MA 15: INNOMAG e.V. Diploma-/Master Prize 2018

Die Arbeitsgemeinschaft Magnetismus der DPG hat einen Diplom-/Masterpreis ausgeschrieben, welcher auf der Frühjahrstagung der DPG im März 2018 in Berlin vergeben wird. Ziel des Preises ist die Anerkennung herausragender Forschung im Rahmen einer Diplom-/Masterarbeit und deren exzellente Vermittlung in Wort und Schrift. Im Rahmen dieser Sitzung tragen die drei besten der für ihre an einer deutschen Hochschule durchgeführten Diplom-/Masterarbeit Nominierten vor. Im direkten Anschluss entscheidet das Preiskommittee über den Gewinner bzw. die Gewinnerin des INNOMAG e.V. Diplom/Master-Preises 2018 in Höhe von 500 EURO.
Talks will be given in English!

Time: Monday 16:55–18:05 Location: H 0112

Invited Talk MA 15.1 Mon 16:55 H 0112
Magnetic particle mapping with magnetoelectric sensors for characterization of bioscaffolds — •Ron-Marco Friedrich[1], Sebastian Zabel[1], Jan-Martin Wagner[1], Christine Selhuber-Unkel[2], and Franz Faupel[1] — [1]CAU Kiel, Institute for Material Science, Chair for Multicomponent Materials, Kaiserstr. 2, 24143 Kiel, Germany — [2]CAU Kiel, Institute for Material Science - Biocompatible Nanomaterials, Kaiserstr. 2, 24143 Kiel, Germany

Bioscaffolds for cell growth have great potential in the area of medical life science. The characterization of the scaffolds with regard to the cell growth needs to meet certain objectives to ensure non-invasiveness and non-destructiveness. Here, a novel detection method for magnetically labeled cells using magnetoelectric (ME) sensors is introduced where, similar to magnetic particle imaging (MPI), the nonlinear magnetization behavior of magnetic particle ensembles is used to detect higher harmonic excitations. The ME sensor consists of a piezoelectric and magnetostrictive thin film on a freestanding cantilever, which shows a sharp mechanical resonance and anisotropy in its sensitivity. This leads to a selective signal acquisition with respect to the spatial orientation of the sensor and the applied excitation frequency. Thus, by moving the sensor over a sample, we can locally detect higher harmonic excitations and create a map of the magnetic field of the magnetic particles. We describe the abilities of the detection system and create a forward simulation of this kind of imaging system to reconstruct the particle distribution.

Invited Talk MA 15.2 Mon 17:15 H 0112
Uncovering Chiral and Topological Orbital Magnetism of Domain Walls and Skyrmions
— •Fabian R. Lux —
Peter Grünberg Institut and Institute for Advanced Simulation, Forschungszentrum Jülich and JARA, 52425 Jülich, Germany

In the field of spin-orbitronics, the orbital physics of electrons plays a central role, and the orbital magnetization represents a key concept for its controlled detection and manipulation. While the orbital magnetism of collinear ferromagnets is relatively well understood, much less is known about it for non-collinear structures such as magnetic skyrmions and domain walls. By employing a semiclassical Green's function formalism, we demonstrate how the orbital magnetization in these extended chiral magnetic systems can be understood as the electronic response to emergent electromagnetic fields [1]. We discovered that in such systems the spin-orbit interaction can be used to a great advantage in that it promotes a complex interplay of real-space and k-space topology leading to enhanced orbital responses in interfacial chiral magnets. Besides discussing possible applications of the emergent orbital magnetism in chiral spin systems we also suggest new perspectives for the field of chiral orbitronics.

[1] F. R. Lux *et al.*, arXiv:1706.06068 (2017)

Invited Talk MA 15.3 Mon 17:35 H 0112
Unified description of high frequency magnetodynamics, and a new way of measuring the magnon contribution to the specific heat. — •Benjamin Zingsem[1,2], Michael Winklhofer[3], Sabrina Masur[4], Paul Wendtland[1], Ruslan Salikov[1], Florian M. Römer[1], Ralf Meckenstock[1], and Michael Farle[1] — [1]University Duisburg-Essen, 47057 Duisburg, Germany — [2]ERC und PGI, Fz Jülich GmbH, 52425 Jülich, Germany — [3]University of Oldenburg, 26129 Oldenburg, Germany — [4]University of Cambridge, Cambridge CB3 0HE, UK

We present a general analytic solution of the ferromagnetic high frequency susceptibility tensor, as well as a new method of measuring the magnon contribution to the heat capacity in ferromagnetic systems, predicted by this solution. This linearized function can be directly applied to ferromagnetic systems with any magnetic energy landscape, any static applied fields and any sufficiently small dynamic fields. It unifies a multitude of approaches know throughout literature and naturally describes the entire reciprocal space for magnons in one simple function. In addition, this approach predicts a new type of metastable eigenmode which can be excited in conventional ferromagnetic resonance experiments, by sweeping the field in an unconventional way. These predicted modes where measured and the deduced behavior of the heat capacity is presented. Furthermore, by including the chiral Dzyaloshinskii-Moriya interaction, this formalism yields a possibility to determine the chiral energy density for small chiral coupling, which was previously inaccessible.

Selection and announcement of the winner.