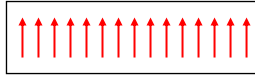


## 11 / 1 Geordnete magnetische Systeme

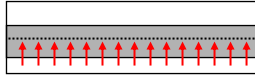
### Grundtypen:

- Einfacher Ferromagnet (lokalisierte Momente)



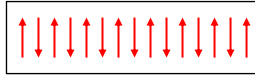
Beispiele:  
CrBr<sub>3</sub>, EuO

- Bandferromagnet



Fe, Co, Ni

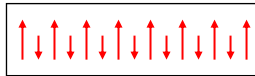
- Einfacher Antiferromagnet



MnO

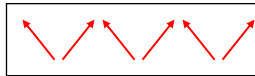
### Komplexere Formen:

- Ferrimagnet

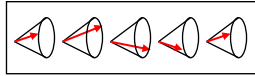


Fe<sub>3</sub>O<sub>4</sub> (Magnetit)

- „Gekanteter“ Ferromagnetismus

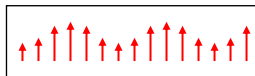


- Helixartiger Magnetismus



Ho

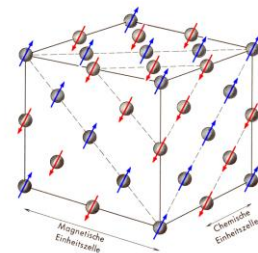
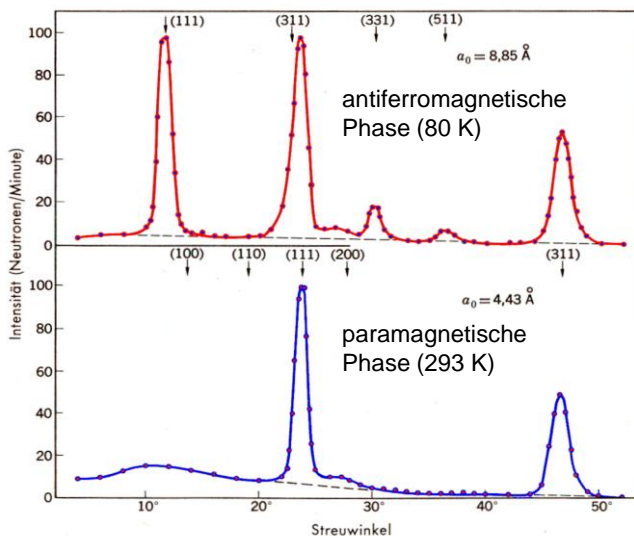
- Spindichtewellen



## 11 / 2 Streuung an magnetischen Strukturen

Neutronenstreuung an (antiferromagnetischem) MnO

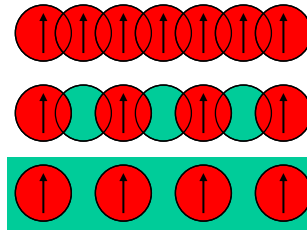
C.G. Shull, et al., Phys.Rev. 83 (1951) 333



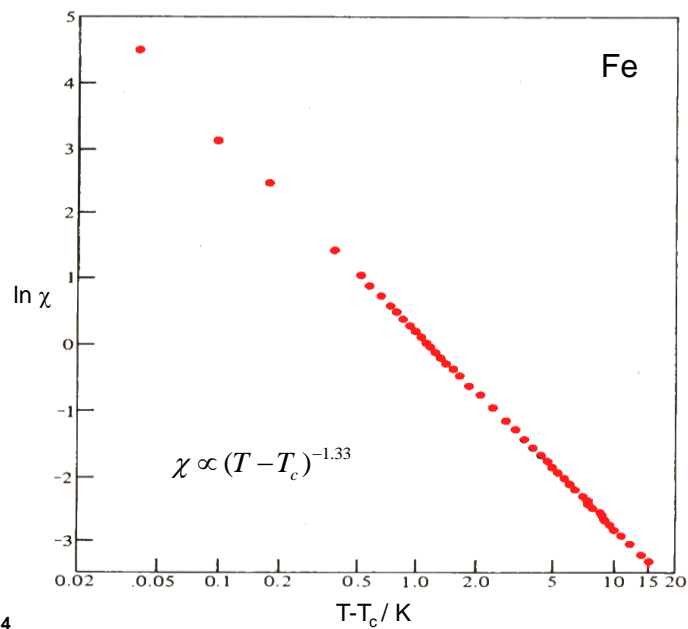
### 11 / 3 Austauschwechselwirkung

Typen von Austauschwechselwirkungen:

