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Coherent and dissipative dynamics at quantum phase transitions

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I will present a dynamic scaling theory aimed at addressing the out-of-equilibrium behavior of many-body systems in proximity of quantum phase transitions of any order. This can be obtained by extending the equilibrium scaling laws ruled either by the critical exponents at continuous transitions, or by the energy gap of the lowest levels at first-order transitions. I will also discuss some aspects related to the effects of dissipative mechanisms, highlighting a nontrivial competition that may arise between the coherent dynamics at quantum transitions and some non-unitary perturbations, such as the coupling with an external Markovian bath or to a quantum-measurement apparatus.

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