

McElvain Seminar in Physical Chemistry

**Tuesday,
April 30, 2013**

11:00 a.m.

**Room 1315
Chemistry Building**

*Imaging Quantum Effects in Biological Systems
to Elucidate Design Principles of Photosynthetic Energy Transfer*



Professor Greg Engel

*Department of Chemistry
The University of Chicago*

Host: Dan Kohler/Wright Group

Photosynthetic antenna complexes harvest light with near perfect quantum efficiency and steer excitonic motion with exquisite precision. Optimized by evolution, these complexes exploit both incoherent (Förster) energy transfer along with coherent (wavelike) motion of energy. We seek to isolate and copy the microscopic details of this mechanism to enable coherent energy transfer in synthetic systems. The talk will show evidence for long-lived quantum coherence in photosynthetic complexes along with new spectroscopic techniques to probe these effects. For example, we have created a new femtosecond optical spectroscopy by exploiting spatiotemporal gradients to image the underlying excited state dynamics within photosynthetic antenna complexes. From our 2D electronic spectra, we find a strong and unexpected mixing between states of the chromophores and some bath modes within the system. At the end of the talk, two new results will be discussed. First, a new theoretical model using non-equilibrium Green's functions will be presented; this model demonstrates that the coherences observed in time domain spectroscopy report on underlying physics with direct implications for light harvesting under incoherent excitation. Second, new results will be shown demonstrating that long-lived coherence can be engineered into a family of novel synthetic small molecules using the insights extracted from the photosynthetic work.

Refreshments will be available prior to the seminar at 10:45 a.m. outside room 1315

Graduate Students may meet with the speaker at 1:15 p.m. in Room 8305f