

Nonequilibrium dynamics and thermodynamics in Ising and Potts models

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Ising and Potts models are paradigmatic systems of equilibrium statistical mechanics. When driven out of equilibrium, however, they display qualitatively new forms of dynamical order [1]. I will discuss finite-time phase transitions following quenches [2], the structure of nonequilibrium response and fluctuations beyond fluctuation–dissipation [3], and synchronization phenomena emerging in driven spin systems [4,5].

References:

- [1] G. Falasco and M. Esposito, *Macroscopic Stochastic Thermodynamics*, Rev. Mod. Phys. **97**, 015002 (2025)
- [2] J. Meibohm and M. Esposito, *Finite-time dynamical phase transition in non-equilibrium relaxation*, Phys. Rev. Lett. **128**, 110603 (2022)
- [3] K. Ptaszynski and M. Esposito, *Critical heat current fluctuations in Curie-Weiss model in and out of equilibrium*, Phys. Rev. E **111**, 034125 (2025)
- [4] J. Meibohm and M. Esposito, *Minimum-dissipation principle for synchronised stochastic oscillators far from equilibrium*, Phys. Rev. E **110**, L042102 (2024)
- [5] K. Ptaszynski and M. Esposito, *Dissipation enables robust extensive scaling of multipartite correlations*, Phys. Rev. Lett. **135**, 057401 (2025)