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Abstract for an Invited Paper
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A rigorous result on many-body localization

JOHN IMBRIE, University of Virginia

The mathematical theory of many-body localization is in its infancy. Lack of thermalization is associated with the existence of a complete set of quasi-local integrals of motion. I will discuss a proof that a particular one-dimensional spin chain with random local interactions exhibits many-body localization. The proof depends on a physically reasonable assumption that limits the amount of level attraction in the system. In a KAM-style construction, a sequence of local unitary transformations is used to diagonalize the Hamiltonian and connect the exact many-body eigenfunctions to the original basis vectors. This provides an explicit construction of integrals of motion via convergent expansions.