Exploring the quantum aspects of mind-body: A Journey into the mystery of a new frontier in neuroscience

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SIC ITVR AD ASTRA
QVO NON ASCENDAM ?

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Abstract

We introduce and review the consistency between structure of the mind-body and quantum theory. The two cannot be seperated, as it is not easy to look at it just from one direction. We will not attempt an in depth look at this approach as it would be impossible to treat it in such a short review. The emphasis is on understanding the broader meaning of the consistency between two theories.

Keywords: Mind-body-quantum theory-cause and effect.

Resumen

Introducimos y revisamos la coherencia entre la estructura de la mente-cuerpo y la teoría cuántica. Los dos no se pueden separar, ya que no es fácil mirarlos desde una sola dirección. No intentaremos profundizar en este enfoque ya que sería imposible tratarlo en una revisión tan breve. El énfasis está en comprender el significado más amplio de la coherencia entre dos teorías.

Palabras clave: Mente-cuerpo-teoría cuántica-causa y efecto.

I. INTRODUCTION

Many years have passed since the advent of quantum theory but it is still very unclear. In order to understand how the mind rotates about the axis of a molecule, we need quantum theory. One of the fundamental theories in physics in the twentieth century has undoubtedly been the formulation of quantum theory.

It has been fantastically successful both in describing the phenomena and in giving birth to completely new areas of physics such as semiconductor physics. These breakthroughs have led to some of the most pervasive forms of technological achievement in the latter part of the twentieth century. In spite of all this, some of the greatest minds in physics have refused to accept quantum theory as it stands, not even with a good reason! Some researchers have shown different outcomes; like the theory proposed about some specific structures called "microtubules" in the brain, which facilitate the delivery of signals in neurons.[1] According to this paper, these proteins are more than just means to transfer a messages, but they can act as a quantum computer, and can exist in at least two conformational states due to London forces, which leads the consciousness to be the result of collapsing one state in brain functions. Since brain is a warm and wet environment, it would be hard to maintain such a fragile process [2, 3]. However, if we take a closer look at a property of atoms called nuclear spin [4, 5] it would be possible to find a better environment. One element of such, is the phosphorus ion in Posner molecules, which has a long coherence time that leads to maintaining the quantum process.[6, 7] About the relationship between physics and the medicine of mind – body can be referred to [8, 9, 10].

II. METHODS

According to Newton's theory, knowledge of physics is based on several logical and fixed rules. According to him, for natural events we can find the reasons using the same logic and identify the cause and effect relationship connecting them. Based on this principle there is no need for metaphysical hypothesis.

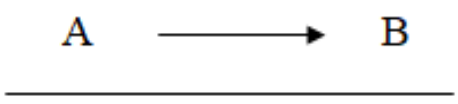

Figure 1. This figure shows that the logical relationship between cause of A and effect of B related to a physical phenomenon.

Now we analyze differently. For the worldly senses, we have cause and effect relationship. When we analyze the

logical relationship in them, we observe that senses in the world are strange to us. Therefore, we have following relationship between A - cause and B - effect:

In above figure, A the cause and B the effect are connected in direct line. This means in our worldly senses cause and effect relation is compatible with logical relation in this area. Therefore, if the above cause relation is considered as a physical phenomenon, it can be predicted logically. Basically cause and effect relation in Newton's physics is such that based on the present system we can predict its future position. Otherwise, if A is an indicative of cognition and B is an introducer of a neuron, linear relationship will not be adjustable. In this situation, an immediate transformation happens which its quality is vague to us. Thus, we consider different diagram as below, which has a deviational course:

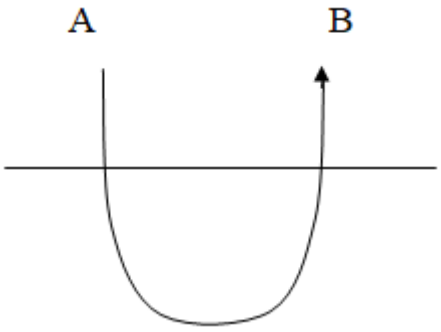

Figure 2. The above figure represents unlike intelligible world and Newtonian straight line, the process that should happen is not in the top of line.

Above figure, shows that against logical world and linear cause relation of Newton, the process that will happen is underlined. Then a kind of hidden conversion happens that changes cognition to a neuron. This transformation does not need duration of the time and will never happen in the area that is within the limits of our senses.

After the birth of quantum mechanics, we find that not all the events in the nature happen at the above of line and a deviational course is necessary. (Light is one of them). Light can behave such as (A- a wave) or such as (B- a particle). In Newton's physics, wave and particle are completely dissimilar as they are non-material waves and material particles. The unique characteristics of waves are interference and diffraction they place on each other and superposition principle is always true for them. But particles that have localized existence and the unique characteristics of them are mass and momentum. It is interesting to note that wavy and particulate characteristic of light were not observed together in the environment of experiment at all. Yang's experiment confirmed wavy nature of light and photo electric experiments confirmed particle nature of light .In none of these experiments incidence of quantum jump or immediate transformation were noticed.

