

All about electrical transport



Hall effect, especially anomalous

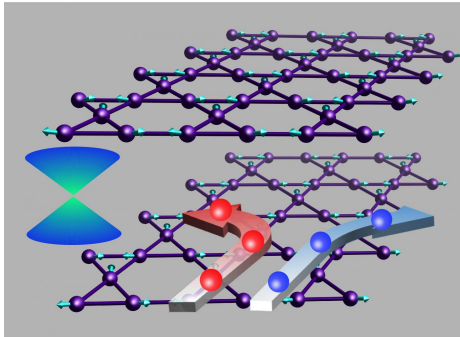
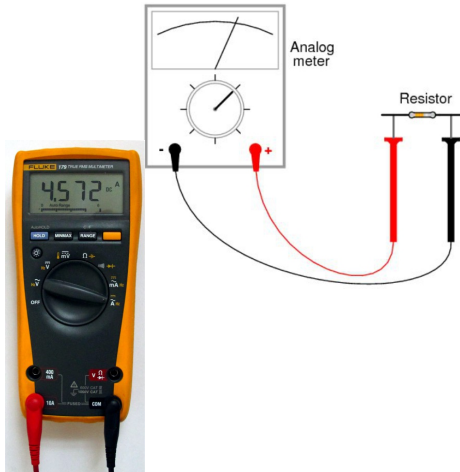


Image by MPI Microstructure Physics, Halle

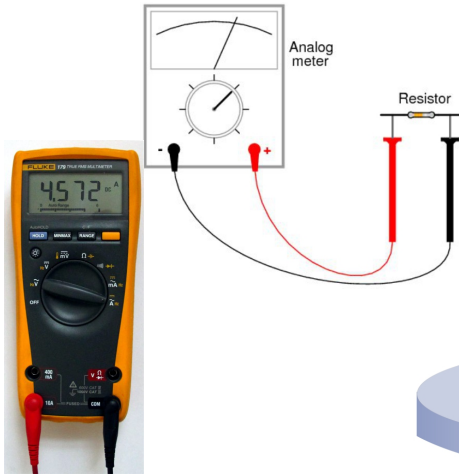


Two-probe vs. four-probe

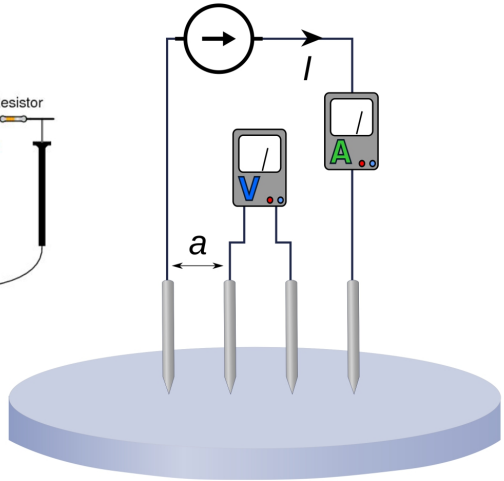


Two-probe method

Two-probe vs. four-probe



Two-probe method
contact resistance



Four-probe method

Image credits: wdwd and Libretxts, SpinningSpark (CC-BY-SA)

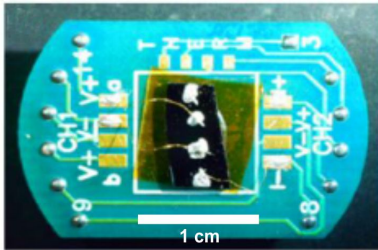
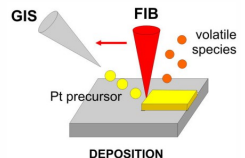
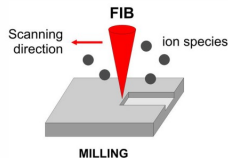
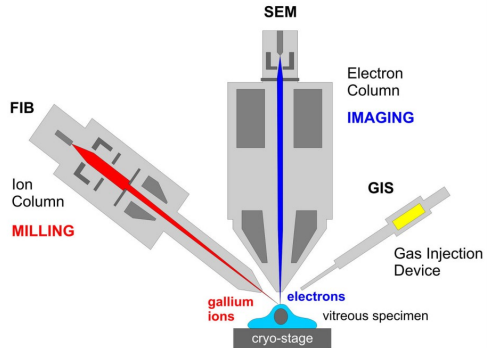
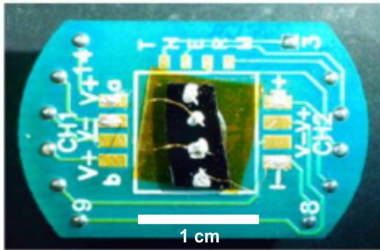


