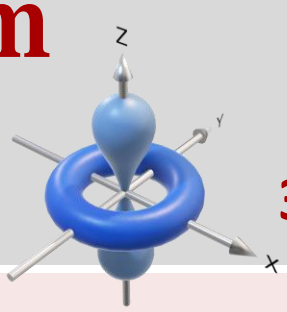
Department of Physics Colloquium

September 18, 2023 **3:00 PM**



Magneto-Ionics and 3D nanowire network

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Magneto-ionics has shown promise for energy-efficient nanoelectronics, where ionic migration can be used to achieve atomic scale control of interfaces in magnetic nanostructures, and in turn modulate a wide variety of functionalities. Recently, we have discovered that adsorbed oxygen and hydrogen on the surface of ferromagnetic films can induce significant Dzyaloshinskii–Moriya interaction (DMI) [1], a handle to introduce topology into nanoscale magnets. This has enabled direct tailoring of skyrmions winding number as well as wall type at room temperature via oxygen chemisorption. We have also demonstrated a sensitive and reversible chirality switching of magnetic domain walls [2] and writing/deleting of skyrmions [3] via hydrogen adsorption/desorption [3] or changing the thickness of a sub-monolayer Pd capping layer [4]. These effects offer an ideal platform to gain quantitative understanding of magneto-ionics at buried interfaces, where the ionic motion can be further controlled by an electric field, leading to modulation of such functionality as exchange bias [5,6]. They are relevant for 3-dimensional information storage, such as in interconnected nanowire networks [7,8].

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[1] Chen *et al*, Science Advances, **6**, eaba4924 (2020).
[2] Chen *et al*, Physical Review X, **11**, 021015 (2021).
[3] Chen *et al*, Nature Communications, **13**, 1350 (2022).
[4] Chen *et al*, Nano Letters, **22**, 6678 (2022).
[5] Murray *et al*, ACS Applied Materials and Interfaces, **13**, 38916 (2021).
[6] Jensen *et al*, ACS Nano **17**, 6745 (2023).
[7] Burks *et al*, Nano Letters, **21**, 716 (2021).
[8] Bhattacharya *et al*, Nano Letters, **22,** 10010 (2022).

This colloquium will be held in-person, at SERC 116 unless announced otherwise.