Physics Colloquium
Monday September 18th, 2006
4:15 PM 428 Pupin Hall
Professor Phillip Kim of
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"Quantum Physics at Your Pencil Tips:

Dirac Fermion in Graphitic Carbon"

Abstract: The massless Dirac particle moving at the speed of light has been a fascinating subject in relativistic quantum physics. Graphene, an isolated single atomic layer of graphite, now provides us an opportunity to investigate such exotic effect in low-energy condensed matter systems. The unique electronic band structure of graphene lattice provides a linear dispersion relation where the Fermi velocity replaces the role of the speed of light in usual Dirac Fermion spectrum. In this presentation I will discuss experimental consequence of Dirac Fermion spectrum in charge transport, realized in two representative low dimensional graphitic carbon systems: 1-dimensional carbon nanotubes and 2-dimensional graphene. Combined with semiconductor device fabrication techniques and the development of new methods of nanoscaled material synthesis/manipulation enables us to investigate mesoscopic transport phenomena in these materials. The exotic quantum transport behavior discovered in these materials, Postsuch as room temperature ballistic transport, unusual half-integer quantum Hall effect, and a non-zero Berry's phase in magneto-oscillations will be discussed in the connection to Dirac Fermion description in graphitic systems.