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Jason Parsley* (parslerj@wfu.edu), Dept. of Mathematics, Wake Forest University, P.O. Box 7388, Winston-Salem, NC 27109-7388. *Helicity, a vector field invariant in three-space.*

This talk focuses on the helicity of a vector field, which measures the extent to which its flowlines coil and wrap around one another. Helicity, calculated via an integral analogous to Gauss's 1833 linking formula for knots, arises naturally in certain energy-minimization problems in plasma physics. For a vector field on a domain Ω of R^3 , its helicity remains invariant under volume-preserving diffeomorphisms of Ω which are homotopic to the identity.

We provide explicit examples and give upper bounds for helicity in R^3 and S^3 . This leads to a discussion of new approaches to understanding helicity as an invariant and its connections to other vector field invariants on three-manifolds. (Received August 21, 2007)