Topology of hopfions and skyrmions in magnetic crystals

Filipp N. Rybakov[1]

[1]*Uppsala University, SE-75120 Uppsala, Sweden*

Recent studies of chiral magnetic crystals have revealed a plethora of new three-dimensional textures with non-trivial topology: skyrmion strings, their clusters and braids [1], as well as hopfions [2,3]. We discuss the topology of these textures and new ways to classify them using homotopy groups [3,4].

References:
[1] F. Zheng, et al. Nat. Commun. 12, 5316 (2021)
[2] F. Zheng, et al. Nature 623, 718 (2023)
[3] X. Chen, et al. e-print Research Square: rs.3.rs-7435743 (2025)
[4] F.N. Rybakov, et al. Phys. Rev. B 111, 134417 (2025)