Vorlesung Quantum Transport – Superconductivity (1)

1. Properties of superconductors
2. BCS theory
    - Order parameter
3. Josephson effect
    - DC / AC Josephson effect
4. Mesoscopic effects
    - Andreev reflection
    - Andreev bound states
    - Proximity effect

Literature

T. Heikkilä: The Physics of Nanoelectronics

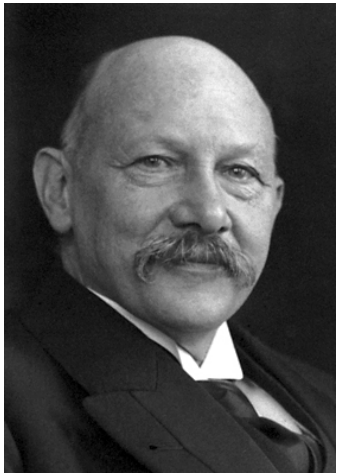
M. Tinkham: Superconductivity

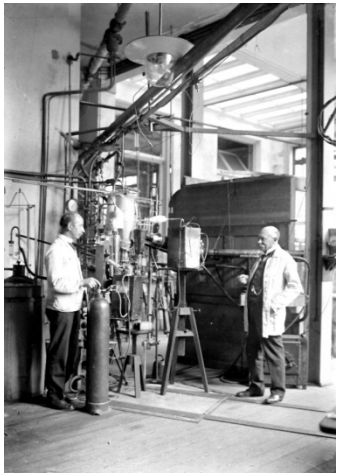
P. G. de Gennes: Superconductivity of Metals and Alloys

