

# **Ab initio spin-orbitronics**

## **From spin-orbit interaction to skyrmionics in real materials**

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Spin-orbit interaction in combination with structural inversion asymmetry at magnetic surfaces, interfaces, heterostructures, multilayers and nanostructures is a source of a variety of spin-dependent transport phenomena and novel magnetic textures, the chiral magnetic skyrmions [Stefan Heinze *et al.*, Nat. Phys. 7, 713 (2011)] being the best known.

Skyrmionics is a very exciting, timely and multidisciplinary field where mathematicians, theoretical and computational physicists meet with experts on film and multilayer growth, on high-resolution magnetization and electronic structure characterization, transport and dynamics, and on device concepts and devices in order to integrate the skyrmions into the field of spintronics. I will discuss the core object of the field the chiral magnetic skyrmion and the primary interactions that are responsible for its existence. In this presentation I will give an elementary introduction into this field. I discuss the issues of skyrmion size, life time and detection. If time permits, I also discuss further localized particles such as bobbars and antiskyrmions for alternatives in race-track applications.

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