BIG energy seminar series

Addressing the scale and complexity of the global energy challenge.

Design Principles for Light Harvesting

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Abstract:

Photosynthetic light harvesting complexes are sophisticated multichromophoric assemblies used to regulate and concentrate photo-excitations for delivery to reaction centers under wide-ranging incident irradiances [1]. They provide wonderful model systems for the study of energy transfer mechanisms in well-defined structures. From those studies, several broad lessons have been learned that were described in a recent article [2]. As concluded in that article, the next step appears to be elucidating how can we write a blueprint to 'make something' based on what we have learned from photosynthetic complexes. Despite the thousands of studies reported on energy transfer, researchers have not really established clear design principles except for the use of an energy gradient. However, most photosynthetic light harvesting complexes do not incorporate a substantial internal energy gradient directing energy flow, that is, only one of two chemical types of chromophores are used. I will discuss an example of a light harvesting 'circuit' and describe various examples of energy transfer in light harvesting. Finally, I will mention new experiments that enable us to perform multidimensional nonlinear spectroscopy without using femtosecond lasers.

BIO:

Greg Scholes is the D.J. LeRoy Distinguished Professor at the University of Toronto in the Department of Chemistry. His research group examines photophysics in systems ranging from semiconductor nanocrystals to conjugated polymers to photosynthetic light-harvesting proteins. He is especially interested in uncovering microscopic details of light-induced energy capture and conversion processes in photosynthesis and organic photovoltaics using a combination of femtosecond laser experiments and theory. Recent awards include the 2012 Bourke Award from the Royal Society of Chemistry, the 2011 Sackler Prize in Chemical Physics from Tel Aviv University, and election to the Academy of Science, Royal Society of Canada in 2009. Dr. Scholes serves as an Editorial Advisor for *New Journal of Physics* and Senior Editor for the *Journal of Physical Chemistry Letters*. He serves on several editorial advisory boards

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