



INSTITUTE COLLOQUIUM

(Physical & Mathematical Sciences)

INDIAN INSTITUTE OF SCIENCE

Prof.H.R. Krishnamurthy

Department of Physics

will deliver a lecture

on

Understanding the Exotic Properties of Doped Manganites

Wednesday, February 21, 2007

at 4.00 pm in the Faculty Hall

THE DIRECTOR

will preside

All are cordially invited

Coffee/Tea: 5.00 pm

Venue: Reception Hall

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 hitherto poorly understood phenomena such as colossal magnetoresistance (CMR), metal insulator transitions, competing magnetic, orbital and charge ordering, to mention only a few.

In this talk I will outline, using language and pictures that should be understandable to people without 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 forces. 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 between undistorted lattice cells. I outline how this new 2-fluid picture leads to results in accord with a variety of observations.
