified second?”. If yes, we often say “a photon did it”. We know perfectly well that the photon existed neither before the emission nor after the detection. However, we also have to recognize that any talk of the photon “existing” during the intermediate period is only a blown-up version of the raw fact, a count. The yes or no that is recorded constitutes an unsplitable bit of information.

There is a cosmological version of Wheeler’s experiment with photons emitted by a distant double quasar that shows that photons interfere with each other not only when observed in the laboratory but also when emitted in the cosmos at huge intervals of time. A double quasar with its light-image deflected due to a gravitational lens made by a galaxy situated about one fourth of the distance from Earth was observed. The additional distance travelled by the photons deflected by this intervening galaxy was fifty thousand light years longer than those that came by the direct way. Although originating billions of years ago and arriving with an interval of fifty thousand years, the photons interfere with each other just as if they had been emitted seconds apart in the lab.

Wheeler developed this *it from bit* perspective studying the unification of quantum gravity theories in black holes and telling that we must understand quantum information as being more fundamental than energy, matter and space-time. This has relevance for consciousness studies as we see consciousness primarily as an informational system. As Doug Matzke [17] states:

[I]t requires the adoption of an energy/information duality for anything within accessible states, such as quantum states and consciousness. The seemingly paradoxical aspects of consciousness will become more understandable adopting this energy/information duality just as early in this century the particle/wave duality was insightful in understanding physics” ... “By understanding quantum states as an information system, the energy/information duality is exposed.

The corresponding nature of quantum spacetime supports non-local behaviors. Quantum information laws form a consistency network that creates all fields, particles and even spacetime itself. Even Einstein was wrong about the thinking of quantum mechanics as mere energy mechanics. Correctly labeling phenomena as information vs. energy will lead to clarity about paradoxical aspects of consciousness.

4. The Cosmic Informational Code

What self-organizes significantly the cosmic evolution is the relationship between the physical entropy and the universe’s non-local quantum-holographic informational content, through a process in which the complexity using the pre-existing informational content reaches each time higher organizational

levels and variety. The concept of quantum information as being more fundamental than energy, matter and space-time, is the foundation of a transdisciplinary holoinformational unified field theory of consciousness that connects “all that is above to all that is below”.

Complexity in the universe grows gradually, from gravity and nuclear powers in the **cosmosphere, with information stored in atomic-nuclear structures**. Intensifies with the emergence of the self-organizing macromolecular systems of the **biosphere, with information stored in the DNA molecules code**. And reaches an almost infinite antientropic state of complexity, variety and informational content with the emergence of the **noosphere and the mind code with information stored in neural networks**, and the **consciousphere the consciousness-universe interconnection code with information stored in quantum-holographic networks**. This universal distributed non-local quantum holographic information network connects our consciousness to the quantum-holographic cosmos. It is a non-local quantum informational unfolding, that self-organizes matter, life mind and consciousness in a meaningful way as we can see in the conceptual framework of the quantum holographic theory of the universe of David Bohm.

Such informational codes, this order that is transmitted in a meaningful and intelligent way through all levels of complexity of the universe, is the negentropic self-organization nature of the information-consciousness, an irreducible physical dimension of the cosmos as energy and matter.

5. Consciousness and Non-Locality

Adding to its equations a Quantum Potential that satisfies Schrödinger’s equation, that depends on the form but not on the amplitude of the wave function, David Bohm [18,19,20] developed a model in which the quantum potential, carries “*active information*” that “*guides*” the particle along its way. The quantum potential has inherited characteristics unknown up to then, because differently from the other nature’s forces, it is subtle in its form, and does not decay with the distance. Such interpretation allows communication between this “pilot wave” and the particle, to be processed in a higher speed than the light, unveiling the quantum paradox of non-locality [20], i.e., of the instantaneous causality, fundamental in our holoinformational view of consciousness.

