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## Bulk Superconductivity in PuCoGa<sub>5</sub> at 18.5 K<sup>+</sup>

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Elemental plutonium is a fascinating metal yet poorly understood. A significant aspect of its complexity is the ambivalent nature of Pu's 5f electrons, which frequently appear to be neither completely localized nor fully itinerant. This issue is emphasized in PuCoGa<sub>5</sub>, the first Pu-based superconductor and with a T<sub>c</sub> exceeding 18 K. Though conventional phonon-mediated pairing may be responsible for its superconductivity, this view must be reconciled with three observations: (1) above T<sub>c</sub>, the static susceptibility of PuCoGa<sub>5</sub> is Curie-Weiss-like with an effective moment of 0.68 μ<sub>B</sub>, close to that expected for Pu<sup>3+</sup>; (2) its Sommerfeld specific heat coefficient of 77 mJ/moleK<sup>2</sup> indicates that electronic correlations cannot be ignored; and, (3) isostructural UCoGa<sub>5</sub> is a Pauli paramagnet with much smaller Sommerfeld coefficient and is not superconducting above 0.3 K. Rather than a conventional superconductor, PuCoGa<sub>5</sub> appears to be more nearly analogous to the isostructural heavy-fermion superconductor CeCoIn<sub>5</sub> in which antiferromagnetic spin fluctuations mediate Cooper pairing. Also as in CeCoIn<sub>5</sub>, the T=0 orbital upper critical field of 74 T in PuCoGa<sub>5</sub> exceeds the Pauli limit by nearly a factor of two. In a scenario of magnetically mediated superconductivity, the almost order of magnitude higher T<sub>c</sub> in PuCoGa<sub>5</sub> would be attributed to stronger 5f-ligand hybridization. Perhaps PuCoGa<sub>5</sub> bridges two classes of unconventional superconductors—the heavy-fermion systems and high-T<sub>c</sub> cuprates.

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