

Abstract Submitted
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Many-body localization in one dimension as a dynamical renormalization group fixed point RONEN VOSK, EHUD ALTMAN, Weizmann Institute of Science — We formulate a dynamical real space renormalization group approach to describe the time evolution of a random spin-1/2 chain, or interacting fermions, initialized in a state with fixed particle positions. Within this approach we identify a many-body localized state of the chain as a dynamical infinite randomness fixed point. Near this fixed point our method becomes asymptotically exact, allowing analytic calculation of time dependent quantities. In particular we explain the striking universal features in the growth of the entanglement seen in recent numerical simulations: unbounded logarithmic growth delayed by a time inversely proportional to the interaction strength. Lack of true thermalization in the long time limit is attributed to an infinite set of approximate integrals of motion revealed in the course of the RG flow, which become asymptotically exact conservation laws at the fixed point. Hence we identify the many-body localized state with an emergent generalized Gibbs ensemble. Within the RG framework we show that long range resonances are irrelevant at strong randomness, and formulate a criterion for when they do become relevant and may cause a delocalization transition.

Ronen Vosk
Weizmann Institute of Science

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