Pengcheng Dai – Colloquium – October 1, 2026
Rice University

Title:
Anomalous and Topological Hall Effect in quantum materials

Abstract:
The Hall effect, discovered by Edwin Hall, is the potential difference across an electric conductor transverse to the current and to an externally applied magnetic field perpendicular to the current. For conventional metals or semiconductors, the ordinary Hall effect (voltage) is linearly proportional to the applied magnetic field. The anomalous Hall effect (AHE), one of the most prominent phenomena of quantum transport in correlated electron materials, describes unconventional electron deflection other than the effect of external magnetic fields. In this talk, I will summarize our recent work in understanding AHE in several quantum materials, including altermagnets candidate MnTe [1] and FeS [2], and strictly collinear antiferromagnet YbMnBi2 [3]. We show uniaxial strain can affect AHE [1,2], and AHE can also arise from a spin nematic liquid crystal phase in the paramagnetic state of a collinear antiferromagnet [3]. Our results thus expand how AHE can be modified and induced in novel quantum materials.

1. Zhaoyu Liu et al, PRX 16, 0310033 (2026). https://doi.org/10.1103/589s-s1yy
2. Weiliang Yao et al., Advanced Materials, e74398 (2026). https://doi.org/10.1002/adma.74398
3. Yaofeng Xie et al,, PRX https://doi.org/10.1103/w1nt-6s12 (2026).