



清华大学高等研究院

Institute for Advanced Study, Tsinghua University

物理学术报告

Physics Seminars (biweekly)

- Title:** Origin of Spin Stripes and Superconductivity in Bilayer Nickelates
- Speaker:** Yi-Ming Wu
Leinweber Institute for Theoretical Physics, Stanford University
- Time:** 4:00 pm, Wednesday, March 4, 2026
- Venue:** Conference Hall 322, Science Building, Tsinghua University

Abstract

We propose and study a microscopic Hamiltonian that unveils the origin of both the magnetism and superconductivity in bilayer nickelate ($\text{La}_3\text{Ni}_2\text{O}_7$). Using density matrix renormalization group calculations, we show that the experimentally reported $(\pi/2, \pi/2)$ spin stripe order emerges in our model and exhibits a hidden quasi-one dimensionality. The spin stripe order occurs over a range of electron concentrations, but requires a sizable Hund's coupling J_H . Superconductivity sets in only when the interlayer antiferromagnetic coupling J_{\perp} becomes sufficiently large, which naturally occurs under pressure. The competition among different pairing symmetries is then examined from a weak-coupling perspective, revealing that the s_{\pm} -wave symmetry is the most favored when J_H is large. Our results demonstrate that the strong- and weak-coupling frameworks lead to qualitatively consistent predictions regarding magnetism and superconductivity, and highlight the indispensable role of Hund's coupling J_H in this system.

Bio

Yi-Ming Wu is currently a Gordon and Betty Moore Fellow at Stanford University (2022-now), and a forthcoming assistant professor at Zhejiang University. Before that, he worked at the Institute for Advanced Study, Tsinghua University as a Shuimu Fellow (2021-2022). He obtained his Ph.D. from University of Minnesota (2021) and B.S. from Peking University (2015). His research interests include un-conventional superconductivity, topological order, magnetism and disorder in correlated quantum materials.