

MAR11-2010-007036

Abstract for an Invited Paper  
for the MAR11 Meeting of  
the American Physical Society

### **Imaging the “Hidden Order” Transition in URu<sub>2</sub>Si<sub>2</sub>**

ANDREW SCHMIDT, University of California, Berkeley

In URu<sub>2</sub>Si<sub>2</sub>, bulk measurements indicating the formation of heavy bands begin at temperatures around 55 K but are interrupted by an unidentified electronic phase transition, the “hidden order,” at  $T_o = 17.5$  K. Heavy bands in a Kondo lattice are expected to form due to strong hybridization between electrons localized in real space on magnetic ions and those delocalized in momentum space. Why the “hidden order” appears has been an outstanding question in heavy fermion physics. We use spectroscopic imaging scanning tunneling microscopy (SI-STM) to image the electronic structure of URu<sub>2</sub>Si<sub>2</sub> through  $T_o$ . Above  $T_o$  we find the Fano spectra expected for Kondo screening of a magnetic lattice, while below  $T_o$  a partial energy gap opens. Heavy-quasiparticle interference imaging shows that the gap forms due to a light momentum-space band splitting below  $T_o$  into two heavy fermion bands. Our observations of the “hidden order” transition are thus consistent with a sudden alteration in both the hybridization at each U atom and the associated heavy bands.