# Scattering theory of transport in magnetic system.

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1. Transport in a phase coherent system.
- From bulk to mesoscopic systems: some systems are more « quantum » than others.
- Mesoscopic physics: a quantum system connected to the classical world. Example of non-local experiments.

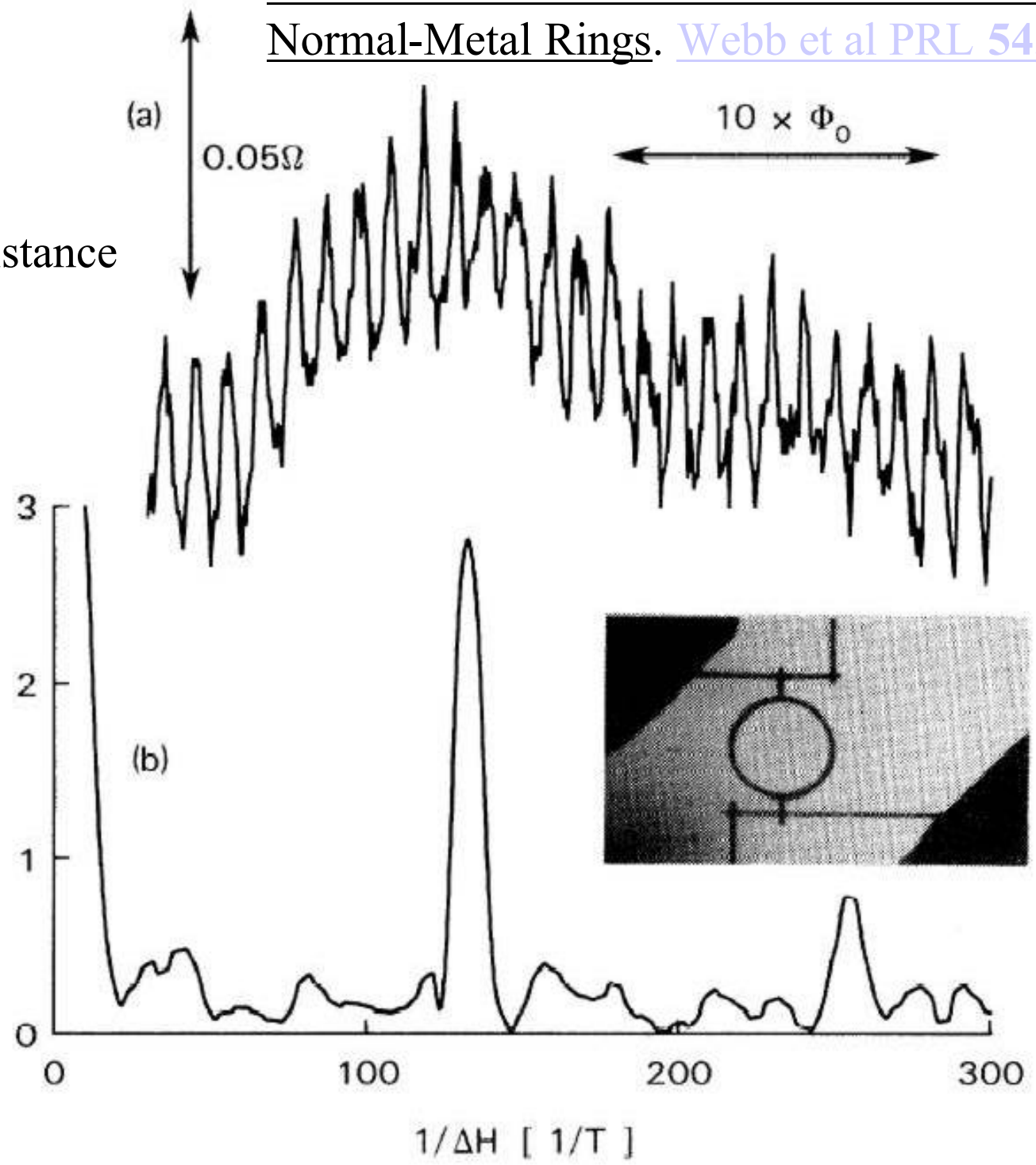
2. A theoretical approach to transport: Scattering theory.
- Introduction of the S matrix
- The Landauer formula

3. Application of scattering theory to magnetic system.
- GMR in a Ferromagnetic-Normal-Ferromagnetic Trilayer.
- Spin current and spin torque in a F-N-F trilayer.
- Spin injection and Larmor precession in a magnetic domain wall.

