

April 18, 2024

## Thoughts on Consciousness

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### Abstract

(1 ~ 4) The place of consciousness in nature; (5 ~ 9) hard problem, Multiple Draft Model, Orch OR theory; (10 ~ 11) space-time field; (12 ~ 13) methodology; (14 ~ 17) application of physio-phenomenology; (18) on electroencephalography signals; (19 ~ 23) mental imagery; (24 ~ 26) pandemonium process and hallucinations; (27 ~ 30) awareness and attention; (31) measurement problem; (32 ~ 33) future works; (34) Summary

*1.Strong and Weak Phenomena:* If phenomena cannot be reduced to further elements it is called strong emergence phenomena (strong phenomena) [1]. Strong emergence phenomena are the basis of physics. These are quantum fields and elementary particles of the standard model. All of the weak-emergence phenomena (weak phenomena) [1] arise from these strong phenomena.

*2.Weak Phenomena of Consciousness:* Since every experience is experienced in a time instance, experiences can be divided into sensations and time. Consciousness is assumed to be weakly emerging from sensations and time. Every sensation has a dimensional aspect, so the strong phenomenon that consciousness emerges is named as space-time field. From this field, sensations and time emerge as weak phenomena and from the relations between sensations and time consciousness arises.

*3.Panpsychism:* The weak phenomena of other quantum fields can not correspond to consciousness in usual meaning, because consciousness presupposes dimensionality and time, which is unique to the assumed space-time field. This result avoids panpsychism.

*4.Hard Problem and Metaphysics:* Without realizing the property of consciousness, that it can only be defined as in-itself, answering the hard problem [2] is impossible. In this article, quantum fields are defined to have this

property. This approach necessitates a metaphysical claim, which is that any field has an in-itself-information that we cannot comprehend, but by  $\mathcal{P}$  they do not form consciousness in the usual meaning.

*5.Hard Problem:* If a theory claims that it answers the hard problem [2], without defining a new physical basis, it unknowingly defines consciousness either by the shape of a known field or by functionality. Intuitively, claiming that consciousness emerges from the shape of electromagnetism -Any physical activity in the brain is just jumbles of quantum electrodynamics- is absurd. The absurd part of the functionality is that any functionality is human taxonomy, so it does not exist in nature. If consciousness is interpreted as a quality of material, then the reason for this qualitative jump from unconscious matter to conscious matter has to be something that exists in nature.

*6.Multiple Draft Model:* Multiple Draft Model (MDM) [3] is an example of functional explanation of consciousness. This theory claims that the brain perceives its own inner work, the same as it perceives the external world. This functionality of the brain creates the illusion of consciousness. This is mentioned by Dennett as;

The workings of the Joycean machine, on the other hand, are just as "visible" and "audible" to it as any of the things in the external world that it is designed to perceive [Dennett, 1991, p.225].

The Joycean machine is the brain's functional behavior. For the Joycean machine to perceive itself the same as it perceives the external world, the sensory organs and their connection to the brain should be equal to the brain's connection to itself. For these two to be equal, the brain has to be able to generate the outside world in other words, the brain represents the outside world the same as sensory neurons' connection to the brain. If the generated world in the brain is a conceptual world (building a world by connecting concepts), then perceiving it the same as the outside world indicates these concepts are correlated with the objects at the outside. For this to happen, concepts should be isomorphic to the sensory organs neural connections or concepts undergo a type of signal processing that generates the same isomorphism. This second possibility can represent objects by their functionality, without concerning their isomorphism with sensory connections. In the brain, there is more than one generated world, and the most correlated world with the external world becomes conscious. In this approach brain and sensory organs jointly create consciousness.

*7.Orch OR Theory:* In Orch OR theory [4],[5], consciousness is explained by adding a self-collapse mechanism to quantum mechanics (objective reduction). In simple terms, it defines a self observation energy,  $E_G$ , which

determines the average collapse time  $\tau$  with the equation

$$\tau \approx \frac{\hbar}{E_G} \tag{1}$$

where  $\hbar$  is reduced Planck constant.  $E_G$  is related to the entanglement of the system. More entanglement means high energy, which indicates small  $\tau$ . At the instant, that objective reduction (OR) occurs, it reduces the system to one of the possible space-time curvatures. This reduction is a non-computable action and creates a proto-conscious moment. Orchestration of these reductions forms consciousness. The brain utilizes these non-computable actions to acquire mathematical knowledge. Which answers Gödel-Turing conclusion [6]. It states that the human brain is not purely algorithmic, so machines can not imitate human intuition. This conclusion is one of the main points of the Orch OR theory, along with the measurement problem [8], and consciousness.

