

Chez Pierre

Presents ...

Monday, May 2, 2016

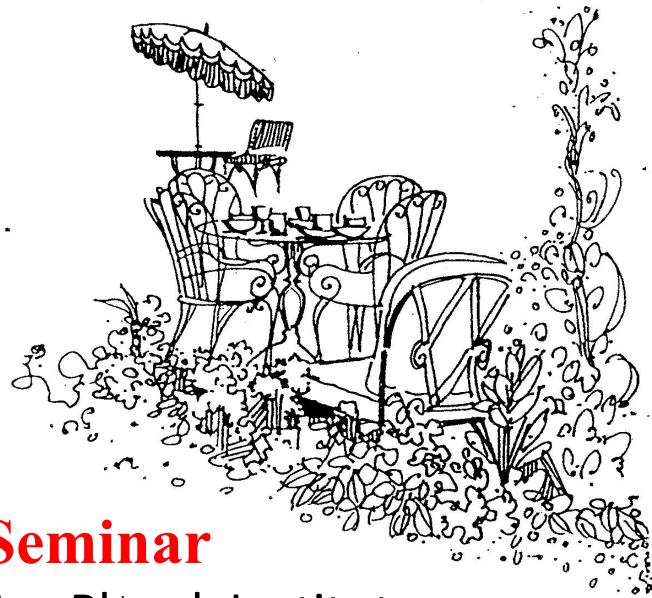
12:00pm Noon

MIT Room 4-331

Chez Pierre Seminar

Andrew Mackenzie – Max Planck Institute

“Water, honey and electrons - evidence for electronic hydrodynamics in naturally occurring materials.”



Electrical transport in solids is almost always analysed using an approximation in which all scattering is assumed to relax the momentum of the electrons. Although this can be justified in the vast majority of cases, because the electrons are moving in a lattice to which momentum is efficiently transferred, recent measurements by several groups give evidence that it is not always true. In ultra-pure systems with extremely long mean free paths, the momentum-conserving collisions that are ignored in standard theory can become more rapid than the momentum-relaxing ones. In this limit, the electronic flow moves into a hydrodynamic regime in which the electron fluid's viscosity dominates the resistance measured in flow through constrained channels. Although not very well known by people working on bulk materials, the study of such effects goes back over fifty years in the theoretical literature and over twenty years in experiments on high purity two-dimensional electron gases. I will try to review the history of the field, then describe new experiments on PdCoO_2 and graphene, and finally make some comments about extending the investigation to other systems.