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Discovery of Topological Magnets in 2D and 3D

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In this talk I present our research on 2D and 3D topological magnets in novel topological, Weyl-Dirac and kagome materials. I start with a demonstration of Chern gap in topological magnets based on intrinsic topological insulators (https://arxiv.org/pdf/0812.2078.pdf (2008) leading to S.-Y. Xu et.al., "Hedgehog spin texture and Berry's phase tuning in a magnetic topological insulator" Nature Physics 8, 616 (2012)) then describe a set of ideas and experiments that led to the discovery of Weyl magnets (Belopolski et.al., "Discovery of topological Weyl fermion lines and drumhead surface states in a room temperature magnet" SCIENCE 365, 1278 (2019)) and demonstration that certain kagome magnets can be topologically non-trivial (Yin et.al., NATURE 562, 91 (2018)) which then led to a new class of Chern magnets (Yin et.al., "Quantum-limit Chern topological magnetism in TbMn6Sn6" NATURE 583, 533 (2020)) with gap larger than 30 meV (>300K). Our unique approach regarding the magnetic bulk–boundary–Berry correspondence covering real space and momentum space demonstrates a proof-of-principle method for revealing or discovering new topological magnets.