- direkter Austausch
- Superaustausch  
(über nichtmagnetische Atome)
- indirekter Austausch  
(über Leitungselektronen)
- Austausch zwischen Leitungselektronen



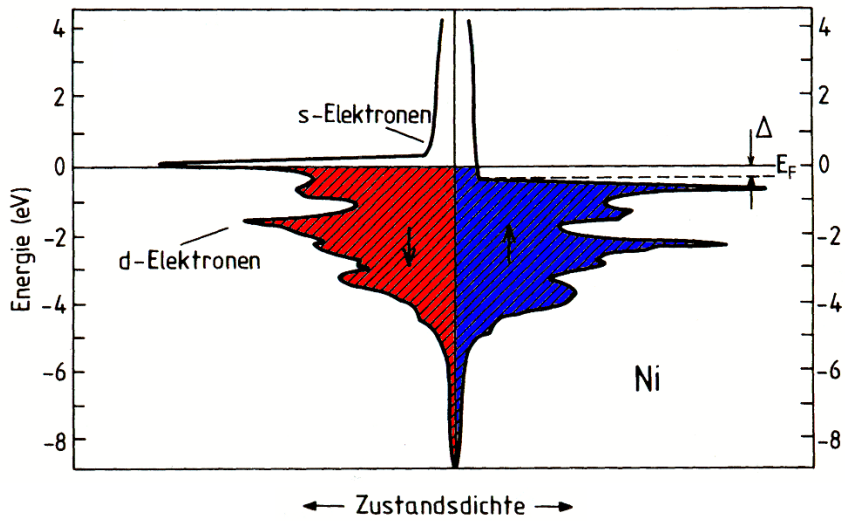
### 11 / 4 Suszeptibilität oberhalb der Curie-Temperatur