Image credits: Seyed Majid Mohseni (PhD thesis); Archives Biochem. Biophys. 581, 122 (2015); npj 2D Mater. Appl. 4, 7 (2020)



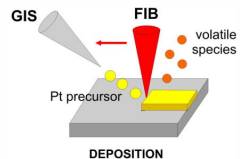
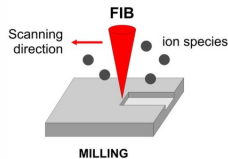
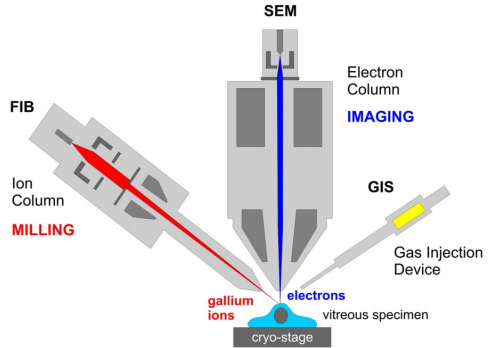
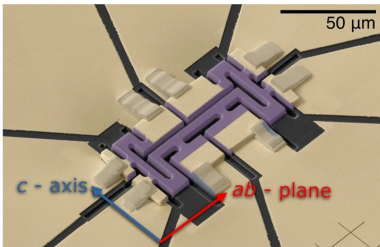
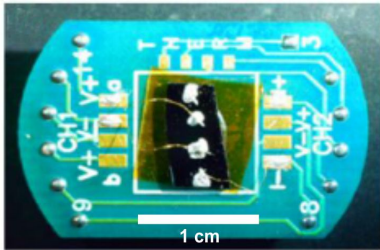


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ELEMENT	77 K ρ_{dc} in $m\Omega \cdot cm$
---------	---

Li	1.04
----	------

Na	0.8
----	-----

K	1.38
---	------

Rb	2.2
----	-----

Cs	4.5
----	-----

Cu	0.2
----	-----

Ag	0.3
----	-----

Au	0.5
----	-----

Be	
----	--

Mg	0.62
----	------

Ca	
----	--

Sr	7
----	---

Ba	17
----	----

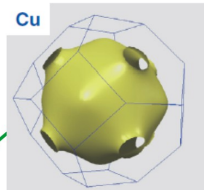
Nb	3.0
----	-----

Fe	0.66
----	------

Sn	2.1
----	-----

Pb	4.7
----	-----

Bi	35
----	----



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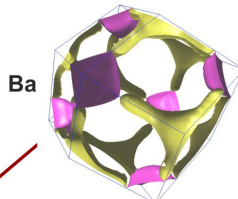
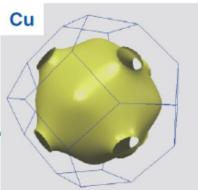
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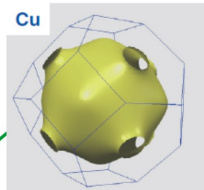
Fe 35

Sn 17

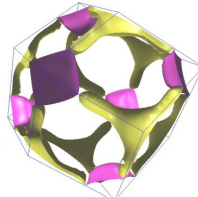
Pb 35

Bi 35

Cu



Ba



Bi

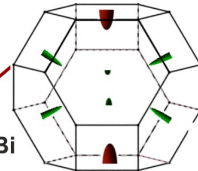




Image credit: Mitchell Instrument (fair use)

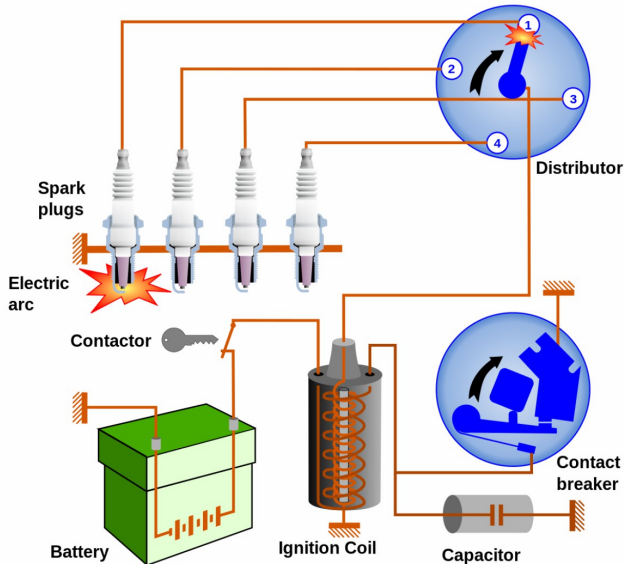


Image credit: Frédéric MICHEL and Rudolf Stricker (CC-BY-SA)

