Nanomagnetism, spintronics and spin dynamics
Mini-colloquium 13

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As micro- and nano-fabrication and characterization tools at the micro- and nano-scale progress, novel magnetic phenomena emerge and new methods for controlling magnetization or inducing magnetization dynamics are investigated. Both lead to a variety of potential applications in future technologies [1,2].

The interplay of the charge in orbital motion and spin quantum degrees of freedom is the basic ingredient to understand the bases of magnetism. Transfer of angular momentum and moment dynamic excitations has been recently achieved through different interactions. Polarized and non-polarized laser have been used to switch magnetization or to induce magnetization dynamics, down to the femtosecond processes [3]. Electric fields effects at insulator/ferromagnetic materials allow modifying magnetic anisotropy and also Curie temperature [4]. Magnetic spin waves can be controlled and conduct to specific spots where it affects magnetization and electronic band structures locally [5].

Besides, polarized current has been now widely used to reverse and excite magnetization since the 2000’s but new features are still being discovered and new materials (ferromagnetic semi-conductors, multiferroics, etc.) are still being developed. Due to size and spin-orbit effects, inversion symmetry can be lifted, leading to topologically rich spin vortex configurations such as spin spirals, skyrmions, solitons, etc. [6]. Spin transfer induced domain wall dynamics is still heavily investigated because of its possible relevance for magnetic logic and storage [2]. Polarized current from thermal gradient has been demonstrated [7]. Finally new devices with pure spin current have been developed and are effectively achieving the spintronic [8].

The mini-colloquium will focus on these latest breakthroughs and emerging physics.
References