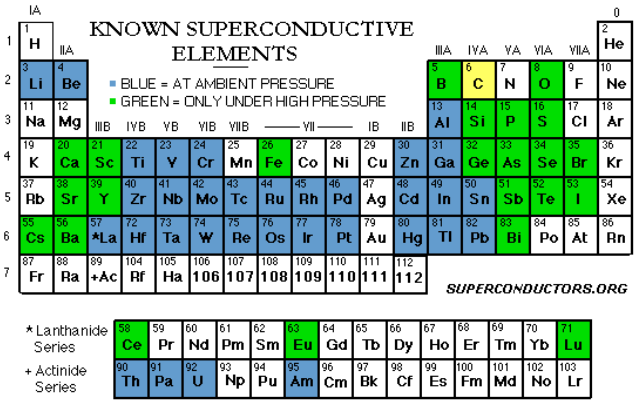
C. P. Poole: Superconductivity

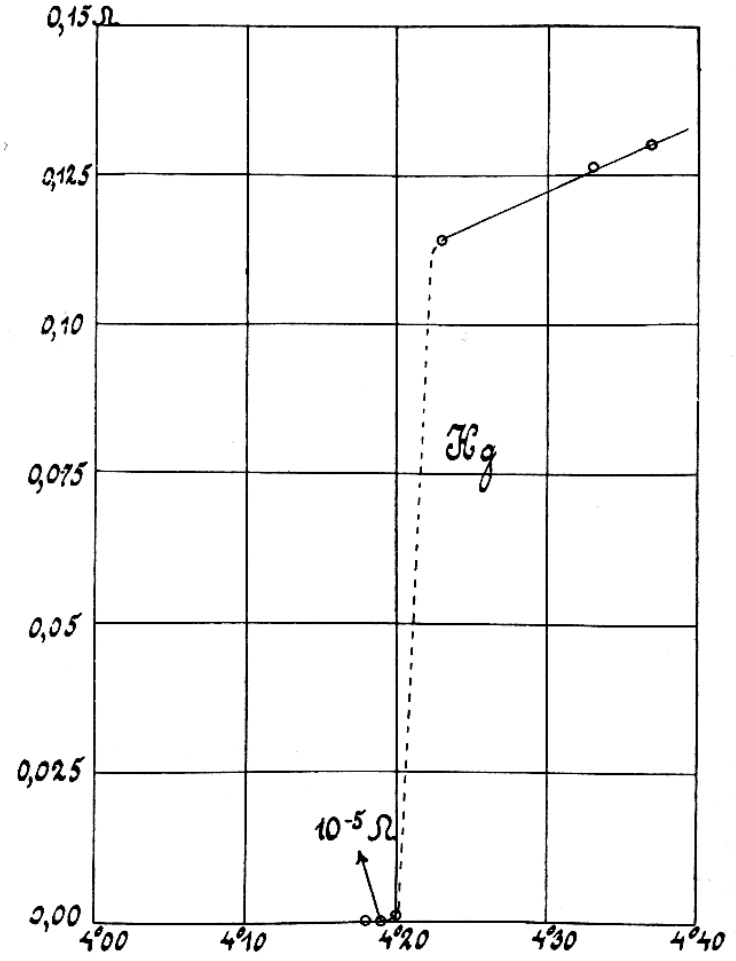
Superconductivity

Discovery: H. Kammerling-Onnes, Leiden, Netherlands, 1911:

