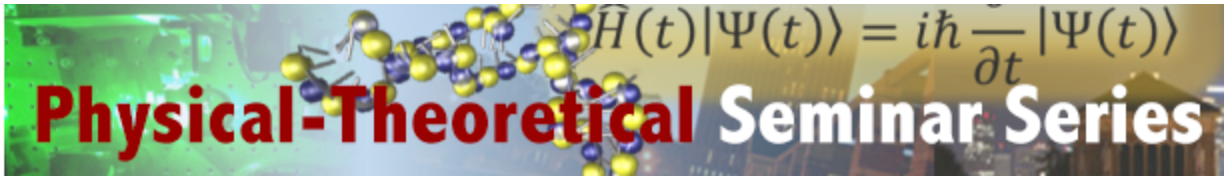

Special Physical Chemistry Seminar
Thursday, January 11, 2018, 12:30 pm
SSL 150
Seaver Science Auditorium next to the library

Professor Ilia Kaminker

Department of Chemistry and Biochemistry
University of California Santa Barbara

Mutual Interrogation of Electron and Nuclear Spins - From a Hundred-fold NMR Signal Amplification to Wet Adhesion Applications

Dynamic Nuclear Polarization (DNP) is at the frontiers of modern magnetic resonance as it overcomes the main limitation of Nuclear Magnetic Resonance (NMR) spectroscopy -- low sensitivity. In the first part of my talk I will present our recent developments towards enhancing high field DNP performance using shaped sub-THz pulses. The current mainstream high-field DNP approach exclusively relies on monochromatic continuous wave (CW) irradiation for polarization transfer from electron to nuclear spins. Historically, a shift from CW to pulsed experiments have transformed both EPR and NMR spectroscopies. I will demonstrate how implementation of 200 GHz shaped pulse capabilities allowed for significantly improved DNP performance (up to a factor of 5) for experiments performed at 7 T (300 MHz 1H). Shaped-pulse-driven DNP broadens the scope and enhances the performance of DNP across a wide range of experimental conditions by making feasible NMR experiments previously deemed impossible. While DNP is most well-known as a method to boost NMR signals by orders of magnitude, it can also be implemented for localization of the NMR signal to distinguish surface water molecules from their bulk counterparts, or to selectively detect other surface species. In the second part of my talk I will present how a combination of the Overhauser DNP (ODNP) and Electron Paramagnetic Resonance (EPR) spectroscopies allowed for elucidating the molecular details underpinning the unusual rheological properties of a promising pressure-sensitive underwater adhesive that was designed to mimic natural adaptations found in mussels.

The scientific community is invited

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