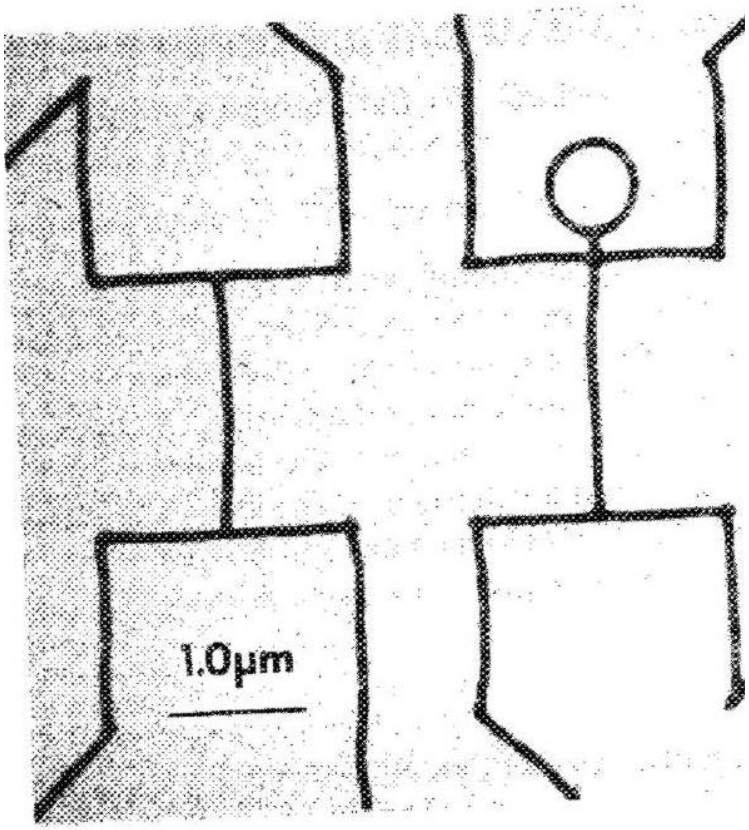
Observation of h/e Aharonov-Bohm Oscillations in Normal-Metal Rings. Webb et al PRL **54**, 2696 (1985)

