Speaker: Aleš Hrabec

Laboratory for Multiscale materials eXperiments (LMX)
Institut Paul Scherrer (PSI)

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The role of chirality in magnetism and spintronics

Bio: Aleš Hrabec received his PhD in 2011 from Institut Néel/CNRS for his work on magnetic domain wall dynamics in ferrimagnetic and ultrathin magnetic films with perpendicular anisotropy. In 2012 he joined the Condensed Matter group at the University of Leeds where he pursued his work on high-spin-orbit interaction magnetic systems. In 2015 he became a post-doctoral fellow at the IDMAG group at Laboratoire de Physique des Solides at Université Paris-Sud where he focused on physics of magnetic skyrmions in systems combining dipolar and DM interactions. Since 2018, he is a senior scientist at the Mesoscopic Systems group of Prof. Laura Heyderman with the main interest in antiferromagnetic materials.

Chirality plays a fundamental role in modern magnetism, arising from key interactions that shape spin textures at the nanoscale. This tutorial will explore the concept of chirality in magnetism, with a focus on the Dzyaloshinskii-Moriya interaction (DMI)—a relativistic exchange interaction that favors noncollinear spin configurations. We will discuss how DMI stabilizes chiral magnetic structures such as skyrmions and Néel-type domain walls, as well as its pivotal role in emerging spintronic technologies. The talk will also cover the historical discovery and theoretical foundations of DMI, along with recent experimental breakthroughs that have leveraged this interaction to achieve efficient domain-wall motion and topological spin textures in ultrathin films. Through this, we will highlight the impact of chiral interactions on the development of next-generation, low-power magnetic memory and logic devices.

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