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Entanglement and thermodynamics in non-equilibrium isolated quantum systems

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Entanglement and entropy are key concepts standing at the foundations of quantum and statistical mechanics. In the last decade the study of the non-equilibrium dynamics of isolated quantum systems revealed that these two concepts are intricately intertwined. Although the unitary time evolution ensuing from a pure initial state maintains the system globally at zero entropy, at long time after the quench local properties are captured by an appropriate statistical ensemble with non zero thermodynamic entropy, which can be interpreted as the entanglement accumulated during the dynamics. Therefore, understanding the post-quench entanglement evolution unveils how thermodynamics emerges in isolated quantum systems.

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