For Bohm, differently from Bohr, the elementary particles do not have dual nature wave/particle but are particles all the time, and not only when observed. Actually, the particle originates from a global quantum field fluctuation, being its behavior determined by the quantum potential “*that carries information about the environment of the quantum particle and thus informs and affects its motion. Since the information in the potential is very detailed, the resulting trajectory is so extremely complex that it appears chaotic or indeterminist*” [21]. Any attempt of measuring particles properties, changes the quantum potential, destroying its information. As John Bell [22] observed, “*the De Broglie-Bohm’s idea seems... so natural and simple, to resolve the wave-particle, dilemma in such a clear and ordinary way, that it is a great mystery... that it was so generally ignored*”.

In the quantum-holographic theory, as Bohm [23] put it:

[T]he implicate order is a wave function, and the superimplicate order or superior informational field, is a function of the wave function, i.e. a superwave function that makes the implicate order non-linear organizing it in complex and relatively stable structures.

*Besides that, the holographic model as a way of organization of the implicate order was dependent upon the quantum informational potential field, that did not have capacity for self-organization and transmission of the information, essential for the understanding of the genesis and development of matter, life and consciousness. The superimplicate order fills this need, allowing the understanding of **consciousness**, energy and matter as expression varieties of a same informational order. As a result consciousness would already have been present since the beginning of creation in the various levels of nature's unfolding and enfolding.*

6. Organisms and Brains are Macroscopic Quantum Systems

In the living world non-local coherence is just present as in the quantum and in the cosmos scale. In living organisms the coordination of functions inside the organisms is ensured by quantum coherence as we can see in the instantaneous correlation between parts and molecules and also between the organism and the external milieu. This instantaneous quantum information transfer are observed in organic molecules in entangled quantum states, in quantum tunneling, in Bose-Einstein condensates, and in superradiance states occurring in brain structures as microtubules, synapses and the cerebrospinal fluid. According to Erwin Schrödinger in his seminal book *What is Life?* [24], in living organisms we must replace the concept of *mechanical order* that make order from disorder, by the notion of *dynamic order*, that produces order from order, from complex organization and information.

This difference between mechanical and dynamical order, according to Schrödinger was first proposed by Max Planck that already made this distinction in a little paper named *The Dynamical and Statistical type of Law*, as I show in Di Biase, *Auto-Organização em Sistemas Biológicos* [8]. That type of non-local informational order explains the living matter and is not based on mechanical molecular chance collisions and interactions, but in a system-wide correlations involving even distant parts that could not have time for mix in a mechanical process. This organic coherence is only possible through the mobilization of non-local information and energy far from thermodynamic equilibrium. Mae-Wan Ho [25] suggests the organism maintain itself in a negentropic state through the superposition of a non-dissipative cyclic process with entropy balance out of zero, and a dissipative irreversible process with entropy production greater than zero.

The cyclic non-dissipative loop coupling with the irreversible energy loop frees the living organism from immediate thermodynamic constraints. But how a self-organizing quantum mind can overlap quantum decoherence and maintain a persistent coherent state for a long time, at room temperature. Ho [25] has been demonstrating that:

Highly polarized multiple layers of liquid crystalline water molecules form dynamically coherent units with the macromolecules, enabling them to function as quantum molecular energy machines that transform and transfer energy with close to 100 percent efficiency. This liquid crystalline continuum of intimately associated polarized water and macromolecules extends throughout the extracellular matrix into the interior of every single cell, enabling each cell, ultimately each molecule, to intercommunicate with every other.

