Mechanical Sensing of Nanomagnetic Systems

Martino Poggio, University of Basel, Switzerland

I will discuss a variety of experiments on magnetic systems, which exploit nanomechanical transducers as sensitive sensors. In particular, I will present measurements of nanometer-scale spin ensembles and nano--magnets based on the sensitive detection of magnetic force and torque. I will discuss techniques such as magnetic resonance force miscroscopy (MRFM) and dynamic cantilever magnetometry (DCM) and I will place them in the context of other state-of-the-art techniques. The former has been used to carry-out the highest resolution nuclear magnetic resonance imaging (MRI) to date, while the latter can provide information on the saturation magnetization, anisotropy, switching behavior, and magnetic phases of individual nanomagnets. I will show how the ability to detect small magnetic moments can provide both critical insights and pave the way to new applications. As an example, I will present recent work on nanowire force sensors, which are the latest manifestation of the push towards smaller and more sensitive mechanical transducers.