IEEE Distinguished Lecture

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The Hall Effects Edwin Hall Never Imagined

ABSTRACT: The anomalous Hall effect (AHE) is one of the oldest and most prominent transport phenomena in magnetic materials. Yet, AHE has remained unresolved for more than a century because its rich phenomenology defies standard classification, prompting conflicting claims of the dominant mechanisms. On the other hand, the more recently discoverded spin Hall effect (SHE) has expeditiouly attracted a great deal of attention because of its potential applications in spin current devices. Various methods have been developed to generate and detect the SHE, and search for materials with larges spin Hall angles. These efforts notwithstanding, reliable and accurate determination of spin Hall angle remains challenging. In this lecture, I will first give a comprehensive discussion on the basic concepts on AHE and SHE. Expoliting the attributes of epitaxial magnetic thin films, I will then explain how to control independenly the different scattering processes through temperature and layer thickness and to identifiy unambiguously the intrinsic mechanism as well as the extrinsic mechanisms of the AHE. Finally, based on the understanding of the microscopic mechanisms of the AHE, I will describe how we develop a new method using the H-patterns to measure quantities inherent to the SHE.

BIO: Xiaofeng Jin received the B.S. and Ph.D degrees in physics from Fudan University in 1983 and 1989, respectively. Concurrently he spent a year at LURE in Orsay, France from June 1987 to May 1988. He has joined the faculty at the Department of Physics, Fudan University since 1989, and became full professor since 1995. He has been a visiting scholar at many research institutes including University of California at Berkeley, Chalmers University of Technology at Goteborg, Max-Planck Institue for Microstructure in Halle, University of Utah, IMR of Tohoko University in Sendai, Hong Kong Univesity of Science and Technology. He has published over 100 technical articles in peer-reviewed journals, including book chapters and review articles, and has given more than 50 invited presentations at international conferences. He served as the chair of the 21st International Colloquium on Magnetic Films and Surfaces (ICMFS) in 2012, and on the advisary committes and program committees of various international conferences on magnetism and spintronics. He is currently the Chair of IUPAP Magnetism commission (C9), member of the IEEE Magnetics Society.

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