Seminar talk June 22nd, at 12 noon, small Max-Born-Hall

Dr. Andreas Menzel from the Paul Scherrer Institut

"X-Ray Ptychography"

Abstract:

More than a makeshift solution in response to the scarcity of efficient high-quality X-ray optics, ptychography is a coherent diffraction imaging technique that has found applications in materials science, the life sciences, and metrology. In its basic form, it comprises the use of a compact coherent probe to measure the diffraction pattern of part of an object and raster scanning that probe over the sample. In effect, this corresponds to sampling the object's spatial spectrogram by windowed (or "short-space") Fourier transforms. Whereas an analytic solution to the inversion problem exists in the form of the so-called Wigner distribution deconvolution, more relevant in praxis are iterative reconstruction techniques that allow for significantly sparser sampling.

Current applications of ptychography will be discussed, as will be recent algorithmic developments, which can yield, for instance, three-dimensional information, account for deviations from ideal measurement conditions, or determine certain types of dynamics. I will talk both about plans to take advantage of the drastically increased usable flux at upcoming sources and about related challenges. I will conclude with the expectation that coherent image retrieval will increasingly be adapted and that ptychographic techniques, amongst others, can and will be readily used to complement and enhance "established" X-ray imaging techniques.