



Quantum Biology

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Definition

- **Quantum biology** is the study of applications of quantum mechanics and theoretical chemistry to biological objects and problems.
- Many biological processes involve the conversion of energy into forms that are usable for chemical transformations, and are quantum mechanical in nature.
- Such processes involve chemical reactions, light absorption, formation of excited electronic states, transfer of excitation energy, and the transfer of electrons and protons (hydrogen ions) in chemical processes, such as photosynthesis, olfaction and cellular respiration

Is this a new idea? NO

- It has been conceptualized by physicists throughout the 20th century.
- Early pioneers of quantum physics saw applications of quantum mechanics in biological problems.
 - Erwin Schrödinger's 1944 book *What is Life?* discusses applications of quantum mechanics in biology. He further suggests that mutations are introduced by "quantum leaps".
 - Niels Bohr, Pascual Jordan, and Max Delbrück argued that the quantum idea of complementarity was fundamental to the life sciences.
 - In 1963, Per-Olov Löwdin published proton tunneling as another mechanism for DNA mutation. In his paper, he states that there is a new field of study called "quantum biology"
 - More recently "Role of Entanglement in Biological Systems"

Links to Quantum Biology

- Video shown today: <https://www.youtube.com/watch?v=ADiql3FG5is>
- Short videos:
 - Part 1 <https://www.youtube.com/watch?v=Zc9Xk99gCr4>
 - Part 2 <https://www.youtube.com/watch?v=almlINDXU5c>