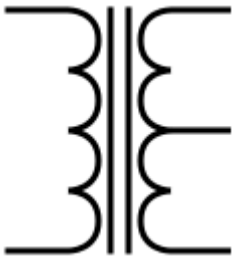
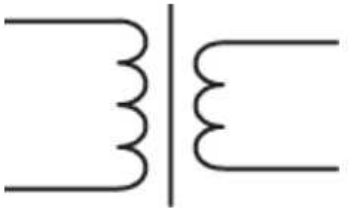
US D

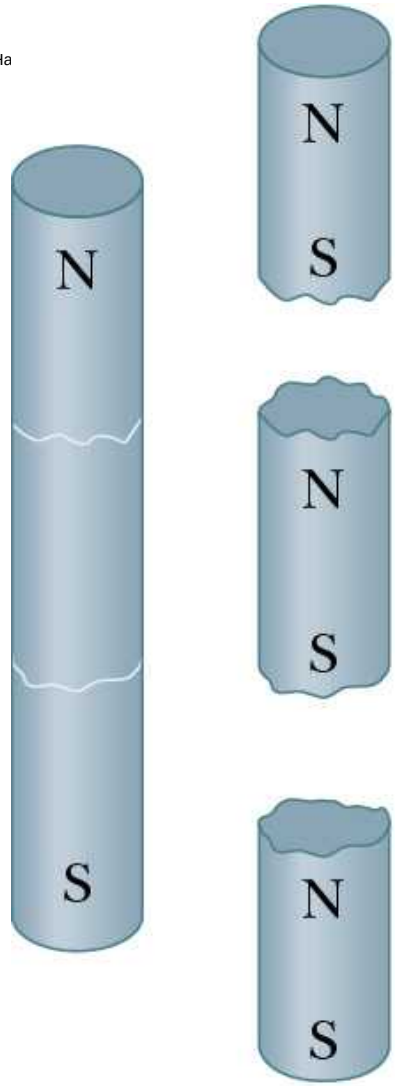
veraltet

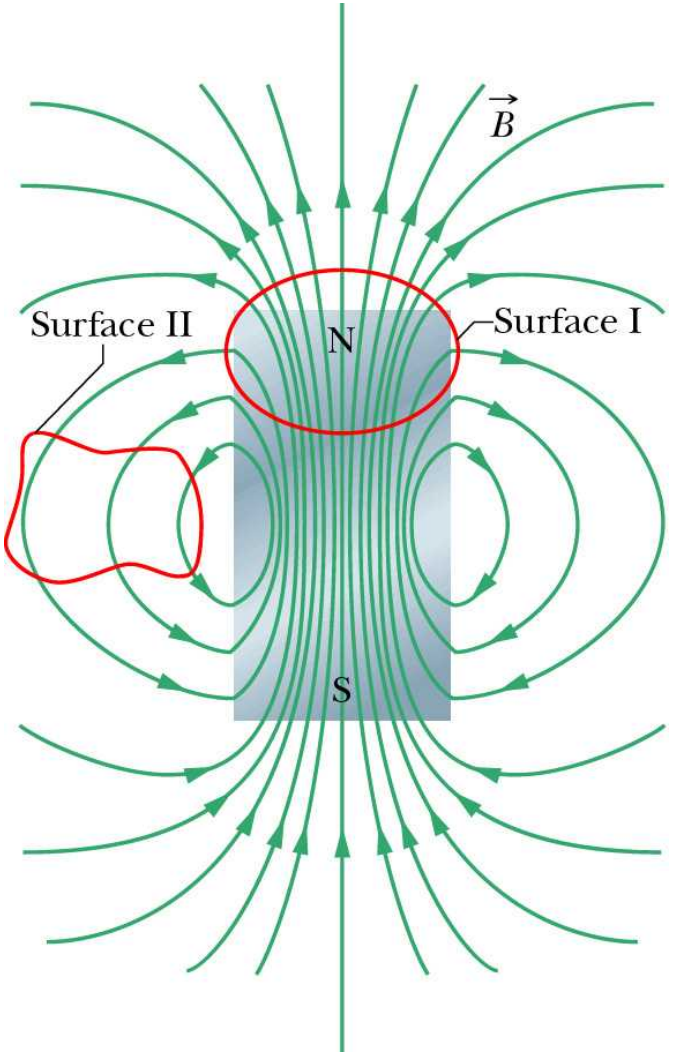





HAMBURG
BREMEN
BERLIN
KÖLN
FRANKFURT
BILDSTÖRUNG
SAARBRÜCKEN
BADEN-BADEN
STUTTGART
MÜNCHEN

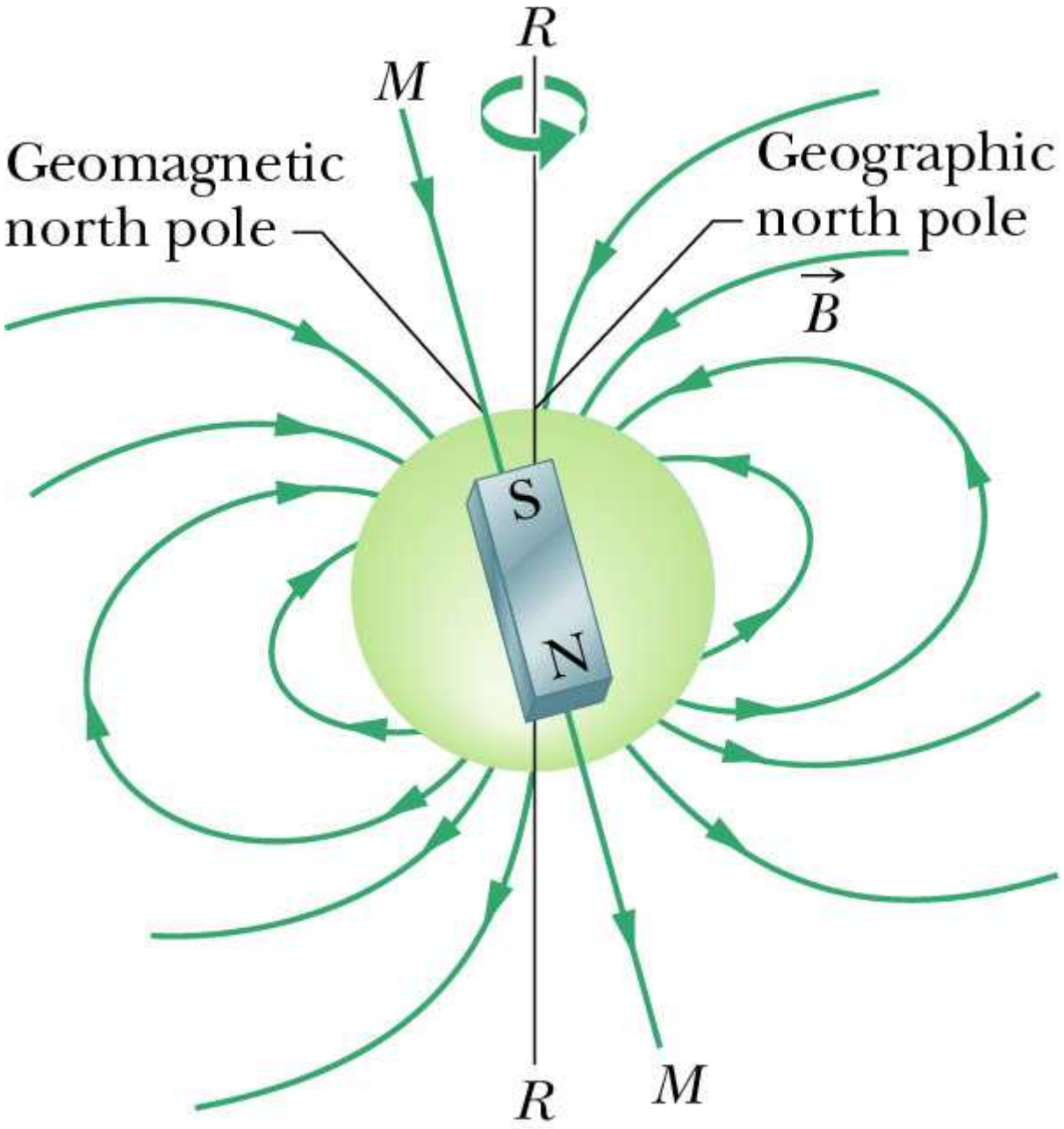
Es gibt keine magnetischen Monopole