J.E. Noakes et al.  
J.Appl.Phys. 37 (1966) 1264

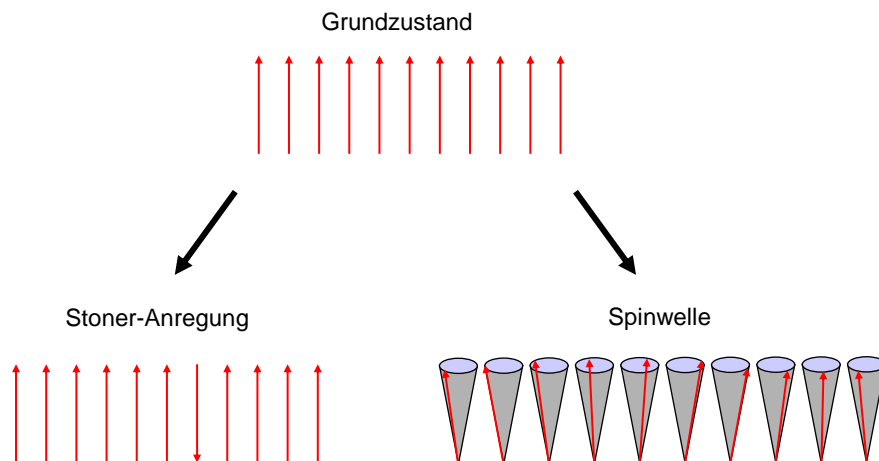
11 / 5

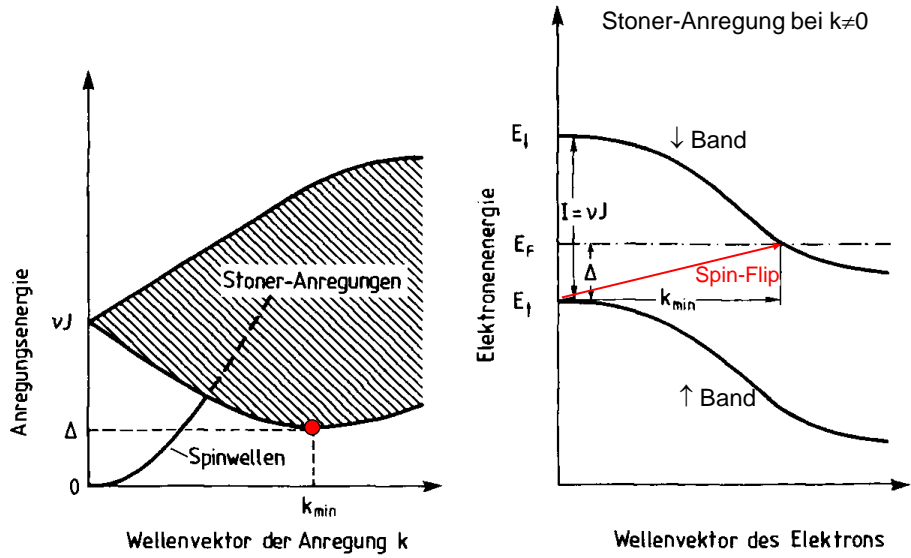
## Bandferromagnetismus



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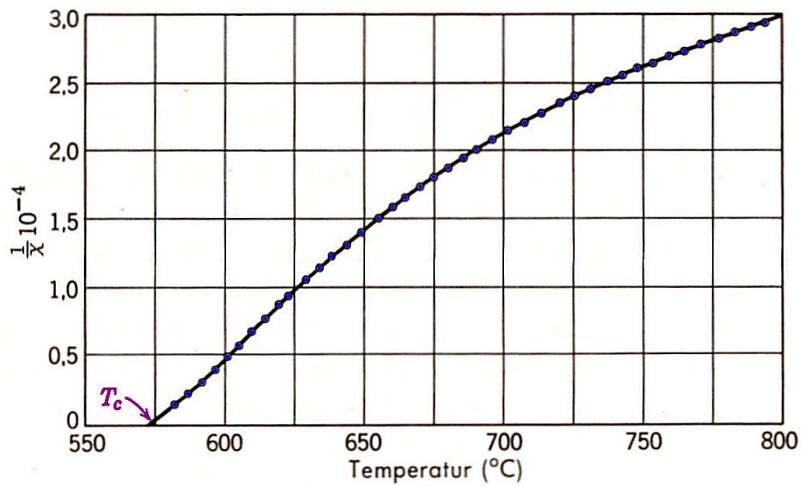
## Spinwellen





nach Ibach/Lüth

Reziproke Suszeptibilität von Magnetit ( $\text{FeO} \cdot \text{Fe}_2\text{O}_3$ ) oberhalb der Curie-Temperatur.



