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SONDERKOLLOQUIUM

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IM HÖRSAAL HERMANN-HERDER-STR.6

HALL PHYSICS IN NOVEL MATERIALS: GIANT COULOMB DRAG, LINEAR MAGNETO-RESISTANCE AND ANOMALOUS HALL EFFECT

Dr. Mikhail Titov
Institute of Molecules and Materials, Radbound University

New materials are quickly reshaping the field of condensed matter physics. The discovery of graphene and continuing search for topological insulators resulted in new and unexpected phenomena observed in experiment. At the same time original theoretical concepts stimulate technological progress in designing novel physical systems. In this talk I review few recent advances we have made in the field. They are based in one way or another on intriguing implications of Hall effect in 2D systems. First I will talk about the physics of giant Coulomb magnetodrag, which was observed in graphene, and explain how it can help us to understand seemingly unrelated phenomena such as non-local transport and linear magneto-resistance in different materials. I will then switch to our recent breakthrough in the theory of anomalous Hall effect that strongly affects the entire field of spintronics and has serious implications to the characterization of Weyl semimetals and chiral superconductors. At the end of my talk I will present my view on perspective research directions in the field.

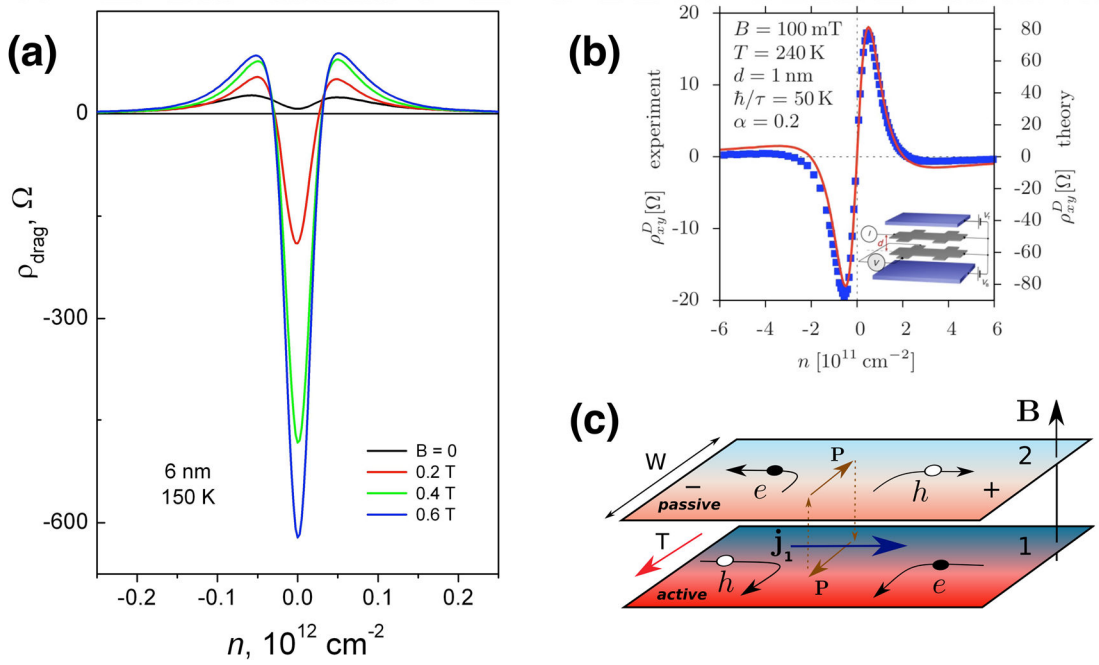

FIG. Coulomb-drag in graphene: (a) experimental data on giant-magneto drag; (b) comparison of Hall drag with theory; (c) illustration of the mechanism.