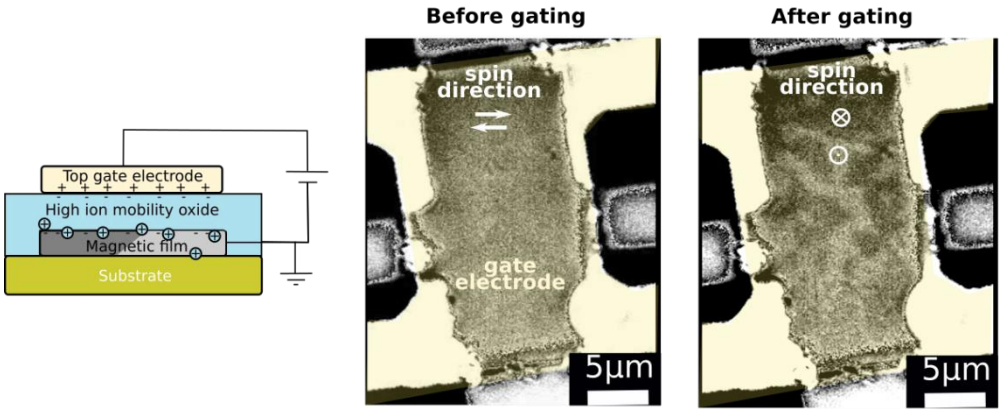
Master internship:

`Magneto-ionic control of chiral magnetic structures for neuromorphic computing'



Magneto-ionics is an emerging field that offers great potential for reducing power consumption in spintronics memory applications. By combining the concept of voltage-controlled ionic motion from memristor technologies, typically used in neuromorphic applications, with spintronics, this field also provides a unique opportunity to create a new generation of neuromorphic functionalities based on spintronics devices. Our group has been at the forefront of investigating the magneto-ionic control of magnetic anisotropy, magnetic domain wall motion, and the Dzyaloshinskii Moriya interaction in various materials [1-3]. Through our research, we have demonstrated large, reversible, and non-volatile effects in magnetic properties due to the chemical interaction between the mobile ions and the magnetic atoms. These findings have significant implications for the development of low-power spintronics memory and neuromorphic devices.

We are currently seeking a highly motivated candidate to join our team and work on an experimental research project focused on **designing artificial synaptic functionalities through magneto-ionic control of chiral magnetic structures.** This includes the gate-control of nucleation/annihilation of skyrmionic spin structures and the gate-control of boundaries between two magnetic anisotropy states. The ultimate goal of the project is to use gate-control of chiral structures as a means to update synaptic weights in spintronics artificial synapses and to integrate them into artificial neural networks. The project will greatly benefit from our team's collective expertise in both magneto-ionics and neuromorphic computing architectures. Our technical means to carry out this project include simultaneous magneto-transport measurements and magnetic imaging (see figure), and nanofabrication tools in our cleanroom.

Requirements: A strong background in condensed matter physics and an excellent level of English. Experience in spintronics and/or nanoelectronics will be appreciated.
Host Laboratory: Centre de Nanosciences et Nanotechnologies, Palaiseau.
Team Integnano, http://integnano.c2n.universite-paris-saclay.fr
Period: 4-6 months, starting in April-March 2024.
PhD thesis funding available.
Contact: liza.herrera-diez@c2n.upsaclay.fr

[1] L. Herrera Diez et al., Phys. Rev. Applied 12, 034005 (2019). [2] R.Pachat et al., Phys. Rev. Applied 15, 064055 (2021). [3] T. Bhatnagar-Schoeffmann et al., Appl. Phys. Lett. 122, 042402 (2023).