Antiferromagnetic spintronics

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One of the main features of antiferromagnets (AF) lies in the peculiar antiparallel alignment of their spin textures. Despite a lack of net magnetization and therefore a fairly challenging access to their magnetic distributions, AF are currently in the limelight thanks to recent breakthroughs which have demonstrated the efficient interplay between spin currents and the AF order parameter [1,2], leading to the emergence of a new field of research focused on antiferromagnetic spintronics [3]. Besides, the intrinsic AF dynamics, unlike its ferromagnetic counterpart, lies directly in the terahertz range. Consequently, current-induced AF control also opens new perspectives in ultrafast magnetization dynamics. On the material side, antiferromagnets represent a large majority of magnetic materials. In this presentation after reviewing the history of antiferromagnets and their main physical characteristics, we will discuss in detail their ultrafast dynamics. On this basis, the interplay between spin currents and AF distribution will be tackled. Finally, we will envision what could be achieved in the future with AF distributions.

References:

[1] T. Jungwirth, X. Marti, P. Wadley and J. Wunderlich *Nature Nanotech*. **11**, 231 (2016)
[2] P. Wadley and al. *Science* **351**, 587 (2016)
[3] V. Baltz et al. *Rev. Mod. Phys.* **90** 015005 (2018)