Dejan Rakovic [26], points out that:

Quantum-Holographic and Classically-Reduced Neural Networks can model psychosomatic functions: “The prevailing scientific paradigm considers information processing within the central nervous system as occurring through hierarchically organized and interconnected neural networks. However, it seems that this hierarchy of biological neural networks is going down sub-cellular cytoskeleton level, being according to some scientists a kind of interface between neural and quantum levels. At the same time it appeared, within the Feynman propagator version of the Schrödinger equation, that the quantum level is described by analogous mathematical formalism as Hopfield-like quantum-holographic associative neural network. The mentioned analogy opens additional fundamental question as to how the quantum parallel processing level gives rise to classical parallel processing level, which is a general problem of the relationship between quantum and classical levels within the quantum decoherence theory as well. The same question is closely related to the fundamental nature of consciousness, whose in-deterministic manifestations of free will and other holistic manifestations of consciousness like transitional states of consciousness, altered states of consciousness, and consciousness pervading body – necessarily imply that some manifestations of consciousness must have deeper quantum origin, with significant psychosomatic implications.

7. Quantum-holographic neuronal dynamics and classical neuronal computer network interconnection

It is very well established experimentally today that the molecules of chlorophyll responsible for the photosynthesis process that transforms light photons in chemical energy in plants, can do this with extraordinary efficiency, for about 750 femtoseconds, compared with 1 to 1.5 femtoseconds frequency of chemical-bond vibrations. This is due to the action of a protein called antenna protein that holds the chlorophyll molecule sustaining the quantum coherence state and suppressing decoherence, by reinducing coherence in decohering parts of the chlorophyll molecule [27]. This shows us that the capability to suppress decoherence at environment temperature is a common process in nature. So the capability to suppress quantum decoherence must be seen as a natural process in the wet brain, and we must work with the possibility that neurons and glia can sustain a quantum coherent state for milliseconds in the organized cellular complex molecular system full of proteins macromolecules, small molecules, ions and water.

It is well known that in the vicinity of these macromolecules there is ordered water, and that proteins with a cavity in its 3 D structure can hold one or a few water molecules by means of hydrogen bonds. Quantum chemical computation shows that these ordered water molecules within and between two proteins separated by 12 to 16 ångströms permits the occurrence of quantum coherent electron transfer [28]. This quantum coherence can propagate through non-local information transfer in the nervous system and in the body by quantum entanglement and superradiance. As biological self-organized systems these molecular systems have a huge structural and functional redundancy that facilitates the non-local interconnection of all parts.

8. In-formation in Self-Organizing Dissipative Structures

Ilya Prigogine [29,30] Nobel Prize winner, developed an extension of thermodynamics that shows how the second law can also allow the emergence of novel structures, and indicates the ways in which order can emerge from chaos. This type of self-organization generates dissipative structures that are created and maintained through the energy's exchanges with the environment in non-equilibrium conditions. These dissipative structures are dependent upon a new order, called by Prigogine "*order from fluctuations*", which corresponds to a "*giant fluctuation*" stabilized by the exchanges with the environment. In these self-organizing processes the structure is maintained through an energy-information dissipation that displaces itself, simultaneously generating (*in-forming*) the structure through a continuous process. The more complex the dissipative structure, the more information is needed to keep its interconnections, making it consequently more vulnerable to the internal fluctuations, which means a higher instability potential and higher reorganization possibilities. If fluctuations are small, the system accommodate them and does not change its organizational structure. If the fluctuations reach a critical size, however, they cause disequilibrium in the system, generating new intra-systemic interactions and reorganization. "*The old patterns interact between themselves in new ways, and establish new connections. The parts reorganize themselves in a new whole. The system reaches a higher order*" [29]. The brain is a dissipative self-organizing conscious quantum computer.

9. Consciousness Self-Organization and In-formation

Pribram [31,39-42] has demonstrated an analogy between the fields of distributed neural activity in the brain and the wave patterns in holograms. His neural network equation is similar to Schrödinger's wave equation of quantum physics with the addition of Bohm's quantum potential that guides by means of active information the particle alongside its course. As any elementary particle is united to the whole cosmos by means of a quantum active non-local information potential, capable of change the structure of the universe, information then can be understood as nature's fundamental process, as Stonier [32,33] put it. This "*active*" (Bohm) non-local in-formation that organizes the particle's world reveal that the whole nature is informational, organized in a meaningful way. In the brain, this informational process is non-local quantum holistic based in quantum-holographic neural network fields, and at the same time local classical Newtonian and mechanistic, based in classical neural networks. So, as Di Biase [11] has been demonstrating in the last years it is a holoinformational field (nonlocal and local).

