1077-53-2888 **Jason Cantarella** and **Jason Parsley*** (parslerj@wfu.edu). *Cohomology reveals when helicity is a diffeomorphism invariant.*

Using knot invariants as our guide, we seek to understand vector field invariants. One vector field invariant is helicity, which calculates the average linking number of the field's flowlines. Computed analogously to Gauss' linking integral, it is widely useful in the physics of fluids. Helicity is invariant under certain diffeomorphisms of its domain – we seek to understand which ones.

By integrating over the configuration space of $2n$ points on a circle, Bott and Taubes computed finite-type invariants of knots. By analogy, we realize helicity as an integral over the configuration space of 2 points on a domain in Euclidean space. We extend this framework to differential $(k+1)$-forms on domains R^{2k+1} and express helicity as a cohomology class. This topological approach allows us to find a general formula for how much helicity changes when the form is pushed forward by a diffeomorphism of the domain. We classify the helicity-preserving diffeomorphisms on a given domain, finding new ones on the two-holed solid torus and proving that there are no new ones on the standard solid torus. (Received September 22, 2011)