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Consciousness - Holomatrix – Quantized Dimensional Mechanics

ISTVÁN DIENES

10.1 Introduction

The present chapter after articulating a simple postulate of consciousness attempts to formulate a new unifying concept, called the Consciousness-Holomatrix Principle¹ (CHM), which may shed light on the nature of reality as a complex self-organized system and the dynamics of the principle of self-awareness. This could help formulate a more refined definition of those systems, and give insight to the current issue of mind/matter duality in both living systems and reality as a whole.

Understanding the nature of consciousness is an age-old problem; recently it has become a leading edge research area. The problem of consciousness is fundamentally important for science as a whole, especially from an epistemological point of view, where the true nature and functioning of the observer is critical because all of science is based on observation. With the advancement of quantum theory this critical issue could no longer be ignored, because the problem of quantum measurement requires that a clear definition of the observer be incorporated into the description of reality as an observed phenomenon.

The new CHM postulate will be utilized in an attempt to unify all the different approaches to the problem of consciousness. First a simple definition of consciousness will be given to show how the CHM principle can be unfolded from it.

10.2 Postulating Consciousness and the Consciousness-Holomatrix

Postulate 1: Consciousness is that which is conscious of itself, which is able to self-interact with or self-observe itself. Every physical system, which exhibits the ability of self-observation or self-interaction, is a conscious system. Because of this quality of self-observation and self-interaction, every conscious system consists of three basic components: *observer*, *observed* and *the process of observation* forming a *three-fold* structure [1-3].

This subject/object duality is the well-known mind/matter problem. Development of the CHM principle, from *postulate 1*, aims to solve this paradoxical duality.

The self-observation three-fold structure of the Consciousness-Holomatrix principle (CHM) means the observer becomes the object of observation by going through a transformation changing its original state, which is sensed by the system because the process of self-observation is topologically closed, that is recursive or self looping. This is a well known hierarchical property of self-organization [4]. Since the whole system transforms, the total information is preserved. Quantum Theory suggests reality and the matter of our nervous system is the manifestation of interacting quantum fields. From this point of view, the nervous system is an interaction space between objective and subjective qualities and quantities.

Entangled quantum fields, because of their ability to self-interact, by the first postulate are consciousness fields, where self-interaction might be expressed by the relativistic field called second quantization [1,2]. Consequently, if we apply the S-matrix approach² to the interacting quantum fields to the brain, then the interaction will involve exchanging information or cognitive and objective quantities. Following Huygens's principle or the Feynman path integral, Fourier analysis of the S-matrix of interaction could be seen as a hologram of the interacting quantities. This can be modelled by the absorber/emitter or transactional approach to quantum field interactions [5,6], to form a basis for quantum holography defined by harmonic analysis on the Heisenberg nilpotent G Lie group and Lie algebra represented by a null-manifold. Here G represents the non-commutative group of symmetries for the unitary dual of G for wavelets generated by phase coherence under Fourier transform F [7]. Consequently the CHM principle could generalize the above mentioned interactions of objective and subjective quantities.

From this point of view the CHM is a universal Gabor filter, a hologram of the Fourier transformation process. Since we formally express this structure by a matrix with the Lie generators of the process as its elements, the holographic and matrix features together define the unifying holomatrix concept¹ and CHM principle. All these concepts are also ingredients of Pribram's holographic brain theory. The above mentioned holographic concept has been generalized in the *CFT/AdS* correspondence formulated by Maldacena [8] stating that an n dimensional bulk space (*AdS* in his case) and its structures are holographically coded on its $n-1$ dimensional surface (*CFT* structure in his case), so all information about higher dimensional space could be regained from the surface structure. Here the holographic phenomenon occurs by moving the operator of the bulk space to the boundary, which through this process projects back the original

space. This implies a dimensional reduction phenomenon inherent in holographic processes and likewise in our CHM principle.

The remaining step is to show the relation of the three fundamental qualities of consciousness to the CHM as an S-matrix of conscious / objective interactions. In the quantum field description of many particle systems the phase space of the interaction is described by tensor products of Hilbert spaces, which forms a functional, or Fock space. The time evolution of the particles are described in this infinite dimensional space, where the basis of the space, which acts as the reference system of the dynamics, is formed by the eigenstates of the N particle operator expressed by the creation and annihilation operators. By functioning as a reference system of the process this basis could be seen as the *observer* in the phenomenon. The *process of observation* is the S-matrix functioning as the operator of the process, and the *observed* are the state vectors of the different particles called *observables* [2]. This structure, because of its matrix algebra form, could readily be translated into logical quantities, for describing the targeted mind/matter interactions. So, by postulating the CHM principle we define a group or Category Theory-like organising structure through which the fundamental mathematical and physical concepts of the conscious property of a complex physical system could be expressed [9,10].

