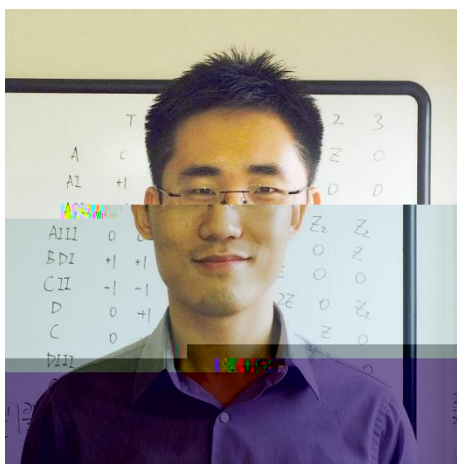




Spinning electrons at a crossroads

Hua Chen

University of Texas at Austin



Time: 4:00pm, July 6th, 2016 (Wednesday)

2016 7 6

4:00

Venue: Room W563, Physics building, Peking University

563

Shortly after Edwin Hall discovered the Hall effect, voltage perpendicular to current direction when conductors are exposed to a magnetic field, he discovered that a similar effect, now known as the anomalous Hall effect, occurs in ferromagnetic conductors that does not require a magnetic field and is often larger. Although the origin of the Hall effect, Lorentz forces on moving charges, was understood soon after the effect's discovery, our understanding of the anomalous Hall effect in terms of magnetic ordering and spin-orbit coupling started to take shape only after a half-century of progress in quantum physics and is still evolving. In this talk I will discuss the key role of the anomalous Hall effect and related phenomena in modern spintronics. It is now understood that the anomalous Hall effect, which was conventionally assumed to exist only in ferromagnets such as Fe, Co, and Ni, can exist in certain antiferromagnets with noncollinear magnetic order, e.g. Mn₃Ir. This prediction has recently been verified experimentally with promising technological implications. I will then discuss the possibility of manipulating the magnetization of noncollinear antiferromagnets using current-induced spin-orbit torques even in systems with global inversion symmetry. Finally I will show that the microscopic processes responsible for the anomalous Hall effect can also influence longitudinal currents and are related to the frequently observed and always controversial linear magnetoresistance.

Dr. Hua Chen is a Postdoctoral Fellow in theoretical condensed matter physics working with Dr. Allan MacDonald at the Physics Department of The University of Texas at Austin. His primary interest is electronic structures and properties, especially those related to magnetism and spin-orbit coupling, of low-dimensional systems. He got his PhD in 2012 under the guidance of Dr. Zhenyu Zhang (now at USTC) and Dr. Hanno Weitering from the University of Tennessee at Knoxville, where he won the UTK-ORNL Joint Institute of Advanced Materials fellowship, Chancellor's Citation Award for Extraordinary Professional Promise, and Paul H. Stelson Fellowship for Beginning Research. He is also a recipient of Chinese Government Award for Outstanding Self-Financed Students Abroad in 2012.