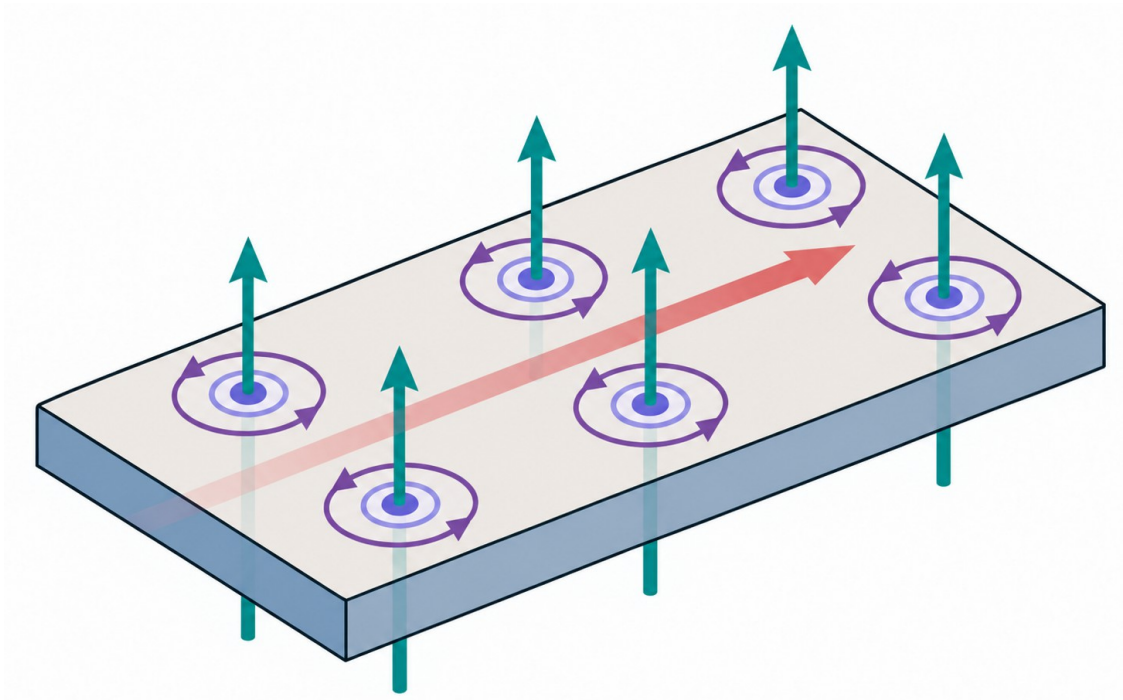
Hall effect in 2D

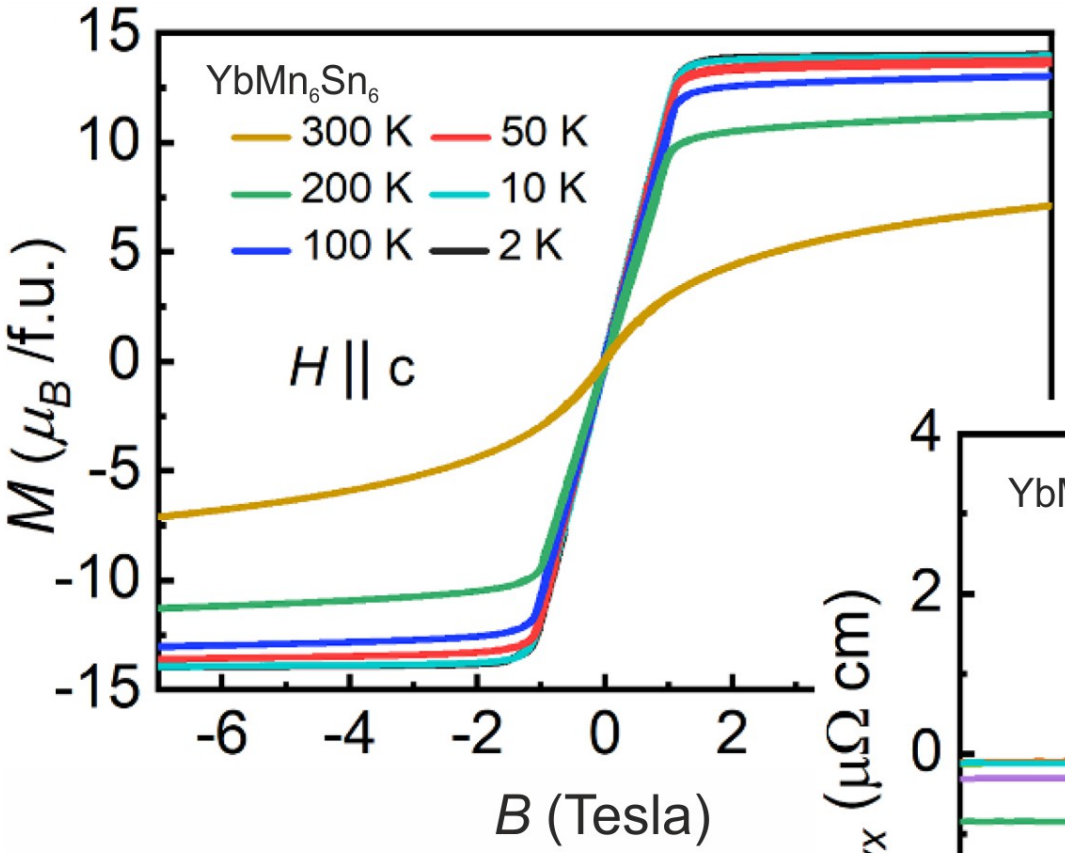
Landau levels

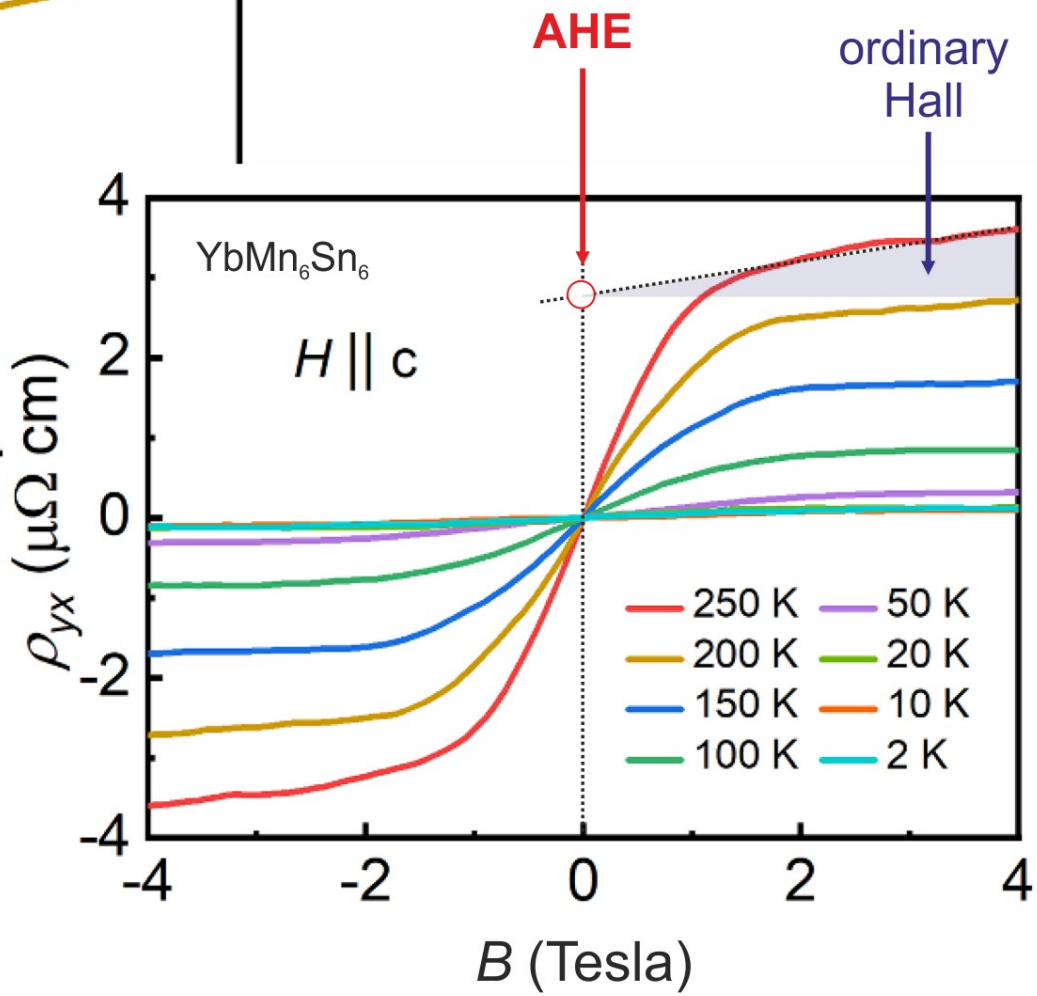


by Alexander Tsirlin, Leipzig University

