

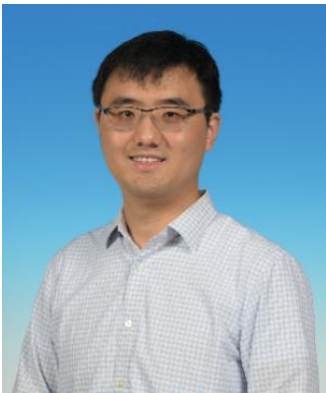


Weekly Seminar

Novel properties due to crystal symmetry in altermagnets

Junwei Liu

The Hong Kong University of Science and Technology



Time: 3:00 pm, April 22, 2026 (Wednesday)

时间: 2026年4月22日 (周三) 下午3:00

Venue: Room w563, Physics building, Peking University

地点: 北京大学物理楼, 西563会议室

Abstract

I will talk about the novel properties due to crystal symmetry spin-splitting antiferromagnets (AFMs) [[Nat. Commun. 12, 2846 \(2021\)](#)] (widely known as altermagnets now). In 2021, we propose the crystal-symmetry-paired spin-valley/momentum locking (CSVL/CSML), which is enabled by crystal symmetries intrinsically in AFMs (e.g., V_2Se_2O , V_2Te_2O , MnTe and RuO_2) [[Nat. Commun. 12, 2846 \(2021\)](#); [Phys. Rev. X 15, 021083 \(2025\)](#)]. CSML enables feasible controls of AFMs by manipulating the corresponding crystal symmetry. Typically, one can use a strain field to induce net valley polarization/magnetization and use an electric field to generate a noncollinear spin current even without spin-orbit coupling. All the predictions have been confirmed in experiments [[Nat. Phys. 21, 760 \(2025\)](#); [Nat. Phys. 21, 754 \(2025\)](#)]. These properties have helped us realize the electric readout and 180° deterministic switching of the Néel order in our experimental work [[Sci. Adv. 10, eadn0479 \(2024\)](#); [Nature 638, 645 \(2025\)](#)], which can be well understood by switching symmetry in our recent proposed unified theory of all magnetic deterministic switching [[arXiv:2603.29136](#)].

About the speaker

Professor Junwei Liu earned his Ph.D. from Tsinghua University in 2014 and conducted postdoctoral research at MIT from 2014 to 2017. He joined the Hong Kong University of Science and Technology (HKUST) as an Assistant Professor in 2017 and was promoted to Associate Professor in 2023. His current research focuses on novel quantum phenomena arising from crystal symmetry and his related contributions include (1) theoretical proposal of crystal-symmetry-paired spin-valley locking in collinear spin-splitting antiferromagnets (also named altermagnet) and its realization and experimental verification in $V_2(\text{Se, Te})_2\text{O}$ -family materials, which is also the first layered quasi-2D altermagnets; (2) the first electrical readout and 180° switching of the Néel order in a collinear spin-splitting antiferromagnet, and (3) the first demonstration of multiple Majorana zero modes in a single vortex and their hybridization.

He has published more than 80 papers, including 2 in *Science*, 3 in *Nature*, 2 in *Nature Physics*, 3 in *Nature Materials*, 7 in *Nature Communications*, 1 in *Physical Review X*, 4 in *Physical Review Letters*, and 1 in *Optica*.