CMP Seminar
Michigan State University

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Superconductivity on the Brink of Spin-Charge Order in a Doped Honeycomb Bilayer (and other quadriatic band touching systems)

Using a controlled weak-coupling renormalization group approach, I will discuss how we can establish the mechanism of unconventional superconductivity in the vicinity of spin or charge ordered excitonic states for the case of electrons on the Bernal stacked bilayer honeycomb lattice. With one electron per site, this system, physically realized in bilayer graphene, is unstable towards a spontaneous symmetry breaking. Repulsive interactions favor excitonic order, such as a charge nematic and/or a layer antiferromagnet. We find that upon adding charge carriers to the system, the excitonic order is suppressed, and unconventional superconductivity appears in its place, before it is replaced by a Fermi liquid. I will focus on firmly establishing this phenomenon using the renormalization group formalism within a model with parabolic touching of conduction and valence bands. Extensions to other systems with quadratic band touching will also be discussed.

Oskar Vafek, James M. Murray, and Vladimir Cvetkovic, Phys. Rev. Lett. 112, 147002 (2014)
Kelly Ann Pawlak, James M. Murray, Oskar Vafek, arXiv:1411.3633

Monday, March 23, 2015
4:10 p.m.
BPS 1400
Prof. Alex Levchenko