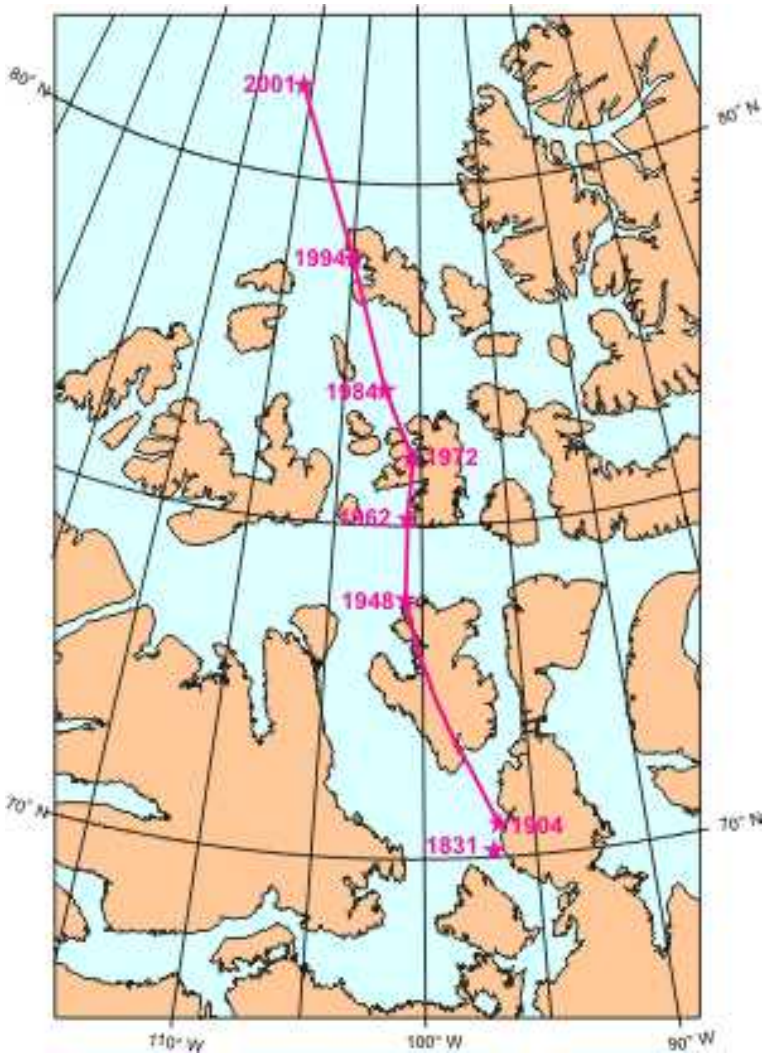


$$\Phi_B = \oint \vec{B}\, d\vec{a} = 0$$

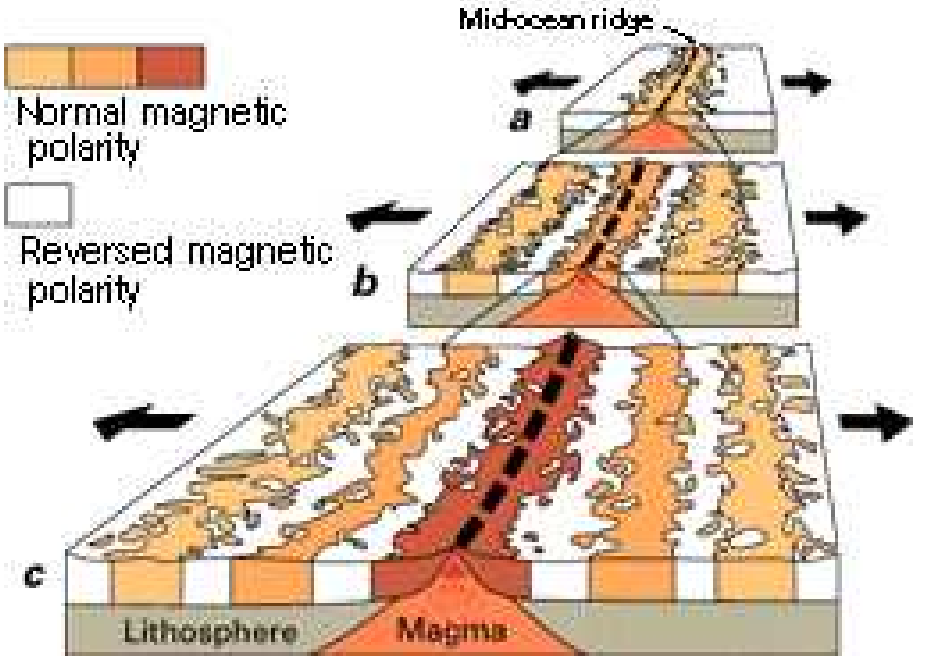
vgl.: $\Phi_E = \oint \vec{E}\, d\vec{a} = q_{innen}/\epsilon_0$



Halliday, 32-4

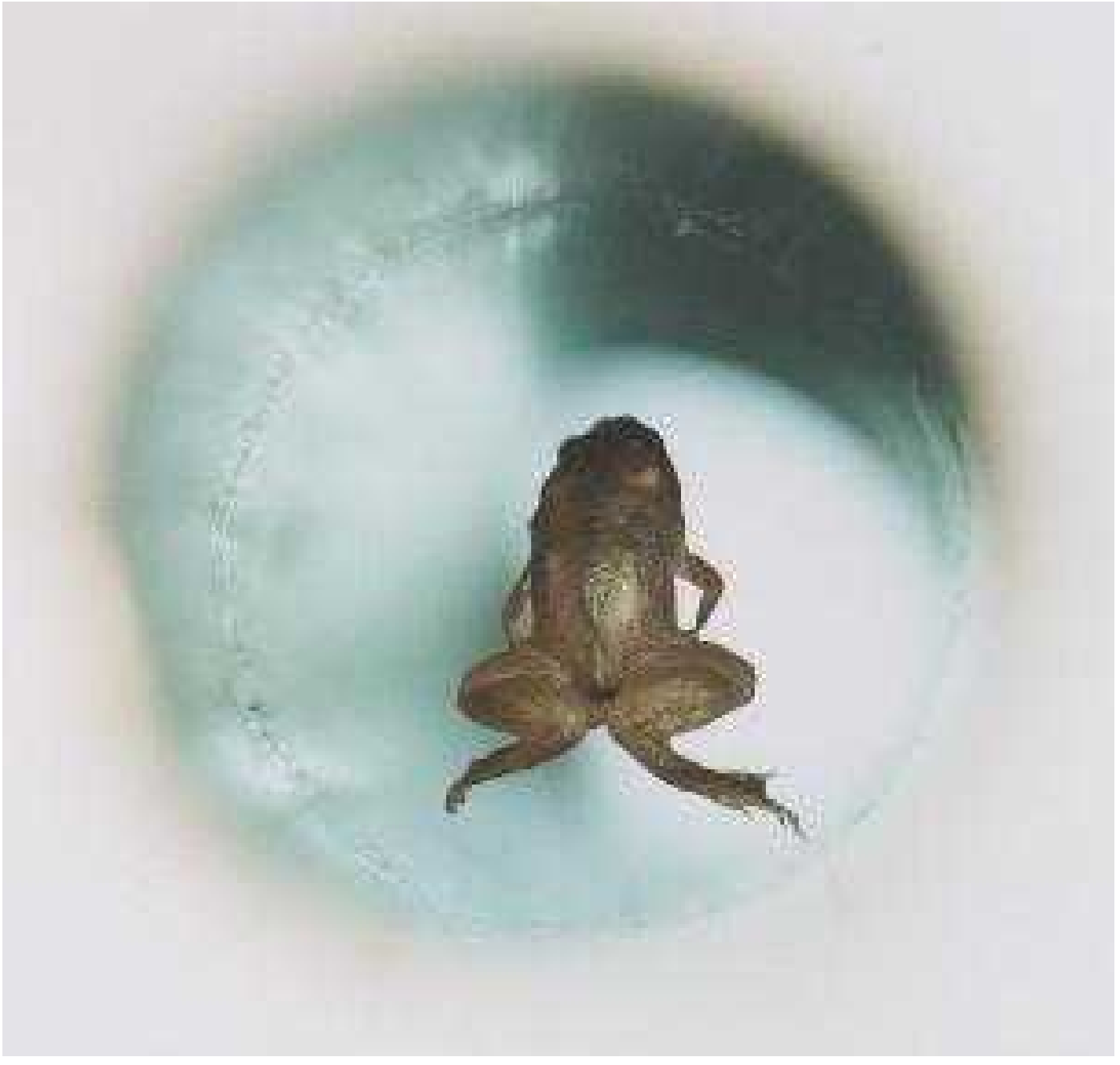


The movement of Earth's north magnetic pole across the Canadian arctic, 1831--2001. Credit: Geological Survey of Canada.



