WORKSHOP #12

Multimodal and Multi-scale Bioimaging for Biomedical and Bioenergy Research

Organizers: Qun Liu (BNL Biology), Liguo Wang (BNL LBMS), Xianghui Xiao (BNL NSLS-II), Yong Chu (BNL NSLS-II), Yang Yang (BNL NSLS-II), Tim Paape (BNL Biology), Yuewei Lin (BNL CSI), Jun Liu (Yale U.), Sean McSweeney (BNL NSLS-II)

Multiple imaging capabilities are being developed at BNL for studying biological complexity across spatial and temporal resolutions which is a decadal grand challenge. These include X-ray microscopy at NSLS-II, optical light microscopy at CFN and Biology Department, and electron tomography at the LBMS cryo-EM facility. In addition, CSI is developing visualization and analysis algorithms and computational tools for the integration of multimodal and multi-scale imaging data to enable a quantitative understanding of the biological complexity such as brain and cancer imaging in humans and plant-pathogen/microbe interactions in bioenergy plants. This workshop brings together scientists to discuss how multimodal and multi-scale imaging techniques can be integrated to understand the biological complexity in life science and biopreparedness. The workshop will also discuss the latest methods and technologies from biological sample preparation and data acquisition to data analysis and interpretation to address urgent biological and biomedical questions. The workshop will be an opportunity to foster a bioimaging research community with expertise across disciplines and with inclusion, diversity, equity, and energy justice.

Thursday, April 27, 2023
Session I: Biomedical and Bioenergy Imaging Research

Start Time (ET)	Title	Speaker (Affiliation)
1:20- 1:30	Imaging Across Scales with Electrons and X-rays: Plans and Ideas at BNL	Sean McSweeney (Brookhaven National Laboratory)
1:30 – 1:55 pm	Multi-scale Analysis of Elements in Biology	Si Chen (Argonne National Laboratory)
1:55 – 2:20 p.m.	Revealing the Effect of Viruses in Host Cells by Soft X-ray Tomography	Venera Weinhardt (Heidelberg University)
2:20 – 2:45 p.m.	Electron Cryotomography of Cells: Progress and Potential	Grant Jensen (Brigham Young University)
2:45 – 2:55 p.m.	Break	
2:55 – 3:20 p.m.	Imaging Metals in Infected Plant-Microbe Tissues using XRF	Reena Sharma (Brookhaven National Laboratory)
3:20 – 3:45 p.m.	XRF Imaging as a Tool to Study Metal Transport and its Regulation in Plants	Olena Vatamaniuk (Cornell University)
3:45 – 4:10 p.m.	Single-cell Multi-scale and Multi-modality X-ray Imaging	Zihan Lin (Brookhaven National Laboratory)
4:10 – 4:30 p.m.	Discussion	
4:30 p.m.	Adjourn	

Friday, April 28, 2023
Session II: Technical and Computational Advances on X-ray, Optical, and Electron Bioimaging

Start Time (ET)	Title	Speaker (Affiliation)
1:30 – 1:55 p.m.	Minimal Structural Components of the SARS-CoV-2 Pore and Assembling Virions	Petr Chlanda (Heidelberg University)
1:55 – 2:20 p.m.	Multiparametric Single Molecule Technologies in Life Science and Beyond	Mircea Cotlet (Brookhaven National Laboratory)
2:20 – 2:45 p.m.	Unveiling the Dynamics of Single Particles in Complex Environments Using Time-resolved 3D Multi-resolution Microscopy	Tian Zhao (Princeton University)
2:45 – 2:55 p.m.	Break	
2:55 – 3:20 p.m.	Annotation-efficient Deep Learning for High-throughput Biological Discovery	Zhaozheng Yin (Stony Brook University)
3:20 - 3:45 p.m.	Physics-guided Machine Learning for Image-based Multi-material Decomposition from Dual-energy CT Scans	Murali Gopalakrishnan Meena (Oak Ridge National Laboratory)
3:45 – 4:10 p.m.	In Situ Architecture of a Parkinson's Disease-Related Lipid Transfer Protein	Shujun Cai (Yale University)
4:10 – 4:30 p.m.	Discussion	
4:30 p.m.	Adjourn	