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Localization and topology protected quantum coherence at the edge of 'hot' matter YASAMAN BAHRI, University of California, Berkeley, RONEN VOSK, Weizmann Institute of Science, EHUD ALTMAN, Weizmann Institute of Science; University of California, Berkeley, ASHVIN VISHWANATH, University of California, Berkeley — Topological phases are often characterized by special edge states confined near the boundaries by an energy gap in the bulk. On raising temperature, these edge states are lost in a clean system due to mobile thermal excitations. Recently, however, it has been established that disorder can localize an isolated many-body system, potentially allowing for a sharply defined topological phase even in a highly excited state. Here we show this to be the case for the topological phase of a one-dimensional magnet with quenched disorder which features spin one-half excitations at the edges. The time evolution of a simple, highly excited initial state is used to reveal quantum coherent edge spins. In particular, we demonstrate, using theoretical arguments and numerical simulation, the coherent revival of an edge spin over a time scale that grows exponentially larger with system size. This is in sharp contrast to the general expectation that quantum bits strongly coupled to a 'hot' many body system will rapidly lose coherence.

Yasaman Bahri
University of California, Berkeley

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