Emergence of coherence at a Quantum Phase Transition

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The out-of-equilibrium dynamics of interacting many-body systems presents one of the most challenging problems in modern many-body physics with implications ranging from thermalization dynamics over transport properties to novel transient effects and the formation of order. During the last years, ultracold atoms in optical lattices have emerged as a very versatile platform to study quantum many-body physics in a clean and well-controlled environment. Compared to electrons in a solid, the much longer timescales of atoms in optical lattices render them especially well suited to study out-of-equilibrium dynamics

In this talk, I will show how the unique control possibilities available for ultracold atoms have allowed us to experimentally observe the real-time dynamics of a Quantum Phase Transition. In particular, we have measuring the emergence of coherence during continuous quenches from Mott insulators to the superfluid regime of the Bose Hubbard model in different dimensions.