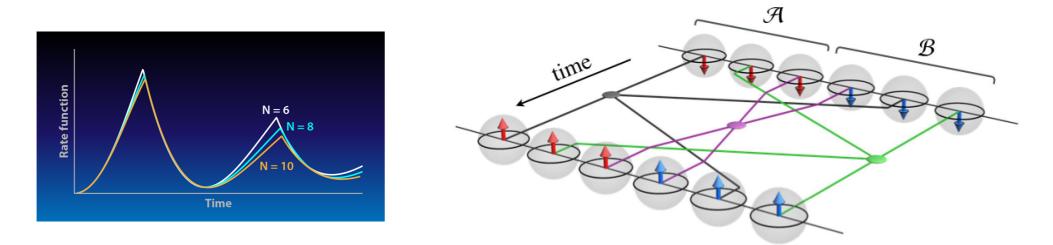
Non-equilibrium vs equilibrium phase transitions EQ phase transitions NEQ phase transitions: novel research field (textbook knowledge) Tin ultracold fermions and trapped ions! Quantum Magnetization 2.5/N critical 0.2 0.4 0.6 0.8 1.0 Scattering length $a(a_0)$ -40 0 40 x magnetization Initialize spins eity $\tilde{h}/2\pi(Hz)$ a. 2D Superfluid Insulator Juantum quench t/UCFT Measuremen -400 -200 0 200 Collective interaction strength $NJ_1/2\pi$ (Hz) QUANTUM 0 PHASE -10 -5 TRANSITIONS Drive Power [dBm] -20 in open quantum circuits! Second Edition [dB] 231 S -30 -40 -40 7.55 7.6 7 65 Frequency [GHz] Subir Sachdev

Explore the fundaments of ...

• <u>dynamical</u> phase transitions in interacting quantum spin chains

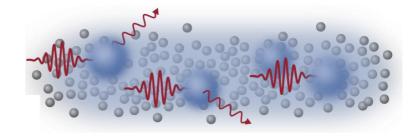
compare equilibrium and dynamical phases; calculate dynamical order parameter and Loschmidt echo for solvable interacting quantum spin chains; combine analytical and simple numerics to get insight into universal phenomena out-of-equilibrium



• <u>dissipative</u> phase transitions in driven-open quantum matter

learn how dissipation can shape novel phases of matter; simulate the Lindblad quantum master equation to study novel phase transitions in driven-dissipative steady states

$$\partial_t \rho = -i[H,\rho] + \kappa \sum_i L_i \rho L_i^{\dagger} - \frac{1}{2} \{ L_i^{\dagger} L_i, \rho \}$$



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