

Chez Pierre

Presents ...

Monday, April 7, 2025
12:00 pm - 1:00 pm
Duboc Room – 4-331



Chez Pierre Seminar

Qimiao Si, Rice University

“Strange metals and flat bands: From topological heavy fermions to superconducting twisted-WSe₂”.

Strong correlations and topology can mutually enrich each other. In this talk, I will illustrate both directions of this outstanding issue in two contexts. From one side, heavy fermions represent a canonical system for correlation physics. With appropriate symmetry, strong correlations lead to Weyl-Kondo semimetals [1] and, furthermore, strange metallicity gives rise to topological semimetals without quasiparticles [2,3]. From the other side, the very recent discovery that twisted-WSe₂ superconducts has generated considerable excitement. I will argue that the moiré transition metal dichalcogenides represent a particularly transparent case where band topology yields new correlation physics. In an intermediate correlation regime, the band topology generates quantum fluctuations [4] that weaken an active flat band’s natural tendency towards electronic order. The resulting competition enables a quantum critical regime from which superconductivity develops [5]. Some general implications of these exemplary cases will be discussed.

References:

- [1] H.-H. Lai, S. E. Grefe et al., [PNAS 115, 93 \(2018\)](#)
- [2] H. Hu et al., [arXiv:2110.06182](#)
- [3] D. M. Kirschbaum, L. Chen et al., [arXiv:2404.15924](#)
- [4] H. Hu, Q. Si, [Sci. Adv. 9, eadg0028 \(2023\)](#)
- [5] F. Xie, L. Chen, S. Sur, Y. Fang, J. Cano, Q. Si, [arXiv:2408.10185](#)