10.3 CHM Logic Organizing Matrix – Quantized Dimensional Mechanics

From the previous discussion, describing the subject/object interaction as an S-matrix means a transformation of information/logical quantities into material ones. So the objective experiences of reality, as cognitive quantities, will form a logical structure and will go through logical transformations in the mind. In reverse informational / logical quantities transform to objective, material structures or particles. Then the following question arises - is it possible to describe logical interactions and structures with the same formal language used to describe material creation as interacting quantum fields? Is there a more general, more comprehensive “operator logic”, which could exhibit the same matrix algebra structures used in field theories? This could make it possible to reduce any kind of logical interaction to numerical and polynomial functions? An answer is found in August Stern’s *matrix logic* which is able to unify different logical systems (fuzzy, scalar, probability, and quantum) [11,12]. To achieve this Stern introduces novel concepts in matrix logic that are complex mathematical objects - logic vectors and logic operators, joined eventually into the more general concept of a logic tensor.

Introducing the concept of logic space and interpreting logic connectives as matrix operators acting in two adjoint spaces of logic vectors allows us to describe logical transformations as operations of symmetry in logic space, where

tautologies or universal truths could be seen as invariant quantities of logical transformations. A fundamental result of matrix logic is the possibility of direct interaction of logic connectives. Inconceivable in conventional logic, the interaction of connectives introduces a higher level of abstraction, where the non-commutative nature of matrix products will allow self-interaction to treat logic space as a conscious quantum field. In this way matrix logic makes it possible to mathematically describe the CHM principle and extend it as an organising process beyond current physical limits to include other knowledge gaining sciences, since all knowledge, whether gained through objective or subjective means, is based on the cognitive processes of the conscious mind.

The matrix operator formulation of logic has not only greatly enhanced the computational power of logic, it also provides compelling reasons to view logic not as an abstract construct but as a fundamental structure underlying real physical interactions, which as such has to be included in the general system of the covariant laws of nature (till the invention of matrix logic quantum logic inadequately performed this task). Since matrix logic permits logical processes to be defined with mathematics similar to the description of fundamental processes, we seek a unified synthesis of logical and physical methods where it is possible to achieve the logical description of physical processes and vice versa. Indeed, from the point of view of matrix operator logic the different matrix algebra structures could be seen as quantum field interactions of matter as well as the logical transformations of the mind!

According to Stern's innovations, the answer to this apparent paradox of duality between the two structures can be found in topology. If we describe self-interaction or the observational nature of logical space with a closed non-orientable topological manifold (like a Möbius strip), then we get a superposition of the two seemingly different descriptions, where the topological twisting makes it possible to convert subjective and objective quantities into each other. As a consequence, the topological transformation of logical structures and its invariant topological quantities could be dually linked or mapped to the conformally invariant Noether or gauge particles of quantum field theories. In this way logical or noetic "particles" could be seen as topological domains, where energy excitation levels of the particles express the logical complexity of the given system, which appears as a topological energy of the field manifested by the knottedness of the field lines – called topological braiding [12]. Furthermore, by describing the "matter" and "conscious logical" degrees of freedom as a density matrix, off-diagonal elements will be non zero (real) [6], which means that the conscious brain is able to perform measurement ontologically without wave function collapse - a fundamental feature of measuring devices exhibiting closed topology.

In a measuring system like this the question which part measures (*observer*) and which part is measured (*observed*) loses its meaning, and the states of the system are simultaneously the statements of it, as well! Logical or thought-like quantities are non-Hermitian, and the matter-like quantities Hermitian operators. To fully describe the brain as a material, and consciousness as a logical structure we need complex and hyper-complex numbers, where imaginary sections will relate to consciousness, and real numbers to material degrees of freedom. The topological transformation is a shift between imaginary and real domains described in complex spacetime by a super luminal or tachyon-like transformation [13].

