Condensed Matter Physics Institute Seminar

13:00 | Friday 6th November | P/T/111

Exploring the chemistry and structure of materials on the single atom level in the electron microscope

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Modern aberration-corrected scanning transmission electron microscopes (STEMs) have been optimised to provide improved data collection ability and greater flexibility even at low acceleration voltages, spurring what could be arguably described as a new era in nano-scale materials characterisation. A wealth of complementary analytical signals is now available from a single experiment: when combining atomic resolution chemically-sensitive Z-contrast and bright field STEM imaging, 2D chemical mapping using analytical techniques such as electron energy loss spectroscopy (EELS) or energy dispersive X-ray spectroscopy (EDXS) together with advanced image analysis, it is possible to fully characterise minute chemical variations around nano-scale defects in materials, down to the single atom level. These in turn can be related to accurately measured atomic displacements and to the electronic properties of the material determined through theroretical calculations. There are further exciting times ahead, with the advent of ultra-high energy resolution monochromators, which are boosting the resolution of STEM-EELS into the sub 10meV range and are now opening the door to vibrational and phonon spectroscopy at unprecedentedly high spatial resolution.