LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

ARNOLD SOMMERFELD CENTER FOR THEORETICAL PHYSICS

# Sommerfeld Theory Colloquium

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## Activating quantum matter

In driven open quantum matter, coherent many-body quantum dynamics, drive, and dissipation play equally significant roles. These systems span a wide range of examples, including cold atomic gases, exciton-polaritons in solid state, and quantum devices designed for quantum information applications. These setups break the conditions of thermodynamic equilibrium on the microscopic scale, prompting questions about how this impacts macroscopic behavior, such as phases and phase transitions. We examine two key points: First, we showcase that a minor out-of-equilibrium perturbation on the microscopic level can lead to substantial macroscopic effects, including the emergence of novel non-equilibrium universality classes. This paves the way to active quantum matter scenarios in solid state physics. Second, we argue that drive and dissipation can be used constructively to maintain or even create fragile quantum mechanical correlations such as phase coherence, entanglement or topological order by carefully engineering the system. A topological quantum phase transition far from equilibrium can be induced in this way, exhibiting intriguing analogies to the problem of directed percolation.

Wednesday, 30 April 2025, 16:15h, Room A348, Theresienstr. 37/III

Prof. Erwin Frey