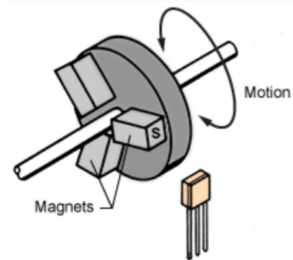
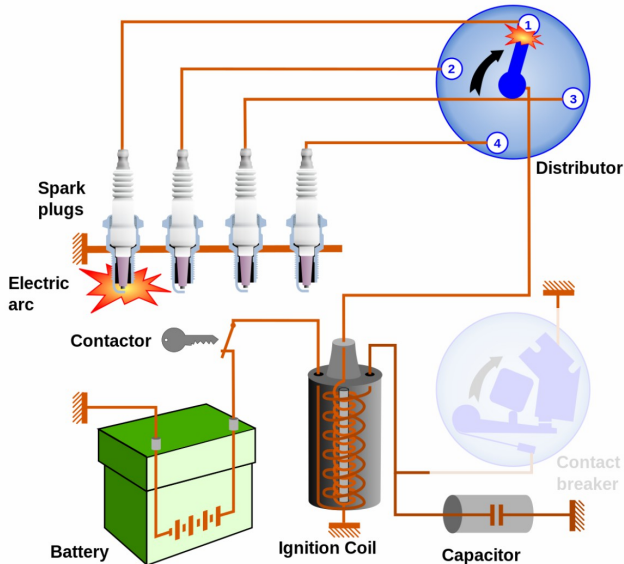
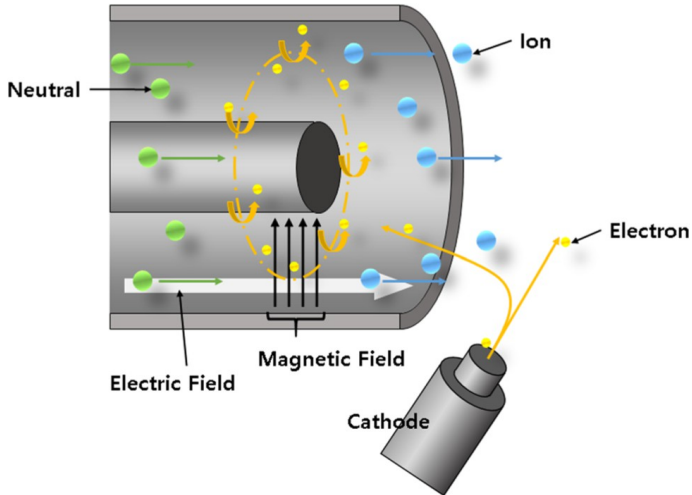
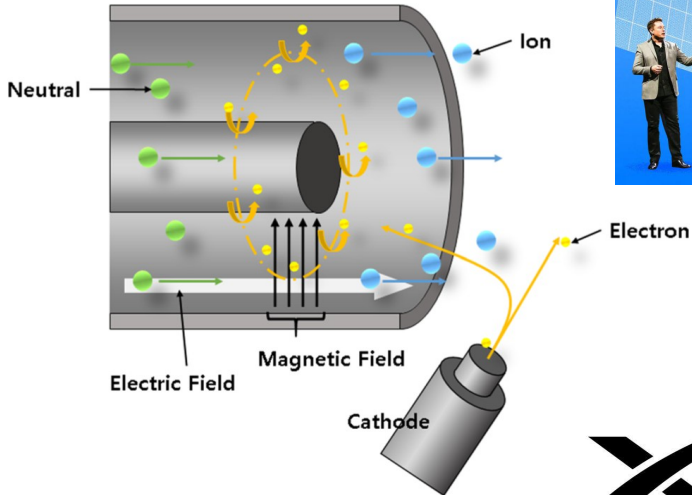
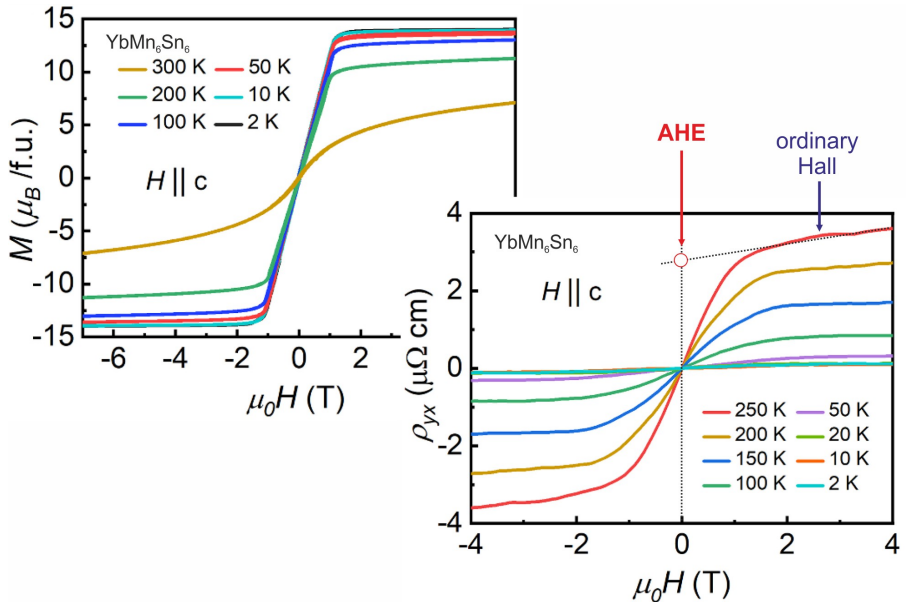
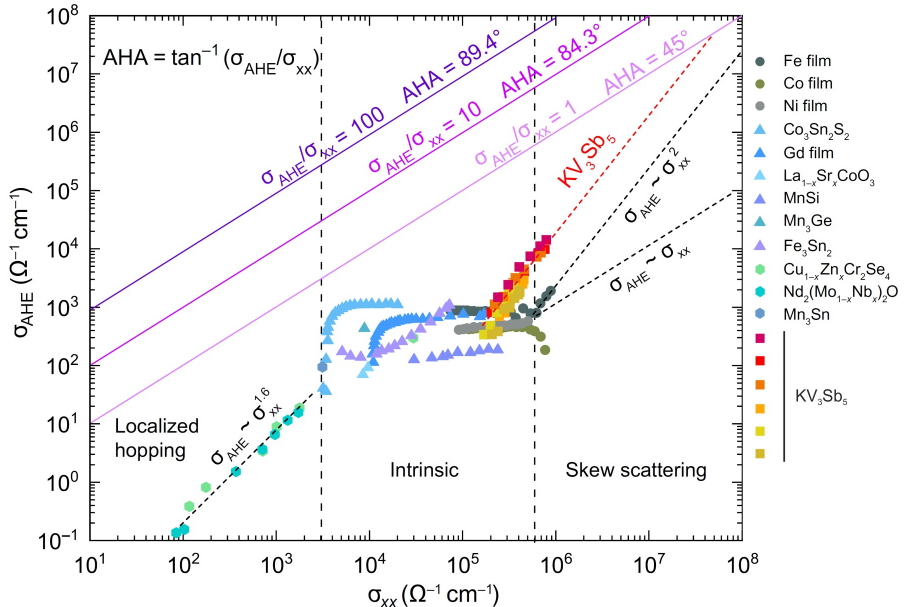


