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INVITATION to IFP-SEMINAR

When Crystal Symmetry Protects Non-Fermi-Liquid Quantum Impurity States

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Host: Karsten Held
Date: 22.04.2026, 16:00
Place: TU Wien, Freihaus Building
Wiedner Hauptstraße 8-10, 1040 Wien
Seminar Room DC red 07 (red section, 7. OG)

Zoom: https://tuwien.zoom.us/j/65583073066?pwd=gtRK6YsrRnzUvNjDrAcLGCF4X6WvH7.1

Abstract:

Non-Fermi-liquid (NFL) metallic behaviors found in three- and low-dimensional materials are abundant and diverse, yet only a handful of solvable microscopic models exist to describe them. One class of such models consists of the frustrated quantum impurity models. I will present the different ways to achieve symmetry-protected NFL behavior arising from quantum impurities in cubic metals, and show that only cubic systems offer symmetry protection. For impurities with a doublet ground state, there are three types of symmetry-protected NFL behavior: two-channel Kondo (2CK) behavior—originally derived by Cox—, topological Kondo physics, and spin-half impurity–spin-3/2 conduction electron Kondo behavior. The first two critical behaviors are difficult to achieve, while the spin-half impurity–spin-3/2 conduction-electron Kondo behavior has the greatest chance of existing in diluted, cubic compounds. I will discuss the thermodynamic signatures of all three NFL states, as well as the time-reversal properties of the underlying microscopic models. I will also consider impurities with a triplet ground state, which can exhibit three possible NFL behaviors, among which the fixed point of quadrupolar–quadrupolar exchange dominates. Our work implies looking at different materials from those previously considered to find NFL quantum impurity states, and provides a clear, theoretical framework for deriving exchange interactions with arbitrary crystal symmetries.

References:
A. I. Tóth, A. D. Huxley, Phys. Rev. B 112, 205120 (2025)
A. I. Tóth, APL Quantum, accepted/in press (2026)
D. L. Cox, Phys. Rev. Lett. 59, 1240 (1987)

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