

SEMINAR: Quantum Matter Out of Equilibrium, from Supersolids to Spin-Liquids

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March 27, 2026

10:00 to 11:00

Seminar Room

Systems far from equilibrium are of fundamental scientific interest, as they can exhibit properties that differ dramatically from those of the same system at equilibrium. Certain classes of out-of-equilibrium systems can even sustain long-lived states with emergent material properties. This talk presents the realization of quantum states out of equilibrium in two different settings. First, we discuss the emergence of self-stabilized square lattice patterns in a superfluid with periodically modulated interactions. We show that these patterned states share key physical properties to a seemingly different equilibrium system, namely supersolids. To demonstrate this correspondence, we probe the excitation spectrum of such a patterned state, identifying two distinct sound modes associated with spontaneously broken $U(1)$ and translational symmetries. Second, we present the non-equilibrium preparation of a $U(1)$ quantum-spin-liquid state in a cesium quantum gas microscope. We implement a two-dimensional monomer-dimer model governed by a $U(1)$ gauge theory. Starting from an initial product state of monomers, we dynamically generate lakes of Rokhsar-Kivelson type $U(1)$ dimer spin-liquids, and study the state's coherence using interferometric round-trip protocols.

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Hosted by: Prof. Dr. Leticia Tarruell