

Condensed Matter Seminar

Dr H.R Krishnamurthy - Visiting Researcher

Title: Understanding the Exotic Properties of Doped Manganites

Abstract: Rare earth manganites doped with alkaline earths, such as $\text{La}_{(1-x)}\text{Ca}_x\text{MnO}_3$, exhibit an incredible variety of phases and phase transitions, with many exotic phenomena such as colossal magneto-resistance (CMR), competing magnetic, orbital and charge ordering, metal insulator transitions which are extra-ordinarily sensitive to perturbations, ...

In this talk I will outline, using language and pictures that should be understandable without a very specialized knowledge of solid state physics, a recent theory for these materials developed in our group at IISc.

I will first review some of the exotic phenomena in the manganites. I will then discuss how these arise due to an amazingly complex and beautiful interplay of electronic states and lattice vibrations or phonons, driven by very strong electron-phonon and electron-electron interactions. In particular I will discuss how it can come about that conduction electrons in these materials spontaneously reorganize themselves into two radically different kinds.

The large majority become what are called "polarons", i.e., localized electrons which are bound to large local lattice distortions, and which therefore move very sluggishly. A minority constitute fast moving electrons running around on undistorted lattice cells and avoiding the polarons. I outline how this new 2-fluid picture leads to results in accord with a variety of observations.

Thursday Nov. 8, 2007- 4:10 to 6PM - Rm 416 PHY/GEO