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# Allgemeines Physikalisches Kolloquium

## Antrittsvorlesung

## Donnerstag, 03.12.2020 um 16 Uhr c.t.
## Online-Kolloquium


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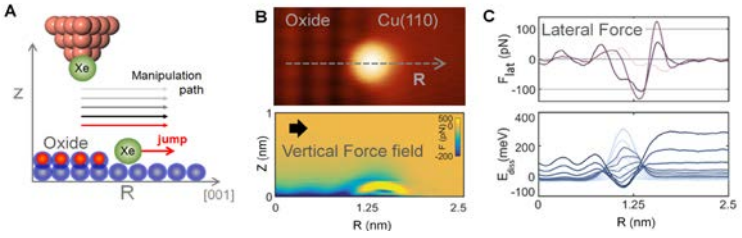
**Westfälische Wilhelms-Universität Münster, Physikalisches Institut**


## *Nanoscale Interface Analytics for Solar Cells and in Surface Chemistry*


In this lecture, I will present experiments from scanning probe microscopy, which allows imaging the topography of a surface with an atomic-scale resolution. Furthermore, the methodology provides spectroscopic information about the local surface electronic structure or about the interatomic force interaction with piconewton sensitivity. As a complementary technique we use photoelectron spectroscopy providing not only information about the surface composition, but also about the global electronic properties and chemical binding states. With these correlating methods, we investigate the defect physics of materials used in thin film solar cells. In particular, we analyse the defect-electronic structure and dipole layer formation with a spatial resolution of a few nanometers. Our results help to develop new strategies for the efficiency optimization of these solar cells.

In a different research field, we focus on the properties of various atomically defined probe tips allowing for ultrahigh resolution in atomic force microscopy. Recently, we demonstrated the outstanding imaging properties of a copper-based tip, which is terminated by a covalently bound single oxygen atom. Based on the high structural stability of this tip, we were able to image single hydrogen bonds in a complex organic network. In our latest work we perform force measurements during the controlled manipulation of single xenon atoms on a laterally anisotropic surface with various atomically defined tip structures. Our results show drastic differences in the force interaction from tip to tip providing fundamental insights in the nano-mechanical properties and chemical reactivity in atomically defined contacts.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**A**, Schematic representation of a force measurement at an oxide boundary during the lateral displacement of a single atom by an atomically defined tip (here: Xe-tip). **B**, Topography image of a single Xe atom nucleated next to the oxide domain boundary (upper panel). Vertical force field recorded during the manipulation experiment with a Xe-tip (lower panel). **C**, Corresponding lateral forces and energy dissipation at various tip heights

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