

# Determination of the Nature of Consciousness by Quantum Effects: Phenomenology and Some Methodological Approaches

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## Abstract

Preconditions of a possible substantiation of some concepts of consciousness from positions of the quantum theory are considered. Analysis attempt of some directions of physical science about use of their substantive provisions for explanation of conceptual problems of psychophysiology is made. Special attention is given to research of synchronicity phenomenon considered within the limits of such direction of deep psychology as "analytical psychology". Also John Eccles and Wilder Penfield's hypothesis on consciousness nature is studied.

**Key Words:** consciousness, synchronicity, quantum entanglement, nucleic acids, mitosis, meiosis, embryogenesis, human origin

**NeuroQuantology 2010; 4: 633-637**

As it is known, substantiation attempts to determine the nature of consciousness by quantum effects were made for a long time. Initially such assumptions were stated in the works of the known physicists-theorists which were laying the foundation of the quantum theory.

At the same time, up to now such approach is represented rather debatable. Really, the theory of electrochemical transfer of nervous impulses in synaptic clefts in due time has been developed, experimentally

proved and checked up. The majority of the researchers working in the field of mentality nature studying proceed from the assumption that the higher psychical functions are caused by electric signaling in brain. In this connection the question on precondition researches in which frameworks anyhow the consciousness nature is compared to the effects, studied by quantum physics, is quite well-founded.

Often enough it is necessary to observe, how for explanation of certain natural phenomena attempts of relevant theory construction are made. Naturally, much bigger admiration is deserved by a situation when again created theory is capable to predict certain effects during specially made experiments. It, as a rule, testifies to legitimacy of such theory. With regard to psychophysiology, perhaps, it is necessary, (at least, in most cases) to be

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Received: July 31, 2010; Revised: August 28, 2010;

Accepted: September 21, 2010

content with the first situation when under already known phenomena this or that theoretical base is brought. Thus, the key decision of the consciousness nature question is, nevertheless, perhaps, the analysis of existing phenomenology for the purpose of its further theoretical substantiation. And the core is the question on allocation of certain classes of psychical phenomena, for the purpose of their studying, including from the position of quantum mechanics.

It is obviously possible to offer two basic directions, to be more exact, two methodological approaches, in which frameworks it would be possible to assume fairly (or not less confidently to reject), determination of the psychic nature by the effects which are the prerogative of the quantum theory study. The author of the present article believes that studying of various structures of a person's brain activity during neurosurgical operations belongs to the first direction. Thus, certainly, the analysis of correlation of certain physiological processes with elementary displays of psychic activity, for example, pronouncing of words by the patient, is performed. Such procedure is quite realizable as, it is known, the majority of neurosurgical operations on brain are spent without application of the general narcosis. Now, true, due to perfection of devices for carrying out of positron-emission tomography and nuclear magnetic resonance tomography this kind of research can be made, without using the possibilities given by neurosurgical intervention. Apparently, it is necessary to relate studying of actually psychic phenomena to the second methodological approach, considered mainly within the limits of the so-called "depth psychology".

So, it is necessary to define phenomena observed during direct studying of brain activity or while carrying out psychotherapeutic sessions which are recognized as subject to studying from positions of quantum physics.

In due time extensive work on studying of brain activity during neurosurgical operations was done by the Canadian researcher Wilder Penfield. The hypothesis put forward by him seems to be

rather interesting, and according to it a person's brain is only the intermediary to display higher psychical functions. The theory can hardly be well-founded without application of the quantum mechanics instruments. The information, according to Penfield's hypothesis, arrives from a substance which is outside (Penfield, 1978). Together with Penfield this theory was developed by John Eccles (Popper and Eccles, 1978). Certainly, for the researcher who is not well-prepared in the quantum physics such theory seems to be not having the right of existence. However, if we try to look at the problem from the quantum theory position, such hypothesis no longer seems to be outstanding.

One of the key concepts of quantum information theory is the so-called "quantum entanglement" - quantum mechanical phenomenon consisting in common description of the state of two or more objects of a micro world (or as they say - by means of the general wave function) even if particles are separated spatially for as much as the biggest distances. The consequence of it is correlation of physical properties of spatially divided particles, and such correlation is carried out instantly, without restrictions on the speed imposed by the special theory of relativity.

And, though, using a phenomenon of quantum entanglement, generally speaking, it is not obviously possible to transmit the information directly, it is quite legal to speak about certain correlation of information processes, in particular, probably - bioinformative and psychical.

Certainly, if the goal of psychophysiological mechanisms explanation defining the consciousness nature is defined, attention focus should be turned to biological objects with definition of various levels of consideration: cellular (cytological), molecular and submolecular. The position of philosophers-idealists, according to which psychic is not connected by any means with physiology is not considered within the framework of this article.

Existence of quantum coherence (and as a direct consequence - quantum entanglement) between biological molecules, as well as prevention in biological systems to

processes of decoherence - transformations of states characterized by quantum superposition ("pure" states) in states for which the quantum phenomena ("the mixed" states) are not obviously possible to observe are both experimentally fixed (Collini *et al.*, 2010; Grondelle and Novoderezhkin, 2010; Ishizaki and Fleming, 2010; Sholes, 2010a).

The researches being done during the last years by a number of analysts have the purpose to find out possibility of existence of the similar phenomena, including in nucleic acids (Ogryzko, 1997; McFaden and Al-Khalili, 1999; Bieberich, 2000; Schemp, 2003; Ogryzko, 2008; Cooper, 2009a and b). A number of phenomena at the level of genetic material are studied in a context of the quantum theory.