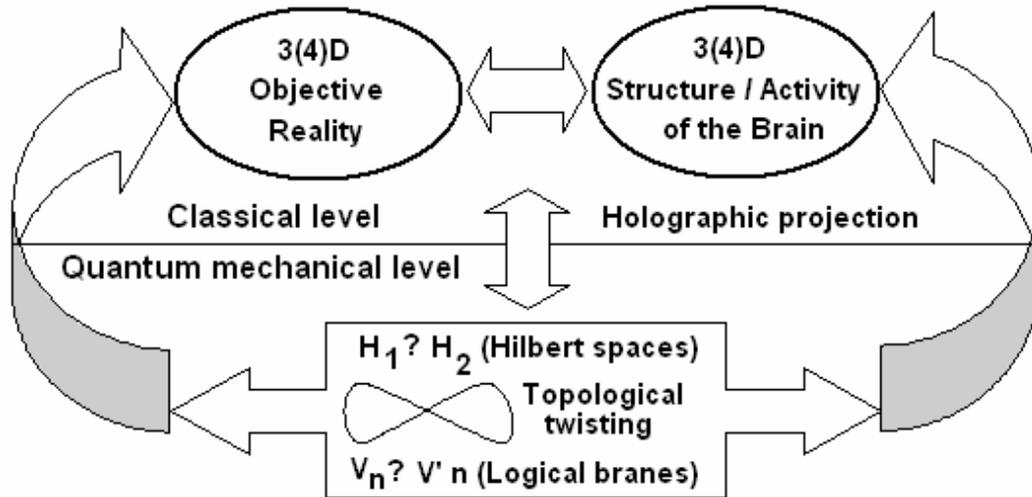
The topological energy / energyless concept could relate to the Eccles psychon [14], and Amoroso's noetic *élan vital* postulate [15], both of which could gain a formal quantitatively detailed description in topo(logical) matrix logic formulation. In this way the neuronal or geometrical activities of brain matter are dual representations of the topo(logical) activities of the conscious logical mind, which means mapping of the 2-dimensional logical space to the 2-dimensional spinor field or lattice of quantum theory. So topological action – *élan vital* – will create an observable dual action in the spinor field. The dual symmetry of the two formal structures is closely related to M-theory, the five different dualities of string theory.

Consequently, the physics of consciousness could be defined as the interactions of the different information/logical structures in the mind – which we call a Quantized Dimensional Mechanics – where the different logical structures are carried by *L-branes*, which are extended objects of the volume of mind-space defined by the matrix operator products of the different logical operators. This mind volume formally parallels Amoroso's noetic space [15,16], and the noetic field equations derived from it, as well as the modern topological quantum field theories, where the holographic principle applies, and into which the logical membrane could be embedded.

Quantized Dimensional Mechanics as a physical process of brane interactions could help to advance the geometrical Langlands program, (headed by Edward Witten) where operators map one brane to another [17]. Consequently, the problem of finding the operator eigenbrane by tensoring the brane with a constant vector field, could be applied to logical vector space and L-branes, where bringing the operator to the boundary yields back the brane itself. This nothing more than self-interaction through boundary reduced holography we call the CHM principle, formally expressed as: $\mathbf{V}_L \otimes B_L = B_L$, where \mathbf{V}_L represents logical vector space, and B_L the logical brane [17]. The appearance of T-duality linked electric and magnetic eigenbranes express topological and Noether charges and could shed more light on resolving the Langlands program.

The holographic and fractal organisation of logical space could also be seen in the formally expressed self-interaction of logic space: $\Omega \cdot \Omega = \text{Tr } \Omega \cdot \Omega$, where Ω denotes the logic space. The Ω logic space manifest itself in dual roles as an operator – called the Universum operator of logic space – an eigenstate matrix in matrix vector space [11]! The auto- or self-interaction causes logic space to contract and because this contraction is spread evenly through the logic space, Ω is an eigenstate with respect to itself, manifesting again the CHM principle. This self-contraction, as a result of continuous self-interaction, ends with the empty operator 0, regaining the whole space holographically, forming the boundary manifold of logic space. This process is a kind of algebraic holography leading to a new definition of the geometrical point as an object with inner dimensions. Since all the elements of observed reality are cognitive quantities projected down on the vector logical space, which through self-observation or interaction will cause self-organisation and self-analysis on its own nature, so this organising principle will penetrate all the layers of reality formally revealing the existence of our CHM postulate.

The topological relationship between the 2-dimensional matrix logical space and spinor fields, where the interacting structure of the later is the holographic recording or projection of the former, could be linked to the modern spin resonance or MRI techniques which utilize the principle of quantum holography. The geometric brain and its refined quantum processes are holographic-like representations of the fundamental topological conscious field interactions (fig. 10.1).



