Can Quantum Biology Enable yet Another Giant Leap?

Quantum mechanics revolutionized physics, probably like never before or thereafter. It put forward concepts that couldn't be accommodated within classical physics. Such was the desperation that Feynman was once quoted of being safe on his assumption that nobody understood quantum mechanics.

In 1944, Erwin Schrödinger made an attempt to define life in his short book titled “What is Life?”. The book tries to account for the events across space and time within the confines of living systems. Interestingly, it attracted many physicists into biology notable among them being Watson, Crick. Within a decade, a framework was set for the discipline which would rule biology for the next several decades. Molecular biology.

A quantum view of biology, however, was never established properly. Quantum physics was (and is) counter-intuitive to most of the physicists. Biologists could not have been expected to do any better. Recent studies have however revived the field. Biology just might be looking for another quantum leap.

**The efficiency of photosynthesis**

“Energy transfer in light-harvesting macromolecules is assisted by specific vibrational motions of the chromophores, We found that the properties of some of the chromophore vibrations that assist energy transfer during photosynthesis can never be described with classical laws, and moreover, this non-classical behaviour enhances the efficiency of the energy transfer.”
A theory of consciousness

Discovery of multi-level memory-switching capabilities of microtubules (by Anirban Bandyopadhyay) present in neurons earlier this year is being seen as a confirmation of a 20 year old theory that consciousness arises from quantum effects.

“The origin of consciousness reflects our place in the universe, the nature of our existence. Did consciousness evolve from complex computations among brain neurons, as most scientists assert? Or has consciousness, in some sense, been here all along, as spiritual approaches maintain? This opens a potential Pandora’s Box, but our theory accommodates both these views, suggesting consciousness derives from quantum vibrations in microtubules, protein polymers inside brain neurons, which both govern neuronal and synaptic function, and connect brain processes to self-organizing processes in the fine scale, ‘proto-conscious’ quantum structure of reality.”

Other biological processes attributed to quantum processes are —

- Magneto-reception in birds – looks like the compasses birds use to navigate while migrating are quantum ones.
- Sense of smell – maybe not much different to how we see or listen (in vibration or waves).
- DNA mutation – could DNA be written in quantum, and not binary, letters?
Quantum phenomena are usually simulated at very low temperatures. How does nature perform quantum processes at regular temperature? No one knows, but it does hint at exciting possibilities in energy, computing, and healthcare.