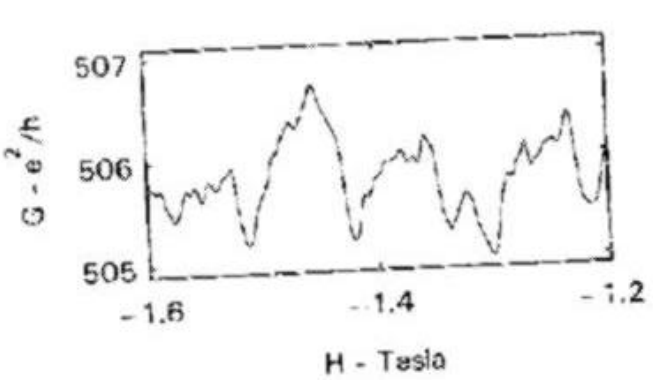
(a)Magnetoresistance

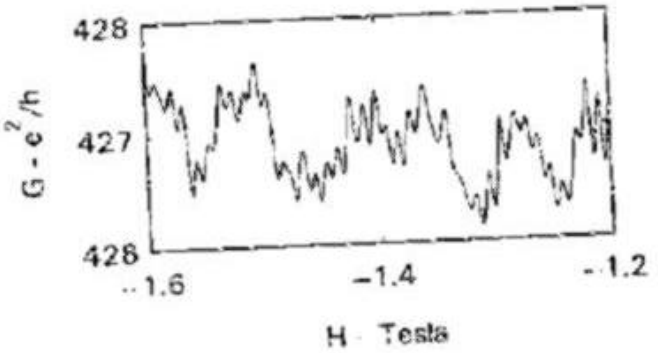
(b) Fourier transform

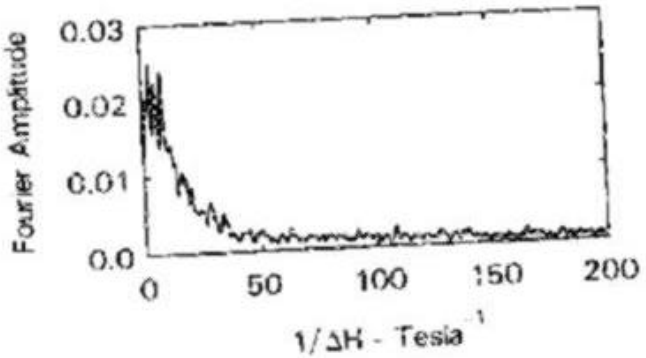


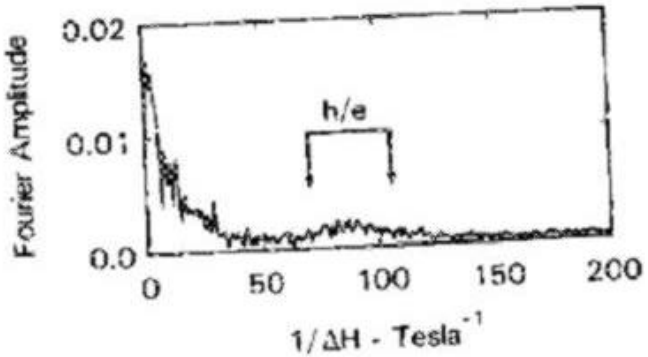
# Umbach et al APL **50**, 1289 (1987)

