

# 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

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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.

\*\* If you require an accommodation to participate in this event due to a disability, please contact the Events Team at [events@icfo.eu](mailto:events@icfo.eu) as soon as possible.

**Hosted by:** Prof. Dr. Leticia Tarruell