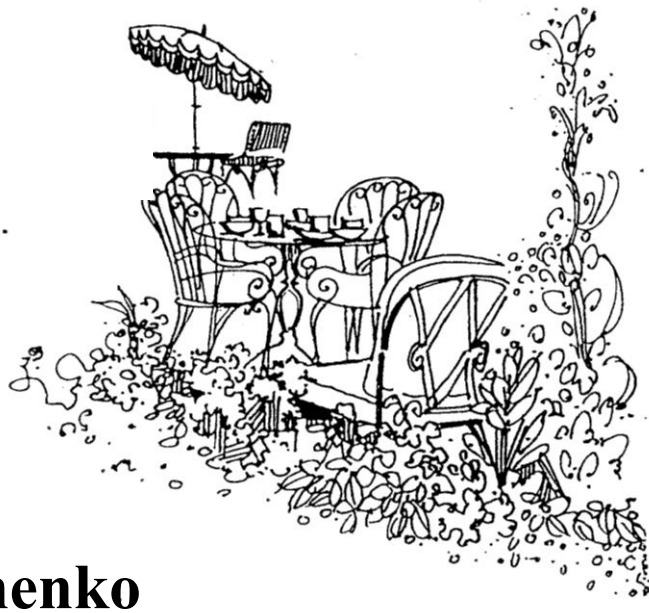
Chez Pierre

Presents ...

Monday, December 10, 2012
12:00pm
MIT Room 4-331



Alex Levchenko

Michigan State University

"Superconductivity in pnictides: quantum fluctuations and proximity related problems "

Recent measurements of the doping dependence of the London penetration depth in clean samples of isovalent BaFe_2 [As_(1-x)P_x)]_2 at T<<Tc [Hashimoto et al., Science 336, 1554 (2012)] revealed a sharp peak near optimal doping x=0.3. This observation points to the existence of the quantum critical point (QCP) beneath the superconducting dome. I will discuss that quantum magnetic fluctuations, associated with the emerging spin-density-wave (SDW) order give rise to the observed feature. The effect comes from the dynamic renormalization of the effective mass that has a maximum at the onset of the spin-density-wave order. The case of pnictides is thus conceptually different from a one-component Galilean invariant Fermi liquid, for which correlation effects do not cause the renormalization of the London penetration depth at T=0. The same observation implies that inside the dome there is a line of the second order phase transition, which terminates at QCP, that separates pure superconducting phase and a phase of homogeneous coexistence of superconductivity and SDW order. Thus we will discuss the emergent proximity effect in mesoscopic circuits which involve conventional superconductor and pnictide superconductor separated by a diffusive normal or ferromagnetic wire. The focus is placed on revealing signatures of the unconventioanal S+- state of pnictides from the proximity-induced density of states and Josephson current.