

PHYSICAL COLLOQUIUM

INVITATION

Monday, 21.06.2021, 4.15 p.m.,
video conference: <https://meeting.uol.de/b/anj-2vc-j6s-fwe>

speaks

**Prof. Dr. Rafal E. Dunin-Borkowski, Director,
Institute for Microstructure Research Director,
Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons,
Peter Gruenberg Institute, Research Centre Juelich, Germany**

about

"Electromagnetic field mapping at the nanoscale in the transmission electron microscope"

Transmission electron microscopy has been revolutionized in recent years, both by the introduction of new hardware such field-emission electron guns, aberration correctors and in situ stages and by the development of new techniques, algorithms and software that take advantage of increased computational speed and the ability to control and automate modern electron microscopes. These developments have resulted in the ability to provide direct images of the internal structures of materials with a spatial resolution of better than 50 pm. In this talk, I will describe how electron microscopy can be used to obtain quantitative information about not only local microstructure and chemistry in materials but also magnetic fields and charge density distributions with close-to-atomic spatial resolution. When combined with model-based iterative reconstruction, electron tomography and in situ techniques, this information can be obtained quantitatively, in three dimensions, as a function of temperature and in the presence of applied fields and reactive gases. I will present results obtained from studies of magnetization distributions in individual magnetic nanocrystals and skyrmions in extended films and geometrically-confined structures, as well as from measurements of the electric fields of nanoscale field emitters. I will conclude with a personal perspective on directions for the future development of transmission electron microscopy, which may require radical changes to the design of electron microscopes, longer experiments, quantitative comparisons of experimental measurements with both complementary techniques and advanced simulations, and new approaches for data handling and storage.

All interested persons are cordially invited.

Sgd. Prof. Dr. Sascha Schäfer