Chez Pierre

Presents ...

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MIT Room 4-331

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“Massless and Massive Electrons in Atomically-thin Carbon”

Graphene, a single atom-thick plane of graphite, has recently been isolated and studied experimentally. In this two-dimensional hexagonal lattice of carbon atoms, the electrons obey the Dirac equation for massless particles, complete with a two-component spinor degree of freedom that mimics the spin of a relativistic particle. Graphene thus represents a unique opportunity to study ultra-relativistic Dirac Fermions in the laboratory. In addition, the extraordinary materials parameters of graphene are attractive for a range of applications from high-speed electronic devices to flexible, transparent conducting coatings. I will first discuss the electronic structure of graphene, and its implications for electronic properties. I will then describe experiments to elucidate the electron scattering mechanisms in graphene in the diffusive transport regime, which illustrate some unique consequences of graphene’s massless electronic dispersion relation. Finally, I will discuss experiments on mesoscopic graphene samples which provide a direct probe of the massless Fermion particle-in-a-box states in graphene, as well as the massive Fermion particle-in-a-box states in its bilayer counterpart.