*8. Empirical Points of Orch OR theory:* In Orch OR theory microtubules (MTs) have an important role. Consciousness and computation are the orchestrated objective reduction (OR) of entangled MTs in neurons (or between neurons). The relationship between anesthetic gasses and MTs makes this claim testable and convincing [7]. These orchestrated reductions orchestrate neurons, and by this orchestration electroencephalography (EEG) signals are explained. EEG signals are claimed to be related to conscious moments or time instances of consciousness [4][5].

*9. Place of Orch OR theory:* MTs themselves are not discussed and it is used as a black box that is related to consciousness, but consciousness purely arising from MTs is unconvincing. The only possible way to differentiate different sensations from a materialistic viewpoint in Orch OR theory is different orchestrated reductions of MTs forming different sensations. Sensory neurons should be related to sensations, and MTs should be related to time. The relation between MTs and time is convincing because Orch OR theory mostly leans on the parameter  $\tau$ , which is a quantity representing average reduction time.

*10. Space and Time:* Sensations are claimed to be related to the dimensionality of experiences (2). Different sensory organs create different sensations with respect to different physical phenomena. From this logic, since time is different than other sensations, it has to be related to different physical phenomena. If time is claimed to be not separated from sensations then explaining the flow of time and having an identity (16) would be hard. This can be explained by claiming different sensations are formed from different sensory organs, and proto-time (time that makes sensations an experience), the flow of time, and identity are from different MTs structures (8). Sensa-

tions and time are separate entities of the space-time field.

*11. Wave Packets:* In terms of field theory, sensations and time are excitations of the space-time field, or wave-packets. Wave-packets of sensations are called dimensional waves. Wave-packets of time are called time waves. For representing different sensations parameter  $\chi$  is used. For representing proto-time, the flow of time and identity parameter  $\tau$  is used.

*12. Physiological Investigation:* Physiological investigation can isolate the exact event that the dimensional waves are created in sensory neurons. In vision, the best possible candidate for this is photoisomerization of retinal proteins. By doing this properties of dimensional waves and parameter  $\chi$  can be better understood. The same is valid for time waves.

*13. Physio-phenomenology:* Without concern about neuroscience, investigating properties of the space-time field with respect to consciousness is called physio-phenomenology. This approach is a consequence of defining consciousness as a weak phenomenon of the space-time field. When consciousness is claimed to be another entity within the brain, investigation of this entity with respect to the pure existence of itself does not require neuroscience. Physio-phenomenological approach can only give descriptive possible behaviors of the field. For defining a consistent mathematical system, neuroscience is needed.

*14. Cartesian Dilemma:* By physio-phenomenology, Cartesian space is investigated from a first-person view. In Cartesian space every point is separated with a positional sense, but in the sense of being in the same Cartesian space they are connected. In the time axes, every moment is separated from each but in the sense of time flow they are connected. The physical explanation of this separation and compression of the wave-packets gives the basic properties of the space-time field.

*15. Fermion-Boson Assumption:* Being dimensional presupposes the inability to overlap. In quantum mechanics, fermions [13] have this behavior. Dimensional waves are assumed to be fermions. Bosons act opposite to fermions, so the compression or connection part of the dilemma (14) is explained by claiming time waves have boson properties [13]. An analogy to understand the process, two groups of strings one separating constantly other compressing itself are connecting. This connection points are proto-conscious moments. The compressing group has another group of strings that are spiral to the group of strings. After proto-conscious moments are sparked, this second group compresses the strings to form the flow of time. The third group of lines compresses these and forms identity. A better explanation is dimensional waves and time waves form proto-conscious moments, the linear superposition of higher period  $\tau$  and low period  $\tau$  does not lose their boson interaction which compresses the proto-conscious moments to an individual

experience.

*16.Identity:* After sleeping, people do not lose their self or connection with the past. This can be claimed to be an illusion created by the state of the brain. Explaining this by using string analogy is more convincing.

