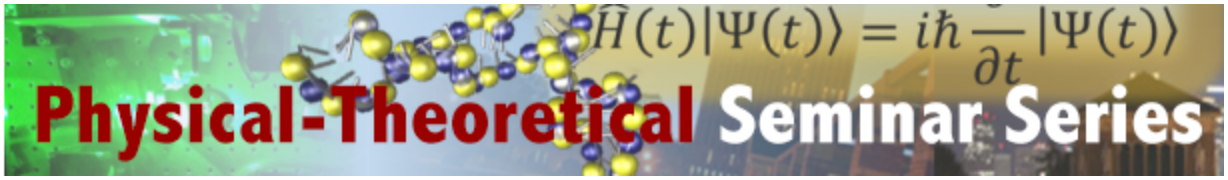

Monday, March 26, 2018, 12:00 pm
Seaver Science Library, Room 150
SSC Auditorium next to the library

Professor Patanjali Kambhampati

Department of Chemistry
McGill University

Surface Science on the Nanoscale and Optical Analogs of 2D-NMR

Two new directions in our research group have emerged from a decade of work on ultrafast exciton dynamics in semiconductor nanocrystals. In both cases we connect classical ideas in physical chemistry to new opportunities in materials science.

The semiconductor nanocrystal is a cluster on the length scale of 1 – 10 nm, at which point quantum confinement effects arise. In this regime, one has the standard quantum dot, characterized by excitons, now well understood. By virtue of their small size, these nanocrystals also have pronounced surface effects. Despite their importance, understanding of these materials' surface within the nanoscience community is in its infancy. Using simple temperature dependent fluorescence spectroscopy, we have shown that the surface can be understood in terms of classical concepts from molecular electron transfer theory. We report on recent chemical and spectroscopic work that reveals how the surface of semiconductor nanocrystals may be understood, controlled and exploited. For a decade our group has employed State-Resolved Pump/Probe spectroscopy to probe ultrafast exciton dynamics in semiconductor quantum dots. These time resolved spectroscopies with one frequency dimension have indeed been useful. But newer multidimensional time- resolved methods, such as Sophisticated Coherent Multidimensional Spectroscopy (CMDS) experiments, can be considered optical analogs to 2D-NMR, albeit with complex beam geometries. Our recent work using laser pulse shaping approaches shows how one can create femtosecond laser pulse trains that are suitably modulated in an automated and programmable manner to enable CMDS in a fully collinear approach using all-optical readout.

Reference:
Kambhampati, P.; Mack, T.; Jethi, L. *ACS Photonics* **2017**, *4*(3), 412–423.

Hosted by Professor Anna Krylov
The scientific community is invited

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