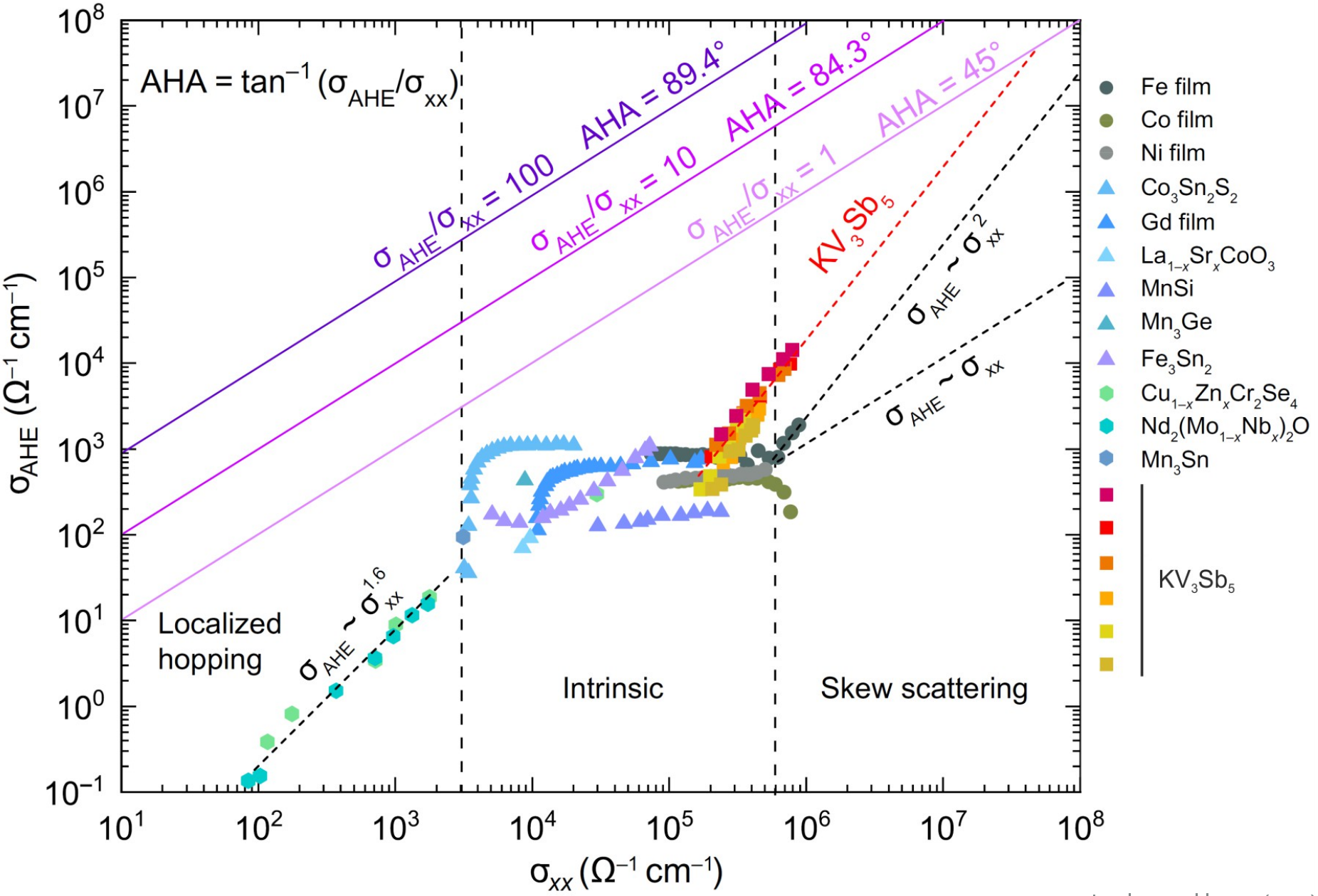
Lecture 3: October 19, 2026

Anomalous Hall effect





J. Phys.: Condens. Matter 36, 315701 (2024)



Sci. Adv. 6, eabb6003 (2020)



Klaus von Klitzing
(born 1943)

$$R_K = \frac{h}{e^2} \simeq 25812.807\,\Omega$$

von Klitzing constant

1980: discovery of QHE

1985: Nobel prize in physics

QHE work: high-field lab (LNCMI) in Grenoble, France

Later, director of the Max Planck Institute in Stuttgart (MPI FKF)

