Department of Physics

Colloquium

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Energy transfer and charge separation dynamics in natural and artificial nano-structured light harvesting systems

day	location	time
OCTOBER 17, 2012 WEDNESDAY	EE01	16:00

ABSTRACT

What are the fundamental, molecular-level differences between the artificial photosynthetic systems, composed of composite and hybrid nano structured materials, that are currently being explored in laboratories around the world for applications in artificial photosynthesis, and the nano technologies that nature has evolved to solve the problems of interconnecting the molecular-scale light harvesting, excitation energy transport and transformation processes that underlie the highly successful Global Natural Photosynthetic systems?

This presentation will focus on the lessons that have been learned recently from ultrafast nonlinear spectroscopy studies and model theoretical calculations [1-4] that suggest that in natural biological systems quantum coherent dynamics, dissipation, and dephasing must be balanced in each of the interconnected nanoscale components to achieve optimal functioning. Understanding how these factors influence the performance of natural photosynthetic machinery may help bridge the nano technology gap and enable design of optimal artificial photosynthetic systems.

References:
[1] "Theoretical Study of Coherent Excitation Energy Transfer in Cryptophyte Phycocyanin 645 at Physiological Temperature", by P. Huo and D.F. Coker, J. Phys. Chem. Letts. 2, 825-833 (2011).
[2] "Iterative linearized density matrix propagation for modeling coherent excitation energy transfer in photosynthetic light harvesting", by P. Huo and D.F. Coker, J. Chem. Phys. 133, 184108 (2010).
[3] "Efficient energy transfer in light-harvesting systems, III: The influence of the eighth bacteriochlorophyll on dynamics and efficiency in FMO", by J.M. Moix, J. Wu, P. Huo, D.F. Coker and J. Cao, J. Phys. Chem. Letts. 2, 3045-3052 (2011).
[4] "Partial linearized density matrix dynamics for dissipative, non-adiabatic quantum evolution", by P. Huo and D.F. Coker, J. Chem. Phys. 135, 201101 (2011).

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