

## Absence of Thermalization in Nonintegrable Systems

Thu, 2011-02-17 10:22 - [Q-Essence Coordinator](#) [1] **Date:** 2011-01-24

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### Reference:

Phys. Rev. Lett. 106, 040401 (2011)

### URL:

<http://link.aps.org/doi/10.1103/PhysRevLett.106.040401> [2]

We establish a link between unitary relaxation dynamics after a quench in closed many-body systems and the entanglement in the energy eigenbasis. We find that even if reduced states equilibrate, they can have memory on the initial conditions even in certain models that are far from integrable. We show that in such situations the equilibrium states are still described by a maximum entropy or generalized Gibbs ensemble, regardless of whether a model is integrable or not, thereby contributing to a recent debate. In addition, we discuss individual aspects of the thermalization process, comment on the role of Anderson localization, and collect and compare different notions of integrability.

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