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The twists and flows of entanglement entropy WILLIAM WITCZAK-KREMPA, University of Montreal, XIAO CHEN, KITP Santa Barbara, THOMAS FAULKNER, EDUARDO FRADKIN, University of Illinois Urbana-Champaign — The entanglement entropy (EE) provides new insights into complex quantum states. We study critical theories on tori and cylinders in 2d/3d, focusing on spatial bi-partitions into two cylinders. We allow for twisted boundary conditions along the cycles. Various results are obtained for the universal EE of the relativistic boson and Dirac fermion conformal field theories (CFTs), and for the fermionic quadratic band touching and the boson with z=2 Lifshitz scaling. The shape dependence of the EE clearly distinguishes these theories, although intriguing similarities are found in certain limits. We also study the evolution of the EE when the system is detuned away from its critical point, by employing a renormalized EE. In certain cases we find non-monotonic behavior of the torus EE under RG flow.

William Witczak-Krempa
University of Montreal

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