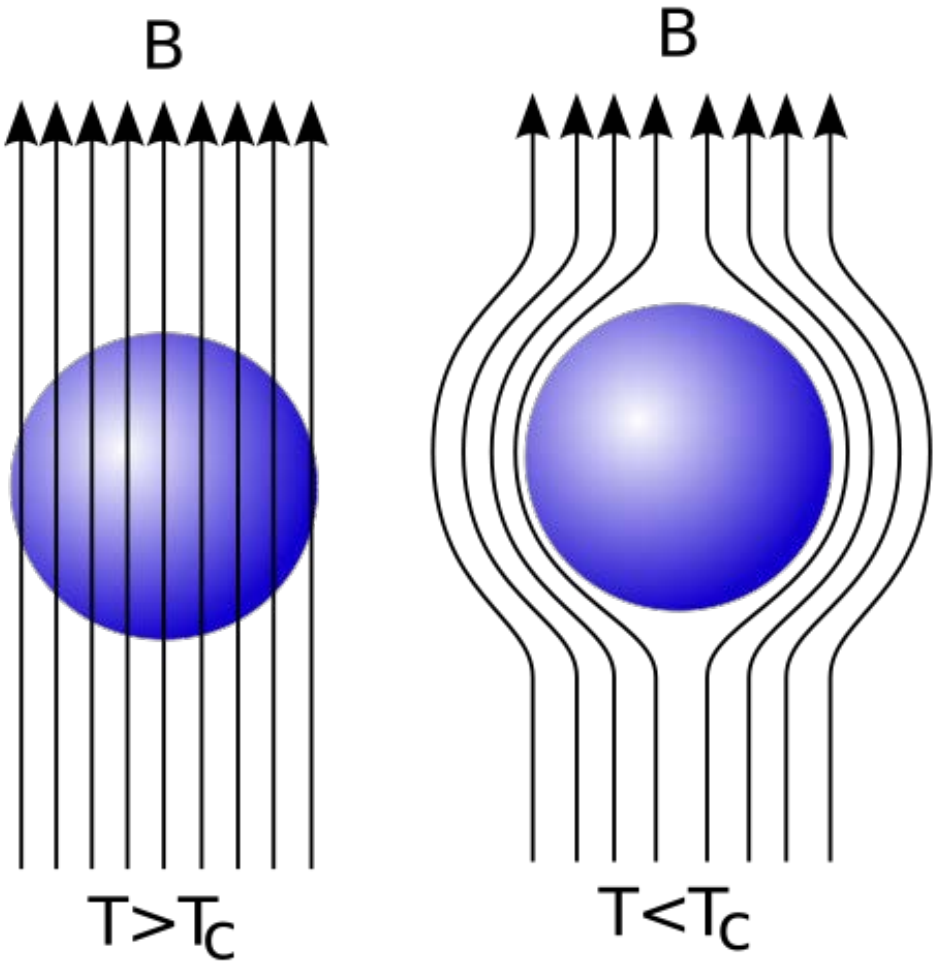




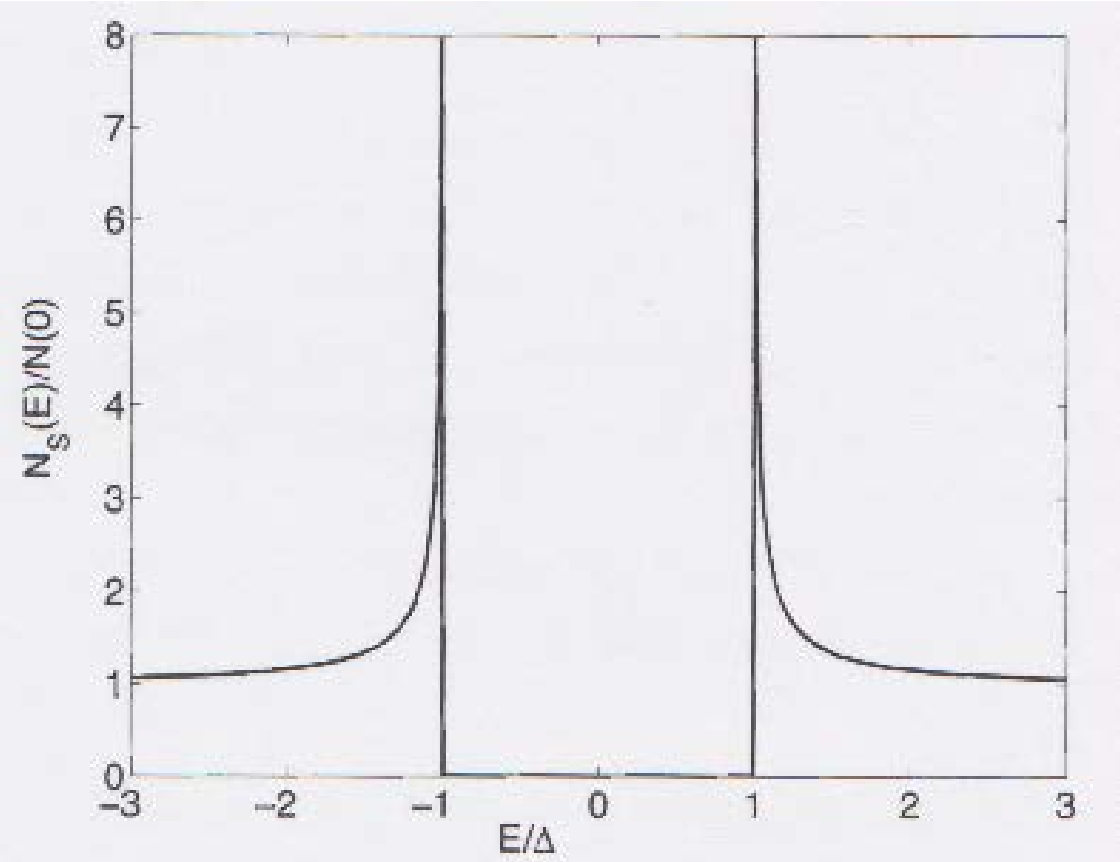




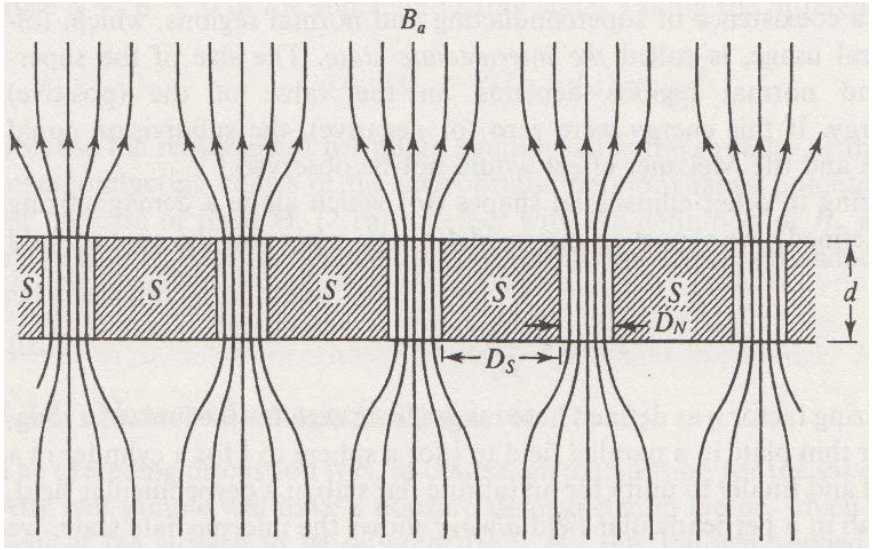
Meissner Effect

