MOLECULAR FRONTIERS

CHALMERS
UNIVERSITY OF TECHNOLOGY

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Seeing the invisible: exploring the quantum nature of the nanoworld with electron (and photon) beams

Quantum effects manifest themselves when we dive into the infinitely small. Specific exotic effects emerge when the electrons of a material are confined due to the reduction of its size or its dimensionality. For example, one can create a superconducting sheet at the interface between two insulating materials or modify the properties of electrons by creating layers of materials with the thickness of an atom. Or, one can create single-photon emitters with applications in quantum information technology by just removing a single atom in an otherwise perfect crystal. Designing and understanding quantum materials for new technological applications requires powerful instrumentation to probe physical effects down at the atomic scale. In this talk, I will show how recent conceptual and instrumental advances in electron microscopy, and in particular the development of new spectroscopies combining photon and electron beams, enable an exciting exploration of the constantly diversifying array of quantum materials.

Odile Stéphan is a Professor of physics at Paris-Saclay University and an honorary member of the Institut Universitaire de France. She is currently the head of the Paris-Saclay University Physics Graduate Schools. Her research interests span from growth mechanisms to optical and electronic properties of various nanostructures and nanomaterials. She focuses on the development and the use of Electron Energy-Loss Spectroscopy in a Transmission Electron Microscope and derived innovative spectroscopy techniques to probe emerging physical phenomena at the nanometer and down to the atomic scale. Her contributions have been recognized by the French Physical Society Ancel Prize and the Belgian International Francqui Professor award. She served at Paris-Saclay University as the vice-president for research in the Physics Department and as the Head of the Electron Microscopy group in the Solid State Physics Laboratory.

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