Magnetic Textures II

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Traditionally the magnetic properties of real materials are described on different levels. Starting on atomic scales the interactions, mutual arrangement and statistical thermodynamics of individual magnetic moments are considered. In contrast, on mesoscopic scales magnetic domains and domain walls reflect the interplay of exchange interactions, magnetic anisotropies and dipolar interactions as described in micromagnetic models. Taken together with the microstructure and shape of the materials these result in the properties observed on macroscopic scales. In recent years a very active field of research has developed the addresses the emergence of new phenomena at the border between the micro- and the mesoscale, where magnetic textures differ radically from the traditional understanding of domains and domain walls. These developments will be illustrated in terms of three examples, notably the quantum phase transition of an Ising magnet in a transverse field, fractionalization and the magnetization process in the spin ices, and, last but not least, the emergent electrodynamics of chiral magnets featuring non-trivial topology.