

# Quantum Simulation of Fermionic Matter at the Single-Atom Level

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The last decades have seen the emergence of ultracold atom experiments as powerful platforms for quantum simulation of complex many-body systems, owing to their ability to probe large ensembles of particles in a well-characterized, tunable, and isolated environment.

Among the various quantum many-body problems within reach of atom-based quantum simulators, interacting fermionic systems play a special role. While they constitute a cornerstone of quantum matter covering a broad fundamental and technological scope, their understanding however still represents a major challenge for existing theoretical approaches, which are widely plagued by the infamous sign-problem.

In this talk, I will present our recent work on quantum gas microscopy of fermionic many-body systems in continuous space, and how we can characterize them at previously inaccessible levels of resolution and control. Our approach offers radically new possibilities for the exploration of strongly interacting Fermi gases at the single-atom level.