Magnetic stripes around mid-ocean ridges reveal the history of Earth's magnetic field for millions of years. The study of Earth's past magnetism is called paleomagnetism. Image credit: USGS

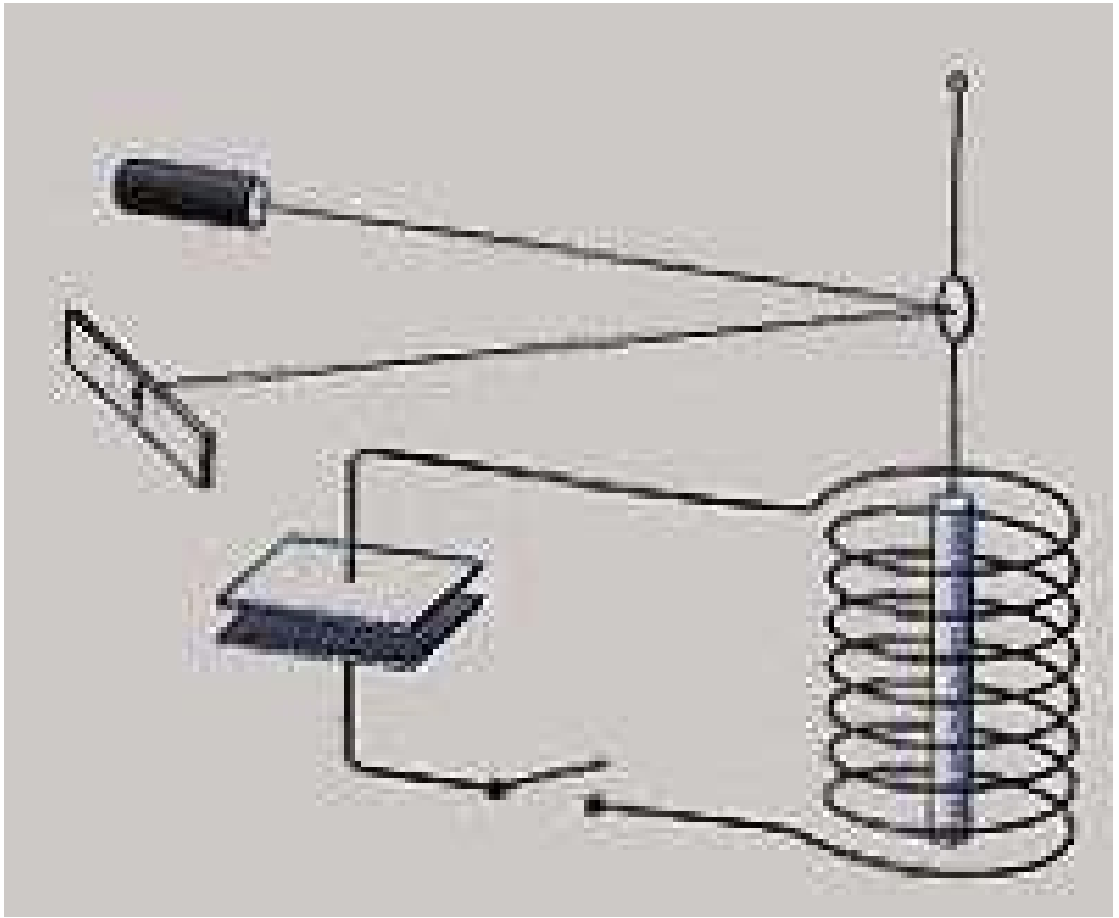
Froschlevitation



Einstein-de-Haas-Effekt

1915 Albert Einstein & Wander Johannes de Haas

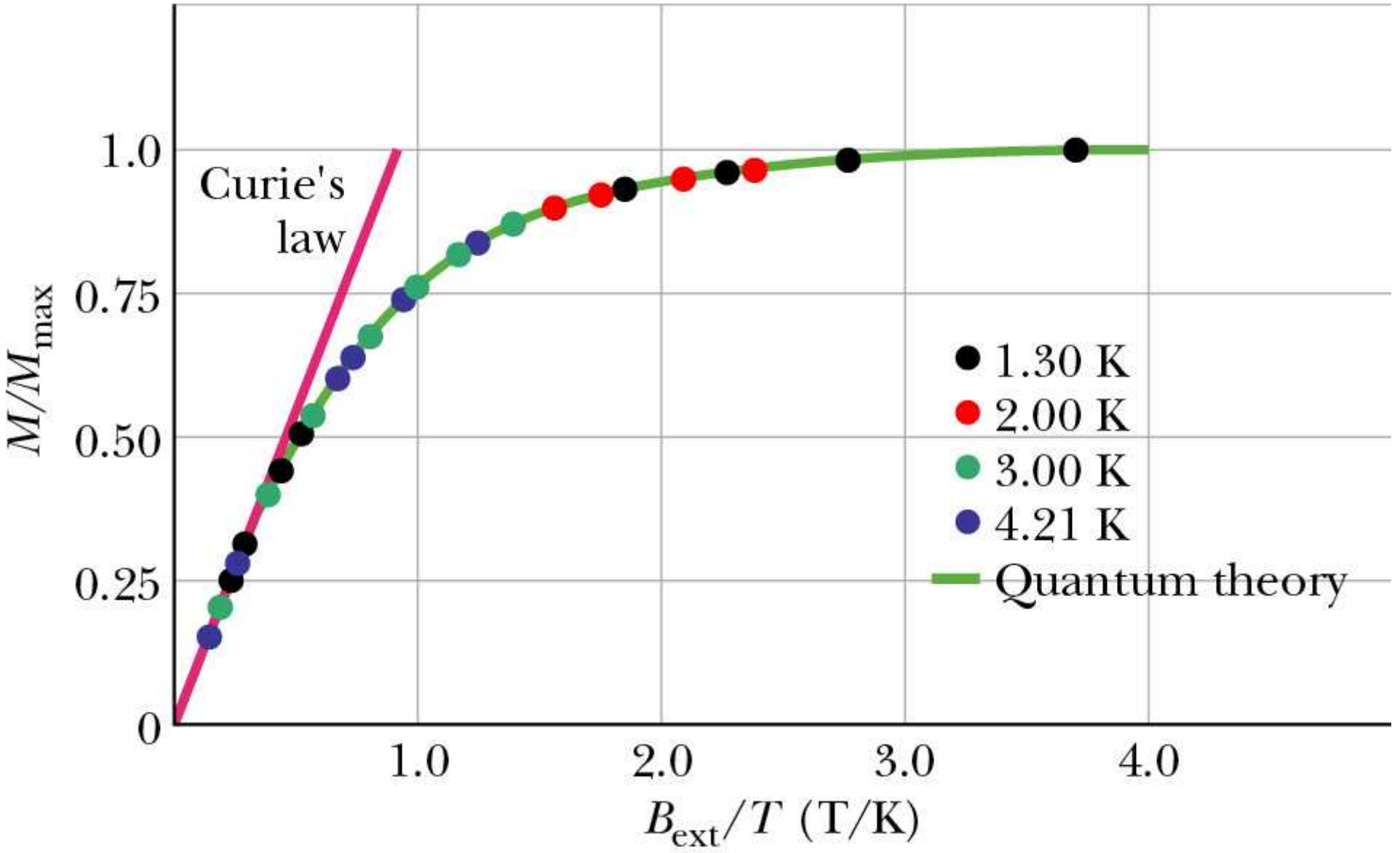
Eisenstab in Achsrichtung ummagnetisieren
Ändert Richtung der Elementarmagnete
damit auch ihre Drehimpulse.
Gesamtdrehimpulserhaltung: Änderung des makroskopischen Drehimpulses



