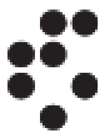

Jožef Stefan Institute
Ljubljana, Slovenia

K7 / Department for
Nanostructured Materials

# SEMINAR

**Tuesday, 03.10.2023, 13:00, Kolar's Lecture Hall**

## Flavours of electron ptychography

**Vinko Sršan**

Scanning transmission electron microscopy (STEM) is a powerful tool for investigating material properties at the atomic level. Conventional approaches to material characterization include diffraction, imaging and spectroscopy. Significant improvements in STEM capabilities were achieved after the development of aberration correctors and monochromators enabling better spatial and energy resolution, respectively. Although spatial resolution was dramatically increased, no dramatic changes to the detectors occurred until technology for direct electron detection was developed.

Implementation of direct electron detectors in STEM, where the whole diffraction pattern is recorded, facilitated the development of a new imaging technique - 4D STEM. A fundamental idea behind 4D STEM is a simultaneous acquisition of big data sets that are processed into distinct signals that uncover various physical material properties  resulting in high-resolution images of charge densities, magnetization, strain maps, light elements etc.

Among all signals arising from 4D STEM data sets, electron ptychography stands out with the highest recorded resolution while enabling probe and exit wave phase reconstruction.

In this seminar, the basic theory of electron ptychography will be introduced. On synthetic data sets generated through multislice simulation methodology, the advantage of electron ptychography over conventional imaging modes will be presented. The focus will be on the role of aberrations, sample thickness and computational complexity.

**Kindly invited.**