This view is crucial to understand the holoinformational nature of consciousness and intelligence in the universe [12]. Matter, life and consciousness are meaningful activities, intelligent quantum-informational processes, order transmitted through the cosmic evolution, originated from a generating non-local informational field beyond our perception limits.

A universe *plenum* of non-local quantum potential in-formation with meaning (active information) is an intelligent universe *functioning like a mind*, as Sir James Jeans already had observed. So, as consciousness has always been present in all nature's levels of organization, matter, life and consciousness cannot be considered as separated entities, capable of being analyzed under a fragmentary Cartesian-Newtonian framework. Actually, **consciousness must be considered a fundamental property of the universe** [12] like information, energy, matter, and space-time and must be seen as an irreducible quantum non-local information distributed in a holistic cosmic way, and

simultaneously by local Newtonian mechanistic relationships, generating self-organization, complexity, intelligence and evolution.

Such view of a holoinformational intelligent “continuum”, a fundamental generating order with a quantum-holographic informational creative flow permeating the whole cosmos, permits to understand the basic nature of the universe as an intelligent self-organizing unbroken wholeness. A kind of cosmic consciousness unfolding in an infinite holoarchy. As a quantum-holographic system this universal consciousness is distributed in every part of the cosmosphere, and our quantum-holographic mind as part of this holographically distributed system contains the active information of the whole indivisible cosmos [Di Biase, 9,10].

10. Eccles Interactive Dualism and Pribram’s Monism

Sir John Eccles [35-38] described in the brain fine fibers structures he called dendrons composed of pre-synaptic teledendrons, synapses and post-synaptic dendrites connections, that he postulated could interact with the mind side of the interaction by way of units he called psychons. He proposed that these psychons could operate on synapses through quantum processes, and with Beck [34] developed a beautiful and logical quantum interpretation of the synaptic function. Pribram [31,39,40] demonstrated that Eccles' dendrons make up receptive fields in cortical sensory units, that:

[A]s sensory receptive fields they can be mapped in terms of wavelets, or wavelet-like patterns such as Gabor Elementary Functions. Dennis Gabor (1946) called these units Quanta of Information. The reason for this name is that Gabor used the same mathematics to describe his units as had Heisenberg in describing the units of quantum microphysics. Here they define the unity structure of processes occurring in the material brain. However, Gabor invented his function, not to describe brain processes, but to find the maximum compressibility of a telephone message that could be sent over the Atlantic Cable without destroying its intelligibility. The Gabor function thus describes both a unit of brain processing and a unit of communication. Brain is material, communication is mental. The same mathematical formulation describes both. The elementary structure of processing in Eccles' material dendron is identical to the elementary structure of processing of a mental (communication) psychon. There is a structural identity to the dual interactive process.

Pribram [43,44,45] proposes a monistic basis for Eccles dualism, showing that “there is a interactive mind/matter duality that is a “ground” from which both matter and mind are “formed” and the “dual” emerges. That ground functions as a potential reality similar to Heisenberg potential world. “This flux provides the ontological roots from which our experience regarding matter as well as mind (psychological processing) itself become actualized in spacetime”. To illuminate this claim, Pribram relates the following story:

Once, Eugene Wigner remarked that in quantum physics we no longer have observables (invariants) but only observations. Tongue in cheek I asked whether that meant that quantum physics is really psychology, expecting a gruff reply to my sassiness. Instead, Wigner beamed a happy smile of understanding and replied, “yes, yes, that's exactly correct”. If indeed one wants to take the reductive path, one ends up with psychology, not particles. In fact, it is a psychological process, mathematics, that describes the relationships that organize matter. In

a non-trivial sense current physics is rooted in both matter and mind. Communication depends on being embodied, instantiated in some sort of material medium. This convergence of matter on mind, and of mind on matter, gives credence to their common ontological root. My claim is that this root, though constrained by measures in spacetime, needs a more fundamental order, a potential order that underlies and transcends spacetime. The spectral basis of both matter and communication portrayed by the Fourier relationship delineate this claim.

