School of Physics and Astronomy

QUANTUM GASES SEMINAR

Exploring Kondo and polaron physics with multiorbital quantum gases

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Multiorbital electron systems, e.g. in transition metal oxides, show intriguing many-body phenomena, such as colossal magnetoresistance, high-temperature superconductivity, or orbital ordering. Many of these problems have not yet been completely understood and numerical calculations are often extremely challenging. Conversely, quantum simulations with ultracold atoms can shed light onto the underlying physics since electrons in the periodic structure of a crystal can be simulated by neutral atoms moving and interacting in optical lattices.

Ytterbium atoms features a long-lived metastable excited state, which is also know as "clock state" due to its application in today's most accurate and precise atomic clocks. We utilize this state together with the ground state to realize quantum gases analogous to electrons with an orbital degree of freedom.

First, I report on our recent efforts to implement Kondo physics in a monochromatic optical lattice. We demonstrate orbital dependent mobility in this lattice and show that interorbital spin exchange, comparable to the coupling in the Kondo model, is present in this system.

Second, I discuss the observation of multiorbital polarons in a two-dimensional Fermi gas. These long-lived quasiparticles are formed by mobile impurities interacting with a Fermi sea, and we precisely characterize their properties across all regimes of interaction strength.

Date:	Monday 15 July
Time:	11am
Venue:	L1, Large Seminar Room, 10 College Walk, Clayton

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