Klitzing at work

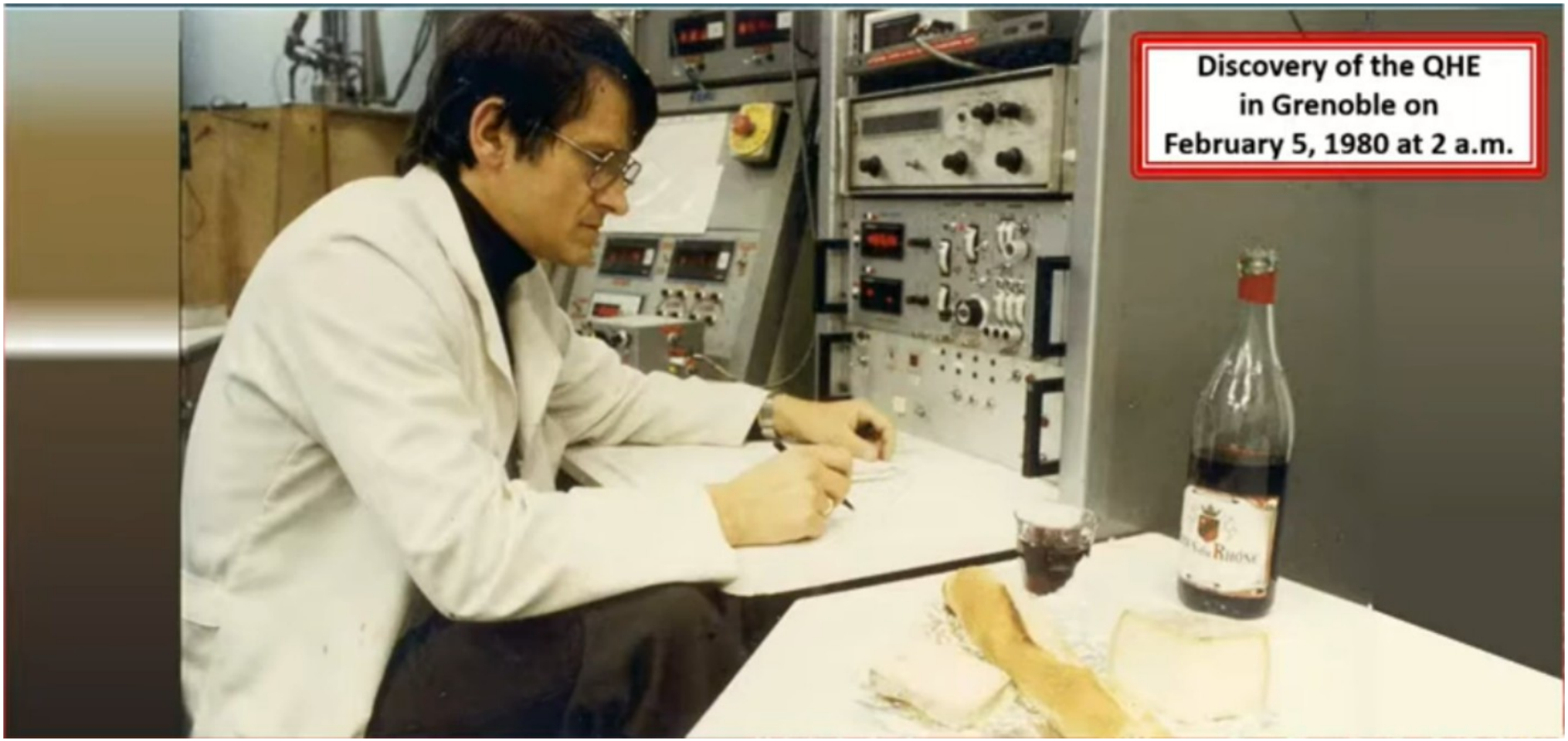
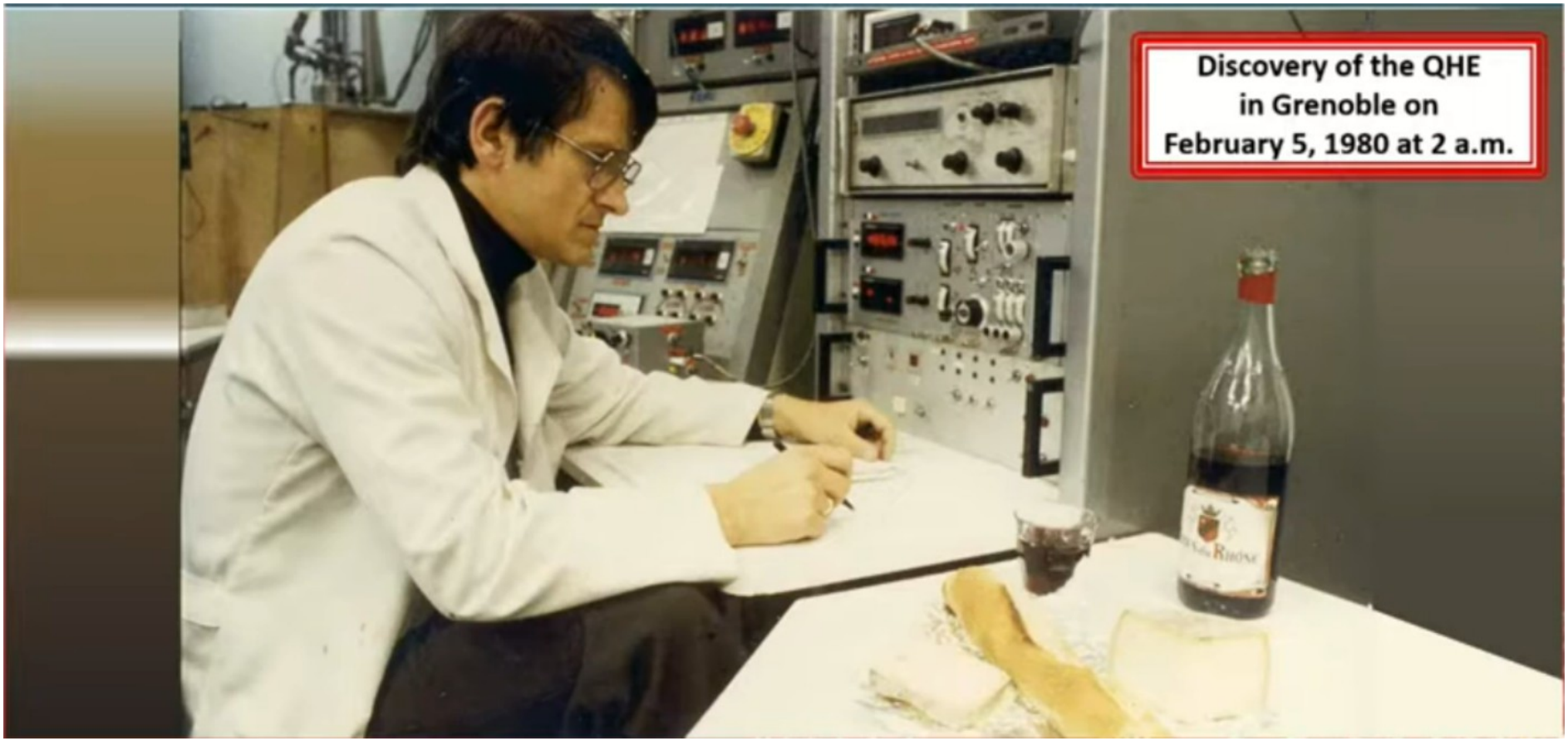


