

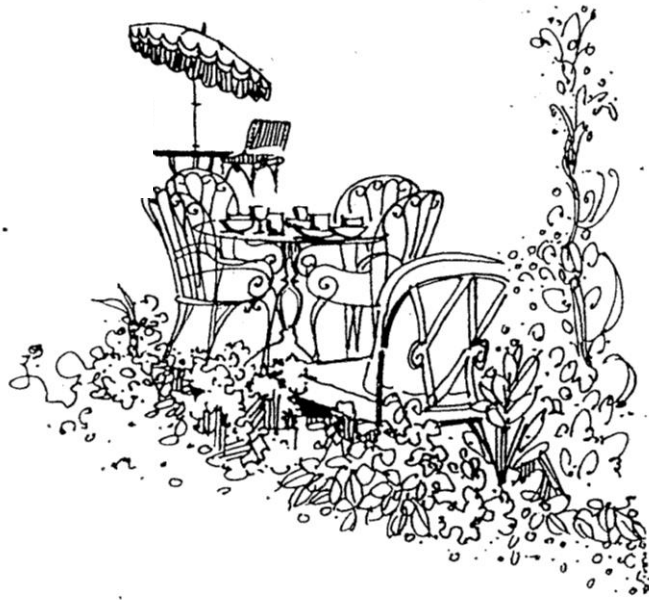
# *Chez Pierre*

Presents ...

**Monday, September 19, 2011**

**12:00pm**

**MIT Room 4-331**



**Dimitri Basov**

University of California – San Diego

***“Infrared Nanoscopy of Dirac plasmons at the graphene-SiO<sub>2</sub> interface”***

Surface plasmons are fundamental collective modes of the electron gas that enable functionalities at the intersection of photonics and electronics. Optical phenomena associated with the Dirac surface plasmon of massless quasi-particles in graphene have so far remained unexplored. In this talk I will report on the infrared (IR) spectroscopy and nanoscopy of monolayer graphene on SiO<sub>2</sub>. We probe the Dirac plasmon by confining mid-IR light at the apex of a metalized tip of radius as small as 20-30 nm: a technique we previously used to investigate the insulator-to-metal transition at the nano-scale [Science 325, 1518 (2009); Science 318, 1750 (2007)]. This approach yields about two orders of magnitude increase in the value of the incident wavevector  $q$ , a precondition for probing Dirac plasmons. At these high wavevectors the Dirac plasmon dramatically enhances the interaction of light with the SiO<sub>2</sub> substrate. Detailed modeling of high- $q$ , ultra-localized IR spectra shows that this effect is produced by concerted action of graphene electrons and SiO<sub>2</sub> surface phonons. Our work affirms an underexploited capability of tip-based optical nanoscopy to probe collective charge modes far away from  $q=0$  of conventional optical spectroscopy.