As the brain has the capacity of function in the holographic non-local mode as in the space-temporal local mode, we think that we are dealing here with Bohr's concept of complementarity in the quantum functioning of the central nervous system.

The holonomic brain theory of Pribram [31] and the holographic quantum theory of Bohm, added with Laszlo's *akashic field* [2], shows that we are part of something much more wider than our individual mind. Our mind is a subsystem of a universal hologram, accessing and interpreting this holographic universe. We are fractal-like holographic harmonic systems interacting continuously with this unbroken self-organizing wholeness. We are this holoinformational field of consciousness, and not observers external to it. The external observer's perspective made us lose the sense and the feeling of unity or supreme identity, generating the immense difficulties we have in understanding that we are one with the whole and not part of it.

In this holoinformational model of consciousness the non-local quantum-informational flow in a continuous holomovement of expansion and enfoldment between the brain and the implicate order, is the universal consciousness self-organizing itself as human mind. This non-local quantum-holographic Cosmic Consciousness manifest itself through our mind, seeing itself through our eyes and our consciousness, interconnecting in a participatory holistic and indivisible way the human brain to all levels of the self-organizing multiverse[45].

11. Quantum Brain Dynamics

Experimental research developed by Pribram [31] and other consciousness researchers like Hameroff [46] and Penrose [47], Jibu and Yassue [48,49], and Ho [25] confirm the existence of a Quantum Brain Dynamics in neural microtubules, in synapses and in the molecular organization of the cerebrospinal fluid, and in the intracellular medium matrix. This Quantum Brain Dynamics can generate Bose-Einstein condensates and the Fröhlich effect. Bose-Einstein condensates consist of atomic particles, or in the case of the Fröhlich effect of biological molecules, that can assume a high level of coherent alignment, functioning as a highly ordered and unified informational state, as seen in lasers and superconductivity. Also Sir John Eccles's psychons [38] operate on synapses by way of quantum coherence processes. These quantum dynamics show us that the interaction process between what Eccles calls dendrons (the brain side) and psychons (the mind side) are not limited to the synaptic cleft, as stated by him, but have a much wider embodiment throughout the whole brain.

Pribram [31,44] demonstrates good evidence that Eccles's dendrons make up receptive fields in cortical sensory units. Dendrons are composed of pre-synaptic teledendrons, synapses and post-synaptic dendrites, and they compose the fine fiber structure wherein brain processing occurs. As Pribram states [44]:

[A]s sensory generated receptive fields they can be mapped in terms of wavelets, or wavelet-like patterns such as Gabor Elementary Functions. Dennis Gabor (1946) called these units Quanta of Information. The reason for this name is that Gabor used the same mathematics to describe his units as had Heisenberg in describing the units of quantum microphysics. Here they define the unit structure of processes occurring in the material brain”.

I see the quantum holographic interactions between brain and cosmos as a natural extension [10,11,12] of Eccles ideas of an interactionism between dendrons and psychons.

Jibu and Yasue [49] studies on quantum brain dynamics with Umesawa also shows that:

[B]rain dynamics consists of quantum brain dynamics (i.e. quantum mode) and classical brain dynamics (i.e. classical mode), and that “quantum brain dynamics is the fundamental process of the brain given by quantum field dynamics of the molecular vibrational fields of water molecules and biomolecules.

