

## SOME RESULTS AND OPEN QUESTIONS REGARDING VECTOR FIELD WINDING

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### ABSTRACT

The helicity is a well-known and critical topological quantity in a number of fields, including magnetohydrodynamics, fluid mechanics, non-linear elasticity and gauge field theories. In fact it is a product of two pieces of information, the strength (flux) of the field, and the winding/linking (the topological part). I will present two results: First that the winding can uniquely topologically classify certain types of braided fields [1] (this uniqueness is lost for the helicity). Second, that in continuum theories there are classes of vector fields for which the helicity can decay but the topology stays fixed [2]. In other words the two distinct components of the helicity have their own evolutionary rules. Using these results I will pose some open questions about the topology of vector fields whose answer I believe would provide significant insight.

*This is joint work with David MacTaggart and Anthony Yeates.*

- [1] Prior, C.B., & Yeates, A.R. 2021 Intrinsic winding of braided vector fields in tubular subdomains. *J. Phys. A: Mathematical & Theoretical* **54**, 465701.
- [2] Prior, C., & MacTaggart, D. 2020 Magnetic winding: what is it and what is it good for?. *Proc. Roy. Soc. A* **476**, 20200483.