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Imaging biological cells by scanning SAXS

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X-rays provide high resolution due to their small wavelength and high penetration power, allowing for imaging of comparatively large, three-dimensional objects. For these reasons, X-rays have been established as complementary probes for bio-imaging, in addition to well-established methods such as visible light fluorescence microscopy and electron microscopy (EM). Scanning small angle X-ray scattering (SAXS), in particular, is well suited for systems with some degree of order, such as bundles of parallel filaments, or high-density aggregates. The method exploits two unique features of X-ray imaging: not only are highly focused beams used to spatially resolve different constituents of biological cells, but each individual scattering pattern contains a wealth of information about the internal structure on molecular length scales.
I will present scanning SAXS experiments that were performed at dedicated synchrotron beamlines, which provide a small beam between 100 nm and 2 μm in diameter, high flux, high-end pixel detectors and a sample environment suitable for cell samples, e.g. ID13 at the ESRF and P10 PETRA III/DESY. I will summarize the most important results we recently obtained on different biological systems, such as components of the cytoskeleton and the DNA in the nucleus.

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