Condensed Matter Physics Seminar Series

Magnetic and electronic topological states in the kagome-net magnet YMn_6Sn_6

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Identification, understanding, and manipulation of novel electronic and magnetic states is essential for the discovery of new quantum materials for future spin-based electronic devices. In particular, materials that manifest an interplay of magnetism and electronic topology are subject to intense investigation; kagome net magnets are prime candidates[1]. In this talk I will present the magnetotransport signatures of the magnetic and electronic topological states in the kagome-net magnet YMn_6Sn_6.

YMn_6Sn_6 crystallizes in the hexagonal space group P6/mmm with Mn atoms forming a kagome net in the basal plane. The material orders antiferromagnetically at 345 K and quickly transitions into an incommensurate spiral below 333 K. For a magnetic field applied in the *ab*-plane, a series of competing phases are stabilized [2,3]. In one of these phases, an enigmatic topological Hall effect (THE) near room temperature is observed, which we attribute to a new fluctuation-driven mechanism[2]. In addition to this THE, YMn_6Sn_6 shows two other intuging magnetotransport features at lower temperatures: an anisotropic magnetoresistance (MR) drop due to a magnetization-driven topological phase transition (Lifshitz transition), and an interlayer MR due to the charge-spin coupling, that does not require spin-orbt coupling[4]. These phenomena provide a unique view into the magnetic and electronic topological states and their interplay in YMn_6Sn_6. I will then briefly show the manipulation of these magnetic phases by partial substitution of Sn by isoelectronic Ge.

Nirmal Ghimire received his PhD from The University of Tennessee at Knoxville (UTK) in 2013 working both at UTK and Oak Ridge National Laboratory. He was a postdoctoral research associate at Los Alamos National Lab from 2013 – 2015, and a Director's Postdoctoral Fellow at Argonne National Lab from 2015-2018. He joined department of physics and astronomy in GMU in 2018, where he is currently an Assistant Professor. His research focuses on discovering and understanding emergent phenomena in quantum materials via designing and synthesizing materials and measuring their magnetic and transport properties.

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Via Zoom