

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

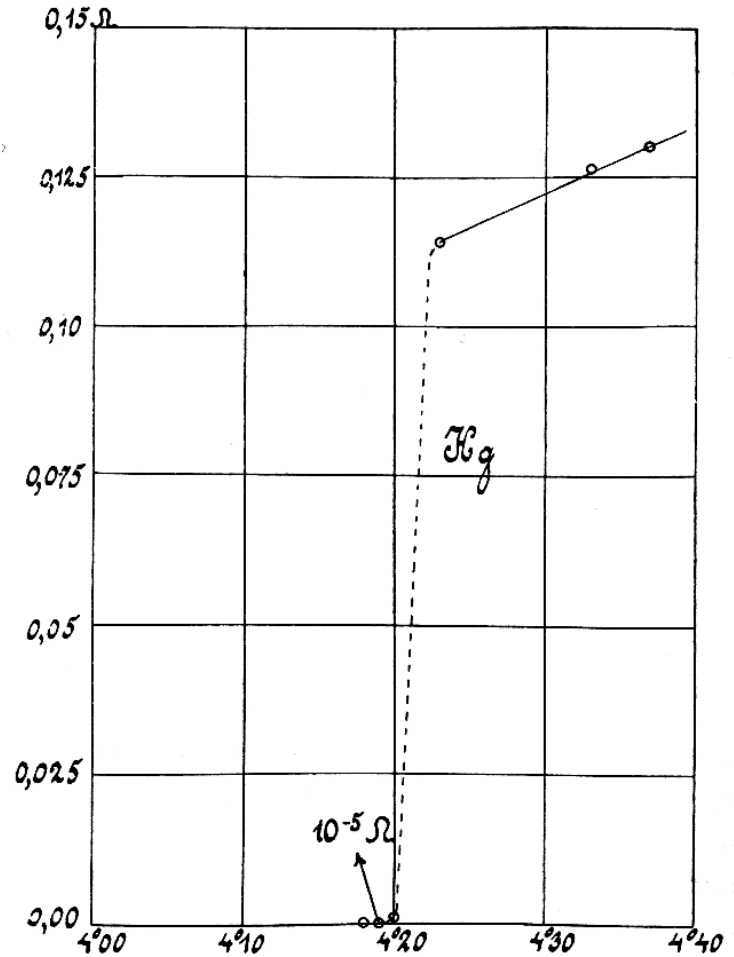
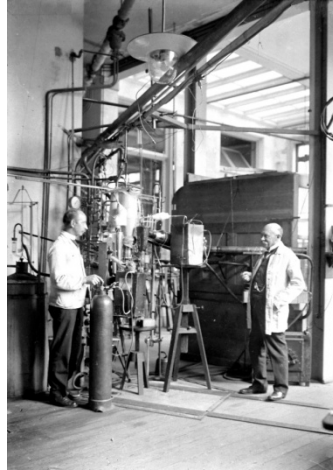
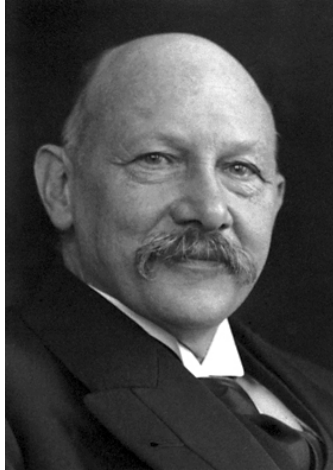
M. Tinkham: Superconductivity

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

C. P. Poole: Superconductivity

Superconductivity

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



KNOWN SUPERCONDUCTIVE ELEMENTS

1	IA																2	
1	H																	He
2	Li	Be											B	C	N	O	F	Ne
3	Na	Mg											Al	Si	P	S	Cl	Ar
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6	Cs	Ba	*La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7	Fr	Ra	+Ac	Rf	Ha	106	107	108	109	110	111	112	SUPERCONDUCTORS.ORG					

