Colloquium on Solid-State Physics

Department of Physics
WS 2022/23

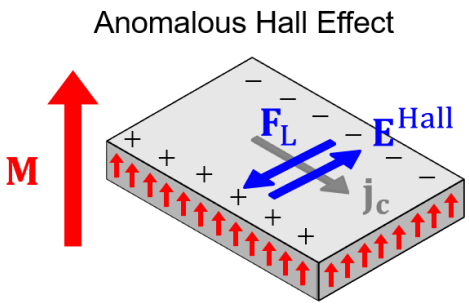
Thursday, 1st December 2022, 17.15 h
Lecture Hall III, Department of Physics, Garching

Transverse Transport Experiments

Sebastian T. B. Goennenwein

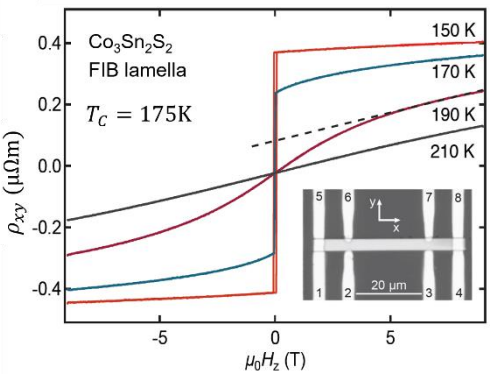
Fachbereich Physik, Universität Konstanz,
Universitätsstrasse 10, D-78464 Konstanz, Germany

Abstract:



About 140 years ago, Edwin Hall observed that a charge current flowing in a metal exposed to a magnetic field is accompanied by an electric field transverse to both current and magnetic field. This phenomenon – the Hall effect – shows that charge transport in solids should be described using a tensorial quantity, e.g., the conductivity tensor. Similar arguments also apply to heat and spin transport effects in solids, such that today a rich variety of *transverse transport phenomena* is established and also exploited in applications.

In the talk, I will first address charge-based transverse transport effects in magnetically ordered materials. More specifically, I will show that characteristic transverse 'Hall' electric fields can arise not only due to an externally applied magnetic field, but also from the internal magnetization, the spin structure or band structure of a solid. These effects are often referred to as anomalous Hall effect and topological Hall effect in the literature. The second part of the talk will then be devoted to thermally driven transverse transport experiments, i.e., the anomalous and topological Nernst effects. In particular, I will show how transverse transport experiments allow probing the spin local structure in magnetic nanostructures. Finally, I will touch upon transverse transport phenomena in antiferromagnets. While it was believed for several decades that



gez:
Alexander Holleitner (Host)

(anomalous) transverse transport phenomena in antiferromagnets must vanish owing to symmetry reasons, recent experiments and a new perspective from theory suggest that particular types of antiferromagnets indeed do show very interesting and large Hall or Nernst effects.

There will be coffee, tea, and cookies in front of the lecture hall at 17.00 h