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Controlling and imaging chiral spin textures

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Chirality in magnetic materials is fundamentally interesting and holds potential for logic and memory applications [1,2,3]. Using spin-polarized low-energy electron microscopy at National Center for Electron Microscopy, we recently observed chiral domain walls in thin films [4,5]. We developed ways to tailor the Dzyaloshinskii-Moriya interaction, which drives the chirality, by interface engineering [6] and by forming ternary superlattices [7]. We find that spin-textures can be switched between left-handed, right-handed, cycloidal, helical and mixed domain wall structures by controlling uniaxial strain in magnetic films [8]. We also demonstrate an experimental approach to stabilize skyrmions in magnetic multilayers without external magnetic field [9]. These results exemplify the rich physics of chirality associated with interfaces of magnetic materials. [1] A. Fert et al. *Nat. Nanotechnol.* **8**, 152 (2013). [2] N. Nagaosa et al. *Nat. Nanotechnol.* **8**, 899 (2013). [3] W. Jiang et al. *Science* **349**, 283 (2015). [4] G. Chen, et al. *Phys. Rev. Lett.* **110**, 177204 (2013). [5] G. Chen, et al. *Adv. Mater.* **27**, 5738 (2015). [6] G. Chen, et al. *Nat. Commun.* **4**, 2671 (2013). [7] G. Chen, et al. *Appl. Phys. Lett.* **106**, 062404 (2015). [8] G. Chen, et al. *Nat. Commun.* **6**, 6598 (2015). [9] G. Chen, et al. *Appl. Phys. Lett.* **106**, 242404 (2015).