MAR10-2009-004931

Abstract for an Invited Paper
for the MAR10 Meeting of
the American Physical Society

**Heavy Fermions and Geometric Frustration on the Shastry-Sutherland Lattice**[1]

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Many of the $R_2T_2X$ ($R$=rare earth, $T$=transition metal, $X$=Mg, Cd, In, Sn, and Pb) form layered compounds where the $R$ atoms lie on triangular units in the geometically frustrated Shastry-Sutherland lattice (SSL). Depending on the relative strengths of the first and second neighbor exchange interactions, these compounds either order antiferromagnetically or show spin liquid properties. These $R_2T_2X$ compounds are metallic, and thus offer the promise of studying the effects of geometric frustration on quantum criticality. $Yb_2Pt_2Pb$ and Ce2Pt2Pb are of special interest, as they lie very near this antiferromagnetic quantum critical point. $Yb_2Pt_2Pb$ orders antiferromagnetically at 2 K, with unusually strong fluctuations in the paramagnetic state. The ordered state is Fermi liquid-like with a Sommerfeld coefficient $\gamma = 0.03$ J/Yb-mol $K^2$. The phase behavior with magnetic field is very complex, terminating in a sequence of magnetization plateaux, as observed previously in insulating SSL systems. In contrast, $Ce_2Pt_2Pb$ appears to be on the spin liquid side of the QCP, and here the ground state is heavy fermion-like, with $\gamma = 0.6$ J/Ce-mol $K^2$. Our results suggest that heavy-fermion behavior occurs near the quantum critical point in this class of SSL compounds, as for unfrustrated heavy fermion compounds, but is strongly suppressed by magnetic ordering.

[1]Work at Stony Brook Physics was supported by the National Science Foundation under grant DMR-0907457.