

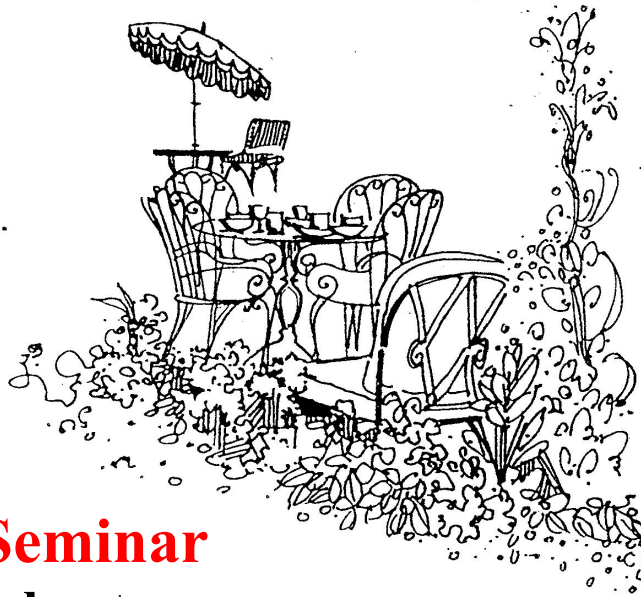
Chez Pierre

Presents ...

Monday, March 7, 2016

12:00pm

MIT Room 4-331



Chez Pierre Seminar

Girsh Blumberg

Rutgers University

” Chirality density wave of the “hidden order” phase in URu_2Si_2 “

Many novel electronic ground states emerge from the hybridization between localized d - or f -electrons and conduction electrons. The heavy fermion (HF) compound URu_2Si_2 exhibits the coexistence of two such ground states: so-called “hidden order” (HO) below $T_{HO}=17.5$ K and superconductivity below $T_c=1.5$ K. Despite 30 years of research the symmetry of the order parameter associated with HO phase below 17.5 K has remained ambiguous.

I will discuss results of low energy polarization resolved Raman spectroscopy study aimed to specify the symmetry of collective modes below the HO transition. These excitations involve transitions between interacting heavy uranium $5f$ orbitals, responsible for the broken symmetry in the HO phase. From the symmetry analysis we determine that the HO parameter breaks local vertical and diagonal reflections at the uranium sites, resulting in crystal field states with distinct chiral properties, which order to a commensurate *chirality density wave* ground state [1]. We further explore the competition between the HO phase and large moment antiferromagnetic (LMAFM) phase and the connection between the HO chirality density wave and the unconventional superconductivity in URu_2Si_2 , which has recently been proposed to be of a chiral d -wave type [2].

Work was performed in collaboration with H.-H. Kung, R. Baumbach, E. Bauer, K. Haule, M. B. Maple, and J. Mydosh.

Reference:

- [1] H.H. Kung, R.E. Baumbach, E.D. Bauer, V.K. Thorsmolle, W.L. Zhang, K. Haule, J.A. Mydosh, and G. Blumberg. Chirality density wave of the ‘hidden order’ phase in URu_2Si_2 . *Science*, **347**, 1339 (2015).
- [2] T. Yamashita *et al.* Colossal thermomagnetic response in the exotic superconductor URu_2Si_2 . *Nature Phys.* **11**, 17 (2014).