According to Jibu and Yasue [49], Umesawa introduced in quantum brain dynamics the notion that “*the quanta of the molecular vibrational field of biomolecules are corticons, and the quanta of the molecular vibrational field of water molecules are exchange bosons.*”

Quantum coherence can propagate through these vibrational fields of biomolecules and water molecules by non-local information transfer, quantum entanglement and superradiance.

The dissipative quantum model in the brain is the extension to the dissipative dynamics of the many-body model proposed in 1967 by Ricciardi and Umezawa[50,51]. The extended patterns of neuronal excitations may be described by the spontaneous breakdown of symmetry formalism of Quantum Field Theory.

Umezawa states that “In any material in condensed matter physics any particular information is carried by certain ordered pattern maintained by certain long range correlation mediated by massless quanta. It looked to me that this is the only way to memorize some information; memory is a printed pattern of order supported by long range correlations...”

As these biomolecular systems are self-organized systems, they have a huge structural and functional redundance, and this creates a quasi-cristaline medium that facilitates the interconnection of the molecular quantum computer networks dynamics with the neuronal classical computer network, i.e. a holoinformational field.

12. The Quantization of Mind

Amoroso [52,53,54] in his Noetic Field Theory, an extension of the De Broglie-Bohm interpretation of quantum theory, has managed to solve the mind-body problem in a comprehensive and empirically testable manner. While ‘qualia’ has remained a philosophical construct in cognitive theory, Amoroso’s Noetic Field Theory: The Quantization of Mind (NFT) has actually physicalized the basis of qualia breaking down the 1st person-3rd person barrier.

Being able to physically quantify qualia led him to develop a formal model of Eccles' psychon, in a similar fashion of the creation of the unit of measure called 'the Einstein' signifying a mole or Avogadro's number of photons used in photosynthesis. Amoroso has created a unit of measure called 'the Psychon' in honor of Nobelist Sir John C. Eccles that quantifies the energy of qualia or measures the energy of awareness .

In this NFT a unified field theory of mind-body interaction, Amoroso says that:

[L]ife is based on the unified field of physics and is a physical real aspect of the unified field. This removes the main stigma of Cartesian dualism that res cogitans violates the laws of thermodynamics and the conservation of energy. In NFT the ordering principle of the Unified Field is not a 5th fundamental force of physics; rather it is a 'force of coherence' applied ontologically (rather than phenomenologically which requires the exchange of energy by quanta transfer) by what is called topological switching.

Amoroso proposes the existence of three regimes to reality: Classical, Quantum and Unified, and states that:

[I]t is in this new 3rd regime that access to the principles of the mind resides. Just as Quantum Mechanics was invisible to the tools of Newtonian Mechanics, so until now has the regime of the unified field been invisible to the tools of quantum mechanics [53].

For him in this 3rd physical regime exists a 'life principle' that interacts with the brain/body forming a self-organized living system. The developing of the Noetic Field Theory required a whole new **Holographic Anthropic Multiverse Cosmology**, title of a Amoroso book co-authored with Elizabeth Rauscher [52] to introduce this essential component absent from Big Bang cosmology:

Essentially NFT's description of the 'mind gate' requires violation of the quantum uncertainty principle [54]. Uncertainty is saw as being the shield 'hiding' the 3rd regime. Related to the uncertainty principle is the zero-point field (ZPF) where virtual quantum particles wink in and out of existence momentarily for a duration of the Planck time (as governed by the uncertainty principle). The 1st component of the gate he developed is called an 'exciplex', short for excited complex - meaning it stays excited and never returns to zero as the ZPF does in terms of the exclusion principle of the Copenhagen Interpretation of quantum theory. Operation of the exciplex gate requires Large-Scale Extra Dimensions that includes an oscillating form of Planck's constant, fluctuating from the continuous-state asymptotic virtual Planck scale (never reached) of the usual theory to the Larmor radius of the hydrogen atom. This is part of the process in which the exciplex gating mechanism violates the quantum uncertainty principle [54] utilizing Large-Scale Extra Dimensions in a continuous-state process such that the gate is only periodically open - cycling like a holophote or lighthouse beacon into each point and atom in spacetime.

