

Introduction

The history of quantum mechanics is one of skepticism and reluctance. Faced with paradoxes and phenomena that defied classical physics, scientists were slow to accept the new theory. Today, something similar is happening at the intersection between quantum physics and biology. Quantum biology is a relatively new field, and it is still in its infancy.

Knock, Knock - Are you there?

The first part in every experiment is the hypothesis--the motivation for what may follow. In this case, the hypothesis is that quantum effects play a role in biological processes. Life on Earth depends on many processes, but photosynthesis stands as one of the pillars. From early education, we learn that plants use sunlight to produce energy. Part of being human is making decisions, using information acquired through experience to predict future outcomes. For years, people have studied the habits of migrating birds. Beyond the complex patterns formed in the sky, there is a quantum phenomenon at play. Beyond the direct employment of quantum phenomena to confer advantages, nature shows signs of mirroring quantum mechanics. Another clear example of quantum-resembling processes in nature is cellular differentiation. Stem cells have the potential to become any type of cell in the body. Several fields have made tremendous progress by adopting ways of thinking from other disciplines--economics, psychology, and even art. However, not all processes in living organisms mimic quantum dynamics--some are simply classical and straightforward. Nucleotides are held together through hydrogen bonds, which consist of protons being shared between atoms.

Final Remarks

One may wonder whether quantum advantage might be limited to a few cases, arguing that quantum effects are rare in the biological world. Another fault in this skepticism is the assumption that the complexity observed in living systems and the quantum world are fundamentally different. Quantum biology has evolved as an idea and stands today to represent a promising field of both fundamental and applied research. The journey ahead is arduous, as investigations into the quantum world require highly controlled conditions and sophisticated experimental techniques.