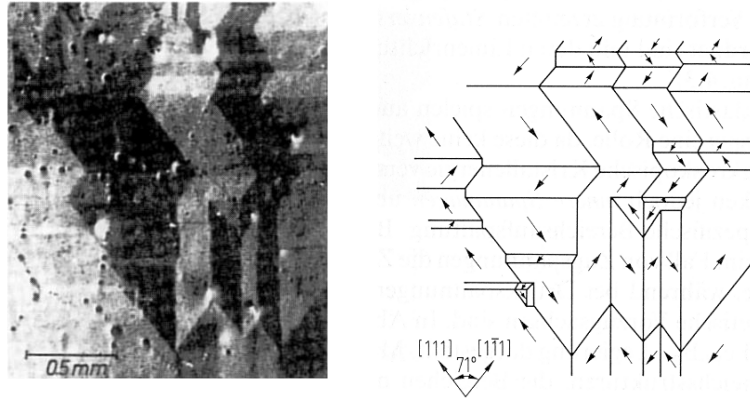
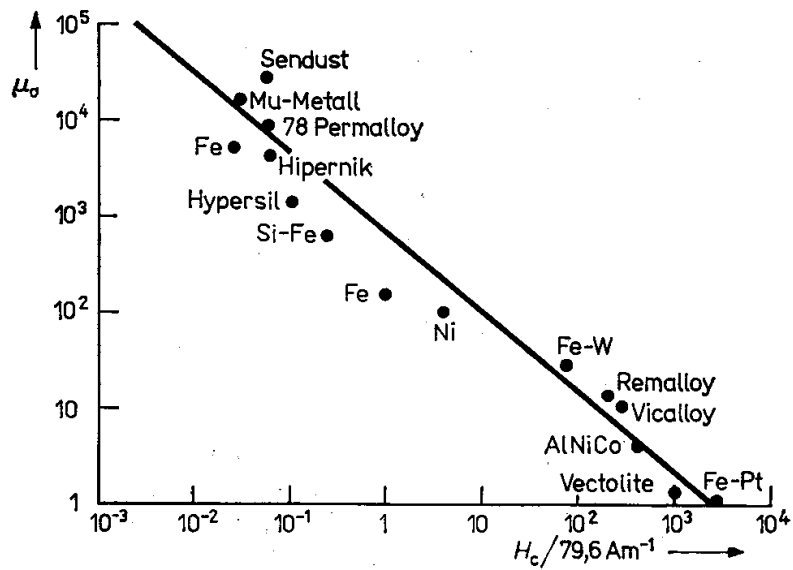
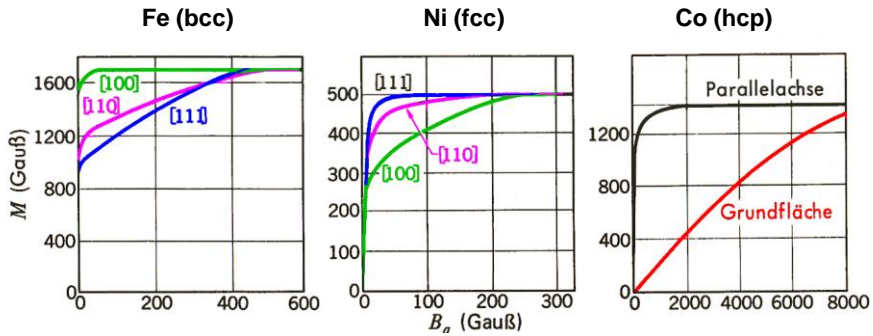


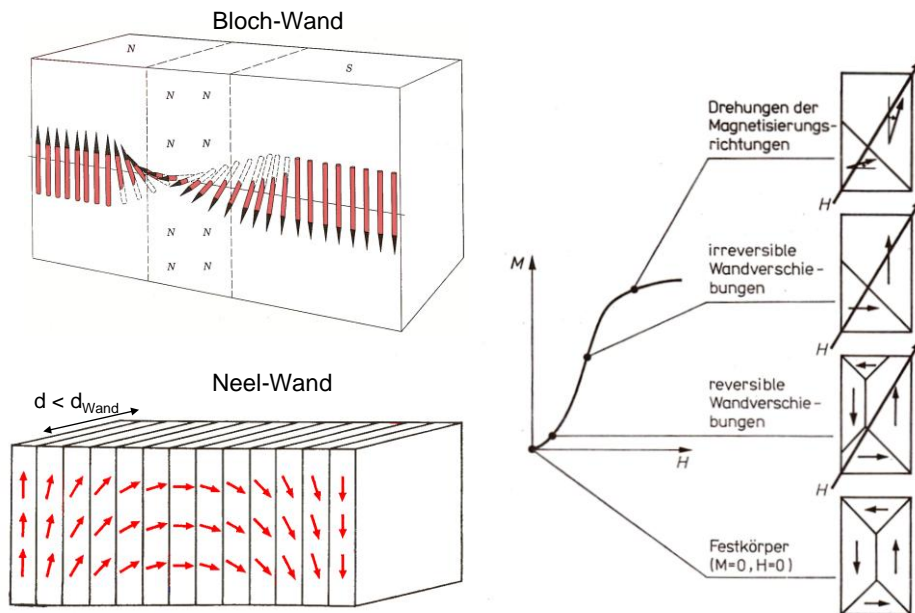
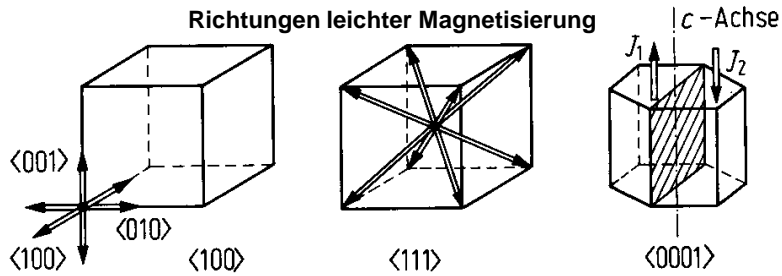
Abb. 8.33 Magnetooptische Kerr-Effekt-Abbildung der Bereichsstruktur auf der (110)-Ebene eines Ni-Einkristalls. Die rechte Seite zeigt die Bereichsanordnung schematisch.



