IS1.1 - Impact of the membrane on the dynamics of photosynthetic light harvesting

Ashley L. Tong[1], John I. Ogren[1, 2] and Gabriela S. Schlau-Cohen[1]

[1]Department of Chemistry, Massachusetts Institute of Technology, Cambridge MA 02139, USA.
[2]Currently at Micro-Leads, Inc., Boston MA 02215, USA.

In photosynthetic light harvesting, absorbed energy migrates through a protein network, generally held within a membrane, to reach a dedicated location for conversion to chemical energy. This process begins with a series of femto- to picosecond energy transfer steps that occur with a remarkable near unity quantum efficiency. These energy transfer steps depend nonlinearly on intermolecular distance, and thus can change dramatically with minor structural changes. To understand the impact of the surrounding environment, we create a membrane environment to solubilize photosynthetic proteins. We use ultrafast transient absorption spectroscopy to measure the energy transfer steps within this membrane environment. Our membrane-protein systems enable the physiological mechanisms and timescales of energy transfer to be accessed as well as identify the role of the membrane in these dynamics. We discuss how the surrounding membrane creates a robust environment to produce efficient energy flow. (Supported by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences, Division of Chemical Sciences, Geosciences, and Biosciences under Award Number DE-SC0018097.)