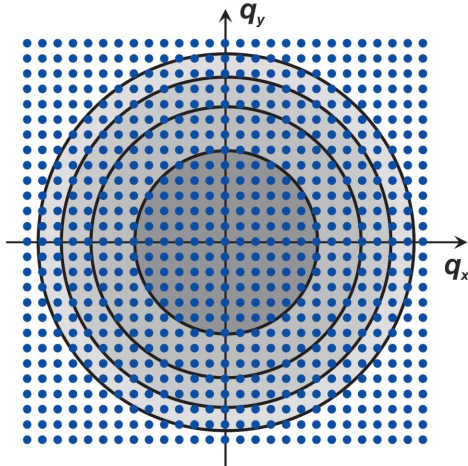
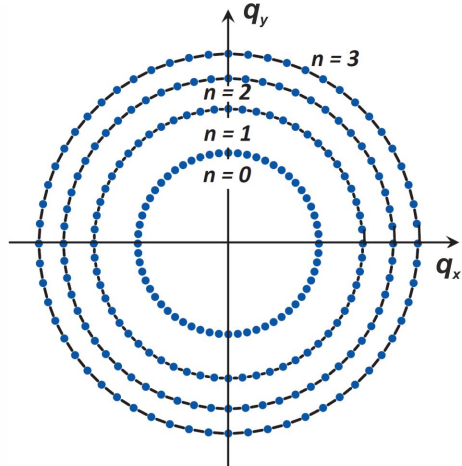
Image credit: Frédéric MICHEL and Vauxford (CC-BY-SA), Allegro Microsystems (fair use)



