

Chez Pierre

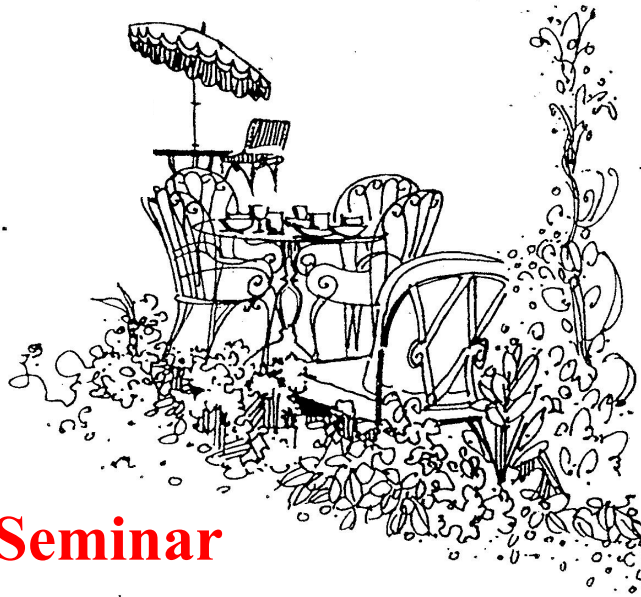
Presents ...

Monday, October 3, 2016

12:00pm Noon

MIT Room 4-331

Chez Pierre Seminar



David A. Muller - Cornell University

“Electron Microscopy 2.0: New Detectors for measuring probability current flow of an atomic-scale electron beam”

Complete information about the scattering potential of a sample is in principle encoded in the distribution of scattered electrons from a localized beam propagating through it. Recovering this information is a classic inverse problem, with complex iterative solutions in general. A new generation of high-speed, momentum-resolved electron microscope detectors brings us closer to realizing this general goal and in doing so enables new imaging modes spanning sub-Angstrom to multi-micron length scales. These include measurements of probability current flow that can be used to map electric and magnetic fields in thin samples, and measuring the orbital angular momentum of an electron beam to record torque transfers. We apply this method to imaging arrays of ferroelectric polarization vortices in $\text{PbTiO}_3/\text{SrTiO}_3$ superlattices. From the asymmetry in probability current flow, we show the vortices are chiral, with a non-trivial axial component. The detector has proved useful for a wide range of quantitative applications including the imaging of strain fields in 2D materials, high-dose-efficiency biological imaging, and octahedral rotations in complex oxides.