

Abstract for an Invited Paper  
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**Heavy electrons and symplectic symmetry of a spin<sup>1</sup>**

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Motivated by the recent discovery of the heavy fermion materials  $\text{NpPd5Al}_2$  [1] and  $\text{PuCoGa}_5$  [2] which transform directly from Curie paramagnets into superconductors, we have developed a novel theory of these materials based on the idea of composite pairing between local moments and electron pairs. This talk will discuss a simple model of this kind of pairing that can be solved exactly in a large- $N$  limit [3]. The talk will discuss how this concept enables us to understand the giant entropy of condensation, the symmetry of the order parameter as well as an enhancement of the Andreev reflection in tunneling measurements and an upturn in the NMR relaxation rate above  $T_c$ .

[1] D. Aoki et al., Jour. Phys. Soc. of Japan 76, 063701 (2007).

[2] J. Sarrao et al., Nature (London) 420, 297 (2002).

[3] R. Flint, M. Dzero and P. Coleman, Nature Physics 4, 643 (2008).

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