MIND AS A VIRTUAL PHASE-CONJUGATED HOLOGRAM

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ABSTRACT: Because of its superior information processing capability, previous authors have proposed that phase conjugation holography offers a feasible mechanism to explain various aspects of human perception. These previous models focused on the relationship between the perceived image of an object and the actual object with little attention to the anatomical location of the phase-conjugation mirror. The present article proposes that phase-conjugation mirrors exist in the brain as 3D networks of organic molecules previously observed to exhibit phase-conjugation behavior. In particular rhodopsin photoreceptor molecules are proposed to form extra-retinal, deep brain networks which function as phase-conjugation mirrors which are distributed throughout the brain. Furthermore, such networks are proposed to convert endogenous biophotons into virtual holograms which function to store cognitive information in the brain. Such a system offers a new functional definition of the mind.

KEYWORDS: Phase-conjugation holography; Rhodopsin networks; Virtual light energy; Mind

INTRODUCTION

Although most scientists believe the mind is a non-corporeal aspect of consciousness, many are still defining the mind in terms of the physical processes in the brain which are associated with its ability to process information. Early theories proposed strong links between the mind and the physical brain drawing on the key role of the electrochemical properties of the synapse in normal brain function. Hence the focus on calcium mediated signal transduction pathways across the neuronal cell membranes (Pereira 2003). Others have addressed the functional role of electromagnetic (EM) wave-fronts generated by electrical activity in the brain (Pribram 1972). The next major advance in the study of the consciousness of mind was the introduction of self-organizing neural networks which were used to explain associative cognitive functions including pattern association, recognition and organization (Carpenter 1989). Finally, a third major advance in this field occurred when quantum processes were considered to explain the properties and functions of the mind.

One of the first quantum mind models, based on Bose-Einstein's condensates, defined consciousness as the sum of quantum processes characterized in terms of collective quantum order vacuum states (Ricciardi 1967). Shortly after, Walker proposed consciousness was associated with quantum tunneling of electrons through the synapse which generated a virtual neuronal network functioning in parallel with the ordinary neuronal network (Walker 1970).

Around the same time 3D 'ghost images' of holography were introduced, it was proposed that holography occurs in the human brain and that holography offered a physical mechanism for memory (Gabor 1968, Longuet-Higgins 1968). Then Pribram introduced the holonomic brain theory which focused on storage of conscious information in holographic networks (Pribram 1974). Since then numerous authors have proposed holographic information processing could also explain various functions of consciousness and the mind including perception, attention, intention, intuition, cognition and learning.

Marcer (1992) defined perception as the act of reconstructing a symbolic image of an external object from interference patterns already laid down in the brain. In contrast, cognition occurs afterwards as pattern recognition and pattern matching without the need for reconstruction. In Marcer's words, cognition is described as "reshaping wave fields" with the aid of 'entropic' neuronal gates.

Since these researchers focused on consciousness, some speculated where the holographic grating might be located in the brain. Pribram (1974) and then Marcer (1992) proposed that electromagnetic (EM) wave-fronts, generated from non-classical electrical oscillations in neurons, produced interference patterns capable of encoding consciousness (Pribram 1974). Others have proposed the grating is localized in neuronal circuitry logic gates (Mitchell 2011), dendritic networks (Pribram 1974) and crystalline/liquid-crystalline structures (Ho 1996) in the brain.

PHASE CONJUGATION

Some of the above theories were extending the use of classical optical holography to phase conjugation holography in order to better understand the nature of consciousness. In phase conjugation an incident coherent light source is not classically reflected at an angle, but retraces its path coincident with the incoming wave-field returning back to its source. The reflected beam, or the phase conjugate replica, is the complex conjugate of the amplitude of the input wave. The reflected beam is referred to as second harmonic (Hsieh, 2010), time reversed (Hellwarth, 1978) and/or virtual (Powers 2011) radiation.

Phase conjugation can be generated using different experimental setups which include four-wave mixing, stimulated Brillouin scattering or a simple phase conjugate mirror.

Phase conjugation is now being used for spatial information processing (White, 1982). It is also used in nonlinear optical imaging to increase the efficiency of image transmission along optical fibers and to restore distorted spatial and phase information (White, 1982). In phase conjugation holography, the photographic film used in conventional holography is replaced with a phase conjugation mirror. This has been achieved experimentally using electro-optical material (Kukhtarev, 1976), crystals (Avizonis 1977) and liquid crystals (Garibyan 1981). Phase conjugation holography uses complex spatial information processing for image storage, amplification and transmission that can surpass those of traditional recording methods (Weingartner 2002).