Quantum entanglement can occur in the so-called "scattering processes", in particular at electrostatic (Coulomb) interaction (Mishima *et al.*, 2004). Such electrostatic interaction in DNA molecule can take place, for example, owing to existence of the attract potential of two segments of a molecule in genetic recombination processes. Other mechanism which probably provides occurrence of quantum entanglement in biological molecules and, in particular, - in biological macromolecules is the so-called "coherent resonance energy transfer" (Collini and Sholes, 2009; Jang *et al.*, 2008; Sholes, 2010b).

Due to processes of genetic recombination (reorganization of the genetic material) at meiosis (the process of formation of gametes) existence of quantum entanglement between the genetic material of parents and descendants is possible. And as a result of cell mitotic division quantum entanglement between DNA of cells of one organism can be formed. So, in particular, at embryogenesis there the quantum entanglement between cells of formed central nervous system can arise. It is necessary to note, however, that for nervous cells it can be fair only if we assume similar process to occur during prenatal period, as neurons are known not to divide during ontogenesis.

Quantum entanglement between cells can occur not necessarily at the expense of such entanglement between DNA molecules.

Any structures of a cell co-operating before mitosis or meiosis processes, and subsequently appearing in various cells, can be potentially subject to the mechanism of quantum coherence occurrence (Hameroff, 2004).

As for the long preservation of quantum coherence and non-admission of destruction of the latter under the influence of electromagnetic fields and other factors, many analysts stake on the so-called "decoherence-free subspaces" (Shabani and Lidar, 2005; Grace *et al.*, 2007; Ogryzko, 2008; Cooper, 2009a, b).

The prospective phenomena in biological molecules can be underlying for some physiological processes, in particular, a hypothesis of the so-called "synchronistic" phenomena - correlations of mental processes of various individuals in the absence of possibility to receive the information on classical communication channels can find the psychophysiological explanation (Walach, 1999; Duch, 2002; Carminati and Martin, 2009; Martin *et al.*, 2009; Martin *et al.*, 2010;).

Here we closely investigate the second methodological approach: consideration of the phenomena which studying is a prerogative of the psychological science. The complex of phenomena defined in terms of the so-called "analytical psychology" as "synchronicity" apparently, are, first of all, necessary to be referred to psychological phenomena which can be described from positions of quantum physics. The author of the present article made an attempt of several physical theories analysis which potentially could throw the light on the synchronicity phenomenon. It is necessary to relate "weak interactions", "spinor (electron-positron) fields", "vacuum state", "the gauge theory", "the symmetry in particle physics", "the string theory", and, at last "many-worlds interpretation of quantum mechanics" (MWI) to the such. However, the most adequate (and most likely - unique) for comparison to the phenomenon of synchronicity, is the phenomenon of quantum entanglement, already mentioned above in connection with the hypothesis of Eccles and Penfield.

Considering observations of Wilder Penfield during neurosurgical operations,

and also “synchronicity phenomena” observed and described by the founder of analytical psychology Carl Jung we can track displays, as the phenomenology leads us to presumable “localization” of consciousness in biological structures and, particularly, as the observable phenomena indirectly specify assumed “physical carriers of consciousness” to us. We will start with the resulted below chain of logic reasoning.

Under statements of Wilder Penfield (and also John Eccles) the nature of psychic displays are such that consciousness localisation cannot be limited exclusively by a brain of one separate person. The brain necessarily, according to the given researchers, is connected (at least by correlation communication) to a certain source from the outside. According to the received during long-term psychotherapeutic practice data of the other researcher – the known Swiss psychologist Carl Jung, psychic processes of various people can correlate, even if various subjects are on big enough distance and do not exchange the information with each other. From the point of view of modern natural sciences, namely, from the position of quantum mechanics the stated above circumstances may be explained taking into account the phenomenon known under the name of “quantum entanglement”. Simultaneously, the conditions of quantum entanglement occurrence are specific enough: they are either the so-called “scattering processes”, in particular electrostatic (Coulomb) interaction, or – “coherent resonance energy transfer”. Hardly probable similar mechanisms can be realized at usual rapprochement of two subjects. Besides, correlation of psychic processes generally can take place between people, which never were in immediate proximity. Therefore, the most probable version is such according to which quantum entanglement appears and is

supported at the level of genetic material. Biological molecules participating in mitosis and meiosis (including DNA) can be quite subject to occurrence of quantum entanglement. As to quantum entanglement between genetic material of a considerable subjects quantity it can be explainable with the account of “monocentric hypothesis of human origin” - the theory according to which a man has originated from a not numerous tribe in Africa. Such theory assumes that a genome of each of us to some extent bears in itself the rests of genetic material of primitive people (Rosenberg *et al.*, 2002; Zhivotovsky *et al.*, 2003). Perhaps quantum entanglement has arisen between DNA or other cellular structures of people still then (80-200 million years ago) and lasts at cellular and molecular level up to now, supporting not local correlations between all of us. Thus, to explain the hypothesis of Penfield and Eccles and also the theory of synchronicity of Carl Jung it is logical to present that “material carriers of consciousness” are cellular structures anyhow connected with meiosis and mitosis. In particular it can be DNA molecules. Thus, for Eccles and Penfield theory case, the “external source of consciousness” is brain cells of other people. Certainly, it is impossible to exclude that molecular orbitals (electron shells) of the molecules participating in mitosis and meiosis, perform only private role on physiological realization of psychic functions. This function is connected with not local correlations between various individuals. Quite probable is that electrochemical transfer of nerve impulses in synaptic clefts is specifically connected with neuron molecules, providing quantum entanglement between nervous cells of various subjects. The final answer, certainly, should be given by an experiment.

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