gyromagnetischer Faktor

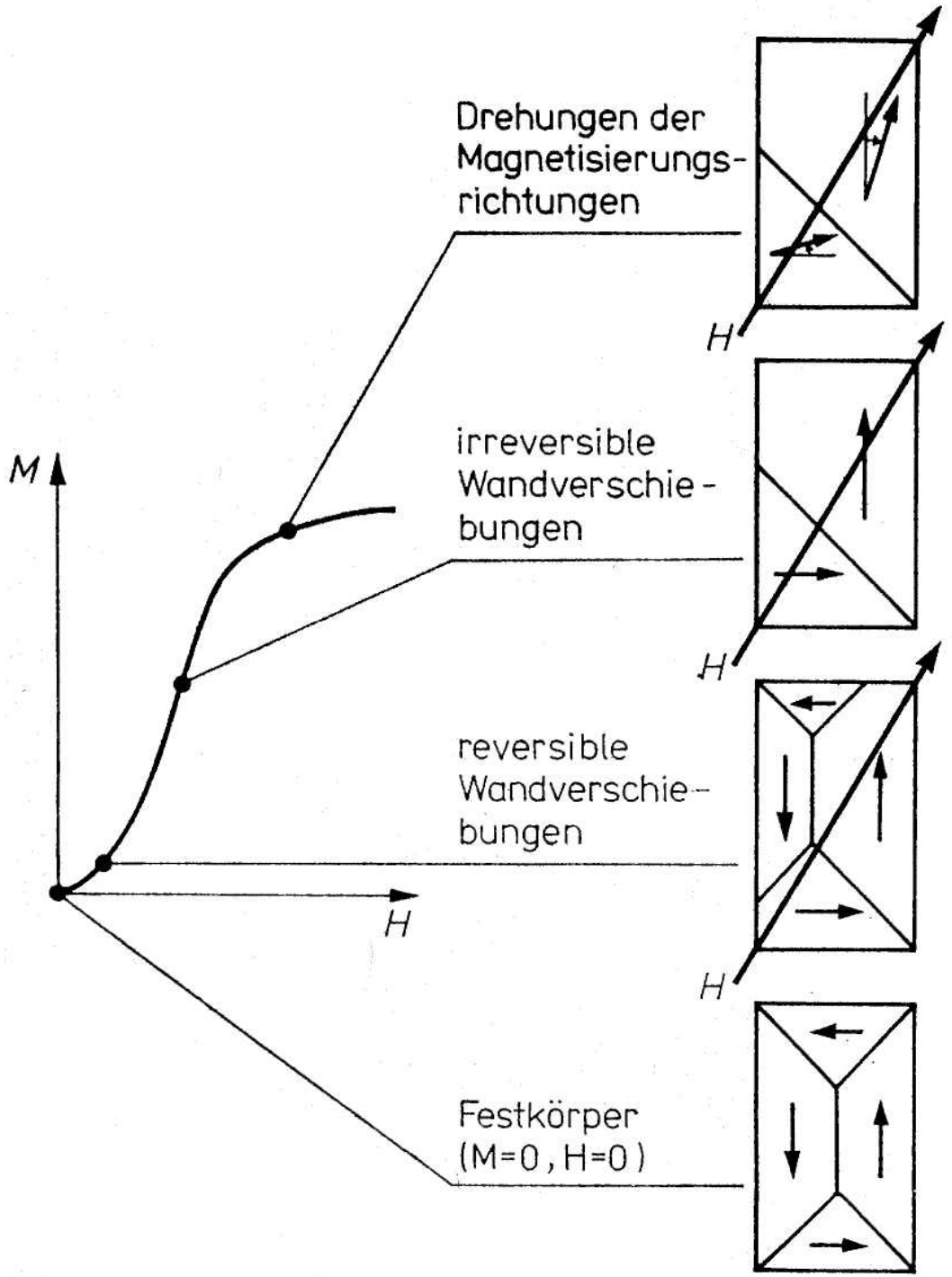
$$g = \frac{\frac{\mu}{L}}{\frac{1}{2} \cdot \frac{e}{m_e}} = 2, \text{ Spin!}$$

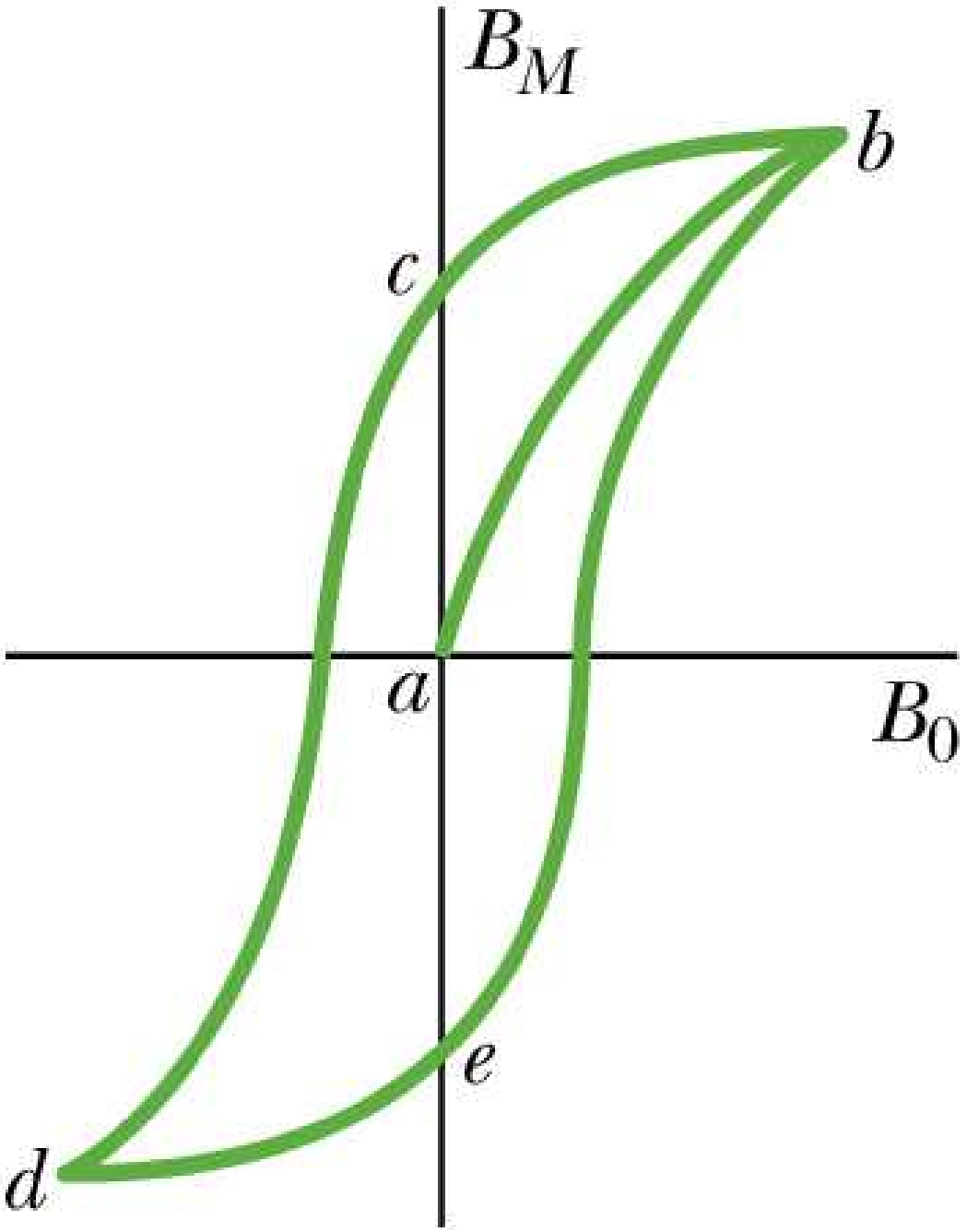
Umkehrung: Barnett-Effekt
1914 Samuel Jackson Barnett



Halliday, 32-9

Three solid steel ball bearings (spheres) easily suspended by miniscule neodymium magnets. The lowest sphere is 3.63cm in diameter (196.1g), and is being held up by a NIB disk magnet 4mm in diameter by 1.5mm thick (0.143g). Such magnets can easily lift thousands of times their own mass.


