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Untangling Superfluid Vortices DUSTIN KLECKNER, MARTIN W. SCHEELER, University of Chicago, DAVIDE PROMENT, University of East Anglia, WILLIAM T. M. IRVINE, University of Chicago — What is the role of topology, or knottedness, in superfluid phase defects (quantum vortices)? In ideal classical fluids, vortex knots may never untie, and so there is an associated conserved quantity – helicity – which measures how tangled a flow is. One might expect a similar robustness for superfluid defects, however, simulations of the Gross-Pitevskii equation demonstrate that vortex knots and links spontaneously untie and unlink. Nonetheless, the topology dramatically affects the vortex evolution, and a component of the initial helicity is transferred to helical coils as the knots unravel. These effects are remarkably similar to the behavior of tangled vortices in viscous fluids, suggesting they are universal features of non-ideal fluids.

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