Skyrmions and other chiral textures

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Simple exchange interaction favors collinear alignment of magnetic moments, which in some classical systems can be described as a continuous magnetization field. A spin-wave excitation would be topologically equivalent to the uniform ferromagnetic ground state, but a vortex like structure where magnetization in the center of the vortex points opposite to the surrounding would be topologically different. It would be impossible to "unwind" such a vortex without ripping the smoothly varying magnetization field. Such a structure is called a skyrmion, and the inability to unwind it implies a degree of topological protection. Skyrmions are intensely investigated – both for fundamental interest in their properties, and for the prospect of spin-tronics and information storage. Skyrmions can be found as isolated excitations of ferromagnetic states in ferromagnetic interfaces, as more or less formed lattices in bulk helical magnets, and more recently in certain frustrated magnets. I will outline the properties of skyrmions and the current state of experimental realisations, with focus on helical magnet systems.

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