Legend:
 ■ BLUE = AT AMBIENT PRESSURE
 ■ GREEN = ONLY UNDER HIGH PRESSURE

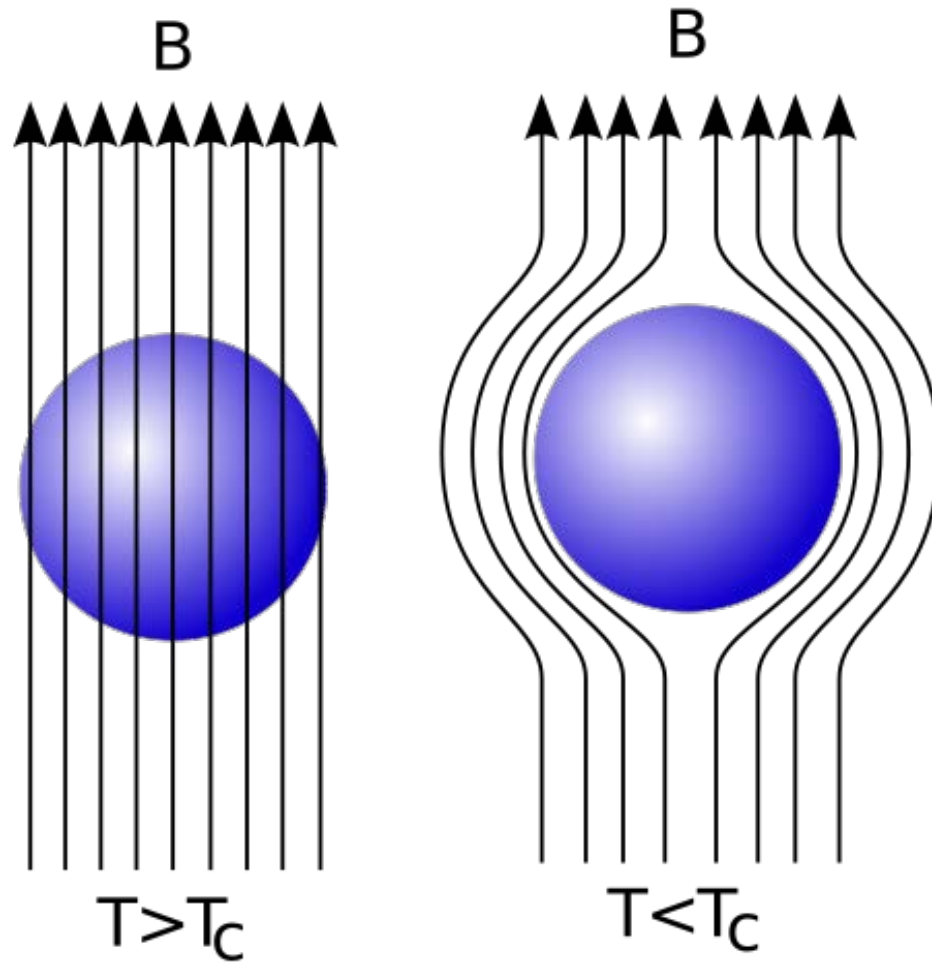
* Lanthanide Series

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu

