Coherence and Charge Separation in Photosynthetic Reaction Centers

Jennifer P. Ogilvie
Department of Physics, University of Michigan, United States

I will discuss CMDS studies of two photosynthetic reaction center complexes. In the bacterial reaction center (BRC) from purple bacteria, CMDS reveals hidden excitonic and vibronic structure. Through analysis of the coherent dynamics of the BRC we resolve specific coherent signatures that allow us to definitively assign the upper exciton energy of the "special pair." We support this assignment with simulations of coherent dynamics of a reduced excitonic model of the BRC. The simulations also identify nonsecular vibronic coherence transfer processes neglected in standard models of photosynthetic energy transfer and charge separation. In the reaction center from heliobacteria (HbRC), which has been proposed to most closely resemble the common ancestor of all photosynthetic reaction centers, I will show how CMDS can test exciton models and reveal its charge separation mechanism.

.