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Imaging complex magnetic textures with a single spin microscope

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In the past years, it was realized that the experimental methods allowing for the detection of single spins in the solid-state, which were initially developed for quantum information science, open new avenues for high sensitivity magnetometry at the nanoscale. In that spirit, it was recently proposed to use the electronic spin of a single nitrogen-vacancy (NV) defect in diamond as an atomic-sized magnetic field sensor [1,2]. This approach promises significant advances in magnetic imaging since it provides non-invasive, quantitative and vectorial magnetic field measurements, with an unprecedented combination of spatial resolution and magnetic sensitivity under ambient conditions.

In this talk, I will show how scanning-NV magnetometry can be used as a powerful tool for fundamental studies in nanomagnetism, focusing on chiral domain walls and magnetic skyrmions in ultrathin ferromagnetic wires and spin cycloids in multiferroic materials.

[1] G. Balasubramanian et al., Nature 455, 648 (2008), J. Maze et al., Nature 455, 644 (2008).