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Soft X-ray Imaging by Coherent Diffraction Methods at the Australian Synchrotron

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Coherent diffractive imaging is a high-resolution method capable of providing phase, chemical and magnetic sensitivity over a large field-of-view[1]. Because iterative algorithms are substituted for image-forming lenses, the technique is not limited by the difficulty of manufacturing X-ray optics. It has been widely adopted by the international synchrotron community and is quickly becoming a routine imaging and tomography technique across a wide field of applications.

A flexible soft X-ray imaging facility was implemented at the Australian Synchrotron early in 2013 on a dedicated branch of the Soft X-ray Spectroscopy beamline[2]. In the first full year of operation, the Soft X-ray Imaging (SXRI) branchline has been used for a wide range of studies, including imaging fully hydrated, unstained mammalian cells, in situ spectrochemical imaging during electrochemical deposition, and for imaging the domain structure of magnetic thin-films. It has also been used to develop methods of ptychography and holography using partially spatially coherent and partially temporally coherent (polychromatic) illumination.

This talk will first briefly describe the imaging techniques supported at SXRI and the history of their development. Examples of research at SXRI will then be described to illustrate the wide potential for the development and application of these techniques.

1. NW Phillips, CT Putkunz, G van Riessen, HD Coughlan, MWM Jones, B Abbey, International Journal of Materials Research, 105, 655-663 (2014)
2. G van Riessen, M Junker, NW Phillips, AG Peele. Proc. SPIE 8851, 885117 (2013).

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Primary author: Dr VAN RIESSEN, Grant (La Trobe University)

Co-authors: Prof. PEELE, Andrew (Australian Synchrotron); Mr TRAN, Giang (La Trobe University); Dr JUNKER, Mark (La Trobe University); JONES, Michael (Australian Synchrotron)

Presenter: Dr VAN RIESSEN, Grant (La Trobe University)

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