Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

" Hydrodynamic description of electron transport in high mobility semiconductor nanostructures"

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Abstract: It is widely believed that, since electron-electron (e-e) collision processes conserve electron quasimomentum, they have little impact onsystem resistivity. As we discuss in this talk there are interesting exceptions to this rule. In high mobility nanostructures at intermediate temperatures the inelastic mean free path due to e-e scattering may be shorter than the spatial scale of the disorder potential. In this regime the e-e interactions may have a dramatic effect on the resistivity. Electric current takes on a role of a hydrodynamic flow of a strongly interacting electron liquid moving in a smooth disorder potential. This flow is markedly different from the Stokes flow. Dissipation of mechanical energy and resistivity is dominated by the heat fluxes that arise in the fluid in the presence of the current rather than by viscous stresses. In this regime, the system resistivity can be expressed in terms of the kinetic coefficients of the electron fluid; viscosity, thermal conductivity, and spin diffusion coefficient.

1:00pm
Wednesday, March 16, 2016
Duboc Room (4-331)

Host: Leonid Levitov