INVITED

Unconventional Superconductivity and Magnetism in Strongly Correlated $CeRhIn_5$

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Localized Ce 4f electrons in $CeRhIn_5$ order antiferromagnetically at 3.8 K at atmospheric pressure. When subject to applied pressure, the antiferromagnetic transition temperature T_N initially increases and then decreases above 5 kbar. At this pressure, superconductivity starts to appear and coexists with the magnetic order on a microscopic scale. Measurements of low-temperature specific heat of $CeRhIn_5$ reveal that superconducting Cooper pairs are formed by itinerant Ce 4f electrons while the magnetism still comes from localized Ce 4f spins [1]. The apparent dichotomy on the nature of single Ce 4f electron poses a challenge to our fundamental understanding of strongly correlated metals. In this talk, we'll argue that the dual nature of Ce 4f electron is relevant to its close proximity to a hidden quantum critical point [2], whose nature is possibly of a local type [3]. This work was performed in collaboration with F. Ronning, E. D. Bauer, J. L. Sarrao, and J. D. Thompson (Los Alamos National Laboratory). [1] T. Park et al., *Proc. Nat. Acad. Sci.***105**, 6825 (2008). [2] T. Park et al., *Nature* **440**, 65 (2006). [3] T. Park et al., *Nature* **456**, 366 (2008).

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