Generalisation of this process will produce artificial quantum holograms and create structures whereby phase locking or self-looping interactions will create the

closed topology enabling the system to manifest the logical or topological energy. Amoroso envisioned a possible experimental set up for this process in his conscious quantum computer design, which could enable us to practically utilise the CHM dynamics [13,18].

10.4 CHM Dimension Reduction Process, Algebraic Atman = Brahman

Counting the dimensional degrees of freedom involved in the CHM process through non mathematical restrictions in Vedic science, shows how logical inquiry finally leads to the same cognitions about reality whether we follow the subjective (Vedic) or objective (scientific) path to knowledge. In Vedic science the different layers of creation are: the five sensory channels transferring information to the mind, cognised by the intellect with feelings and sensed as our individual ego embedded in the universal consciousness, which is the ultimate observer of the whole [19]. Counting layers gives 10 degrees of freedom ($5+1+1+1+1+1 = 10$), which equals the dimensions postulated by string theory. Adding a time dimension gives the 11 dimensions of M-theory and the unified field the 12 dimensions of F-theory.

Holographic dimensional reduction compactifies these dimensions giving the singularity of the ego and an interesting problem. If we view the singularity of the ego as a geometric point, manifested by the holographic reduction process, the ego singularity records all the information carried by higher ones, consequently it should have inner structure. In short, instead of having a null-dimension, a geometrical point should also have dimensional structure as is the case in string theory. This could be described as an orthogonal nullvector space, formed from the eigenstates of the empty operator 0 mentioned above. In this way zero becomes an extended object or zero-brane. Fortunately this phenomenon is well known in complex Clifford bundles. To create the correct complex vector bundle we modify \mathbb{C}^2 to make different fibres (great circles) disjoint, with no common origin. To achieve this we replace the origin by a copy of the entire Riemann sphere, so that instead of having just one zero, we have a whole Riemann sphere's worth of zeros, one for each fibre, giving the zero section of the bundle. This procedure is known as *blowing up* the origin of \mathbb{C}^2 .

Since zero is now allowed on the fibres, continuous cross-sections of the bundle exist. These cross-sections represent the spinor fields on S^2 giving a 2-complex-dimensional vector space, which can be mapped to the 2-dimensional logic space of matrix logic. Following this reasoning we could use this blown up zero, as a basis space, for Stern's denktor (gedanken or thinking vector) concept denoted by a $| \rangle$ sign [12]. Stern's denktor represents the final abstraction level denoting a direction in nothingness, functioning as a template function for vector

spaces. Indeed we could say that the Riemann sphere of zeros (as its Σ surface) are the boundary of nothingness generated by the template vector. Interestingly, with the denktor we are bale to generate the basic concepts or categories of mathematics, which we could call meta-mathematics, in the following way:

$$\begin{aligned} \text{Tr} | \rangle \langle | = \langle | \rangle = 0 = \{ \{ \} \} = B \subset T, \quad \text{Tr} R t = 1 = \| \| \rangle \langle \| \|, \\ | \rangle \langle | = \mathbf{0} \Rightarrow \Sigma_{\text{Riemann}} \Rightarrow \text{Clifford bundle.} \end{aligned}$$

where B denotes the trivial basis of a topological space T , and Rt is the retrace operation defined in matrix logic. This sequence of symbols actually shows the unity of mathematical concepts in the holographic dimensional reduction concept of CHM.

From the point of view of category theory [9,10] the denktor could define a new forgetful functor, which forgets the elements of the given category and memorises the structure, represented by the symbols, which could be called the unmanifest logical holomatrix or transcendental mind. By making a composition functor from the two and making an automorphic mapping on a category we could define a holographic self-interaction and self-projection, which simultaneously memorises the element and structure concepts in nothingness, and is able to project them out again. Since the trace of nothingness could define the trivial basis of topological spaces, this structure is a topological condensate or ground state of the logical energy mentioned previously. Physically this is the vacuum state of the unified field, where vacuum fluctuations carry this topo(logical) energy. Twistor theory could link the trace of nothingness to the null projective twistor [20]: $\text{Tr} | \rangle \langle | = \langle | \rangle = 0 = Z^e \bar{Z}_e$, representing a light ray at infinity in spacetime. This ground topological energy could be seen as coherent Bose-Einstein condensates. Self-interaction phase modulates this bulk light, which memorises itself in the form of interference patterns on the bulk surface giving rise to the primordial holomatrix of the universal mind. This modulation occurs because the bulk with its own memory as a matrix operator behaves like a nonlinear optical medium. The logical potential carrying the logical energy could be linked to the Bohr energy of atomic structures in the following way: $\infty(k) = \oint \mathbf{M} dq = 2\pi(n+1/2) = k\pi$, where q is a logical variable (if it is zero than the contour integral runs a full great circle on the zero Σ), n is the winding number specifying the numbers of times the closed curve runs round in an anticlockwise sense, and $\mathbf{M} = \sqrt{0}$ is the logical momentum operator satisfying the commutation relation $(q, \mathbf{M}) = 1$. When n runs the bosonic numbers and $(n + 1/2)$ the fermionic numbers. The topological potential is an odd multiple $\pi = (2n + 1)\pi$ of the elemental topological phase π and is \hbar^{-1} times the Bohr energy of the quantum

