News Brief: Quantum Photosynthesis

Biology seems to make use of whatever is around it: water, carbon, quantum mechanics…wait, what? That’s right, some of the first evidence of a biological system making use of the laws of quantum mechanics, more specifically a process known as coherence, has recently come forward in a paper published in the Proceedings of the National Academy of Sciences. In physics, coherence refers to the property of interfering waves that allows them to add together to create a larger wave, or subtract from one another to create a smaller wave. In quantum mechanics, we know that a light can behave like a wave or a particle, and coherence allows a photon, for instance, to pass through something by actually taking all possible paths (as a wave would) and then “selecting” the shortest or most efficient path as at retains the properties of a particle. (For a very cool example of light’s properties as both a wave and a particle, check out the Double-Slit Experiment video on our homepage.)

A short lesson in physics aside, what does this have to do with biology? New findings suggest everything. A team of researchers out of the University of Chicago have show that plants take advantage of coherence when photons hit their leaves. Something called the FMO protein complex apparently makes use of quantum coherence in order to assure that photons take the shortest path from the tiny “antenna” like proteins on the surface of leaves that detect light energy, to the proteins inside that then work to convert light into usable energy. More simply, by taking advantage of quantum coherence, plants ensure the maximum amount of energy transfer occurs.

News of this magnitude almost certainly means that a huge influx of research into quantum systems pervading biological ones is imminent. It seems inevitable almost that the more we look, the more we will find quantum mechanics at work in the world immediately around us.

Original Paper: http://www.pnas.org/content/106/41/17255.abstract?sid=d6cd7b09-7aad-43d8-afa6-fc2ff98ad8d9