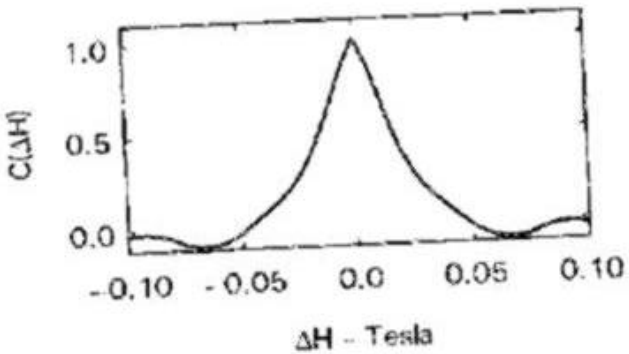


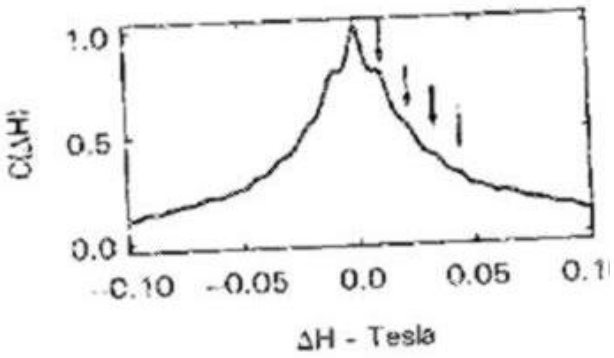



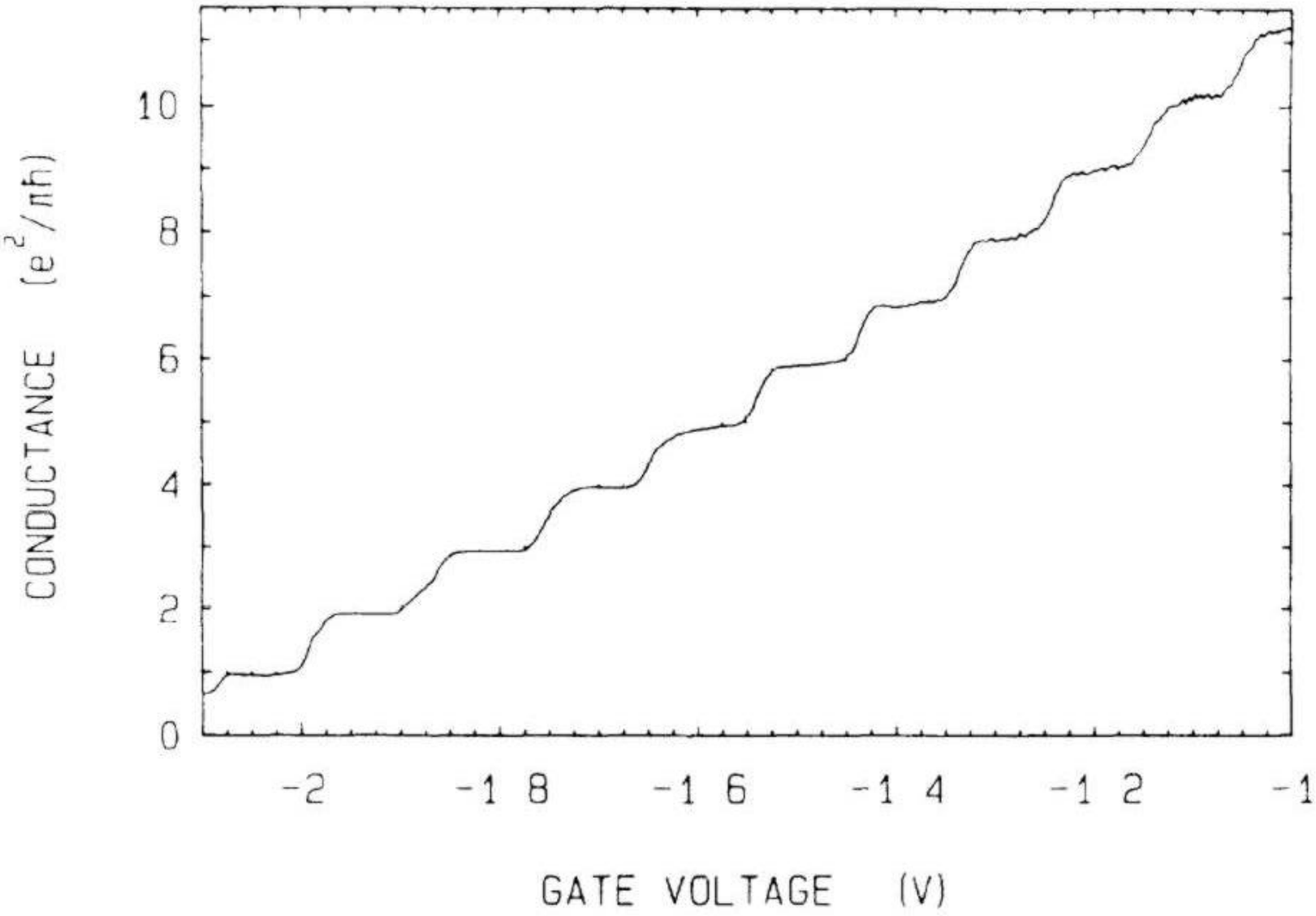



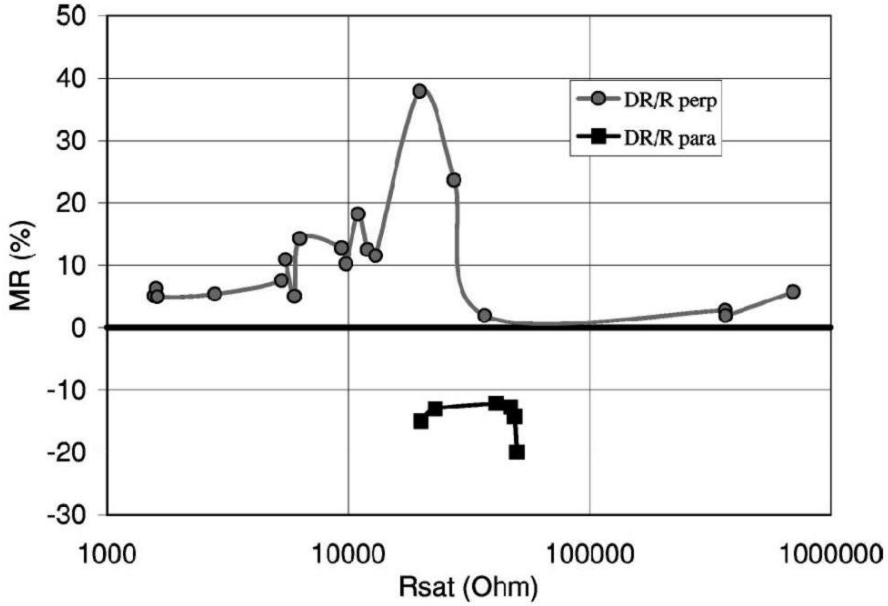
# Quantum Point Contact: conductance quantization

