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Universality in the Disappearance of Quantum Integrals of Motion Under Perturbation[1] MAXIM OLSHANII, KURT JACOBS, UMass Boston, MARCOS RIGOL, Georgetown U, VANJA DUNJKO, UMass Boston, HARRY KENNARD, Cambridge U, VLADIMIR YUROVSKY, Tel Aviv U — A central question of dynamics is to what extent it preserves the initial properties of the system. Its study in classical mechanics began with the problem of the stability of the solar system, was intensified by the Fermi- Pasta-Ulam "paradox," and led to the seminal Kolmogorov-Arnold-Moser (KAM) theorem, which characterized how conserved quantities cease to be conserved under a perturbation away from integrability. Here we show that for a conceptually important class of quantum systems, the disappearance of conserved quantities is described by a universal relation. The relation, numerically confirmed for several diverse systems, follows from an exactly solvable statistical model that quantitatively describes the recently proposed connection between the many-body localization and the transition from integrability to non-integrability.

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