

Making every electron count – Ptychography at low dose

Angus Kirkland^{1,2}

¹Department of Materials, Parks Road, Oxford OX13PH, UK

². The Rosalind Franklin Institute, Harwell Science and Innovation Campus, Didcot, OX110QS, UK

This talk will describe recent developments in the use of Electron Ptychography for studies of materials, including biological structures at low electron fluence.

Importantly for this application, ptychography is an inherently dose efficient technique, enabling effective phase reconstruction of radiation sensitive samples. I will particularly highlight recent developments in optimised scanning and data processing using machine learning for reductions in radiation damage and noise reduction in low fluence data sets.

In the life sciences Cryo-electron ptychography holds much promise particularly when used with a defocused probe to scan across a specimen with highly overlapped probe positions. This can be applied in a variant of conventional single particle analysis to provide 3D structures taking advantage of the known resolution variation of the effective ptychographic transfer function with convergence angle to provide wide spatial frequency bandwidth transfer. This geometry also allows datasets from wide fields of view to be collected that are suitable for studies of biologically relevant structures in a cellular context.

Finally Fourier Ptychography as an alternative data acquisition and processing strategy will be discussed.