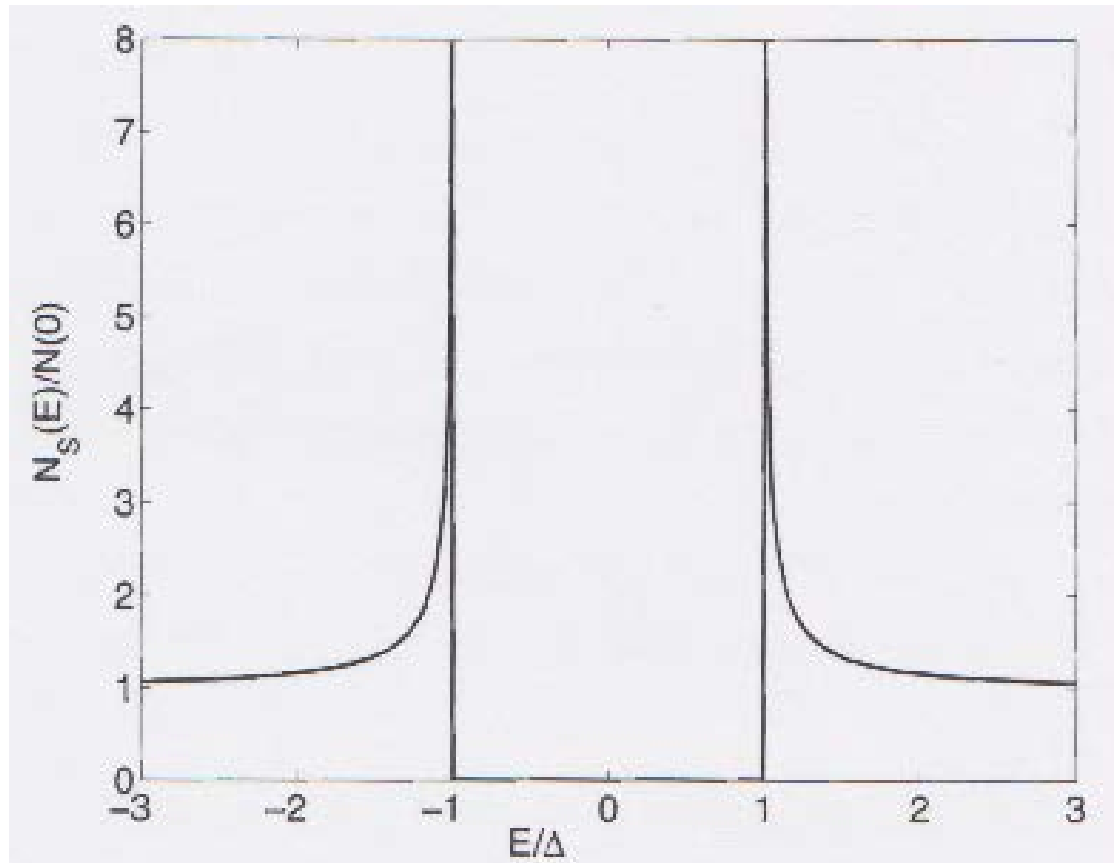
+ Actinide Series

90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

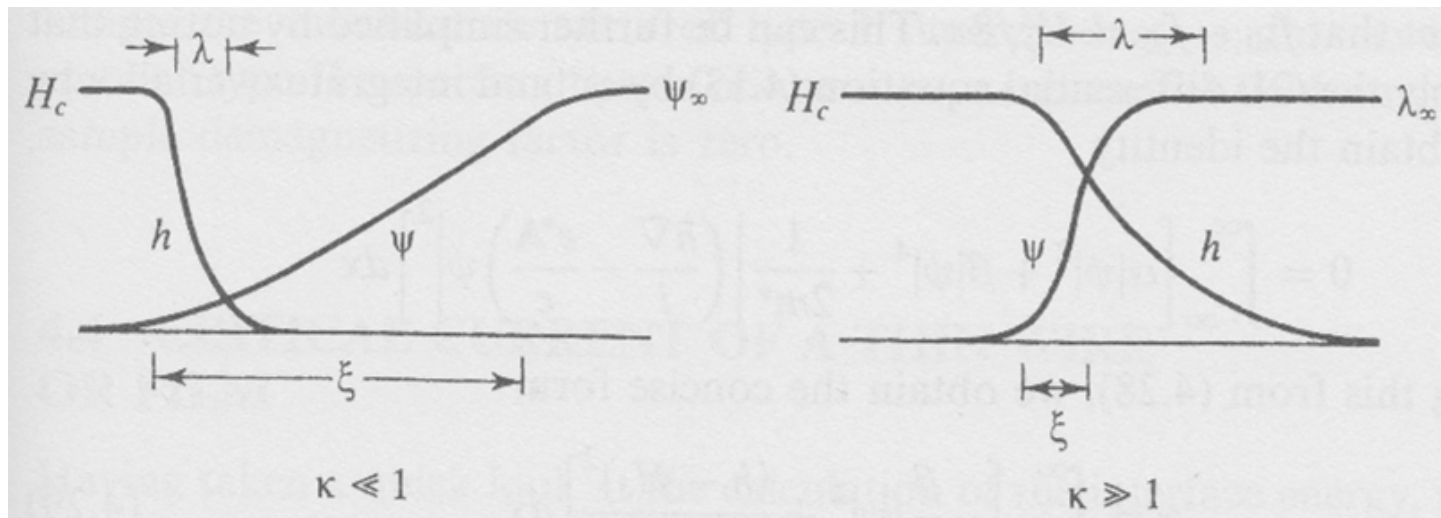
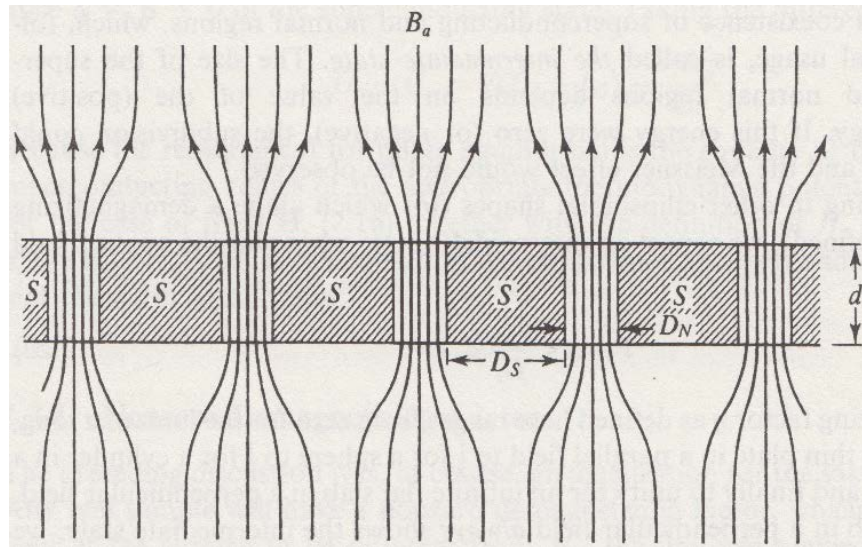
Meissner Effect