*17. Colors:* By using physio-phenomenology colors are investigated. For representing colors, red, green, and blue colors (pure rgb colors) are superposed in color space (CIE 1931 color space). Without intensity, the color space can be represented as a two-dimensional circle. The pure rgb colors are points on the circumference of the circle. Having two pure colors forms only a line in the color space. Having three pure colors forms a triangular area. This indicates, that linear combinations of dimensional waves, that carry pure rgb colors, create new colors. With respect to the result of 15, different pure rgb colors correspond to different states of dimensional waves, because they can be linearly superposed. For two fermions to be linearly superposed, they have to be in different energy states or have different spins. In this case, different pure colors are different energy states.

*18.EEG signals:* From 8, EEG signals are assumed to be related to consciousness. The proto-conscious moments either create electromagnetic fields (EMF) or induce neuronal firings which correlate with EEG signals. To induce neuronal firings, chemical reactions are needed. In chemical reactions the dominant field is EMF. So either case the space-time field creates EMF. Since the space-time field induces motion, in the evolutionary process, it is likely to be utilized. If a wave-packet forms EMF and EMF does not affect wave-packets, the mathematical system would violate the conservation of energy. From this, assuming EMF affects wave packets is convincing.

*19.Mental Imagery:* Since mental imagery is a part of the consciousness, it has to be explained by the space-time field. A well-known fact is that after losing sensory organs, people can continue to imagine related experiences with respect to lost sensations. This indicates dimensional waves are saved in the brain.

*20.Cognition of Mental Imagery:* To understand how the brain forms mental imagery, cognition of mental images is investigated by an example from Shepard 1978; 'If I am asked to imagine a zebra but then turn out to be unable to report the number of its stripes ... difficult to represent the presence of stripes without implicitly representing their number'. He explains this by claiming mental imagery is limited by its inherent concreteness. With respect to the space-time field, the brain conditions the saved dimensional waves to form mental images. This conditioning is related to the concepts, such as zebras, strips, and numbers. In 6, the second possibility of working of Joycean machine is consistent with this result. Brain saves concepts as neural structures and by conditioning another structure, it creates mental

images. To have meaningful images, the conditioned structure should have an apriori structure that is consistent with the properties of vision.

*21. Creativity and Mental Imagery:* Shepard 1978 discussed the relation between creativity and mental image. He discussed historical examples of creative people and their extensive use of mental images. In 18, the relation between EEG signals and consciousness is discussed. From this, mental imagery can create additional EMF. On the connections of neurons, this induces an additional complexity, which may increase the flexibility of thoughts.

*22. Gödel-Turing Conclusion and Mental Imagery:* From the apriori conditioning structure of mental imagery (20), human mathematicians may have the framework to imagine any formal system in the brain, like the ability to form any image in their mental eye. However, to answer the Gödel-Turing conclusion a non-computable action [6] is required, and how this framework is related to a non-computable action is not clear. If the Gödel-Turing conclusion is accepted then whatever creates this non-computable action, instead of EMF, utilizing this action may related to creativity.

*23. Types of Mental Imagery:* In 20 mental imagery is defined as conditioned neural structures by concepts. I claim that I can imagine a little toy zebra walking on my desk, with a very faded existence. This is different than imagining a zebra in the mental eye. Let's differentiate them as imagery perception and imagery memory.

*24. Dennett's Pandemonium Process:* In the chapter 'How Words Do Things With Us' [3], Dennett uses the pandemonium word demons analogy to describe the brain's internal work. The pandemonium word demons create random words or letters. Opportunistically, these words become conscious. In the sense of 20, the concepts are pandemonium demon's words and they form unconscious mental imagery.

*25. Hallucinations:* Unconscious mental imagery, as an imagery perception (23) overcoming real perception is a hallucination that occurs in the moment of perception (Stalinesque Revisions [3]). Unconscious mental imagery, as an imagery memory (23) overcoming the saving process of real perception is a hallucination that occurs after the moment of perception (Orwellian Revisions [3]).

*26. Back Referral:* If time waves carry the time, that they are created, the sensations can be experienced at a past moment. From this possibility, an unrealistic revision case arises. If a future revision overwrites what is perceived, this may revise the perception of the past (Back Referral Revision [9]).

*27. Awareness:* Perceiving objects gives pandemonium demons more opportunity. These demons form unconscious mental imagery onto the objects. If these are claimed to be the state of the neural network, which points the

concepts without their imagery (or without conditioning the framework(22)), then the relation between concepts and mental imagery, and the relation between concepts and perception should have two distinct structure which is unnecessary. Since understanding the concept of a bottle from perception forms an isomorphic neural structure with sensory neuron connections, using the same isomorphism to imagine a bottle is more efficient. Therefore, mental imagery and filtering perception to realize objects as concepts do not have different neural structures. From this, the Joycean machine of Dennett (6) actually creates awareness, not the whole consciousness.

