

WK7: High-resolution 3D X-ray Imaging

Organizers: Si Chen, Doga Gursoy, and Vincent de Andrade (Advanced Photon Source, Argonne National Laboratory)

Location: Bldg. 401, Room A1100

Many science areas have been revolutionized by the use of high-resolution x-ray tomography. Both the structural information and elemental/chemical or magnetic distribution can be revealed in 3D in a non-destructive fashion. These studies have been further advanced by combining tomography with the development of scanning nanoprobes and full-field systems like transmission x-ray microscopy (TXM) or projection microscopes, with spatial resolution routinely operated at sub-100 nm and expected to approach sub-10 nm in the case of coherent diffraction imaging techniques after the upgrade of the storage rings with the multi-bend achromat lattice at the APS and other light sources. As the spatial resolution approaches nanoscale, new challenges arise due to the limitations in various aspects, including instrument stability, measurement precision, rotation stage runout, and shallow depth of field of focusing optics. Both instrumentation and novel methods in data collection and processing are essential to realize the potential of high-resolution 3D imaging. This workshop will serve to strengthen collaborations among the synchrotron x-ray nano-imaging community to elevate high-resolution 3D x-ray imaging beyond demonstration stage and make it practical for routine user operations.

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| 8:30 | Opening Remarks |
| 8:40 | Evgeny Nazaretski (NSLS-II)
<i>Hard X-ray Imaging Approaching 10 nm Spatial Resolution: Instrumentational Challenges and Solutions</i> |
| 9:10 | Jan Garrevoet (Petra III)
<i>Spectroscopic X-ray Imaging at the Nanometer Length Scale</i> |
| 9:40 | Nestor Zaluzec (Argonne National Laboratory)
<i>Hyperspectral Imaging and Tomography using Electron-Optical Beam Lines</i> |
| 10:00 | Break |
| 10:30 | Yuan-Hung (Mike) Lo (University of California, Los Angeles)
<i>3D Coherent X-ray Diffractive Imaging of Biological Structures</i> |
| 11:00 | Mingyuan Ge (NSLS-II)
<i>Quantitative Analysis of Fluorescent Nanotomography and Recent Progress of the TXM Beamline at NSLS-II</i> |
| 11:30 | Ke Yuan (Argonne National Laboratory)
<i>Investigation of Metal-Mineral Interactions by Transmission X-ray Microscopy</i> |

- 12:00 Lunch
- 1:30 Young-Sang Yu (Advanced Light Source)
Three-dimensional Localization of Nanoscale Battery Reactions Using Soft X-ray Tomography
- 2: 00 Peng Li (University of Sheffield)
Ptychographic Tomography
- 2:30 Stefano Marchesini (Advance Light Source)
Ptycho-tomography: Algorithms and Challenges
- 3:00 Break
- 3:30 Junjing Deng (Argonne National Laboratory)
High-resolution Fast Ptychography with Photon-efficient Scanning
- 4:00 Vincent de Andrade (Argonne National Laboratory)
Fast X-ray Nano-tomography with Full-field Techniques
- 4:30 David Vine (Sigray)
Sigray Ultimxrmtm: Designing a Next-generation X-ray Microscope for On-demand Nanoscale Tomography