Abstract template for talk: Resetting quantum systems

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In the first part of the talk, we consider closed quantum many-body systems subject to stochastic resetting. This means that their unitary time evolution is interrupted by resets at randomly selected times. The study of the non-equilibrium stationary state that emerges from the combination of stochastic resetting and coherent quantum dynamics has recently raised significant interest. The connection between this non-equilibrium stationary state, an effective open dynamics and non-equilibrium signatures of quantum phase transitions is, however, not fully understood. We provide a unified understanding of these phenomena by combining techniques from quantum quenches in closed systems and semi-Markov processes. We discuss as an application the paradigmatic transverse-field quantum Ising chain. We show that signatures of its ground-state quantum phase transition are visible in the steady state of the reset dynamics as a sharp crossover.

In the second part of the talk, we consider the case where stochastic resetting is superimposed to a Markovian open quantum dynamics. We show that the ensuing dynamics is non-Markovian and has the form of a generalized Lindblad equation. Interestingly, the large-deviation statistics of quantum-jumps can be exactly derived. This is achieved by combining techniques from the thermodynamics of quantum-jump trajectories with the renewal structure of the resetting dynamics. Our findings show that stochastic resetting may be exploited as a tool to tailor the statistics of the quantum-jump trajectories and the dynamical phases of open quantum systems.

[1] G. Perfetto, F. Carollo, M. Magoni, I. Lesanovsky, Phys. Rev. B **104**, L180303 (2021).
[2] G. Perfetto, F. Carollo, I. Lesanovsky, Arxiv:2112.05078 (2021).