

MONASH CENTRE FOR ELECTRON MICROSCOPY

Comprehensive materials characterization at the nanoscale

Date: Wednesday January 22, 2025

Time: 11:00am – 12.00pm

Venue: S1, 16 Rainforest Walk, Clayton Campus

Abstract

Determining and utilizing the correlation of materials properties to the underlying atomic structure is at the core of materials science and solid state physics. While computational tools, such as density functional theory and its extensions to excited states, as well as molecular dynamics simulations are important in understanding these correlations, they can only be applied to existing materials if the precise positions of atoms in these materials are known, and if the materials properties can be linked directly to the relatively small number of atoms that can be handled by these techniques. Transmission electron microscopy provides access to both, the electronic and optical properties as well as the (3D) atomic structure on the nanometer scale. In this talk I will introduce recently developed methods and experimental results for determining the local atomic structure, as well as the dispersion of opto-electronic and vibrational properties of materials on the nanometer scale. This includes the utilization of dynamical (multiple) elastic electron scattering for reconstructing the local atomic structure at deep sub-Angstrom resolution, as well as the dispersion of phonon excitations, exciton polaritons or hybrid excitations of excitons and plasmons - all in inhomogeneous materials that cannot be treated as single crystals. In the talk I will also introduce a framework for collaborative research data management which facilitates joining and correlating this very diverse materials information.

Biography

Research Interests:

The research of the structure research and electron microscopy group focuses on the development of **new methods in quantitative (scanning) transmission electron microscopy and -spectroscopy** and their application to relevant materials science problems.

Short Biography:

- 1996 - 1997: Undergraduate studies at Heidelberg University (physics)
- 1997 - 1998: Exchange student at Arizona State University
- 1998 - 2002: PhD in physics at Arizona State University (Adv.: Prof. John C.H. Spence)
- 2002 - 2011: Postdoc at MPI for Metals Research, Stuttgart
- 2011 - 2015: Professorship (W3) at Ulm University, Dept. of Physics (endowed by Carl Zeiss Foundation)
- since 2015: Professorship (W3) at Humboldt-Universität zu Berlin, Dept. of Physics
- since 2020: Managing director of the Dept. of Physics at Humboldt-Universität zu Berlin

Convenor: Professor Laure Bourgeois

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