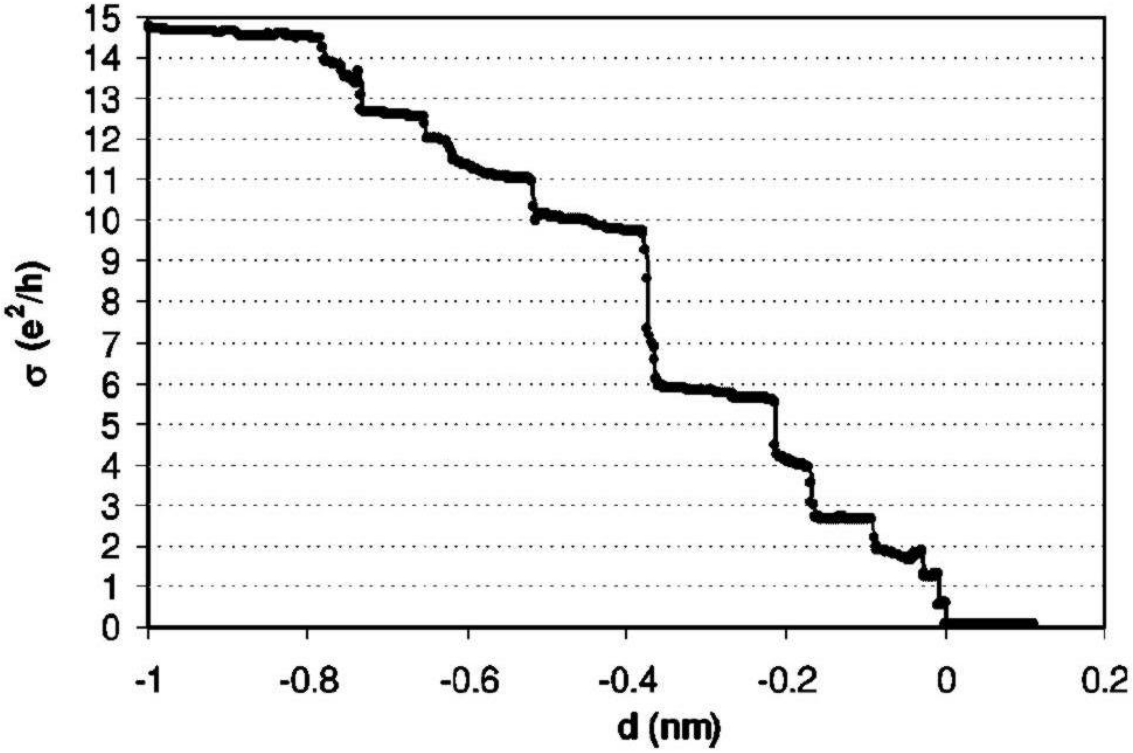
Wees et al PRL **60**, 848 (1988).



Viret et al PRB **66**, 220401(R) 2001.

