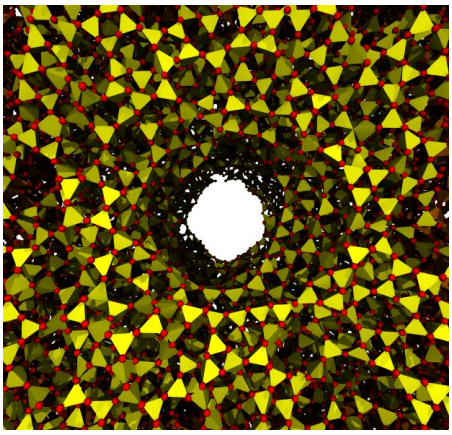
NANOHOUR

Wednesday, September 1, 2010 3:00 pm
Beckman Institute - Room 3269

Computational microscopy of synthetic nanopores

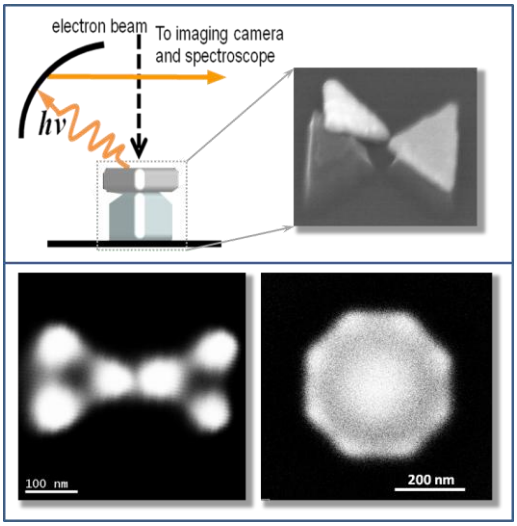
Eduardo R. Cruz-Chu, Biophysics and Computational Biology
Graduate Student with Professor Klaus Schulten



Advances in nanotechnology have allowed researchers to manufacture pores in synthetic membranes with subnanometer precision, so-called synthetic nanopores. Immersed in aqueous solution, these nanopores can be deployed to study the translocation of charged molecules and ions. However, little is known about the molecular level dynamics inside nanopores or the mechanism by which molecules and ions interact with nanopore walls. This seminar presents molecular dynamics simulations of synthetic nanopores made with two different materials: silica and polyethylene terephthalate. A challenging aspect of this research involves building all-atom models that can accurately describe the amorphous topography and intermolecular interactions of the nanopore surface. Once validated, such nanopore models were used to provide atomic descriptions of several phenomena reported in nanopore experiments.

Plasmonics: Electron beam as plasmon excitation source and measurement probe

Anil Kumar, Electrical and Computer Engineering
Graduate Student with Professor Nicholas Fang (MechSE)



Elastic scattering of electrons have long been used for imaging. Recently, electrons have been used for exciting surface plasmon polaritons (SPPs) through their interaction with the conduction band electrons in metals. Consequently, radiation emitted by the oscillating plasmons on metallic surfaces can be used for studying local fields with very high spatial resolution, well beyond the diffraction limit.

In this talk, I will first give a brief overview of surface plasmon excitation and imaging using an electron beam source. We have investigated several plasmonic nanostructures using cathodoluminescence (CL) by exciting and mapping different SPP modes. Specifically, I will focus on how CL can be used to map the 'hot-spots' of triangular nano-antennas. With support from FDTD simulations, we investigate long standing questions on the relationship between near- and far-fields of the nanostructures, and which resonances give highest field enhancements (dipole, quadrupole, or mixed modes?). Finally, I will focus on our current CL investigations on ultra-small nano-disk resonators, which are promising candidates for Purcell-enhanced spontaneous emission and next generation cavity lasers.

Coffee and cookies will be served
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