Incident photons ⟶ output photo-electrons
Causal relation connected to photoelectric experiment

Radiative waves ⟶ light and shade areas
Causal relation connected to Young's experiment

It is observed in photoelectric experiment, cause A is particle and effect B is particle too and in Yang's experiment A is radiative waves from the source and B is the unique characteristic of diffraction wave. Now it is necessary to plan a mental experiment and not change the environment of experiment until both of supplementary behavior of wavy and particulate are observed.

Imagine that we are in a room and there is a lamp in it. The nature of this lamp is such that when we touch the lamp every time, the intensity of illumination of lamp will decrease. By continuing this process continuously, we will observe that by touching repeatedly, the illumination decreases to minimum of its quantity. The minimum of the light quantity is like not only wave, but also is like particle. Therefore, light changes from wavy situation to particulate situation by quantum jump without going to the other true limit.

Therefore, we can draw a basic quantum event with the help of following diagram:

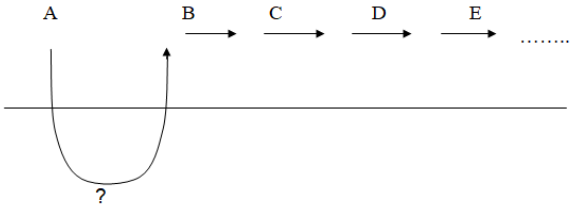

Figure 3. This figure shows that the logical relationship between cause of A and effect of B related to a physical phenomenon.

A can be mental or cognition event and the other letters are different physical processes which will go on continuously. If these processes show physical changes of human's body, cause and effect are related to each other by a logical chain. But, it is interesting to note that if the first jump of A (mind) does not happen to B (material) none of the subsequent processes will happen.

There is another important topic that is the genesis of boundary that separates our sense world from the limitation out of our sense [11]. This problem is discussed in another form in theoretical discussions of quantum mechanics. If we show quantum world with Q and the classical world with C then:

$U = Q \cup C$, so that U is universe.

So that, $Q \cap C = \emptyset$, it means that there is nothing common between quantum world and classical world. We will discuss this issue at some other time to find what is the boundary between these?

The boundary between Q and C that divides U must be adjusted to each particular situation: first we define Q, and then we define C as U – Q. The division of U may be viewed as arbitrary and inherent not to U but to our way of probing U through quantum mechanics. It thus triggered an intense debate among scientists and philosophers [12, 13].

III. CONCLUSION

In this paper we have tried to make connection between structure of mind-body and quantum theory. This survey can be a beginning for students to start exploring the vast literature on this subject.

How exactly does quantum effect our existence? Could it be our sense of consciousness that seperates us from dead, if we are nothing but matter and energy?

REFERENCES

[1] Hameroff, S.m, *Quantum computation in brain microtubules? The Penrose Hamero_`Orch OR' model of consciousness*, Phil. Tranf. R. Foc. Land. A. **356**, 1869-1896 (1998). 10.1098/rsta.1998.0254

[2] Seife, C., *Neuroscience: Cold Numbers Unmake the Quantum Mind*, Science, **287**, 5454 (2000). 10.1126/science.287.5454.791

[3] Tegmark, M., *Importance of quantum decoherence in brain processes*, Phys. Rev. E, **61**, (2000). 10.1103/PhysRevE.61.4194

[4] Hore, P. J., *Nuclear Magnetic Resonance*, (Oxford Science Publications, 2011)

[5] Wehrli, F. W., *Temperature dependent Spin-lattice relaxation of ^{6}Li in aqueous Lithium chloride*, *J. Magn. Reson*. **23**, 527-532, (1976).

[6] Fisher, M. P. A., *Quantum Cognition: The possibility of processing with nuclear spins in the brain*, Ann. Phys. **362**, (2015). 10.1016/j.aop.2015.08.020

[7] Weingarten, C. P., Doraiswamy, P. M. and Fisher, M. P. A., *A New Spin on Neural Processing: Quantum Cognition*, Front. Hum. Neurosci **10**, (2016). 10.3389/fnhum.2016.00541

[8] Paul, D., *God and the New Physics*, (Simon& Schuster, New York, 1984).

[9] Larry, D., *Space, Time and Medicine*, (Shambhala, Boston, 1982).

[10] Jon, F., *Molecules of the Mind*, (Atheneum, New York, 1987).

[11] Jafari Matehkolaee, M., *Underestanding the measurement theory in quantum mechanics*, Lat.Am.J.Phys.Edu. **5**, 3 (2011).

[12] Halliwell, J.J., *Quantum mechanics in Stochastic evolution of quatum states in open systems and measurement processes*, Editted by L. Diosi. (Singapore, World Scientific, 1994).

[13] Wheeler, A. and Zurek, W. H., *Quantum theory and measurement*, (Princton University Press, Princeton, N.J., 1983).