

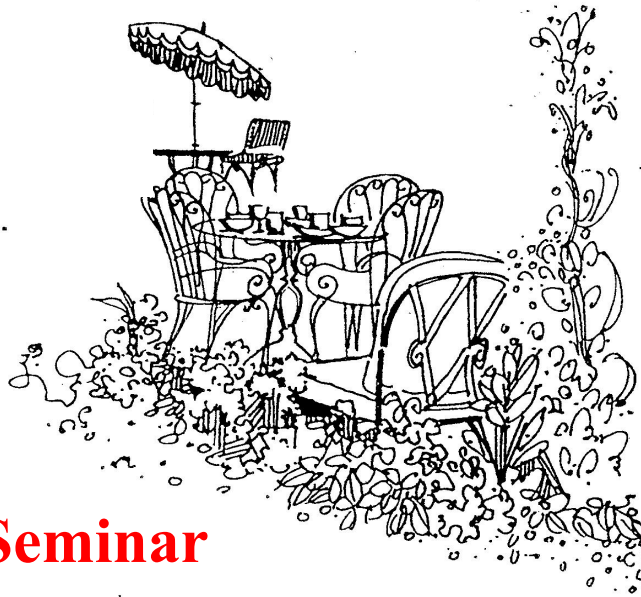
# Chez Pierre

Presents ...

**Monday, October 5, 2015**

**12:00pm**

**MIT Room 4-331**



## **Chez Pierre Seminar**

**Piers Coleman**

Rutgers University

### **” KONDO INSULATORS: Magnetism meets topology“**

The electrons in Heavy fermion materials are subject to spin-orbit coupling interactions that greatly exceed their Kinetic energy. It has long been known that the spin orbit coupling stabilizes new kinds of heavy fermion metals, superconductors and "Kondo insulators" against the competing state of magnetism. I will discuss the latest realization that spin orbit coupling can change the topology of Kondo insulators, sometimes giving rise to Topological Kondo insulators[2,3] with surface Dirac cones. We'll specifically discuss SmB<sub>6</sub>, a KI discovered 50 years ago, predicted to be topological in 2010[2], and tentatively confirmed to be so in a series of experimental studies of the past year[3,4,5]. I'll discuss a simple model for a topological Kondo insulator[6] and discuss how Kondo breakdown at the surface has the effect of tuning the topological edge states from "heavy" to "light". I will discuss the recent observation of "quantum criticality" in dHvA oscillations in SmB<sub>6</sub>[7], and why we think these signals are likely due to Kondo breakdown in the topological surface states[8].

[1] Work supported by DOE grant DE-FG02-99ER45790.

[2] M. Dzero et al. Phys. Rev. Lett. 104, 106408 (2010).

[3] S. Wolgast et al, Phys. Rev. B, Rapid Comm., vol. 88, no. 18, p. 180405, Nov. 2013.

[4] G. Li et al, Science 346, 1208 (2014).

[5] Nan Xu, X. Shi et al, Nature Communications 5:4566 (2014).

[6] V. Alexandrov, P. Coleman, and O. Erten, Phys. Rev. Lett. 114, 177202 (2015).

[7] B. S. Tan, Y.-T. Hsu, B. Zeng, M. C. Hatnean, N. Harrison, Z. Zhu, M. Hartstein, M. Kiourlappou, A. Srivastava, M. D. Johannes, T. P. Murphy, J.-H. Park, L. Balicas, G. G. Lonzarich, G. Balakrishnan, and Suchitra E. Sebastian, Science 349, 287 (2015).

[8] Onur Erten, Pouyan Ghaemi and P. Coleman, preprint (2015).