Image credit: Klaus von Klitzing

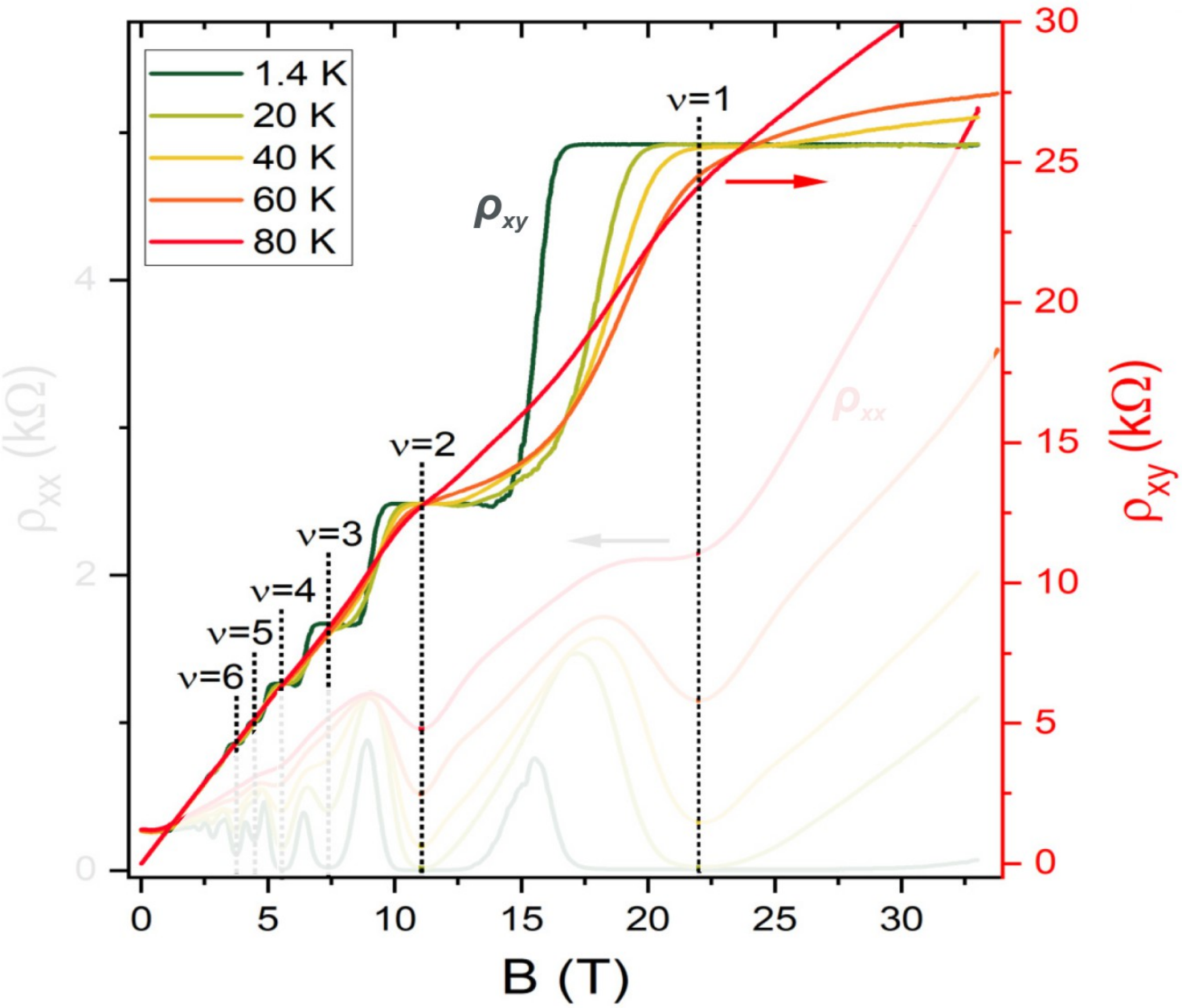
Klitzing at work



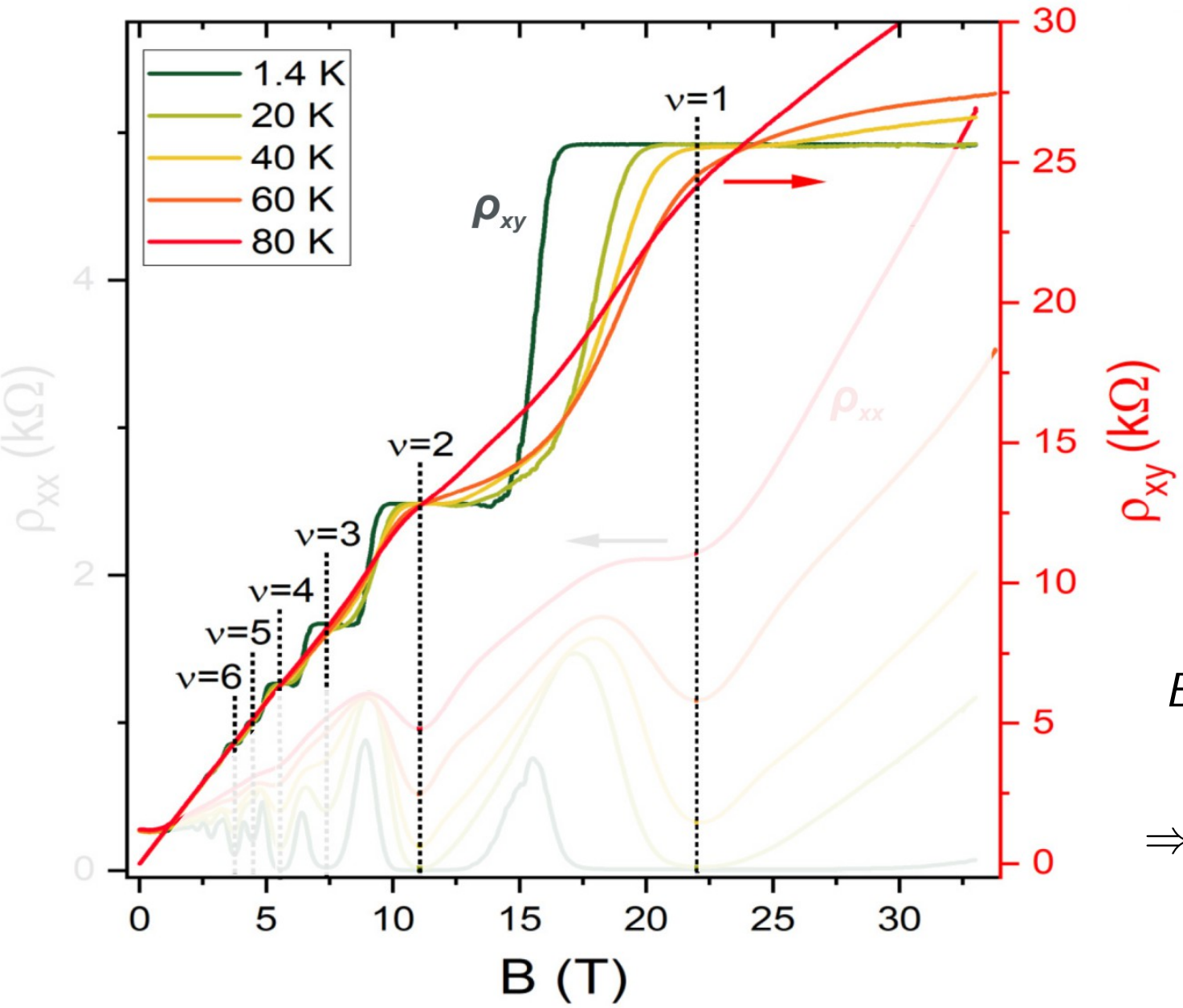
Why Grenoble? Why 2 a.m. in the morning?

Image credit: Klaus von Klitzing

Sample data



Phys. Rev. Research 6, 023259 (2024)



$B > 10 - 15\,\mathrm{T}$ required!

$\Rightarrow$ high-field lab!

Phys. Rev. Research 6, 023259 (2024)