For Amoroso, the Unified Field, *UF* is not a 5th force per se, and is also not phenomenological as:

[F]orces are mediated by the exchange of energy transferred by quanta, i.e. the EM field is mediated by the photon[;] [t]he UF does imply force, however it is an ontological or energyless 'force of coherence.

I see Amoroso's Unified Field as **in-formation with a status like energy, matter and space-time**, I described elsewhere in this paper. Amoroso says that this in-formation "is transferred by a process called 'topological switching', and that "this is what occurs when staring at a Necker cube and the vertices change position".

In Amoroso's theory, There is a *super quantum potential' of the unified field, that arises from NFT use of Large-Scale Extra Dimensions extension of the de Broglie-Bohm interpretation of quantum theory. Recall that in their theory quantum evolution is continuous and guided. Thus in terms of NFT one would say that the quantum potential/pilot wave are a subset of the action of the unified field*

Observed (virtual) 3D reality arises from the infinite potentia of 12D space, as a 'standing-wave-like' (advanced-retarded future-past) mirror symmetric model. Realize that the standing-wave of reality is hyperdimensional. NFT is related to a unique M-Theoretic model of 'Continuous-State' UF dynamics, and its putative exchange quanta of the UF is called the noeon".

Amoroso proposes as an essential part of this "continuous-state anthropic multiverse cosmology" that "our observed reality is closed and finite in time as a 'Poincare-Dodecahedral Space' at the cosmological scale and as a 'virtual Euclidean cube' at the microscopic".

13. Nature, Information and Consciousness

In my conjecture the interconnectedness between brain and cosmos is an instantaneous holistic nonlocal quantum connection and I proposed the concept of a holoinformational flux, from which both mind and matter are in-formed, that resembles Bohm's holomovement. But in this new concept, the quantum holographic brain dynamic patterns are conceived as an active part of the universal quantum-holographic informational field, and capable of generating an informational interconnection that is simultaneously nonlocal quantum-holistic (mind-cosmos holographic connection), and local Newtonian-mechanistic (brain-mind neural networks connections), i.e., holoinformational.

Taking in consideration the basic mathematical property of holographic systems in which the information of the whole system is distributed in each part of the system, plus Bohm's holographic quantum physics data, and the experimental data of the holonomic theory of Pribram, we propose that this universal interconnectedness could permit us to access all the information coded in the wave interference patterns existing in all the universe since its origin.

Each part of the universe, each brain-mind-consciousness, interconnects with all the quantum information stored in the holographic patterns distributed in the whole cosmos, in an indivisible irreducible informational cosmic unity.

The beautiful buddhist metaphor of Indra's Net of the Avatamsaka Sutra, reflects in its poetry this holoinformational nature of the universe:

Far away in the heavenly abode of the great god Indra, there is a wonderful net which has been hung by some cunning artificer in such a manner that it stretches out indefinitely in all directions. In accordance with the extravagant tastes of deities, the artificer has hung a single glittering jewel at the net's every node, and since the net itself is infinite in dimension, the jewels are infinite in number. There hang the jewels, glittering like stars of the first magnitude, a wonderful sight to behold. If we now arbitrarily select one of these jewels for inspection and look closely at it, we will discover that in its polished surface there are reflected all the other jewels in the net, infinite in number. Not only that, but each of the jewels reflected in this one jewel is also reflecting all the other jewel, so that the process of reflection is infinite.

According to Francis Cook [55] this metaphor “show a Cosmos with an infinite interrelation between all parts, every one defining and maintaining all others. The Cosmos is a self-referent self-maintaining and self-creator organism. It's also non-teleological, because don't exist a beginning of time, nor a concept of creator, nor a questioning about the purpose of all. The universe is conceived as a gift, without hierarchy: It has not a center, or maybe if exists one, it is in every place.”

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