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Trace index and spectral flow in the entanglement spectrum of topological insulators ARIS ALEXANDRADINATA, Princeton Physics Dept, TAYLOR HUGHES, UIUC Physics Dept, ANDREI BERNEVIG, Princeton Physics Dept — We investigate the entanglement spectra of topological insulators, which manifest edge states on a lattice with spatial boundaries. In the physical energy spectrum, a subset of the edge states that intersect the Fermi level translates to discontinuities in the trace of the single-particle entanglement spectrum, which we call a "trace index." We find that any free-fermion topological insulator that exhibits spectral flow has a nonvanishing trace index, which provides us with a new description of topological invariants. In addition, we identify the signatures of spectral flow in the single-particle and many-body entanglement spectrum; in the process we present new methods to extract topological invariants and establish a connection between entanglement and quantum Hall physics.

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