

CU Physics Department Colloquium

Monday, December 7, 2009 4:10 PM 428 Pupin Hall

Energy and Phase Phenomenology of Novel Superconductors

Since early 1980's several novel and unconventional superconductors have been discovered. They include organic BEDT (T_c up to 12 K), high- T_c cuprate (140 K), heavy-fermion (T_c is rather low), buckyball A_3C_{60} (35 K), and the newest comer FeAs systems (55 K) which were discovered in 2008. In these systems, superconducting T_c exhibits correlations with the energy scales of the superfluid density and the inelastic spin resonance mode. Superconducting states exist adjacent to parent magnetically ordered states, separated by first-order quantum phase evolutions. In the overdoped / pressurized regions, these superconductors further evolve into normal Fermi-liquid metals, in a way very different from BCS superconductors. I will discuss these phenomena in analogy to superfluid ^4He and comparison to Bose-Einstein to BCS crossover, and propose a resonant spin-charge coupling as a possible key concept to understand pairing of these novel superconductors.

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