Magnetisierung von Einkristallen

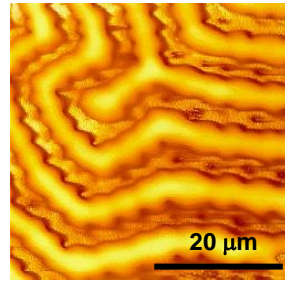
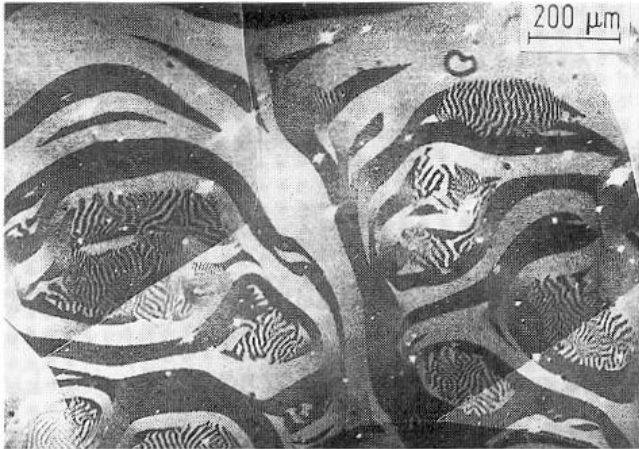


Richtungen leichter Magnetisierung

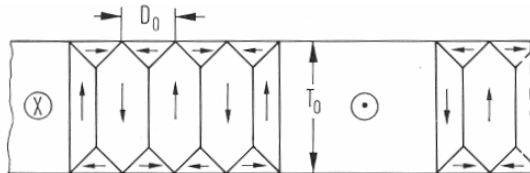


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### Magnetische Domänen



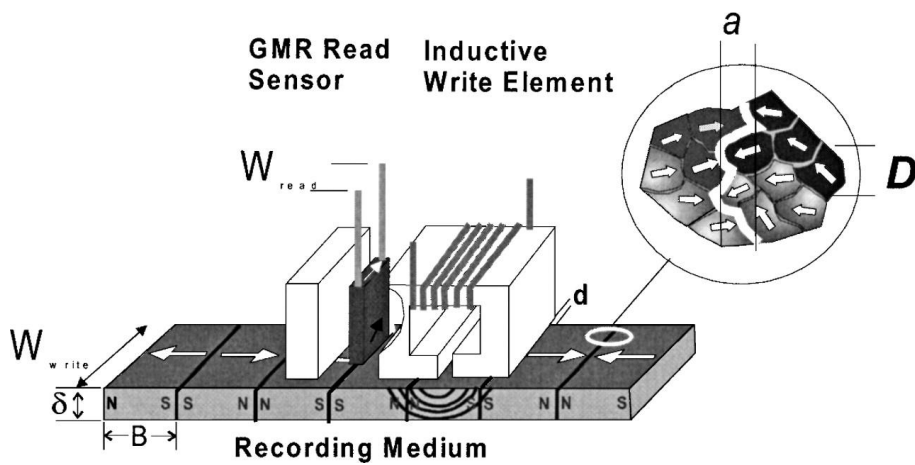
Magnetkraftmikroskopie



amorphe  $\text{Fe}_{80}\text{B}_{20}$ -Legierung mit weiten und engen Lamellen (magnetooptische Kerr-Effekt-Aufnahme).

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### Magnetische Speichertechnologie



D. Weller, Ann. Rev. Material Sci., 30, 610 (2000)