TECHNISCHE UNIVERSITÄT WIEN

INSTITUT FÜR FESTKÖRPERPHYSIK
Institute of Solid State Physics

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# EINLADUNG zum IFP-SEMINAR

## Gapless Topology and Electron Correlations

**Qimiao Si**

Department of Physics and Astronomy & Rice Center for Quantum Materials, Rice University

Host: Silke Bühler-Paschen

Termin: Mittwoch, 1. Februar 2023, 16:00 Uhr

Ort: TU Wien, Freihausgebäude

Wiedner Hauptstraße 8-10, 1040 Wien

Seminarraum DA grün 04 (grüner Bereich, 4. OG)

Oder via ZOOM
https://tuwien.zoom.us/j/94747112837?pwd=QVNxRnFVSW0wV2QzZ0JBb2lyMkJPdz09
Meeting ID: 947 4711 2837
Password: 1e972d15

Abstract:

Electrons in a crystal behave as waves that interfere with one another. Accordingly, an electronic system can have non-trivial properties when viewed through the lens of topology. At the same time, the electrons also exist as charged particles that repel one another, which raises the question of whether strong electrostatic interactions can cooperate with the wave nature of the electrons to produce correlated topological matter. For insulators, the answer is long known in affirmative as exemplified by the fractional quantum Hall effect. In the case of metallic systems, however, the question is open and pressing.

In this talk, I will outline the route we have taken from certain canonical correlation physics to metallic topology. I'll show how correlation effects in the form of Kondo interactions produce emergent excitations that are subjected to the constraints of crystalline symmetry, leading to Weyl-Kondo semimetals [1,2]. I will describe a design principle for new materials that realize a variety of Weyl-Kondo semimetals, both for heavy fermion materials [3] and flat-band-hosting transition metal systems [4]. Finally, I will discuss a class of correlation-driven topological states that lose quasiparticles through fractionalization [5]. Some implications about topology and correlation physics in general will be discussed.

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References:

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[2] S. Dzsaber et al, PNAS 118, e2013386118 (2021). https://doi.org/10.1073/pnas.2013386118
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[3] L. Chen et al, Nature Physics 18, 1341 (2022). https://doi.org/10.1038/s41567-022-01743-4
[4] L. Chen et al., arXiv:2212.08017. https://doi.org/10.48550/arXiv.2212.08017
H. Hu et al., arXiv:2209.10396. https://doi.org/10.48550/arXiv.2209.10396
[5] H. Hu et al., arXiv:2110.06182. https://doi.org/10.48550/arXiv.2110.06182

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Q-M&S. Correlated Quantum Materials & Solid State Quantum Systems