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NANOLUND

AT THE FOREFRONT OF NANOSCIENCE



*Prof. Tim Salditt
Institut für Röntgenphysik,
Universität Göttingen, Germany*

NANOSCIENCE COLLOQUIUM

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X-ray imaging at the nanoscale: ptychography, holography and tomography

X-rays can deeply penetrate matter and thus provide information about the functional (interior) architecture of complex samples, from biological tissues and cells to nanoscale composite materials. Until recently, however, this potential of hard x-rays in view of penetration, spatial resolution, contrast, and compatibility with environmental conditions was significantly limited by the lack in suitable x-ray optics. With the advent of highly brilliant radiation, and the development of lens-less diffractive imaging and coherent focusing, the situation has changed. We now have nano-focused coherent x-ray synchrotron beams at hand to probe nanoscale structures both in scanning and in full field imaging and tomography.

We explain how the central challenge of inverting the coherent diffraction pattern can be mastered by different reconstruction algorithms in the optical far and near-field. In particular, we present full field projection imaging at high magnification, recorded by illumination with advanced x-ray waveguide optics, and show how imaging and diffraction can be combined to investigate biomolecular structures within biological cells. As an example we present 3d reconstructions of aggregated nano particles in macrophages, which have penetrated lung tissue.

Host: Jesper Wallentin (Synchrotron Radiation Research)