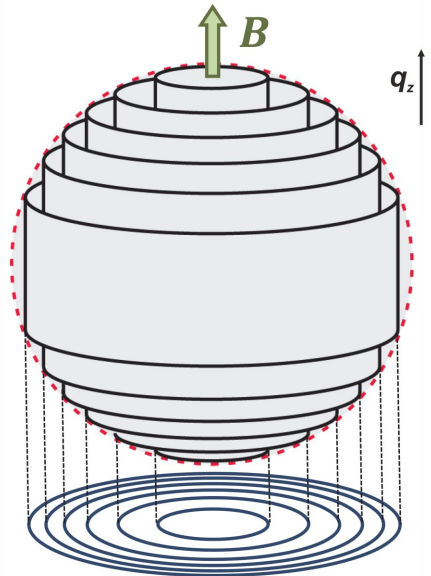
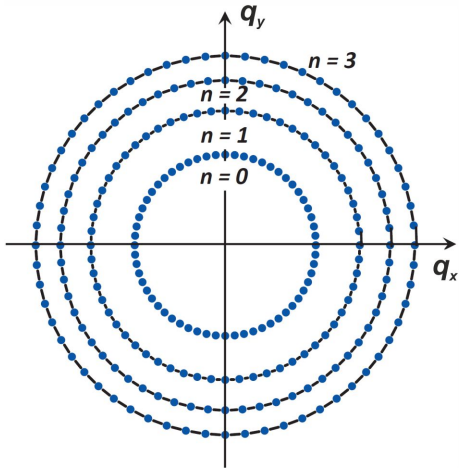


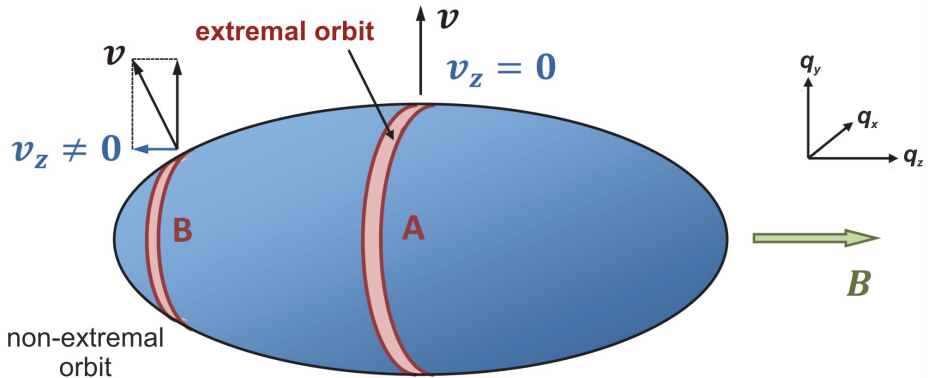




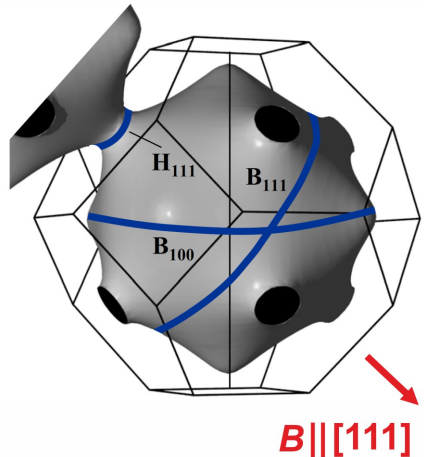
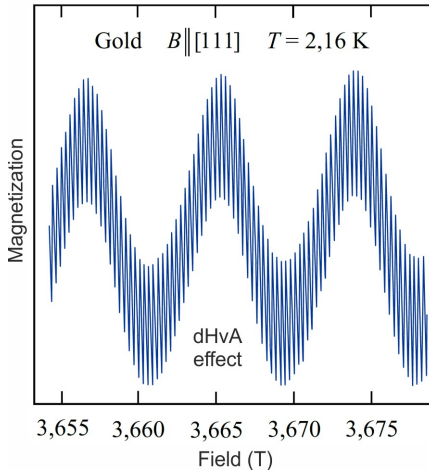
zero field ($B = 0$)magnetic field ($B \neq 0$)

Magnetic field re-distributes electronic states of a crystal





Only **extremal orbits** manifest themselves in quantum oscillations



Two frequencies from two extremal cross-sections: “belly” and “neck”