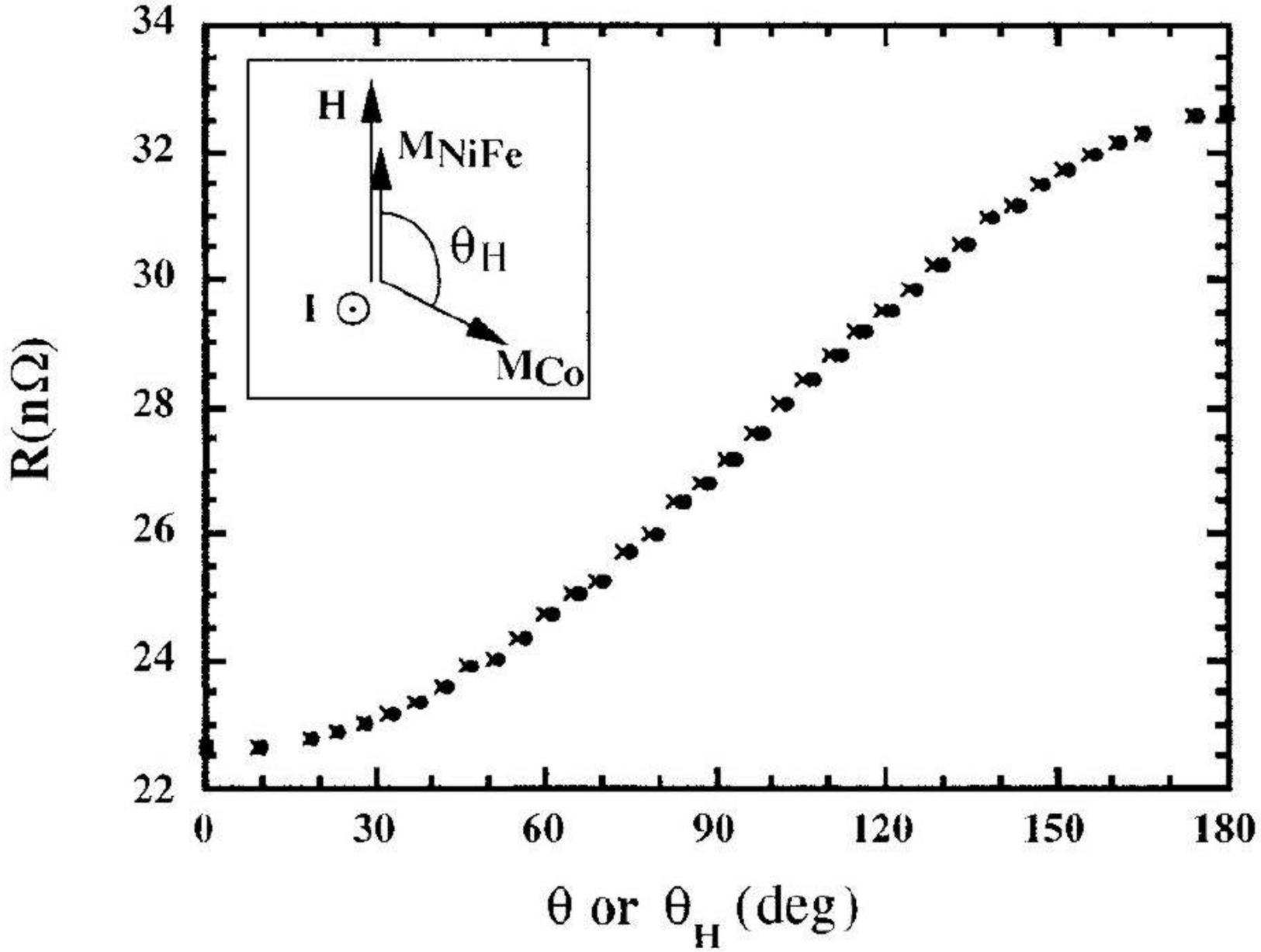
# Broken junctions.



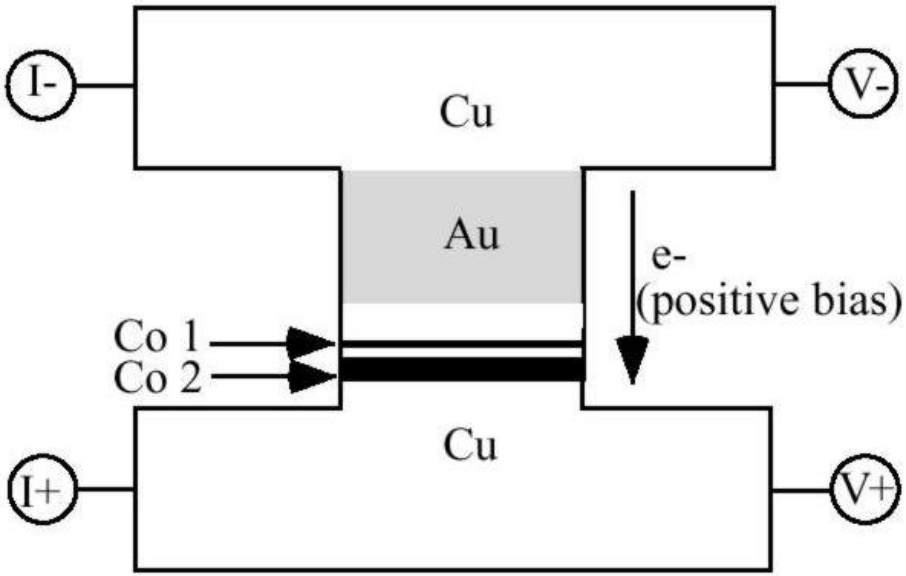
Magnetoresistance as a function of the angle between the magnetizations.