The molecular electronics industry has synthesized several organic dyes and polymers which exhibit unusual non-linear optical properties. In some cases these photorefractive materials have been used to make holographic gratings. Surface and relief holographic gratings can be made in the laboratory by exposing polymer thin films and photoconductive materials to interference patterns at an appropriate wavelengths of the two polarized interfering writing beams (Johnson 1978). Laser ablation techniques have also been used to inscribe gratings on polymers (Phillips 1991). Laser-induced processes result in altered physical, chemical and optical properties of the gratings. These include induction of birefringence, changes in refractive indices, conformational changes, photochrome alignment and photo-isomerization (Korchemskaya 1994). Such gratings have been used in various forms of holography.

In some case the holographic gratings exhibit phase conjugation behavior. For example certain infrared absorbing dyes (Maloney, 1988) and certain chemicals, like isopropanol and hexane (Slatkine 1982) exhibit phase conjugation behavior.

THEORETIC PREDICTION OF PHASE CONJUGATION IN THE BRAIN

The association between phase conjugation holography and consciousness was first proposed by Marcer (Marcer 1992, 1997). This model detailed how the image of an external object, generated as a virtual reflection off a phase conjugation mirror, is superimposed on the physical object during the act of visual perception. Thus the perceived object is reflected off a phase conjugation mirror-like grating containing stored information about the object in the form of holographic interference patterns. The virtual light which is reflected off the mirror forms a virtual image of the original object. The image and the object are coincident, superimposed and entangled. The brain then interprets the image as the perceived object (Marcer, 1992, 1997). Mitchell (2011) similarly proposed that the virtual energy field of an object is reflected off a holographic grating in the brain and this outgoing field interacts with the incoming virtual field from the object itself. When these two virtual fields meet, they form a virtual interference pattern and a standing wave. This model further proposes that the observer also emits a virtual energy field of its own which is reflected off a phase conjugation mirror located in the perceived object. The reflected virtual light from the object interacts with the virtual light from the perceiver and forms a second set of interference patterns. Furthermore, the two sets of interference patterns exchange information via resonance interactions.

Whether physical or virtual interference patterns are considered, shinning a light on these patterns creates a hologram. Marcer (1992, 1997), Mitchell (2011) and Pitkanen (2015) describe this hologram as a conscious quantum hologram. All three models use the quantum hologram to characterize and even define the mind, although Mitchell admits that holograms can occur in every cell of the body.

The location of the holographic mirror/grating in the body and in the brain is rarely described. This is of particular concern when using phase conjugation holography. Since phase conjugation has been observed in nanoparticles (Hsieh 2010), fluorocarbons (Yoshida 1997) and sodium atoms (Hemmer, 1995), these molecules assumedly contain a phase conjugation mirror. Since phase conjugation holography has been proposed to mediate perception, the phase conjugation mirror has been proposed to reside in the neuronal circuitry of the brain. Mitchell proposed that the grating is found in the logic gates within neuronal circuitry of the brain (Mitchell 2011). Some propose the holographic grating occurs as spatio-temporal patterns in the brain. Others have proposed that the grating exists in crystalline and liquid-crystalline structures in the brain (Ho, 1996). This is a reasonable hypothesis because there is scientific evidence that planes within a crystal lattice interact with incoming laser light and exhibit phase conjugation behavior (Kukhtarev, 1976). It was also proposed that the holographic grating exists as space/time patterns in free space or in the ZPE of the vacuum (Marcer 1992, 1997) and not in the brain.

The author previously proposed, for the first time, how the holographic grating in the body was originally formed (Rein 2016). Thus it was proposed that in the embryo, when the spinal cord is formed, two main holographic grating are created – one at the base of the spine and one at the top of the head. In the first case, Universal Consciousness enters the top of the head as quantum light and acting as a reference beam descends down the central channel of the spinal cord until it reaches the base of the spine at the coccyx. A portion of this quantum light is deflected off the central channel by crystalline lattice structures at the top of the head which act as a beam splitter. As this light descends toward the base of the spin, it interacts with the cells immediately surrounding the spinal cord where it is reflected by various cellular components (biochemicals, microtubules, DNA etc). Thus, this beam is modulated by the information contained within these structures and acts like an object beam in holographic language. These two beams meet at the base of the spine where their interaction produces constructive interference patterns thereby creating a holographic grating as a 3D network of porphyrin-enriched bone cells in the coccyx. This holographic plate was proposed to function as a phase conjugation mirror (Rein 2016).

Man-made holographic gratings are being prepared in the laboratory and are being used for electro-optical devices. For example, photochromic materials are being prepared using thin-film polymers and are being used for information transmission and data storage. When irradiated with a strong laser, surface gratings can actually be formed (Kim 1995). Shining polarized light on the gratings once formed results in a series of photo-induced transformations including conformational changes, changes in viscosity, electron transfer processes and absorption of light (Goldstein 2016).

EXPERIMENTAL DATA FOR PHASE CONJUGATION IN BIOLOGICAL SYSTEMS

Relatively few studies have demonstrated the ability of natural bio-molecules to exhibit phase conjugation behavior. The benzene molecule is of particular interest because of its ubiquitous nature in all biological system and its quantum properties due to its delocalized pi electrons (Wyatt, 1992). The first published article demonstrating experimentally the ability of benzene to exhibit phase conjugation behavior using Bourillion scattering was reported in 1982 (Slatkine 1982).

