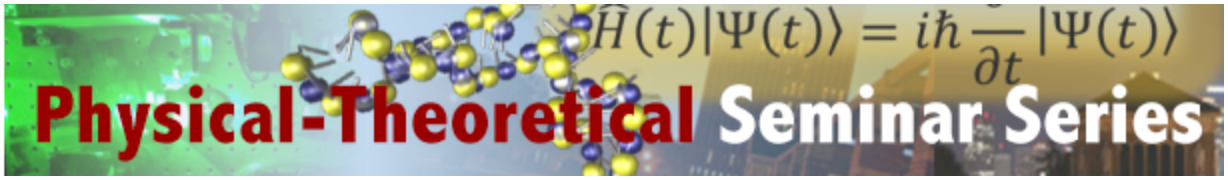

Monday, October 30, 2017, 12:00 pm
Seaver Science Library, Room 150
SSC Auditorium next to the library

Professor John Marohn

Department of Chemistry and Chemical Biology
Cornell University

Pushing the Spatio-temporal Limits of Scanned Probe Microscopy

Imaging the structure and function of soft materials at nanometer resolution represents a major challenge in Imaging the structure and function of soft materials at nanometer resolution represents a major challenge in analytical, physical, and materials chemistry. I will describe my group's work to address this challenge by pushing the spatio-temporal limits of scanned probe microscopy.

I will begin by describing how we have used time- and wavelength-resolved scanned-probe photocapacitance and photovoltage experiments to gain fresh microscopic insight into the puzzling process of charge generation in polymer photovoltaic films [1]. To detect and image charge recombination in photovoltaic films we have developed a new approach that has allowed us to improve the time resolution of photocapacitance measurements from microseconds to nanoseconds. Second, I will describe my laboratory's work pushing the *spatial* limits of scanned probe microscopy [2]. Here we use scanned-probe microscope technology to detect magnetic resonance as a force, with sensitivity sufficient to push magnetic resonance imaging (MRI) to nanometer resolution. I will describe the development of attonewton-sensitivity cantilevers with integrated nanomagnet tips. We have used these cantilevers to detect magnetic resonance from a polymer film at cryogenic temperatures with a sensitivity of a few hundred proton magnetic moments. A range of experiments underway suggest that cantilever-detected magnetic resonance is on its way to becoming a powerful new route for creating a three-dimensional image of a *single copy* of a globular protein, membrane protein, or macromolecular complex.

Suggested reading:
[1] Dwyer, R. P., Marohn, J. A. et al., *Science Advances* (2017) 3: e1602951.; Tirmzi, A. M., Marohn, J. A. et al., *ACS Energy Lett.* (2017) 2: 488.
[2] Longenecker, J. G., Marohn, J. A. et al., ACS Nano (2012) 6: 9637; Isaac, C. E., Marohn, J. A. et al., Phys. Chem. Chem. Phys. (2016) 18: 8806.

Hosted by Professor Anna Krylov

The scientific community is invited

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