Session 23bB

The stripe phenomenon: Mott insulators turning incommensurate. 23bB1

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It is by now well established that stripes are an ubiquitous phenomenon in doped Mott insulators. They are often discussed in a weak-coupling (charge/spin density wave) language. This is misleading because stripes are an expression of Mottness: stripes are discommensurations associated with an electron crystal which is 'nearly' commensurate with the crystal lattice. The topological order (the charge stripes being domain walls in the spin system) appears to be driven by a natural extension of the superexchange mechanism. The topological order corresponds with an unfamiliar but genuine type of long range order order and I will argue that its quantum-destruction is controlled by a gauge theory controlled by Ising local symmetry.

The Mott Transition in V_2O_3: Model versus Material 23bB2

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Results for the Mott-Hubbard metal-insulator transition in V_2O_3 from studies of simple models, such as the one-band Hubbard model, are contrasted with recent insights from the material-specific computational scheme LDA+DMFT. The latter approach combines the strength of conventional band structure theory in the local density approximation (LDA) with a modern many-body technique, the dynamical mean-field theory (DMFT). The spectrum above and below the Fermi energy, the orbital occupation, and the spin state determined by LDA+DMFT are found to be in good agreement with recent experiments.

23bB3 Local Quantum Critical Point and Non-Fermi Liquid Properties

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Quantum criticality provides a means to understand the apparent non-Fermi liquid phenomena in strongly correlated electron systems. How to properly describe quantum critical points, especially in metals, has however been poorly understood. The issues have become particularly well defined due to experiments over the past few years on heavy fermion metals, in which magnetic quantum critical points have been explicitly identified. In this talk, I will describe some recent theoretical work[1] on the subject. I will introduce the notion of "local criticality", and summarize the experimental consequences on the inelastic neutron scattering, NMR, Fermi surface properties and Hall coefficient. Some formal similarities with the Mott transition phenomenon will also be briefly discussed.

[1] Q. Si, S. Rabello, K. Ingersent, and J. L. Smith, Nature **413**, 804-808 (2001); —, cond-mat/0202414.

23bB4 Metal-Insulator Transition in C_{60} Fullerides

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Intercalated fulleride A_3C_{60} (A =K and Rb) are well known BCS-type superconductors, but its superconductivity is easily destroyed by subtle chemical modification, resulting in the antiferromagnetically ordered states. This property is suggestive of the importance of electron correlation effect. Using microwave cavity perturbation technique, we found that the conductivity of the antiferromagnet compounds at 200K is already 3-4 orders of magnitude smaller than those of superconducting compounds. These results strongly suggest that the Mott-Hubbard transition in the A_3C_{60} systems is driven by a reduction of lattice symmetry.