LNCMI

24 MW power consumption!

$\Rightarrow$ night experiments only

Image credit: LNCMI

MOSFET: 2D electron gas

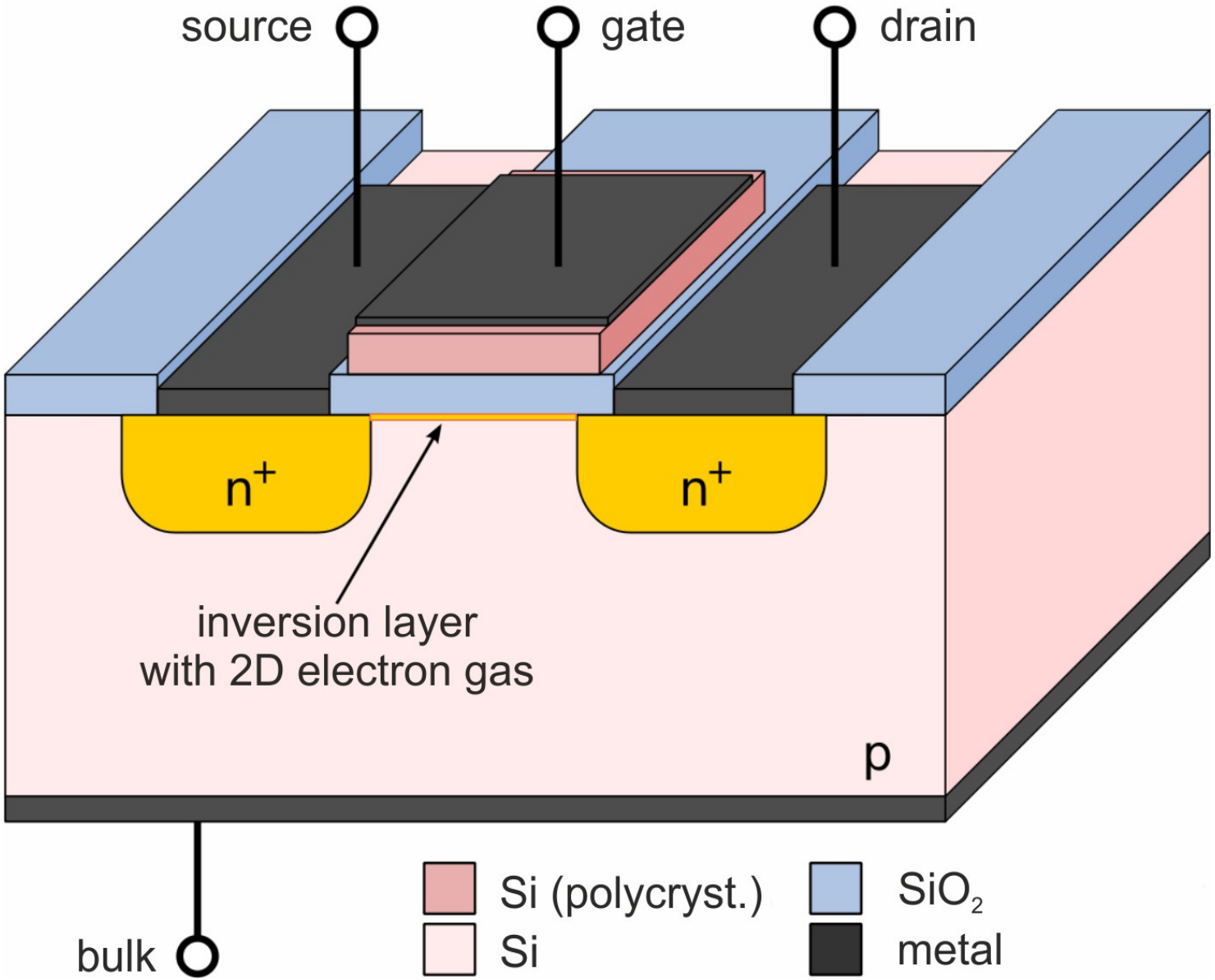
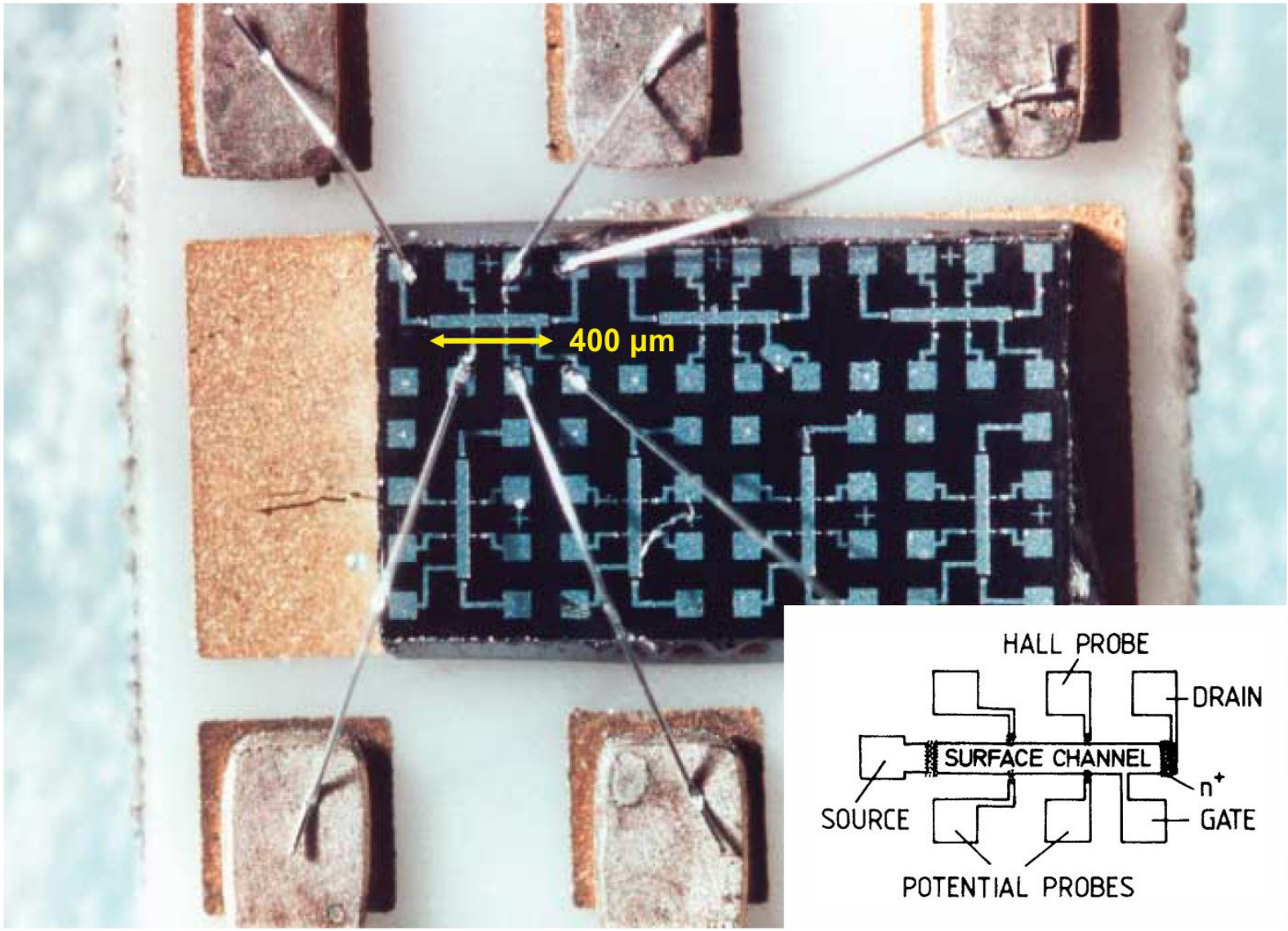