Another class of biomolecules have also been shown to exhibit phase conjugation behavior. Several articles have demonstrated that prophyrin molecules are natural biomolecules which exhibit phase conjugation (Devane, 1984; Gosh, 1998). Porphyrins themselves contain four benzene groups connected by coordination bonds to a metal ion (Fe, Mg, Mn, etc) in the center. Porphyrins are conjugated systems because they contain alternating single and double bonds. As such they contain delocalize and highly mobile pi electrons which generate large amounts of energy due to highly efficient electron transfer. In some cases electron transfer can occur via quantum tunnelling thereby indicating they can function at the quantum level. Thus, they are used in the electronics industry as p-n junctions, transistor sensors, semiconductors and solar cells (Studener, 2015). In biological systems, they function to convert chemical energy and to transport oxygen in the blood (Goldberg, 1988).

Porphyrins are usually attached to heme protein molecules. Protein molecules themselves are capable of inter-molecular communication - a phenomena which is well described in the literature in terms of protein-protein interactions. Such interactions form networks which allow information to be transferred non-locally within the networks

(Jansen 2003).

Both benzene and porphyrin organic bio-molecules themselves form coordination networks. In the case of porphyrins, coordination complexes are formed around a metal ion. When made into thin films such metalo-organic networks are used in photovoltaic and electronic materials as sensors and as semiconductors (Xu 2006). The topological features and global organization of such networks are often studied in systems biology. Like proteins, porphyrins have the ability to self-assemble into coordination networks (Abrahams 1994). These crystalline-like networks are held together by Van der Waal forces, hydrogen bonds and pi-pi interactions. Porphyrin molecules function as building blocks forming highly ordered supra-molecular assemblies capable of long range inter-molecular interactions. They form various 2D and 3D interconvertible topologies including closely packed rhombic, hexagonal and square symmetries (Lein 2001, Kuhn 2008). As a result of these studies the author previously proposed that a holographic grating in the body is composed of a 3D network of porpyrin-encriched cells which functions as a phase conjugate mirror and generates a virtual energy field known as the biofield (Rein 2016).

Here we consider a third class of biomolecules which exhibit phase conjugation behavior as alternative locations for the holographic grating than that formed by porphyrin networks. In the present article, the rhodopsin family of molecules are considered because of their relevance to visual perception and consciousness and because they have been demonstrated experimentally to exhibit phase conjugation behavior (Werner 1990).

VISUAL PIGMENTS

Rhodopsins are a large family of photoreceptor proteins consisting of proteo-rhodopsin, halo-rhodopsin, archael-rhodopsin and bacterio-rhodopsin. Rhodopsins are the primary visual pigment in rod cells in the mammalian retina. As part of the vision process, they transform light into bio-electricity. These different types of rhodopsins all share a similar tertiary structure and the same common chromophore, cis-retinal, although their amino acid sequences will inevitable be different. Absorption of a photon and photo-excitation of rhodopsin results in isomerization of its photopigment where cis-retinal is converted to all-trans retinal (Rozanowska 2005). Photoisomerization in turn triggers conformational changes resulting in activation of membrane G proteins and the opening of neuronal ion channels/gates, which then initiates a series of biochemical phototransduction reactions ultimately ending up as human perception.

PHOTOPIGMENT NETWORK LATTICES

Rhodopsin molecules are highly concentrated within rod cells of the visual system. They are differentially distributed throughout rod cells in a pattern highly dependent on light/dark cycles (Artemyev 2008). Functionally they are known to mediate signal processing, protein transport along cilia, ion channel activity and light adaptation. Their complex protein-protein interactions form the basis of intricate network lattice structures. Specifically they form paracrystalline dimer arrays which ultimately form networks with complex 3D geometries. Their spatio-temporal patterns dynamically change in response to light. Recently, the structural and functional properties of rhodopsin networks have been described in detail in the rod outer segments (Kiel 2011). These authors classify the rhodopsin networks in terms of different modules. It is further observed that rhodopsin molecules can 'connect' with other non-visual proteins including structural proteins like tubulin and therefore are proposed to be involved with microtubule assembly. In passing the authors proposed that the binary interactions between two neighboring proteins function to store digital information (Kiel 2011).

It is proposed here that such networks contain interference patterns, store information and function as a phase conjugation mirror. The rhodopsin network is distributed throughout the brain and is not limited to the visual sysstem, as rhodopsin itself has been found in deep brain regions (Wada 1988) and in the pineal (Hartwig 1982). It is further proposed that endogenous biophotons in the brain act as the incident light source and are converted to virtual light via the phase-conjugation process. This endogenous virtual light is herein defined as the energetic matrix of the mind.

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