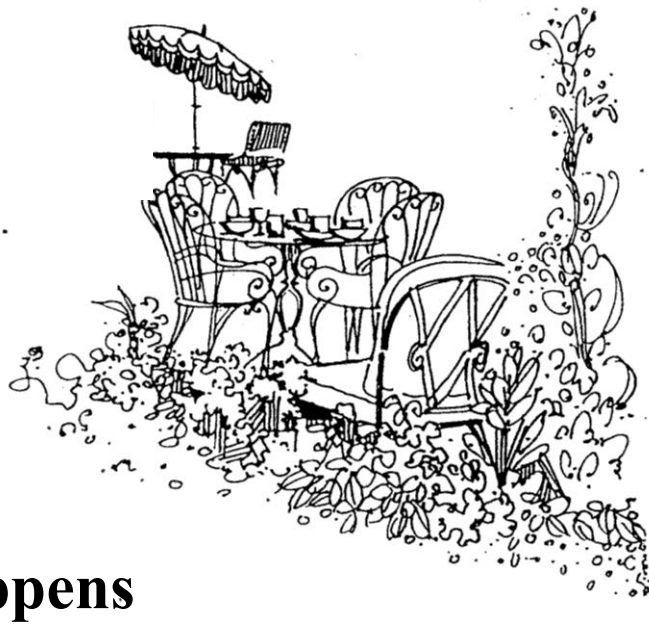
Chez Pierre

Presents ...

Monday, December 2, 2013
12:00pm
MIT Room 4-331



Frank Koppens

ICFO-The Institute of Photonic Sciences - Barcelona, Spain

"Plasmonics and Hot carrier multiplication in graphene "

Graphene, a two-dimensional sheet of carbon atoms, has recently emerged as a novel material with unique electrical and optical properties, with great potential for novel opto-electronic applications, such as ultrafast photo-detection, optical switches, strong light-matter interactons etc. In this talk I will show how to exploit graphene as a host for guiding, switching and manipulating light and electrons at the nanoscale. This is achieved by exploiting surface plasmons: surface waves coupled to the charge carrier excitations of the conducting sheet. We find remarkably strong plasmon reflections at defects and edges, and support our findings with a physical picture of this intriguing phenomenon.
Additionally, I will discuss novel types of hybrid graphene photodetectors and the effects of carrier dynamics and carrier multiplication in graphene. By studying the ultrafast energy relaxation of photo-excited carriers after excitation with light of varying photon energy, we find that electron-electron scattering (and thus carrier multiplication) dominates the energy relaxation cascade rather than electron-phonon interaction. This singles out graphene as a promising material for highly efficient broadband extraction of light energy into electronic degrees of freedom, enabling a new class of high-efficiency optoelectronic and photovoltaic applications.