

WORKSHOP # 2
September 17, 2025
NSLS-II Bldg 745, Room 183

Frontiers in Magnetism: From Underlying Physics to Advanced Technologies

Organizers: Thomas Feggeler, Asish Kundu, Joe Dvorak, Claudio Mazzoli, Valentina Bisogni,
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National Synchrotron Light Source II

Magnetism is intrinsically quantum, arising from the combination of two quantum concepts: spin and electronic correlations. In the solid state, the interplay of many-body physics and electrons interactions leads to emergent phenomena such as fractionalization, insulator-to-metal transitions, high temperature superconductivity, and complex magnetic structure and dynamics. The study of magnetism is fundamental to technological advancements, as its findings directly support critical industries, ranging from permanent magnets, materials for energy conversion, biocompatible nanostructures to advanced electronic devices for computers and medical applications. There are many key unresolved challenges and opportunities for discovery in magnetism: the spin transport and propagation across interfaces, the understanding of spin transfer and spin orbit torque, magnetization dynamics, multiferroic switching properties of materials, magnetostriction and strain effects, the comprehension of the light perturbations leading to the modification of magnetism, and decoherence in spin-1/2 magnetic qubits are a few. With the recent proliferation of methods to fabricate materials (e.g., ultrathin films, nanoparticles, low-dimensional materials, atomic exfoliation) and the discovery of hidden (topological) symmetries that dictate material properties, a plethora of new magnetic or spin-related phenomena has emerged in quantum materials such as transition metal oxides, van der Waals, and The workshop will invite leading experts in the field of magnetism to discuss the current status of open problems in magnetism and to solicit an open discussion on how to address them, ultimately discussing what synchrotron based experimental resources can contribute to address these challenges.

Start Time (ET)	Title	Speaker (Affiliation)
September 16, 2025		
5:30pm Dinner (provided)		
8:30a	Breakfast (coffee, tea, pastries)	
9:15a	Introduction	Workshop Organization Team
9:20a	Magnetic Textures Revealed by Soft X-ray Coherent Scattering: Current Status and Opportunities with Next-Generation Light Sources	Nicolas Jaouen (remote) Synchrotron Soleil, France
9:50a	Spin-resolved time-of-flight momentum microscopy	Hans-Joachim Elmers (remote) Univ. of Mainz, Germany
10:20a	Polarized X-ray Probes of Magnetism: Applications and Opportunities for NSLS-II	John Freeland (remote) Advanced Photon Source, USA
10:50a	Break (coffee, tea, snacks)	

11:00a	Frontiers in 3d nanomagnetism	Peter Fischer Lawrence Berkeley Nat. Lab, USA
11:30a	Magnetization Dynamics at the Nanoscale: New Opportunities with High Coherence X-ray Sources	Dario Arena Univ. of Southern Florida, USA
12:00p	Lunch Break (provided)	
1:15p	Scanning Transmission X-ray Microscopy: A Swiss knife tool for spin related phenomena	Hendrik Ohldag (remote) Advanced Light Source, USA
1:45p	Spin-resolved spectroscopy at Lawrence Berkley National Laboratory	Alexei Fedorov Advanced Light Source, USA
2:15p	spin-ARPES as a probe of hidden quantum geometry	Riccardo Comin Mass. Institute of Techn., USA
2:45p	Break (coffee, tea, snacks) - Group Picture	
2:55p	Coherent X-ray Interactions with Magnetic Metamaterials and their Applications in Unconventional Computing	Jeffrey Hastings Univ. of Kentucky, USA
3:25p	Opportunities in reduced dimensionality spin structures	Yves Idzerda Montana State Univ., USA
3:55p	Conceptual Implementation of Spin Resolved ARPES endstation at ESM	Joseph Dvorak Brookhaven Nat. Lab, USA
4:10p	Panel Discussion	Workshop Participants
5:00p	Adjourn	Workshop Organization Team