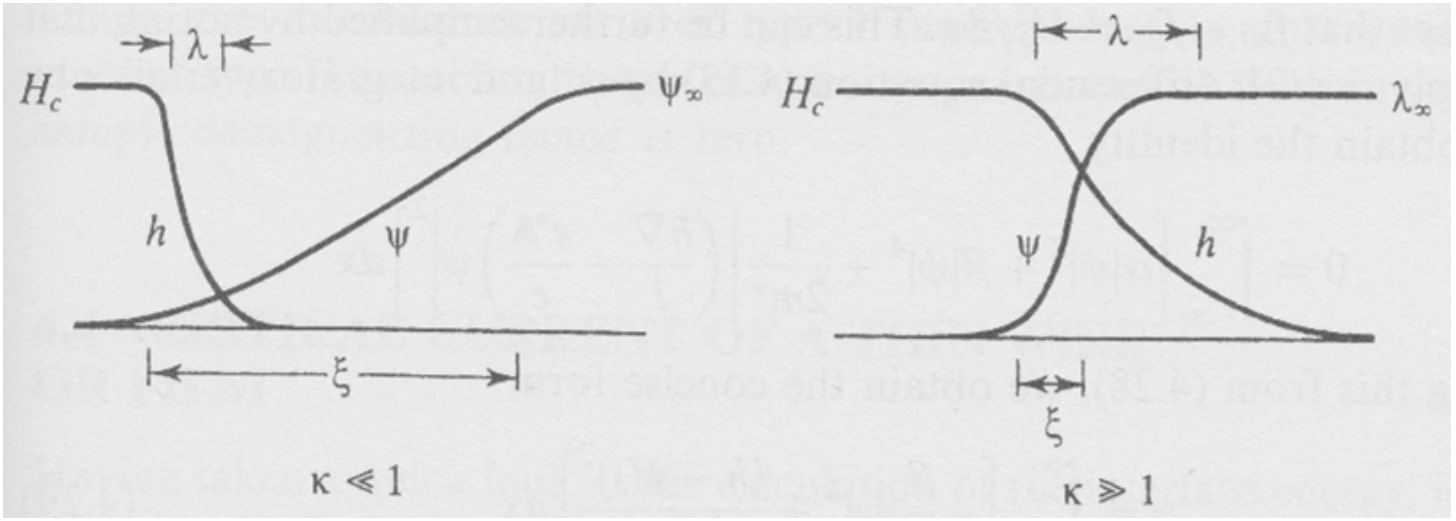


BCS theory

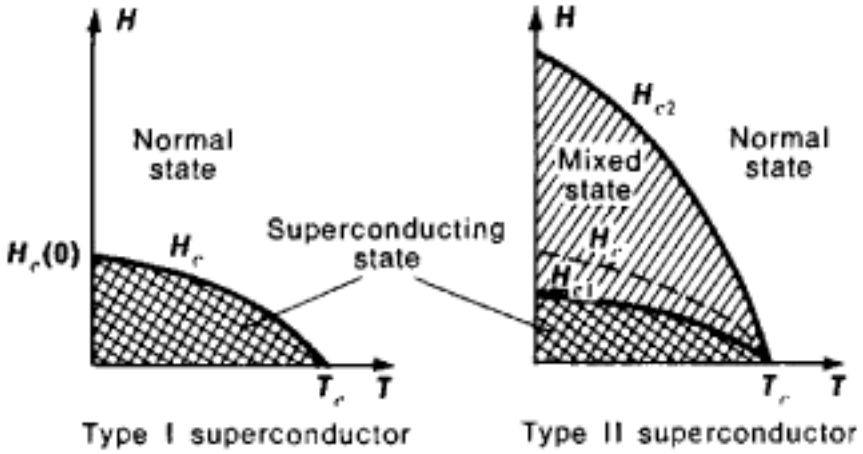


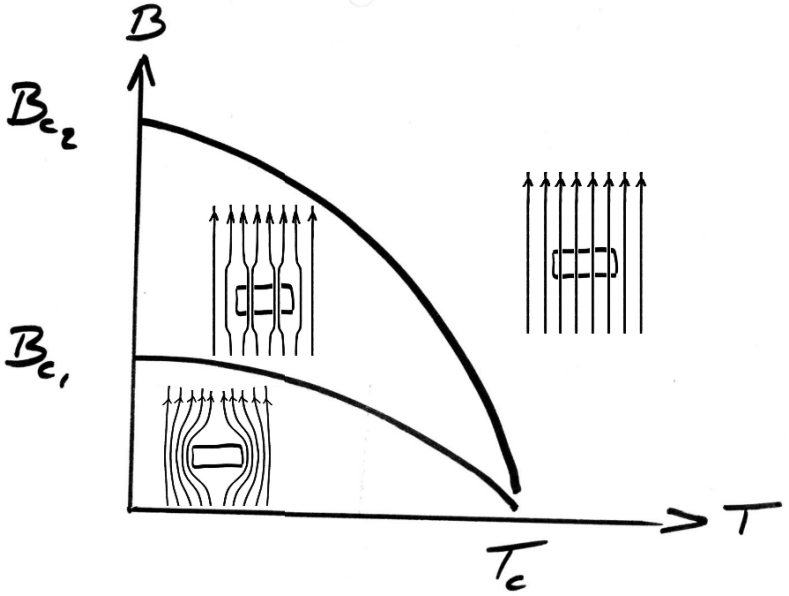
type I / type II superconductors