oscillator: $\oint \mathbf{p}dx = 2\pi\hbar(n+1/2)$, where the position and momentum operator satisfy the standard quantum commutation relation: $[x, p] = i\hbar$. As we see, the topological potential, multiplied by the factor \hbar , gives the Bohr quantum energy opening up the possibility to treat atomic structure as a dynamical logic in a fundamental sense, where quantization stems from the closed topology or self-observation feature at this fundamental level of reality. Another interesting conjecture which follows is, since matter, as energy, ($E = mc^2$) is a topologically transformed logical energy, the mass of an object is basically the information contained in the holomatrix which projects it out from the ground state. Accordingly, it wouldn't be surprising if quantum gravity researches culminated in the discovery of the holographic principle.

Now we can see how the fundamental duality between mind and matter arises, since the physical brain is actually the logical brain, multiplied by the quantum of action \hbar [12]! The continuous self-interaction increases the phase modulation giving rise to greater separation of the two sections of the original unified consciousness structure manifesting the above mentioned layers and their realities as logical eigenbranes, forming an endless pulsation of the CHM dimension reduction projection process expressed by the $\text{TrRt} = 1$ identity equation in topological matrix logic called *quantized dimensional mechanics*.

The same is true in algebraic geometry, expressed as algebraic holography. According to this postulate an infinite number of infinite rationals could exist like real units ($M/N = 1$) so that spacetime points could be infinitely rich Hermitian quantities. Infinite integers would correspond to positive energy many particle states (gauge particles) and their inverses (infinitesimals with number theoretic structure) to negative energy many particles (logical particles) and $M/N = 1$ would be a counterpart of a zero energy ontology to which oneness and emptiness are assigned in Vedic science. This means that a single spacetime point, usually regarded as a dimensionless irreducible mathematical structure, would take the role of a Platonia of mathematical and physical ideas able to represent in its number structure the quantum state of the entire Universe. Algebraic Atman (individual self) = Brahman (Cosmic self) identity and algebraic holography would be realised in a rather literal sense [21]!

The ability of a number to compactly represent totality is expressed in Vedic mathematics by drawing a circle around the integer [22], called the absolute number. $\textcircled{0}$ $\textcircled{1}$...etc. With the pumped zero Riemann sphere in mind, as the ultimate self-sustained holographic concept memorizer and generator, the Vedic symbolic representation gains a fundamental status. With this symbolic expression we are able to simply express the fact that every concept is at the same time its own holographic operator originating from the empty operator of Vedic nothingness or Heisenberg Potentia.

10.5 End Note

Finally I would like to cite an ancient Vedic hymn [23], which expresses all that has been said so far, showing that nothing new has been discovered, since “there is nothing new under the Sun”!

Richo Ak-share parame vyoman yasmin deva adhi vishve nisheduh, yastanna veda kim richa karishyati ya it tad vidus ta ime samasate.

The Richas (sounds, verses) of the Ved (knowledge) are generated by the collapse of unity within itself, in which reside all the dynamical impulses of natural law responsible for the whole manifest universe. He whose awareness is not open to this field, what can the sounds of the Ved accomplish for him? Those who know this level of consciousness are established in unity, wholeness of life.

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NOTES

¹ The term holomatrix is used in a context similar to that used in the *Star-Trek* Sci-Fi series which helped inspire this author to develop the concept theoretically.

² S-Matrix Theory (‘S’ is for scattering or ‘Strahlung’ - radiation) as developed by Geoffrey Chew relates a final state in the infinite future with an initial state in the infinite past; the S-matrix is defined as the unitary matrix connecting asymptotic particle states in Hilbert space.

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