

### Proposing quantum phenomena in neural events and cognition (Review)

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**Introduction:** More than a century ago, Max Planck proposed the quantization of energy to solve a problem called the ultraviolet catastrophe. Louis de Broglie also claimed that particles exhibit wave behavior. Davison-Germer tested Louis de Broglie's theory and obtained results that were consistent with the theory. Wave behavior occurs due to the smallness of Planck's constant in the scales of elementary, atomic, and molecular particles. The first person who tried to find a connection between the quantum and the brain was Alfred Lotka in 1925, and it was the beginning of entering the strange world of quantum mechanics and its role in neuroscience. The Orch-OR theory, developed by Roger Penrose and Stuart Hamroff in recent years, has helped draw attention to quantum mechanics' effects on the brain. There have been articles published regarding quantum phenomena that may occur at the synapse in recent years. The uncertainty phenomenon occurs when sodium and potassium ions pass through their channels. Due to the effect of quantum mechanics in the creation of spin chemistry, quantum mechanics can be indirectly considered as the cause of the development of neurochemistry. Quantum tunneling can also occur when neurotransmitters are released at the synapse. A photon is a quantum of energy in electromagnetic radiation and is known as a massless particle, so when examining the effects of light on the retina, the interaction should be considered quantum. The measurement problem is an unanswered question in quantum physics, theories related to the influence of the conscious observer on the collapse of wave function have been given, which may reveal a connection between consciousness and quantum mechanics. Brain function cannot be explained digitally with 0 and 1, so maybe we need quantum mechanics concepts for these things that happen at the moment, and we call them inspiration. Today, some researches in quantum biology about the mechanism of olfactory sense and magnetic orientation in birds, such as the European red-breasted bird (robin) are ongoing based on quantum mechanics.

**Methods:** A review of articles on quantum consciousness, quantum neuroscience, quantum brain, and quantum biology.

**Results:** Although people resisted the use of quantum mechanics in neuroscience in the last century, at least today they have understood that only using classical physics is not enough to explain neurocognitive phenomena.



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**Conclusion:** While quantum phenomena occur at the microscopic level, humans are unable to observe them at the macroscopic level due to the low Planck's constant. Although several mental and cognitive activities of the nervous system are probably on this scale, perhaps by designing creative research projects using the latest new technologies presented in quantum physics, it is possible to decipher some mysterious cognitive mechanisms with quantum mechanics.

**Keywords:** quantum; consciousness; Neuroquantology; quantum brain