

# UTe<sub>2</sub>: Excitement along the road of heavy fermion superconductivity

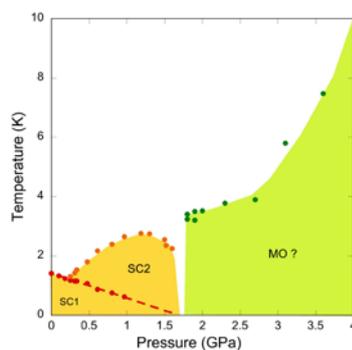
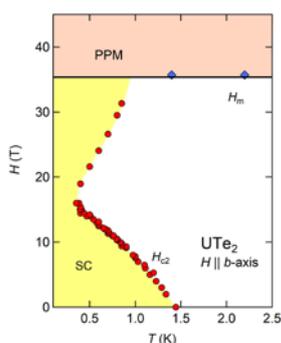
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Unconventional superconductivity was first discovered in heavy fermion systems 40 years ago. Today this field for research is constantly yielding new information and surprises. One particularly fruitful branch is the family of uranium based ferromagnetic superconductors, which have brought the decisive proof of the role of magnetic fluctuations in the superconducting pairing mechanism, as well as harboring such rare phenomena as a probable triplet “p-wave” superconducting order parameter and an enhancement of superconductivity by an external magnetic field. This latter spectacular effect was qualitatively understood by the destabilization of ferromagnetic order when a field is applied transverse to the direction of the ordered moments in these Ising type systems, leading to a new channel of magnetic fluctuations boosting superconductivity. This picture was however recently challenged by the discovery of superconductivity with a similar enhancement under magnetic field in the paramagnetic heavy fermion system UTe<sub>2</sub>. Over the past year UTe<sub>2</sub> has been the subject of intense research by teams in the US, Japan and France. I will present some of the recent results including reinforced or re-entrant superconductivity under applied field, metamagnetism, as well as the surprising behavior under pressure where the superconducting critical temperature is enhanced by a factor 2, reaching 3K, and the rare phenomenon of multiple superconducting phases is found.



Left figure shows the phase diagram of UTe<sub>2</sub> under magnetic field applied along the b-axis.

Right figure shows the phase diagram of UTe<sub>2</sub> under hydrostatic pressure. SC1 and SC2 are 2 different superconducting phases. MO indicates probable magnetic order.