Chez Pierre

Presents ...

Monday, October 26, 2009
12:00pm
MIT Room 4-331

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"Theory of Graphene: QED and FET on a pencil tip"

I will discuss our current theoretical understanding of transport properties of 2D graphene layers using extensive comparison with existing experimental data as the guide. In particular, I will argue that the currently available graphene samples are sufficiently dirty from environmental charged impurities that it is more appropriate to think of graphene simply as a Si MOSFET with linear, chiral electronic band dispersion than as a Dirac system with exotic properties (e.g. a universal minimum conductivity). I will show how both the high density (i.e. high gate voltage) and the low density transport in graphene can be understood on the basis of electrons (or holes) scattering off screened charged impurity centers randomly distributed in the graphene environment. Very high room temperature mobilities are possible in graphene because of weak electron-phonon coupling. Finally, I will comment on the effect of disorder on exotic phenomena such as Klein tunneling, universal minimum conductivity, and localization. I will establish that we have an excellent zeroth order theoretical description of 2D graphene transport.