T_CSUH Special Seminar

Texas Center for Superconductivity at the University of Houston

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What is Going on in the Iron Pnictides?

Thursday, April 9, 2009
Room 102, University of Houston Science Center
4:00 p.m. - 5:00 p.m.

Abstract

Since the surprising discovery of high T_c superconductivity in the iron pnictides in early 2008, a large body of physical properties have already been accumulated. In this talk, I will attempt to draw a coherent picture about the microscopic physics of these systems.

Based on the fact that they are "bad metals," I will make the case that these materials lie at the boundary between Mott localization and itinerancy [1,2,3]. The incoherent electronic excitations are modeled in terms of localized magnetic moments, with J1-J2 superexchange interactions on the iron square lattice. Such a magnetic frustration leads to a (pi,0) collinear antiferromagnetic ordering and a reduced ordered moment [1], and naturally yields a magnetism-induced structural phase transition; both are observed experimentally. The coupling of the local moments to the coherent electronic excitations tunes the strength of antiferromagnetic order, leading to a magnetic quantum critical point [2,3]; emerging evidence for quantum criticality will be summarized. The implications of these considerations for superconductivity will be discussed.

[1] Q. Si and E. Abrahams, PRL101, 076401 (2008)
[2] J. Dai et al, PNAS 106, 4118 (2009)
[3] Q. Si et al, NJP (2009) -- arXiv.org:0901.4112

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