B2

Challenges of spintronics

Tim Mewes

Since the discovery of the giant magnetoresistance effect by A. Fert and P. Grünberg in 1988 the field that is now known as **spin tr**ansport electr**onics** or short “spintronics” has already resulted in numerous applications affecting our everyday life – for example the continuous increase in storage density of modern hard drives relies heavily on the tunnel magnetoresistance effect used to read out the ever shrinking bits. However, the future prospects of spintronics are much broader, they also include for example the possibility of a dense and fast universal random access memory, which will be non-volatile and will operate at significantly lower power than current semiconductor memories. Performing logic operations using the spin rather than the charge of the electron is another promising area of spintronics, which is currently taking shape. In this talk I will outline some of the major challenges that we now face in spintronics and how we can address them: Understanding and predicting the relaxation of the magnetization in existing and new materials is essential to guide research in this area. Generating and maintaining highly spin polarized currents is also of crucial importance to achieve functioning spintronic devices. In addition the nanoscale dimensions of the structures of interest also significantly alter the magnetization dynamics, which requires adequate simulation tools.