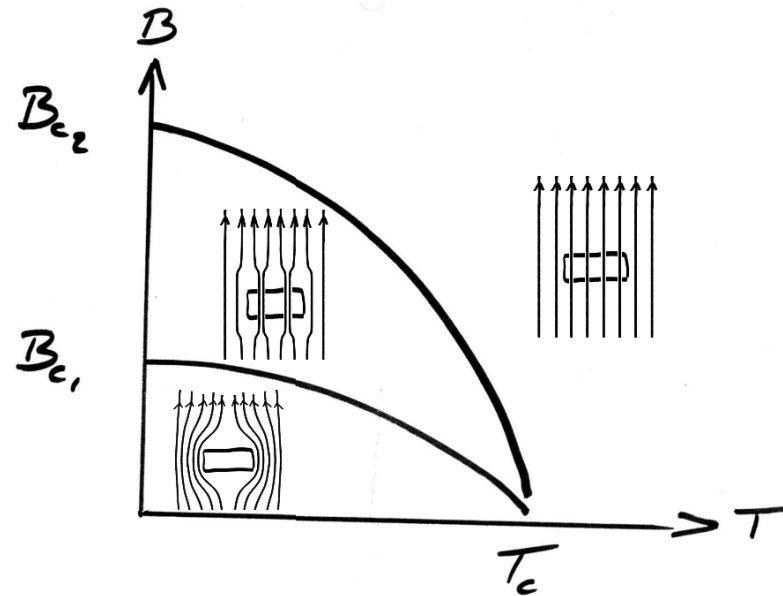
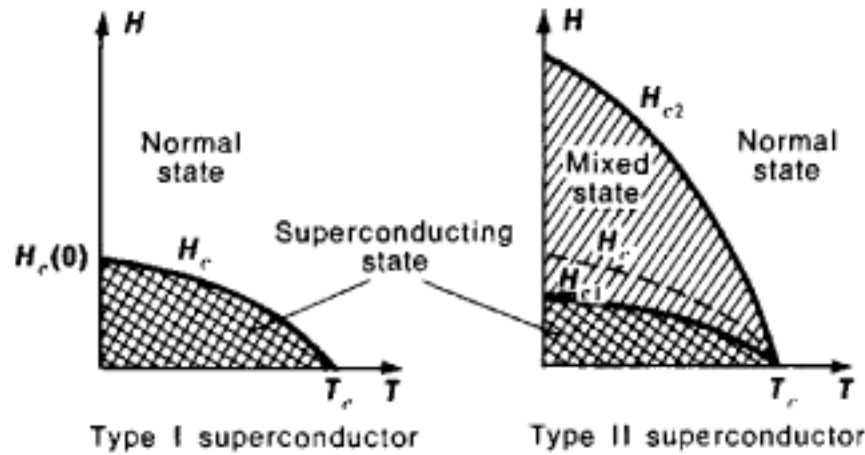
BCS theory



