

Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme*

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Universität Stuttgart, Pfaffenwaldring 57, 70569 Stuttgart-Vaihingen

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Magnetism and Superconductivity: A new era of convergence in condensed matter physics

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Abstract

Three years after the discovery of superfluid He-3, Physicists at Bell Labs observed a closely related phenomenon in metals, a new kind of unconventional superconductivity was observed in a mysterious alloy of Uranium, yet the open mind-set required to embrace these results as a It took the efforts of a brave and determined set of heavy electron pioneers to change the mind-set.

Today, there is a new convergence of magnetism and superconductivity in condensed matter physics, with many new families of materials in which magnetism provides the driver for a new generation of strongly correlated metals and superconductors. Some believe that the nexus of these phenomena lies at quantum critical points that appear to be present in heavy electron, cuprate and iron-based superconductors.

This talk will introduce the new ideas and the severe challenges severe challenges of this new frontier. I'll describe how some physicists seeking to understand high temperature superconductors are turning to the almost-magnetic f-electron materials with much lower transition temperatures which exhibit new kinds of hidden order.