Drehungen der Magnetisierungs-richtungen
irreversible Wandverschie-bungen
reversible Wandverschie-bungen
Festkörper (M=0, H=0)
M
H
H
H
H



Halliday, 32-13

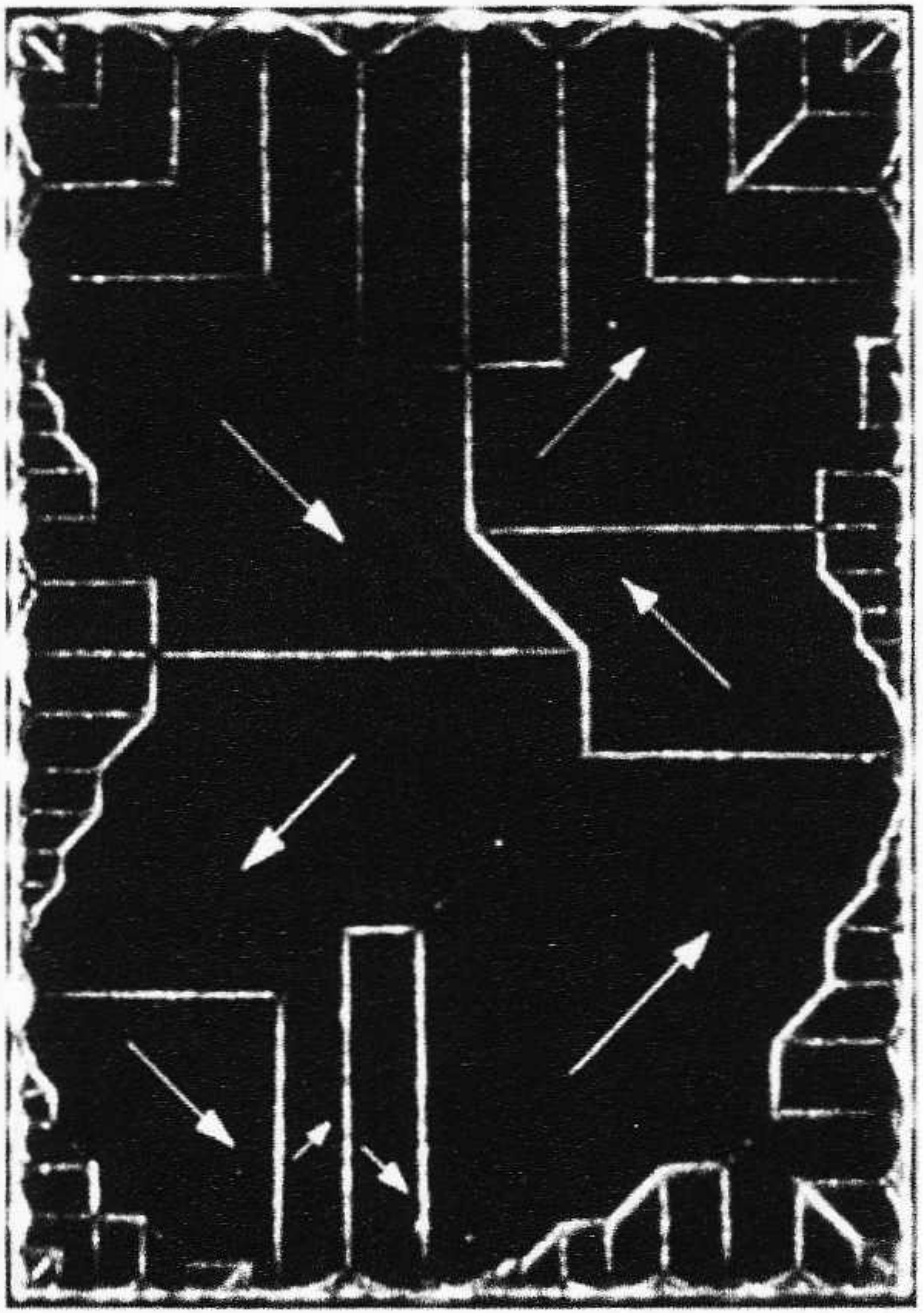
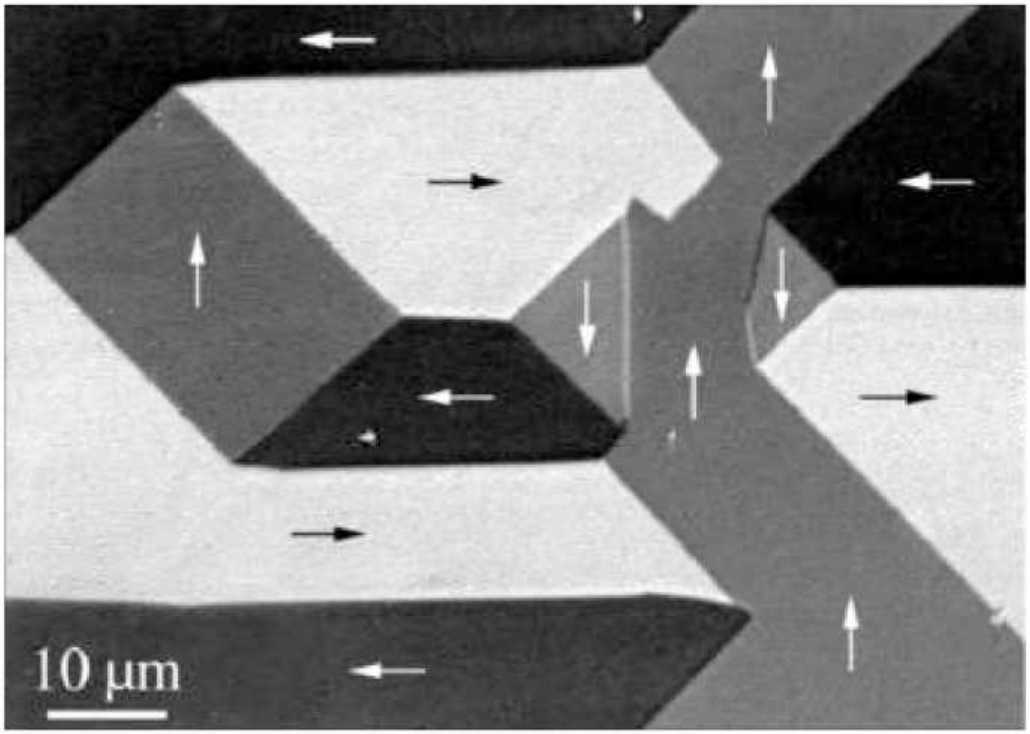


Abb. 32-12

Eine Fotografie der Domänengrenzen an der Oberfläche eines Nickel-Einkristalls. Die eingezeichneten weißen Pfeile zeigen die Orientierungen der magnetischen Dipole in den Domänen und damit die Orientierung der resultierenden magnetischen Dipole der Domänen. Der Kristall als Ganzes ist nicht magnetisiert, wenn die Vektorsumme der magnetischen Dipole aller Domänen null ergibt.

