Universität Bielefeld Fakultät für Physik

Physikalisches Kolloquium

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Computational magnetism with classical spins – adventures and challenges in the nano, micro, and macro regime

"Everything should be made as simple as possible, but not simpler." – This sentence said by Albert Einstein almost a century ago may act as a synonym for the balancing act that one has to face when dealing with classical atomistic spin dynamics methods within the nanomagnetism community. There is for sure no doubt about the tremendous success of the classical spin dynamics approach for the prediction of physical properties of (infinite) bulk magnetic systems over the past 40 years. However, when it comes to molecular magnets it seems to be questionable to what extend a classical approach, usually exploiting the Heisenberg model, would be accurate enough to describe these systems or whether one over-simplifies the problem by totally ignoring quantum effects. Reality, however doesn't leave us a choice! Always limited by and hungry for more computational power, numerical simulations based on classical spins appear just too tempting compared to exact quantum calculations which are still very often beyond today's most advanced computational capabilities even for relatively small and simple systems. In this talk I will show that numerical simulations based on classical atomistic spin dynamics methods serve as an excellent tool to complement exact and approximate quantum methods. Moreover, classical spin dynamics methods as such and in combination with molecular dynamics allow us to explore interacting magnetic systems at the nano and micro scale very efficiently which has led to the discovery of a variety of new and surprising physical phenomena.

Montag, 15.04.2019, 16:15 Uhr
Ort: Hörsaal 6