INSTITUTE SEMINAR

Monday, 31 March 2014 4.00 pm Fermion

Speaker:
Dr. Arijit K. De
Postdoctoral Fellow, Physical Biosciences Division, Lawrence Berkeley National Laboratory and Department of Chemistry, University of California at Berkeley

Title:
Probing ultra fast coherent dynamics by incoherent fluorescence detection: Towards a spatiotemporal approach

Abstract:

The remarkable efficiency of sunlight harvesting in natural photosynthesis has motivated researchers to study the microscopic origin of energy transfer dynamics in photosynthetic pigment-protein complexes independent of ensemble averaging, thereby exploring the possibilities of controlling energy transfer efficiency. Two-dimensional coherent spectroscopy (2D-CS) has been developed as one of the state of the art spectroscopic tools to disentangle population and coherence dynamics in the condensed phase. The sensitivity of 2D-CS deteriorates with fewer molecules (or molecular complexes) for which two-dimensional fluorescence-detected coherent spectroscopy (2D-FDCS) provides the enhanced sensitivity. However, the machinery of 2D-FDCS requires a distinct experimental realization that limits its wide applicability. In this talk, starting with a comparison between different aspects of 2D-CS and 2D-FDCS, a novel experimental scheme combining the two distinct approaches will be discussed.
This will be followed by a brief presentation of research on contrast generation in two-photon fluorescence microscopy by pulse-pair/-train excitation and on stable optical trapping of nano-particles by pulsed excitation. Toward the end of the talk, a research proposal combining ultrafast temporal resolution with sub-diffraction spatial resolution will be discussed which will enable us ‘visualize’ energy transfer through light harvesting networks. Two other proposed experiments will also be presented, addressing systematic exploration of energy transfer through artificial light harvesting analogs and speeding up energy transfer by controlling fluctuations in the environment.
