Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Complexity of knotting in chaotic 3D eigenfunctions ALEXANDER TAYLOR, MARK DENNIS, University of Bristol — Quantised vortices occur generically in disordered 3D complex scalar fields, forming a geometrically complex and statistically random large scale tangle even in systems with very different origins of complexity such as turbulent superfluids, optical volume speckle, the quantum eigenfunctions of chaotic 3D cavities, and liquid crystal phases. Although all such systems are random and fractal on large scales [1], it has previously been established that topological measures such as the probability of vortices knotting or linking with one another are sensitive to the local physics. We use the wave chaos as a universal model system with just one physical lengthscale, the wavelength, beyond which its vortices are Brownian. To access finite-volume realisations of wavefields, vortices are traced numerically in three different random degenerate eigenfunction systems, each approximating the random isotropic limit but with different constraints and symmetries that significantly impact topological statistics even at high energies. By a simple mode counting argument, we observe that the probability of a generic eigenfunction containing a knotted vortex line reaches 50% by around its 1000-3000th mode.

[1] A J Taylor and M R Dennis, *J Phys A* **47** 465101 (2014)

Alexander Taylor
University of Bristol

Date submitted: 05 Nov 2015

Electronic form version 1.4