

Talk-7

Key symmetries of superconductivity: Inversion and Time Reversal Symmetry

Manfred Sgrist
ETH Zürich, Switzerland

Abstract

Symmetries play an important role for superconductivity. At the superconducting phase transition $U(1)$ -gauge symmetry is spontaneously broken and in so-called unconventional superconductors even further symmetries may be violated which give rise to extraordinary phenomena. Besides this phenomenological symmetry concept there is also the microscopic point of view that superconductivity is based on the formation of Cooper pairs built of degenerate electronic states very close to the Fermi surface. The availability of such degenerate electronic states relies on two key symmetries, inversion and time reversal symmetry, which allow for the most basic classification of superconductors into even-parity (spin singlet) and odd-parity (spin-triplet) pairing. The absence of any of these two symmetries yields a modification of the Cooper pairing states with numerous implications. This presentation will shed light on some of the physical properties resulting from the lack of time reversal and inversion symmetry and discusses examples, which we encounter among ferromagnetic and non-centrosymmetric superconductors. Special attention will be given to the latter class in the light of recent remarkable developments for the non-centrosymmetric heavy Fermion superconductors.