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Entropy Production in Isolated Quantum Many-Body Systems[1]
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Beginning with the Liouville-von Neumann equation for the density matrix of an isolated quantum many-body system, and applying well-known projection-operator techniques, we derive an equation of motion for the rate of change of the thermodynamic entropy, valid to arbitrary order in the perturbation deviating the system from equilibrium. To lowest order, a balance equation is obtained which coincides with the one defining the entropy production in irreversible thermodynamics. A connection with fluctuation theorems is mentioned, as well as an application of the results to clarify the "thermalization problem" in the Jaynes-Cummings model.

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