28. *Experimental Data on Attention:* In the experiments of Landau et al. (2007), there are two blocks where human faces pop up, and subjects are expected to report which face popped up. In the first experiment, they told the subjects to expect faces to pop up at the marked block. This conditioning creates an EEG signal before a face pops up. While they are giving correct answers they did not have active EEG signals, but while giving invalid answers, more active EEG signals are measured. In the second experiment, they told them to ignore the marker. In this case, there were no EEG signals before a face popped up. The measured EEG signals were between 20-100 Hz.

29. *Attention and Pandemonium Process:* This experiment demonstrates EEG signals are formed when there is a perceptual focus. This focus increases the opportunity for certain pandemonium demons. This definition does not explain what opportunity is, and why there is 20-100 Hz EEG signal. To understand the process of the brain, it is claimed that the Gödel-Turing conclusion has to be answered. This is because mathematics is related to attention [15]. This indicates same non-computable action may occur in every part of the human brain.

30. *Attention, Mental Imagery, and Awareness:* Attention, mental imagery, and awareness are similar. All three of them are related to concepts and conditioning. Mental imagery and attention are more active than awareness. In mental imagery and attention, there are certain tendencies that direct the person to certain concepts or imagery.

31. *Gödel-Turing Conclusion, Chaotic Systems, and Measurement Problem:* In the book (chapter 3.22) [6], Penrose discusses if chaotic or random processes can answer the Gödel-Turing conclusion. He conclude that 'It would have to be the case that, in such situations, a chaotic system can closely approximate non-computational behaviour in some asymptotic limit- or something of this nature.' Measurement problem can form this kind of non-computational chaotic system. It is known that any little wrong measurement (classical terminology) eventually creates an immense miss prediction in weather (example of a chaotic system). A quantum analog of this, the wave function evolves such that, it forms multiple weathers at the same

time. However, if the measurement (quantum terminology) itself is a result of one of these different weathers, then the weather that induces the measurement has to be the wave that the system collapses, because of the causality. This is clearly a non-computational action. If collapsing the wave function phenomena is related to dimensional waves and time waves interactions, the brain may have utilized this, by building mental imagery framework (22) type of structures. The concepts that the brain needs create measurements, which makes the system collapses to that concept. This analogy contradicts with decoherence theory [8], but it can be true if dimensional waves have a property that makes them chaotic.

*32. Physio-phenomenology, Neuroscience, Neurons, Physiology:* If the origin of consciousness is accepted to be related to a quantum field, then the investigation of consciousness in a pure sense (physio-phenomenology) describes the properties of the field. To make this description consistent with the working of the brain's neural network would bring out new properties of the space-time field. After this, being consistent with the working of neurons would require a mathematical model. Another direction is, that a mathematical model of dimensional waves can be investigated directly from sensory neurons (12) or by investigating P. Polyceptum<sup>1</sup> [10][11].

*33. Cosmology:* The common knowledge of dark matter is an additional force on the outer shell of galaxies that pushes them to rotate faster than the expected velocity. The dark energy is the expansion of the universe. The problem with the black holes is the Schwarzschild radius creates infinities at the origin. The space is assumed to have spin behaviour. In quantum scales, this behaviour may prevent collapsing of black holes. On large scales, collective behaviour may push the universe to expand further. The boson behaviour of time, as a wave-packet, compresses the galaxies which decrease their radius.

*34. Physio-phenomenology, Cognition, Neuroscience:* By physio-phenomenological investigation, Cartesian dilemma (14) is found. By answering this dilemma, the properties of the space-time field are defined. Using this definition, string analogy (15) is described, which describes fermion and boson behaviour of the space-time field. By investigating mental imagery, dimensional waves are found to be stored in the brain. With respect to cognitive abilities, awareness and mental imagery are found to be related, and attention is found to be related to the Gödel-Turing conclusion. For defining a non-computable action with respect to chaos theory, quantum weather analogy is given, which presupposes a chaotic behaviour in quantum systems or in the space-time

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<sup>1</sup>It is a maze solving single cell organism that behaves like a neural network and its act is governed by sensory information.

field.

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