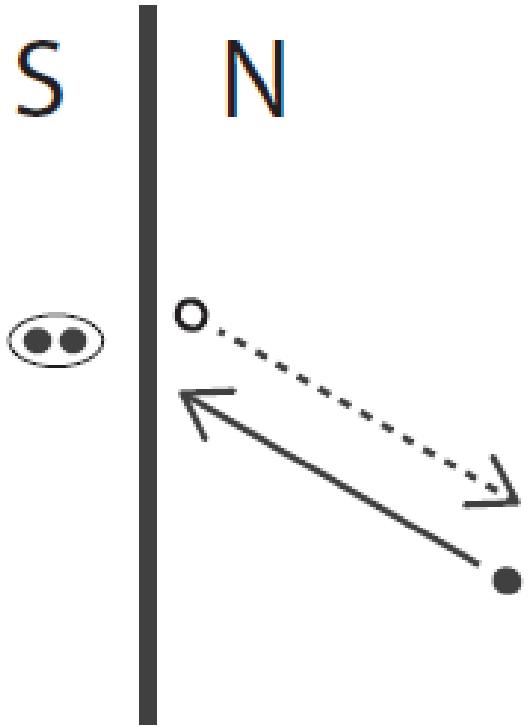


type I / type II superconductors





Andreev reflexion



$$-e, \vec{v}, m^* \rightarrow +e, -\vec{v}, -m^*$$

Andreev Bound States (ABS)