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## Equilibrium and out of equilibrium physics with ultracold fermions in optical lattices

Strong interactions between electrons in a solid material lead to surprising effects. A prime example is the Mott insulator, where the strong repulsive interaction make it energetically very unfavorable to place two fermions of opposite spin on the same lattice site. Hence, a Mott insulator is characterized by insulating behavior, incompressibility and a strong reduction of double occupancy. The physics of this paradigm of strong correlations is well captured by the Fermi-Hubbard model.
In my talk I will present experiments in which we have realized this model with ultra-cold atoms and investigated both its equilibrium and non-equilibrium properties. Due to the intrinsic purity of the experimental system we can directly compare the experimental results with theory. I will focus on precision measurements of the double occupancy, which - when compared with DMFT simulations or high-temperature series expansions - can serve as a thermometer. The far-from equilibrium dynamics of such strongly correlated systems is mostly unchartered territory and I will present experimental and theoretical results revealing the importance of higher order processes for thermalization.

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