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Thermalization and its mechanism for generic quantum isolated systems[1] MAXIM OLSHANII, VANJA DUNJKO, University of Massachusetts Boston, MARCOS RIGOL, University of California, Santa Cruz — Time dynamics of isolated many-body quantum systems has long been an elusive subject, perhaps most urgently needed in the foundations of quantum statistical mechanics. In generic systems, one expects the nonequilibrium dynamics to lead to thermalization: a relaxation to states where the values of macroscopic quantities are stationary, universal with respect to widely differing initial conditions, and predictable through the time-tested recipe of statistical mechanics. The relaxation mechanism is not obvious, however; dynamical chaos cannot play the key role as it does in classical systems since quantum evolution is linear. Here we demonstrate[2], using the results of an *ab initio* numerical experiment with 5 hard-core bosons moving in a 5×5 lattice, that in quantum systems thermalization happens not in course of time evolution but instead at the level of individual eigenstates, as first proposed by Deutsch[3] and Srednicki[4].

[1]supported by NSF and ONR
[2]M. Rigol, V. Dunjko, and M. Olshanii, to appear in Nature (2008)
[3]J. M. Deutsch, Phys.Rev. A 43, 2046 (1991)
[4]M. Srednicki, Phys. Rev. E 50, 888 (1994)

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