

From Noether's theorem we know that symmetry leads to conservation laws. What is left up to nature is the ordering of conserved quantities—for example, the quantum numbers of the ground state. In physical systems the ground state is generally associated with low-dimensional irreps, but there is no a priori reason to expect this. By construct random matrices with nontrivial point-group symmetries, I find the ground state is always dominated by certain, low-dimensional irreps. While work is still in progress, this may be related to certain mysteries, for example the dominance of $J=0$ g.s. even for random two-body interactions.

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