Observation of the Layer Hall Effect in Topological Axion Antiferromagnet $MnBi_2Te_4$

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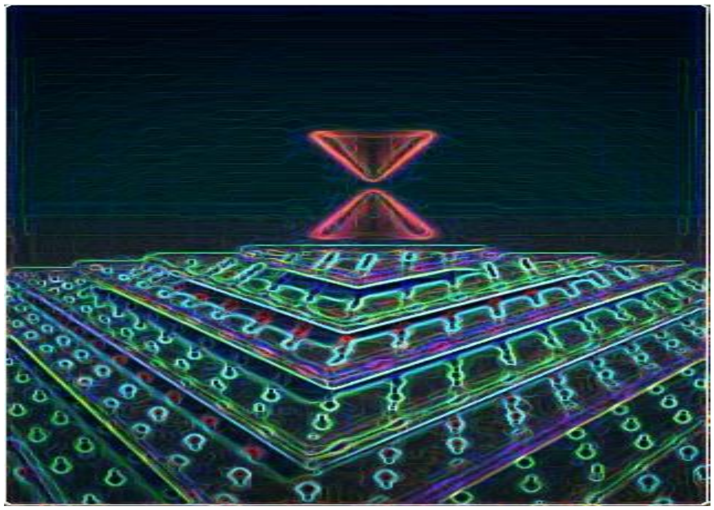

While ferromagnets have been known and exploited for millennia, antiferromagnets were only discovered in the 1930s. The elusive nature indicates antiferromagnets' unique properties: At large scale, due to the absence of global magnetization, antiferromagnets may appear to behave like any non-magnetic material; At the microscopic level, however, the opposite alignment of spins forms a rich internal structure. In topological antiferromagnets, such an internal structure leads to a new possibility, where topology and Berry phase can acquire distinct spatial textures. We study this exciting possibility in an antiferromagnetic Axion insulator, even-layered $MnBi_2Te_4$ flakes. We report the observation of a new type of Hall effect, the layer Hall effect, where electrons from the top and bottom layers spontaneously deflect in opposite directions.

Reference:

A. Gao, et al. "Layer Hall effect in a 2D topological axion antiferromagnet." *Nature* 595, 521 (2021).

Bio: Suyang Xu received PhD in the Physics Department of Princeton University under the supervision of Prof. M. Zahid Hasan. During his phd, Xu experimentally realized a wide range of new topological phases of matter, including the discovery of the Weyl semimetal in the TaAs class of material, which was selected as a top10 breakthrough in physics in 2015. In 2016, Xu moved to MIT Physics for postdoc under the supervision of Prof. Nuh Gedik. There, Xu pioneered in nonlinear optical studies of topological materials including photocurrents, nonlinear Hall and second-harmonic generation. In 2020, Xu started his independent career in the department of Chemistry and Chemical Biology at Harvard as an assistant professor.