Chez Pierre

Presents ...

Tuesday, February 12, 2013
2:00pm
MIT Room 4-331

SPECIAL CHEZ PIERRE SEMINAR

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"Emergent electronic behavior in novel materials"

Interactions can make a condensed matter system adopt properties qualitatively different from those of its constituent electrons. Examples range from "conventional" superconductivity and magnetism to more exotic states. The study of new and, sometimes, familiar materials continues to push our understanding of how electrons self-organize – I will discuss two cases with rather different underpinnings.

In topological insulators, the surfaces of an electrical insulator support symmetry-protected metallic states with novel properties, the most striking of which are chirality and protection against localization. I will describe efforts to grapple with the experimental challenges of isolating the conduction of surface states in the archetypal topological insulator Bi2Se3. I'll also touch on expanding the search for topological surface states in other promising materials.

The interesting behavior of strongly correlated electrons derives from a complicated interplay of localized and itinerant electronic states. One of the oldest mysteries in this realm is the hidden order state of the heavy fermion superconductor URu2Si2, the nature of which remains uncertain after 25 years of study. I'll describe recent experimental developments that suggest an unusual twist: electrons may independently break the rotational symmetry of the underlying crystal lattice.

References:
N. P. Butch, et al, Phys. Rev. B 81, 241301(R) (2010); arXiv:1003.2382v1.
N. P. Butch, et al, Phys. Rev. B 84, 220504(R) (2011); arXiv:1109.0979v2.
X. Zhang, et al, arXiv:1211.5532.

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