

# Ultrafast Nano-Optics: Novel light and electron sources for surface science

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Functional nanomaterials are essential building blocks for a variety of modern technologies. Understanding and controlling the structure and function of nanomaterials requires novel and powerful microscopes providing ultrahigh spatial but also ultrahigh temporal resolution. Consequently a considerable amount of new, often accelerator-based ultrafast light, x-ray and electron sources are currently under development throughout the world. In this talk I want to show that also nanotechnology itself offers powerful and partially rather surprising novel microscopy tools which are based on the ability to manipulate and control light on nanometer length and femtosecond time scales. For this, I will discuss different recent developments in the field of ultrafast nano-optics, including a new optical microscope based on the localisation of propagating coherent surface plasmon polariton wavepackets, an ultrafast switchable metallic mirror and a novel approach for a spatially and temporally highly resolved electron microscope.