Halliday, 32-12

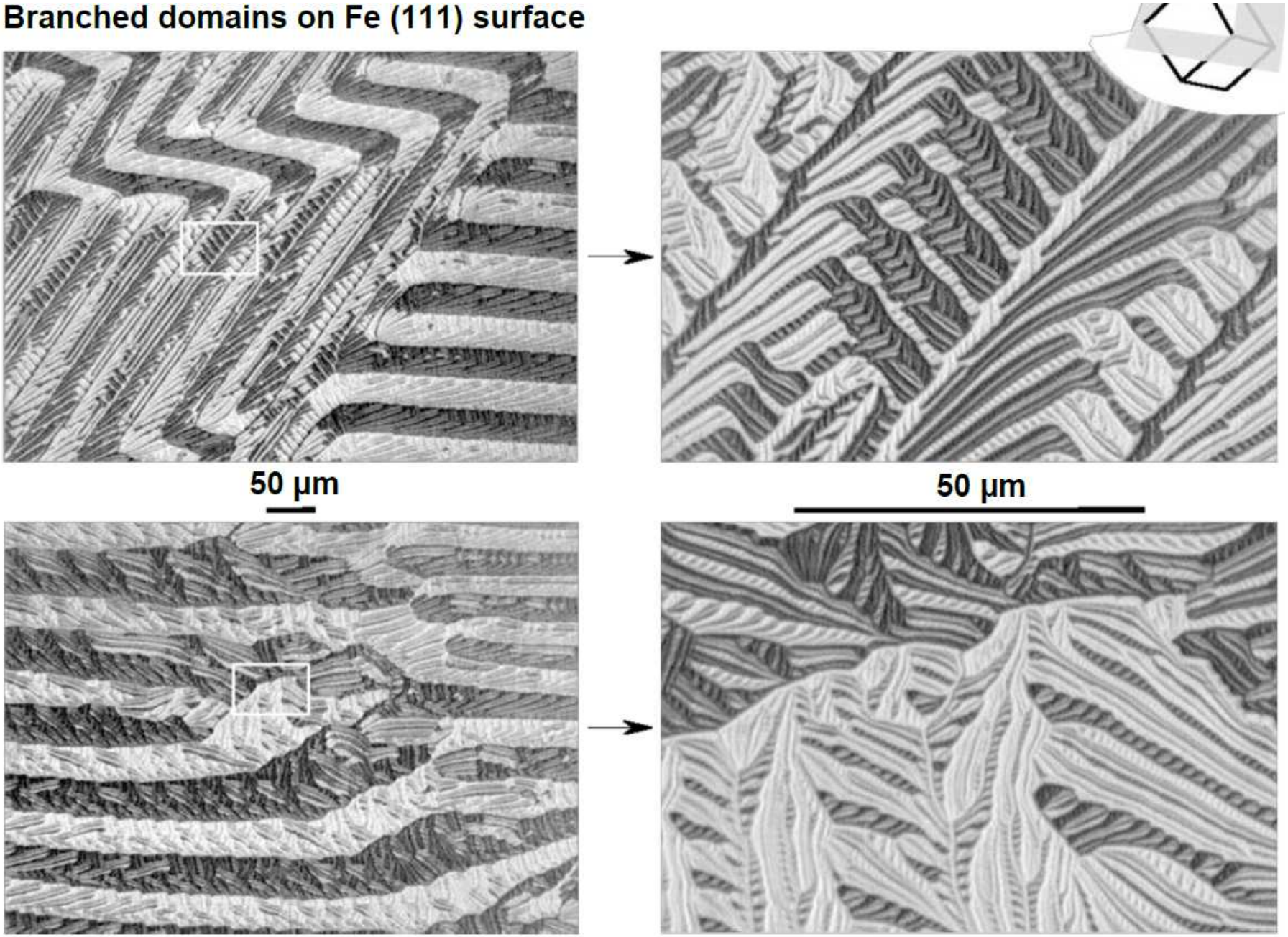
domains on (100)-FeSi sheet



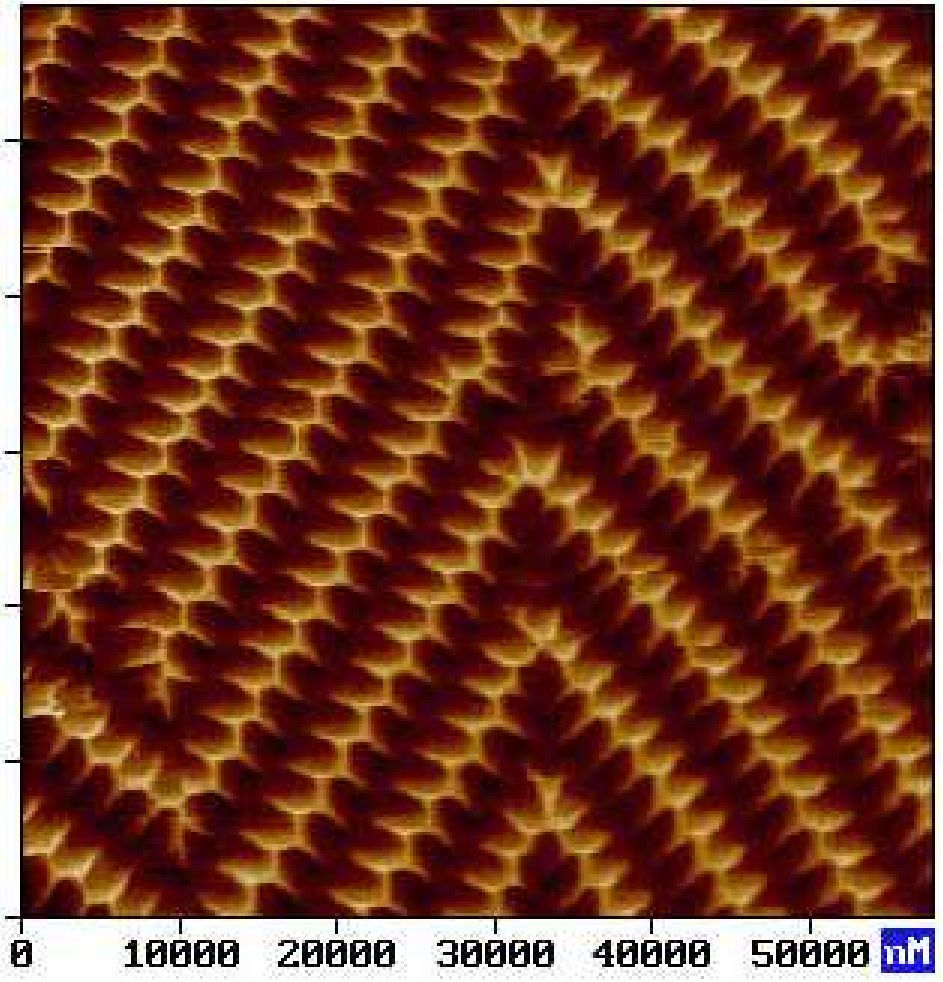
transversal

Aus Vortrag „Introduction to Magnetic Imaging“ von Rudolf Schäfer, IFW-Dresden

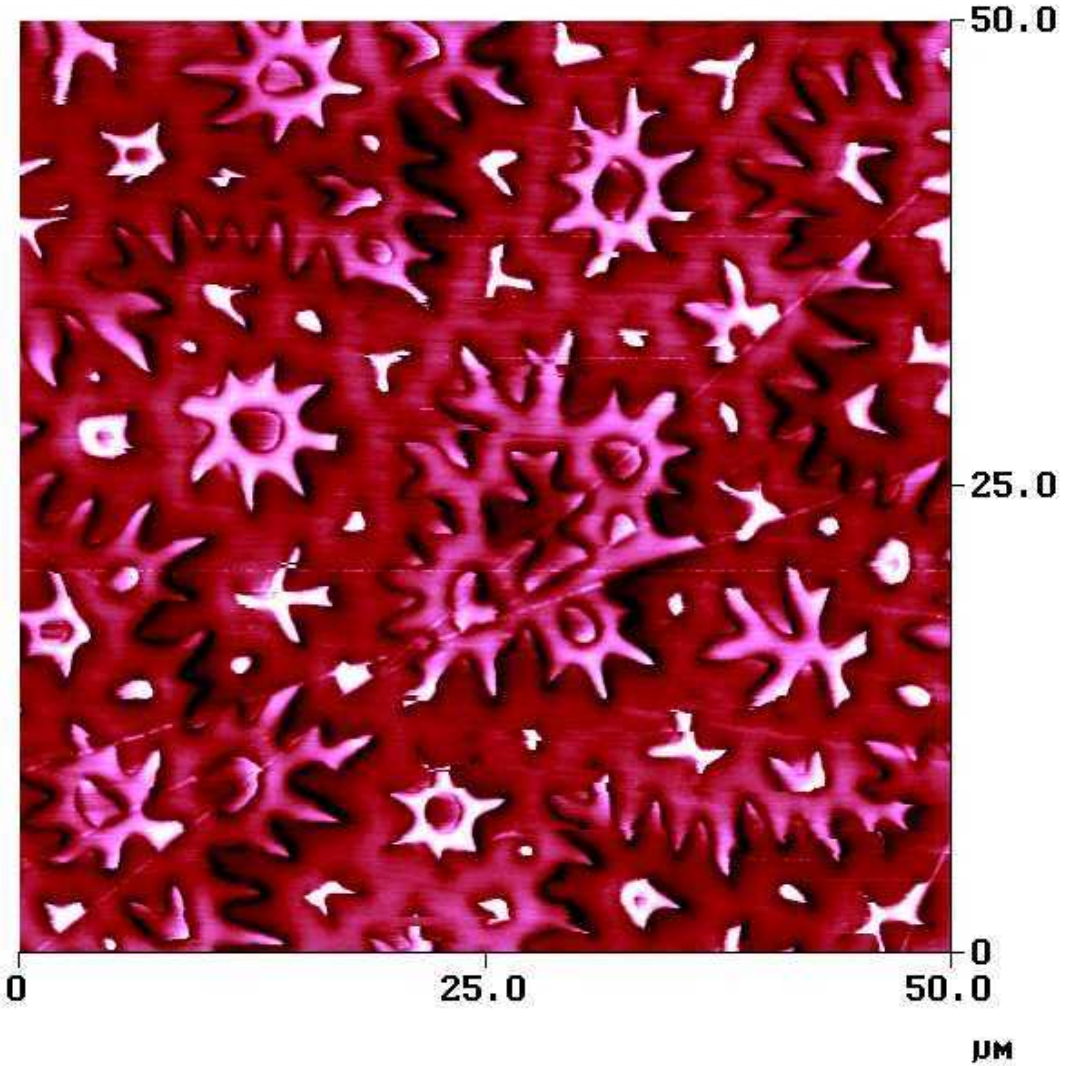
Branched domains on Fe (111) surface



Aus Vortrag „Introduction to Magnetic Imaging“ von Rudolf Schäfer, IFW-Dresden



Different complex domain structures of inhomogenious film of Yttrium Iron Garnet (YIG). YIG film has substantial variation of anisotropy field across the film thickness. Mode: Magnetic Force Microscopy (MFM) Image courtesy of A.G. Temiryazev and M.P. Tikhomirova, Institute of Radioengineering & Electronics RAS, Fryazino, Russia.

