MAR12-2011-000915

Abstract for an Invited Paper
for the MAR12 Meeting of
the American Physical Society

**Chromium at High Pressure**

RAFAEL JARAMILLO, Harvard University

Chromium has long served as the archetype of spin density wave magnetism. Recently, Jaramillo and collaborators have shown that Cr also serves as an archetype of magnetic quantum criticality. Using a combination of x-ray diffraction and electrical transport measurements at high pressures and cryogenic temperatures in a diamond anvil cell, they have demonstrated that the Néel transition ($T_N$) can be continuously suppressed to zero, with no sign of a concurrent structural transition. The order parameter undergoes a broad regime of exponential suppression, consistent with the weak coupling paradigm, before deviating from a BCS-like ground state within a narrow but accessible quantum critical regime. The quantum criticality is characterized by mean field scaling of $T_N$ and non mean field scaling of the transport coefficients, which points to a fluctuation-induced reconstruction of the critical Fermi surface. A comparison between pressure and chemical doping as means to suppress $T_N$ sheds light on different routes to the quantum critical point and the relevance of Fermi surface nesting and disorder at this quantum phase transition. The work by Jaramillo *et al.* is broadly relevant to the study of magnetic quantum criticality in a physically pure and theoretically tractable system that balances elements of weak and strong coupling.

[1] R. Jaramillo, Y. Feng, J. Wang & T. F. Rosenbaum. Signatures of quantum criticality in pure Cr at high pressure. *Proc. Natl. Acad. Sci. USA* **107**, 13631 (2010).

[2] R. Jaramillo, Y. Feng, J. C. Lang, Z. Islam, G. Srajer, P. B. Littlewood, D. B. McWhan & T. F. Rosenbaum. Breakdown of the Bardeen-Cooper-Schrieffer ground state at a quantum phase transition. *Nature* **459**, 405 (2009).