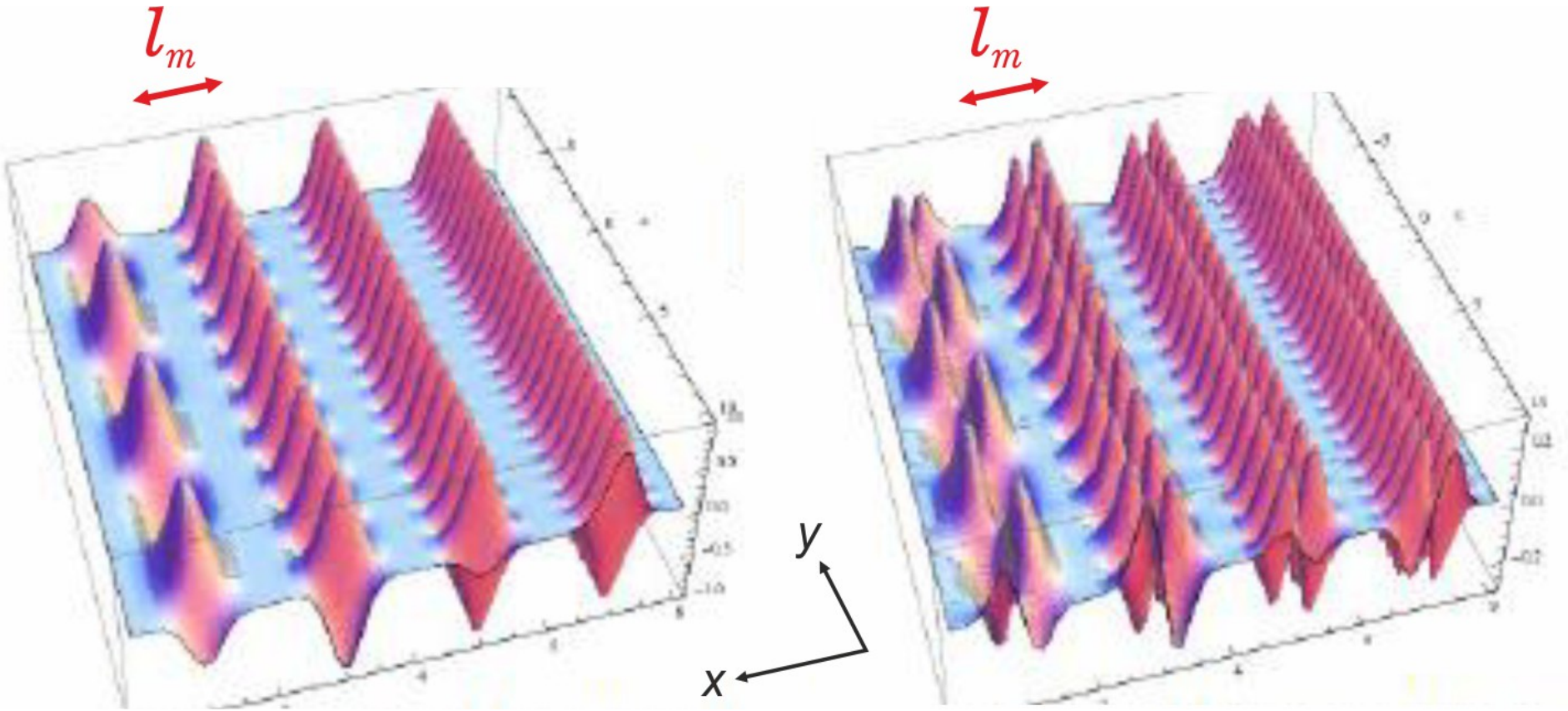
Image credit: Markus A. Hennig (CC-BY-SA)

QHE sample



Phil. Trans. Royal Soc. A 363, 2203 (2005) and Phys. Rev. Lett. (1980)

Sample wave functions



$n = 0$ Landau level

$n = 1$ Landau level

Image credit: Eva Andrei