Vortex knots in a Bose-Einstein condensate

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I will revise what is a Bose-Einstein condensate and present the easiest model to study its dynamics: the three-dimensional nonlinear Schroedinger (NLS) equation - also known as Gross-Pitaevskii equation. I will discuss why NLS models a superfluid and how quantised vortex lines arise naturally in this system. I will show how these coherent structures interact and how knots may be created and evolve.

In particular, I will present a method for building ab initio topologically different quantum vortex knots by wrapping a vortex line on a torus and display their breaking mechanisms arising due to reconnections.