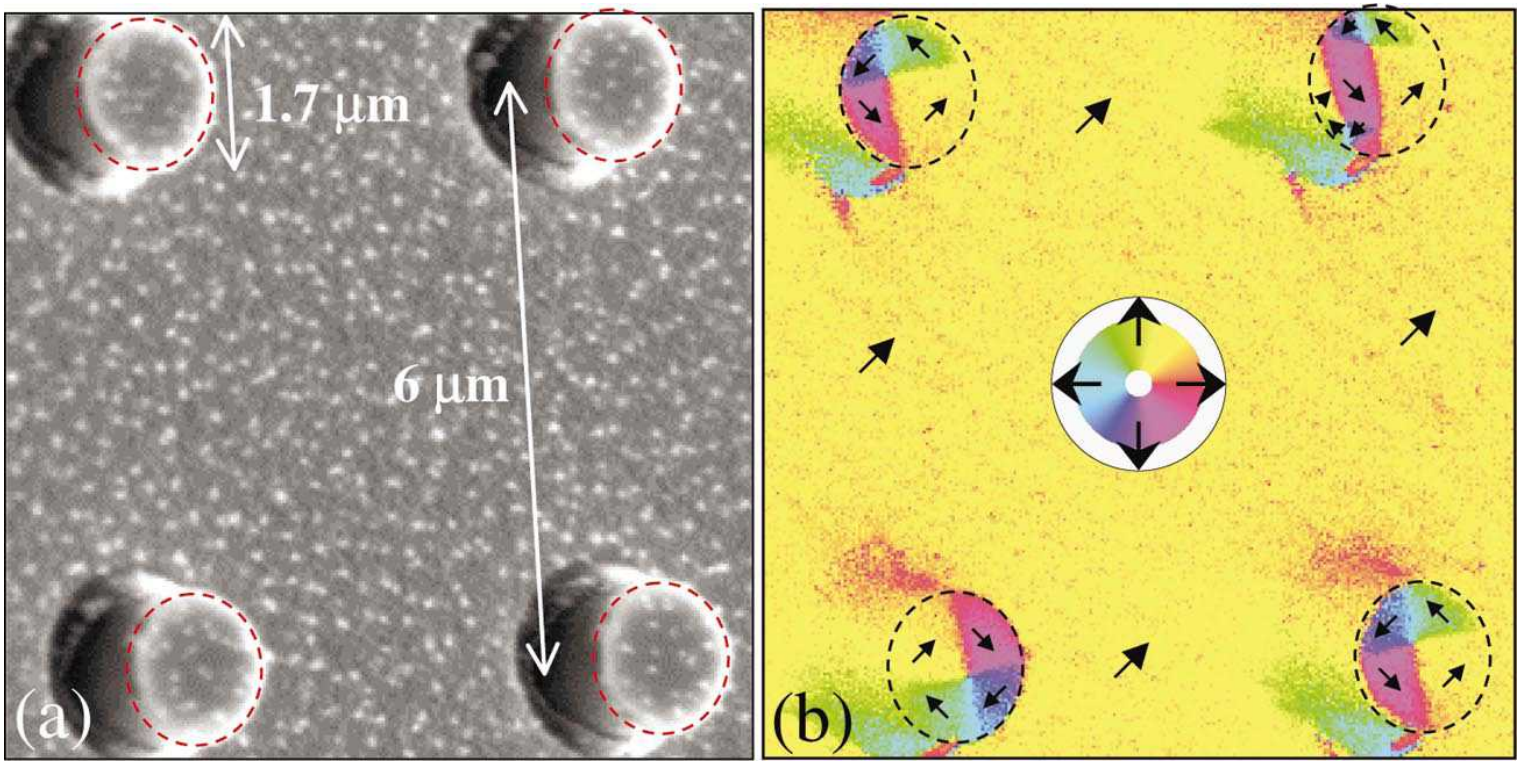


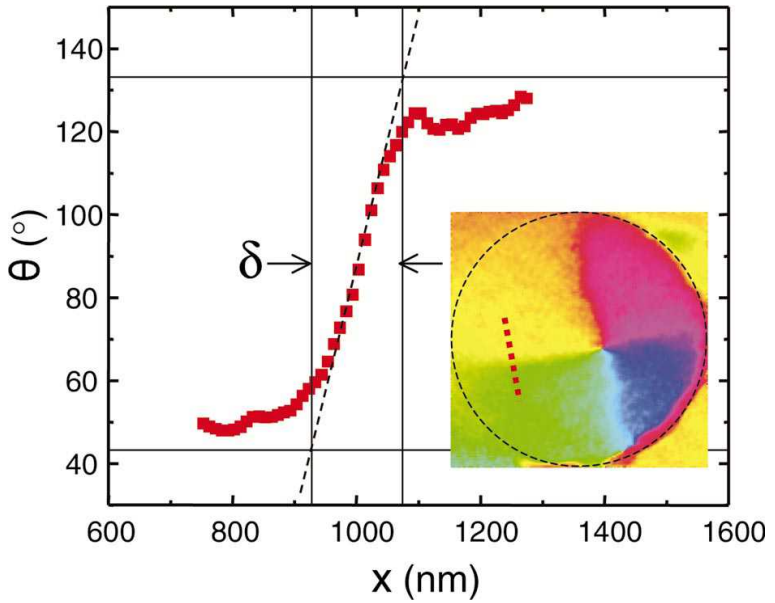
Magnetic domain structure of a BaFe12O19 single crystal imaged with the Magnetic Force Microscope. (Fraunhofer)

