

Distinguished Lectures at HZB

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## **On the “fantastic” future of magnetic nanomaterials: Insights with soft x-rays**

**02.12.2019 – 3.30 p.m.**

Lecture Hall, Albert-Einstein-Str. 15, 12489 Berlin

Since the discovery of the GMR effect in 1985, the field of spintronic has become a flourishing synonym of envisioned future low-power, ultra-fast and advanced information technologies based on magnetic nanomaterials with fantastic promises. New lines came up in the last years as magnonics, spin-orbitronics, antiferromagnetic spintronic, skyrmionics, multiferroics and valley electronics including topological aspects appearing in novel graphene-like and van-der-Waals systems. However, the impact of all these materials on the real market is today still rather limited, since the serious drawbacks are present not only from the technological site but even from fundamental aspects.

Beside the difficulties of a controlled design of magnetic nanosystems, the demand of appropriate magnetic characterization on the nanoscale is still present, even novel attractive techniques have been developed in the last two decades. Hereby the synchrotron methods play an important part especially for using soft x-ray with their huge magnetic cross sections as x-ray circular and linear magnetic dichroism as well as the inherent time structure of synchrotron sources. It allows to apply spectroscopic and imaging techniques to magnetic targets and provide powerful tools to investigate magnetic nanostructures, surfaces and interfaces in an element-specific, quantitative and time-resolved manner.

In this presentation I try to outline the present promises, potentials and drawbacks of spintronics and co. and discuss the important role of the synchrotron based soft x-ray characterization tools in these fields.