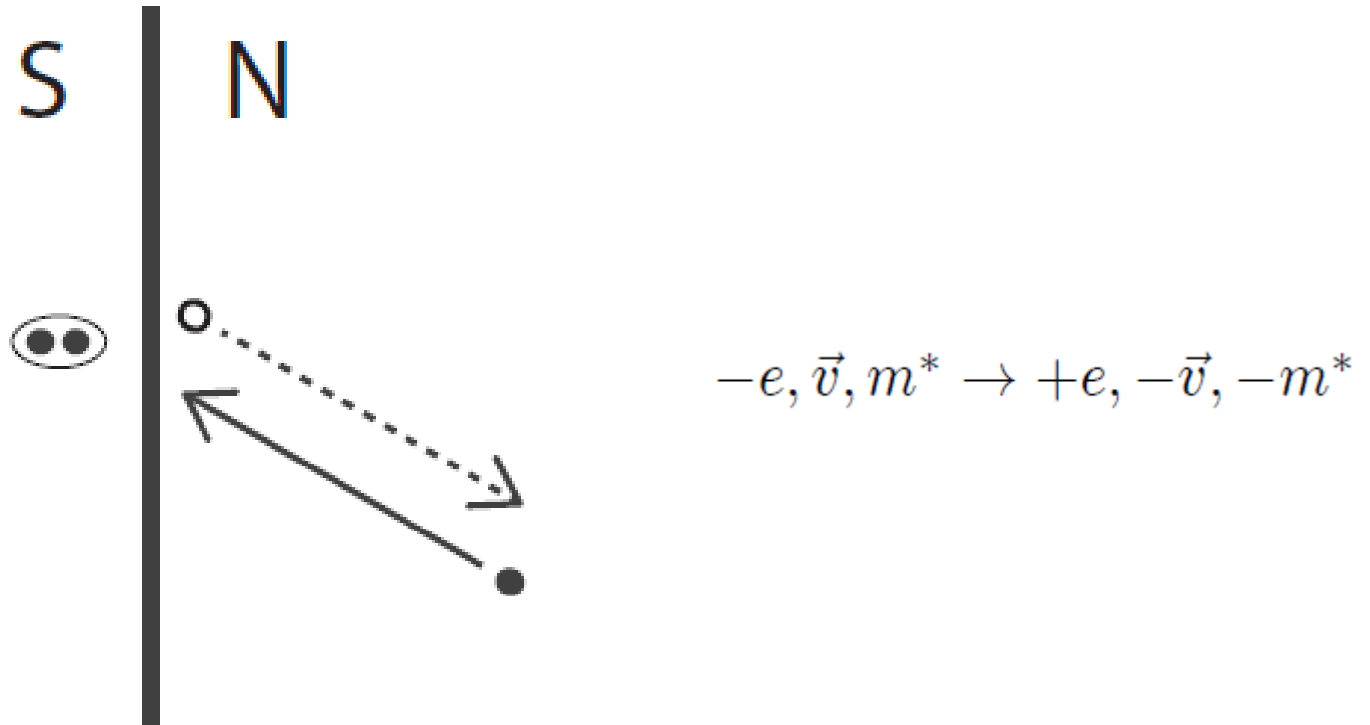
type I / type II superconductors



type I / type II superconductors



Andreev reflexion



Andreev Bound States (ABS)

