

Explaining the brain function with quantum effects

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Abstract

Introduction: The problem of how the brain works and produces consciousness, remains one of the greatest challenges in the science world. Classical physics explains this by linking the synapses of different neurons. Although this approach is widely accepted, it alone is unable to explain some phenomena, such as consciousness in single-celled organisms like Paramecium. With the advent of quantum mechanics, the quantum approach to the brain gave rise to new theories that one of the most important of which is the theory of ‘orchestrated objective reduction’ (‘Orch OR’). According to this theory, quantum phenomena such as entanglement and superposition may play an important role in describing brain function and explaining consciousness.

Methods: The Orch OR model is the result of the collaboration of theoretical physicists (Roger Penrose) and anesthesiologist (Stuart Hameroff). Penrose first looked at the problem from a mathematical point of view, and in particular Gödel's incompleteness theorems, and then Hameroff came up with the idea in a study of cancer and anesthesia and neurons study.

Results and discussion: The basis of the Orch OR theory is the occurrence of the process of collapse (reduction) of the quantum wave function in neurons. This event is related to the quantum dependence states in tubulin proteins. According to this theory, consciousness arises when a system is adequately organized (here in the tubulin proteins in microtubules) and is able to maintain (isolate) its quantum coherence among its constituents. This system can automatically undergo an orchestrated reduction of the wave function which results in a system (microtubule assemblies in neurons) producing successive reducing waves and eventually creating a cascade of consciousness.

Conclusion: In our interaction with the outside world, our quantum brain is capable of reproducing equivalent geometry of spacetime by means of "coordinated objective reduction" in microtubules and thus "perception" takes place.

Keywords: Quantum consciousness, Orchestrated objective reduction, Brain, Microtubules

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