MAR16-2015-001398

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Itinerant magnetism without magnetic elements[1]

EMILIA MOROSAN, Rice University

The origin of magnetism in metals has been traditionally discussed in two diametrically opposite limits: itinerant and local moments. Surprisingly, there are very few known examples of materials that are close to the itinerant limit, and their properties are not universally understood. In the case of the two such examples discovered several decades ago, both itinerant ferromagnets (IFMs) $ZrZn_2$ and Sc_3In, the understanding of their magnetic ground states draws on the existence of 3d electrons subject to strong spin fluctuations. In this talk I will contrast the physical properties of these two IFMs without magnetic elements with those of the recently discovered first itinerant antiferromagnetic (IAFM) metal with no magnetic constituents, TiAu. The IFMs have surprisingly different properties, with $ZrZn_2$ showing signatures of mean field, Fermi liquid behavior, while the Sc_3In compound is characterized by non-mean field magnetization exponents, and displays non fermi liquid behavior in both the FM and the paramagnetic states. The IAFM TiAu orders below a Neel temperature $T_N \approx$ K, about an order of magnitude smaller than in the IAFM Cr, rendering the spin fluctuations in TiAu more important at low temperatures. Like in the two IFMs, doping induces a quantum phase transition in TiAu, and the quantum critical behavior in all three systems is discussed and compared.

[1]This work is supported by NSF DMR-1506704.