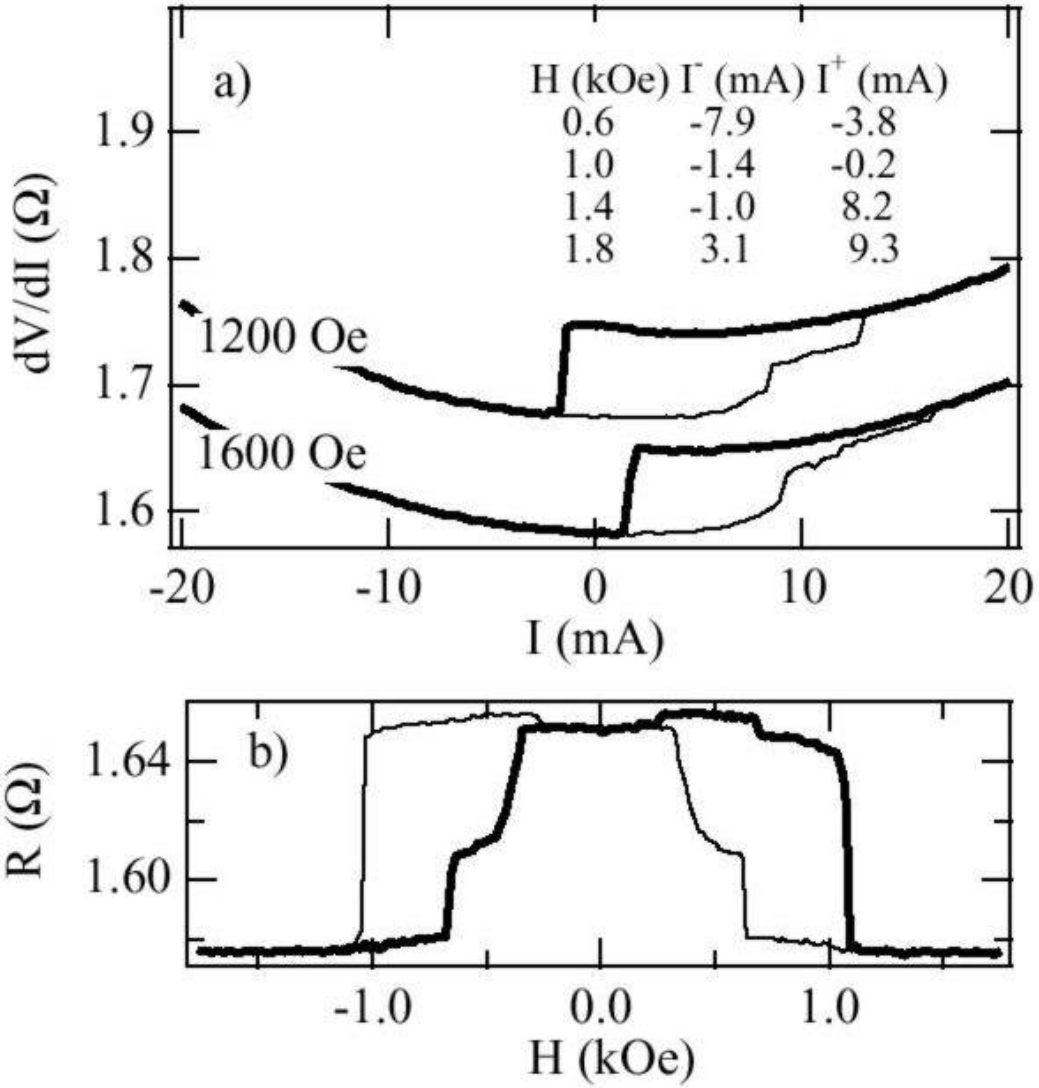
Dauguet et al. PRB **54**, 1083 (1996)



# Spin torque in a Ferro-Normal-Ferro trilayer.

Katine et al PRL 84, 3149 (2000)



Those lecture notes.

Scattering approach to spin torque