School of Physics & Astronomy

UNIVERSITY OF LEEDS

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Seminar Wednesday 4th June 2008 4-5pm
Conference Auditorium 2

"Phantom Ferromagnetism"

Dilute solid solutions of 3*d* cations in a nonmagnetic dielectric oxide matrix are the most puzzling and controversial magnetic materials today. Thin films exhibit signs of magnetic order above room temperature, despite dopant levels of order 1% (and sometimes even in undoped films!).

It is a common view is that materials such as ZnO:Co, SnO2:Mn, or In2O3:Cr are dilute magnetic semiconductors. However, the Curie temperatures are more than an order of magnitude greater than can be expected from any known exchange mechanism.

Data on systems including TiO2: Fe2+ and In2O3:Mn3+ throw new light on the problem. These films behave ferromagnetically, although it can be shown directly by conversion electron Mössbauer spectroscopy in the first example that the dopant cations are themselves paramagnetic. It seems that dilute magnetic oxides are in no sense dilute magnetic semiconductors, and another explanation of their remarkable magnetism must be found, that does not depend on the *magnetic* character of the 3*d* dopants. A new, general model for anomalous high-temperature ferromagnetism is proposed, based on charge transfer to defect states.

At the end, I will tell a cautionary tale of ferromagnetic silicon.

Host: Professor B J Hickey; head-phys@leeds.ac.uk