Old Dominion University
Department of Physics

Colloquium

Tuesday, September 27, 2016

"Measuring local crystallographic and electronic structure in materials through atomic resolution electron microscopy"

Peter Nellist
Oxford University

Abstract: The interaction of electrons with matter has provided science with an invaluable tool to characterise materials. The scanning transmission electron microscope (STEM) has emerged as one of the preeminent tools for determining the crystallographic structure and local chemistry of materials at atomic spatial resolution, and is a remarkable instrument. It makes use of one of the brightest sources of radiation known to science. Correctors for the inherent spherical aberration of the imaging lenses allow for the incident electron wavefront to be controlled with picometer precision. High-speed pixelated detectors running at speeds up to 20,000 frames per second have just become available and allow angle-resolved electron scattering to be measured. X-rays, light and secondary electrons generated by the beam-sample interaction can be detected, and the energy-lost by the incident electrons measured at millielectron-volt energy resolution.

In this talk I will demonstrate how these capabilities can address a wide range of materials characterisation challenges. Examples will include determining the 3D structure of catalyst nanoparticles, determining the structure of complex carbon nanostructures, using optical sectioning to measure atomic displacements associated with dislocations, and the use of spectroscopy to investigate the electronic effects of dopants in graphene and the pressure of He bubbles in irradiated metals.

Presentation: OCNPS 200 @ 3:00 pm
Refreshments: OCNPS Atrium @ 2:30 pm

All interested persons are cordially invited to attend.