A historical view of the relation between quantum mechanics and the brain: a NeuroQuantologic perspective

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Abstract

Over the past decade, discussions of the roles that quantum mechanics might or might not play in the theory of consciousness/mind have become increasingly sharp. One side of this debate stand conventional neuroscientists who assert that brain science must look to the neuron for understanding, and on the other side are certain physicists, suggesting that the rules of quantum theory might influence the dynamics of consciousness/mind. However, consciousness and mind are not separate from matter. Submicroscopic world of the human brain give rise to consciousness, mind. We are never able to make a sharp separation between mind and matter. Thus ultimately there is no “mind” that can be separated from “matter” and no “matter” that can be separated from “mind”. The brain as a mixed physical system composed of the macroscopic neuron system and an additional microscopic system. The former consists of pathway conduction of neural impulses. The latter is assumed to be a quantum mechanical many-body system interacting with the macroscopic neuron system.

Keywords

mind, brain, quantum biology, neuroquantology, consciousness, quantum physics, history

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Does the brain use quantum mechanics? That’s a perfectly legitimate question, says Fisher. On one level, he is right – and the answer is yes. The brain is composed of atoms, and atoms follow the laws of quantum physics. In this view, current non-quantum ideas of the brain’s workings are doing just fine. “The evidence is building up that we can explain everything interesting about the mind in terms of interactions of neurons,” says philosopher Paul Thagard of the University of Waterloo in Ontario, Canada. Physicist David Deutsch of the University of Oxford agrees. “Is there any need to invoke quantum physics to explain cognition?” he asks. “I don’t know of one, and I’d be amazed if one emerged.” In quantum mechanics apparent (a.k.a. epistemic) randomness also plays an important role and reflects our lack of full knowledge of the state of a system. A state of a system in quantum mechanics corresponds to a vector in a Hilbert space, and is described by the projector operator on that vector. Quantum-mechanical probabilities are regarded (like their counterparts in classical statistical mechanics) as only a practical necessity and not as an inherent lack of complete de-termination in the properties of matter at the quantum level.” So Bohm’s theory has to be regarded as non-local hidden variable theory and therefore it does not allow intrinsic randomness; similarly, the many-world interpretation (MWI) suggests that intrinsic randomness is an illusion (Vaidman, 2014). Quantum mechanics calls these suppositions into question. Since mechanisms are hierarchical it appears that even macroscopic mechanisms must supervene on a set of “objects” that behave non-classically. In this paper we argue, in part by appeal to the theory of quantum decoherence, that the universal validity of quantum mechanics does not undermine neo-mechanistic ontological and explanatory claims as they occur within in classical domains. Additionally, we argue that by relaxation of certain classical assumptions, mechanistic explanatory strategies can sometimes be carried over into the quantum...