Co disks

Topograph

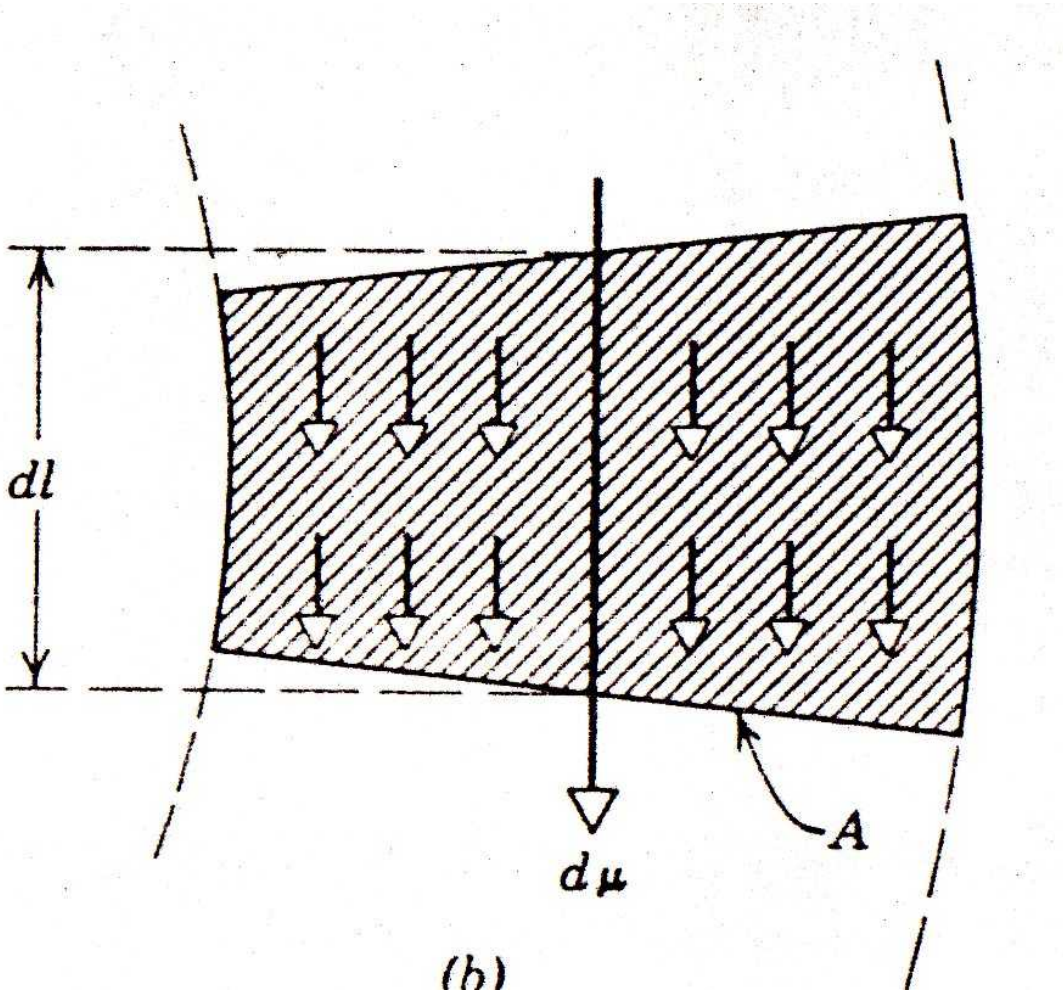
SEMPA image



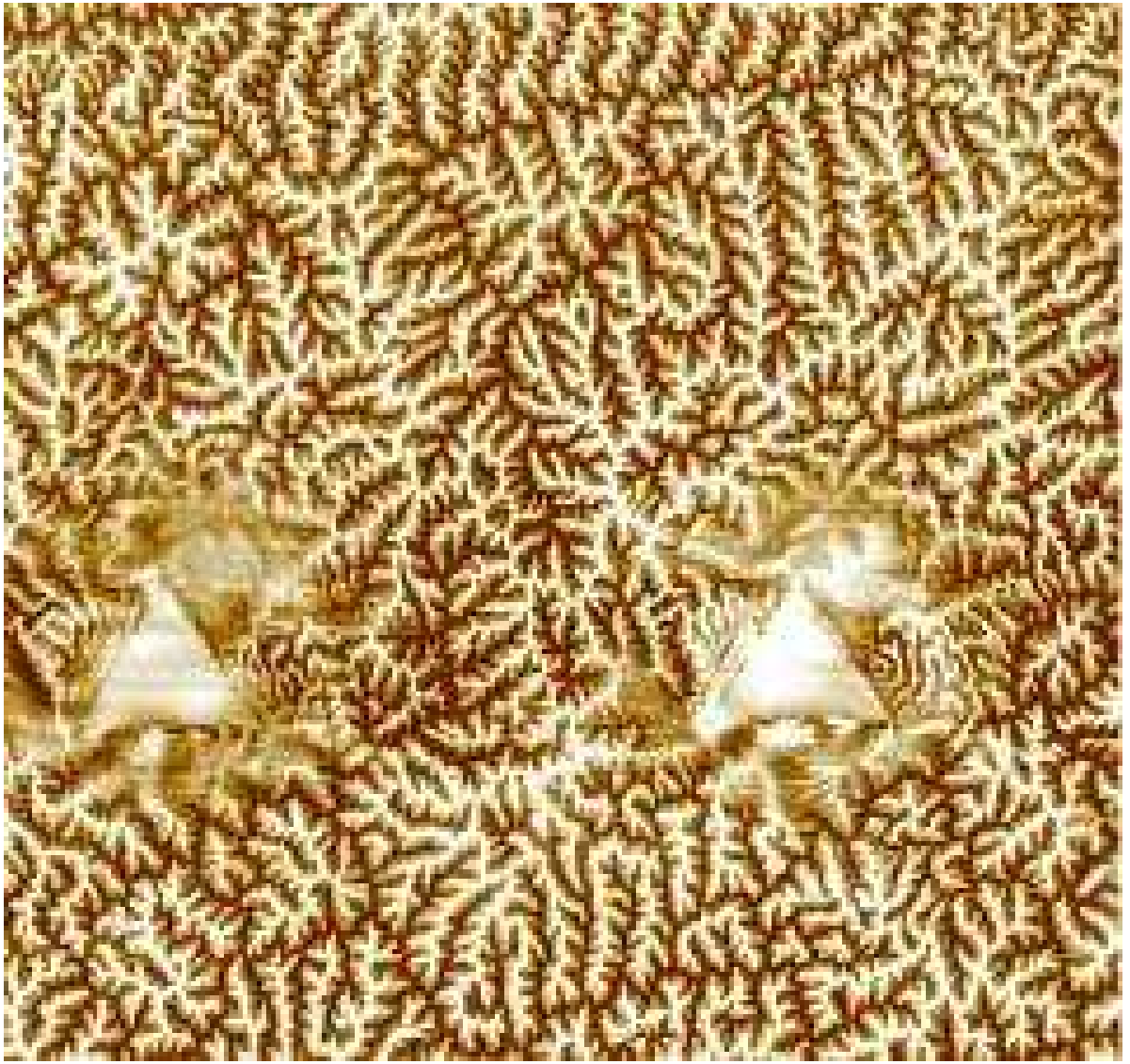


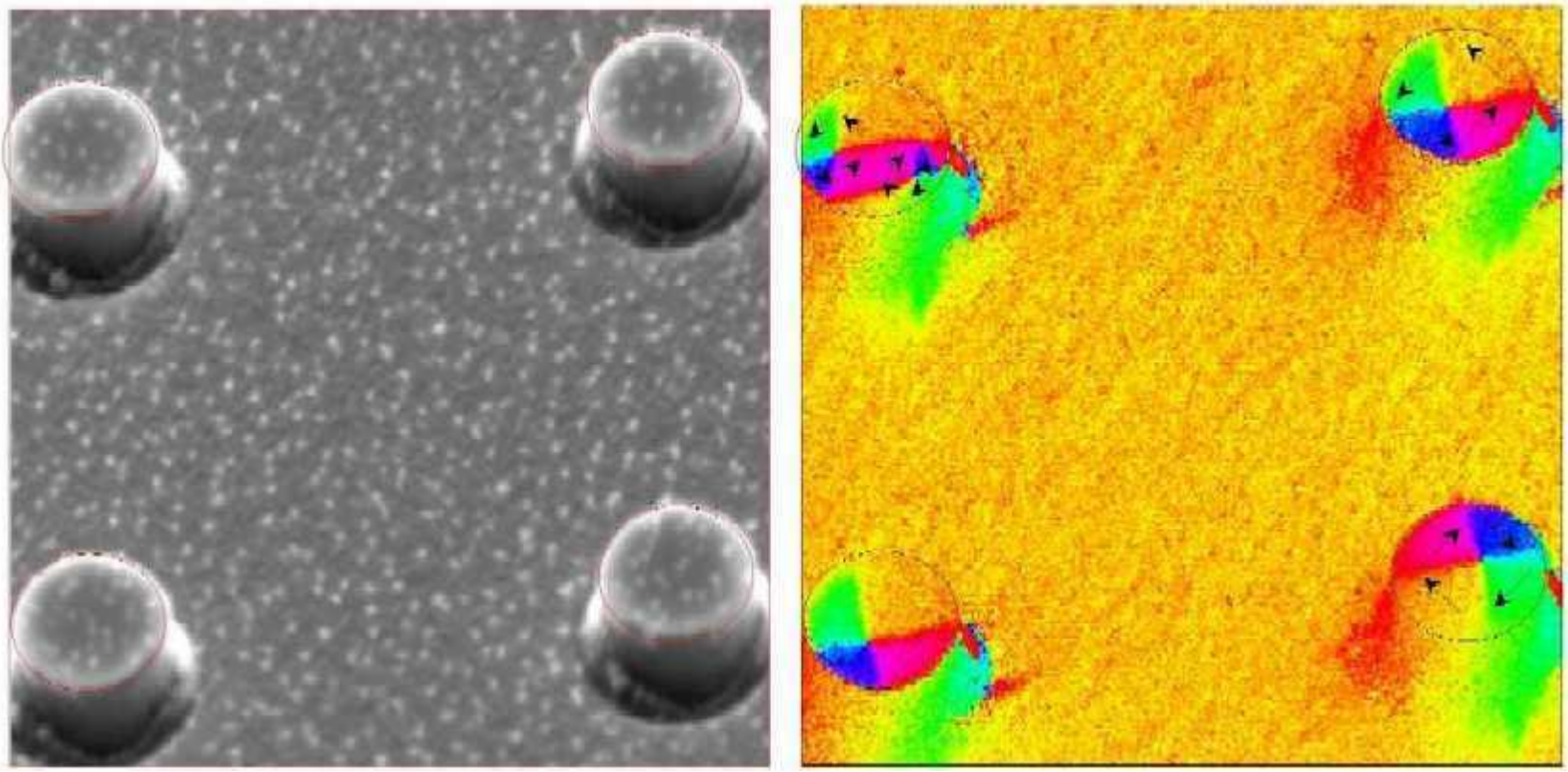
Remanent magnetic states in epitaxial fcc Co small disks

C. A. F. Vaz et al., Phys. Rev. B, **67**, 140405 (2003)



(b)





Topography (left) and SEMPA images (right) of Co discs.
NIST, Gaithersburg