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Emergent symmetry and transport in disordered quantum chains

Recently, we have proved rigorously that strong disorder can lead to an emergent symmetry: strongly disordered spin-1 chains with manifest $SU(2)$ symmetry show an emergent $SU(3)$ symmetry in two different phases. This phenomenon is more general than this one model. Indeed, we found that strongly disordered chains with explicit $SO(N)$ symmetry accommodate two different phases with emergent $SU(N)$ symmetries. Furthermore, transport properties of these systems are particularly interesting, as they offer one of the few cases where disorder and interactions can be treated rigorously. We will show that Anderson localization survives interactions in these systems, although care must be taken in order to characterize it correctly.