

12th Annual FIB SEM Workshop

Monday, May 6th - Tuesday, May 7th, 2019

Science and Engineering Hall
George Washington University
Washington DC

Organizers

Nabil Bassim, McMaster University
Christine Brantner, George Washington University
Kenneth Livi, Johns Hopkins University
Keana Scott, National Institute of Standards and Technology

Sponsors



FIB SEM 2019 Agenda - Day 1

Monday, May 6th, 2019

Science & Engineering Hall, B1 Level

8:30 AM - 10:00 AM *Coffee & SIGN-IN*

Morning Session (Lehman Auditorium)

10:00 AM - 10:15AM **Welcome**

10:15 AM - 11:15 AM **TUTORIAL 1**
Introduction to Focused Ion Beam (FIB) Chip Circuit Edit
Steve Herschbein, Globalfoundries

11:15 AM - 11:30 AM ***Lucille A. Giannuzzi**¹, Paul A. Anazalone¹, Jiancun Rao², Wen-An Chiou², Tom Hoffman³, Mike McGee³, Joseph Girgis³, Jamie Ford⁴, Douglas M. Yates, Eric A. Stach⁴*
¹TESCAN USA, ²University of Maryland College Park, ³JEOL USA, ⁴University of Pennsylvania
[Xe⁺ PFIB Specimen Preparation for C_s-Corrected HRSTEM Imaging](#)

11:30 AM - 11:45 PM ***Suzy Vitale**¹, Joshua D. Sugar²*
¹Carnegie Institution for Science, Geophysical Laboratory ²Sandia National Laboratories, Livermore
[Samples of Unusual Size: TEM Preparation Using Xe PFIB](#)

11:45 AM - 12:00 PM *Matthias Kemmler, Andreas Rummel, Klaus Schock, **Andrew J. Smith**, Stephan Kleindiek*
Kleindiek Nanotechnik, Germany
[in situ TEM Lamella LiftOut for Backside Preparation - LO&Flip](#)

12:00 PM - 1:15 PM *LUNCH*

Afternoon Session (Lehman Auditorium)

1:15 PM - 1:30 PM ***P.G. Callahan**¹, J.C. Stinville¹, E.R. Yao¹, J. Shin¹, F. Wang¹, M.P. Echlin¹, M. De Graef², D.S. Gianola¹, T.M. Pollock¹*
¹University of California Santa Barbara, ²Carnegie Mellon University
[Observation of Dislocation Dynamics in a Nickel-Base Superalloy using Transmission Scanning Electron Microscopy](#)

1:30 PM - 1:45 PM ***Ioan Lascu***
Smithsonian Institution, National Museum of Natural History
[Unlocking geologic mysteries using mineral magnetism and FIB-SEM nanotomography](#)

1:45 PM - 2:00 PM ***Shawn Wallace***
EDAX
[Applications of CMOS-Based Imaging Sensors for High-Speed EBSD Mapping](#)

2:00 PM - 2:15 PM ***Laurie Palasse***
Bruker Nano GmbH
[Advanced 3D analysis of EBSD/EDS data with ESPRIT QUBE](#)

2:15 PM - 2:30 PM	<u><i>Matt Thorseth</i></u> , <i>Daria Monaenkova</i> , <i>Will Edsall</i> , <i>Matt Benedict</i> Dow Chemical, Analytical Sciences 3D Surface Reconstruction using FIB-SEM Imaging and Open-Source Software
2:30 PM - 3:15 PM	COFFEE BREAK
3:15 PM - 3:30 PM	<u><i>S. Ali Shojaee</i></u> Thermo Fisher Scientific Five Phase Segmentation of FIB-SEM Images of Layered Oxide Cathode for Li-ion Batteries
3:30 PM - 3:45 PM	<i>Benjamin Provencher</i> ¹ , <i>Nicolas Piché</i> ¹ , <u><i>Mike Marsh</i></u> ² ¹ Object Research Systems, Montreal, ² Object Research Systems, Denver Real-time Automatic Image Processing and Image Segmentation for FIBSEM Nanotomography
3:45 PM - 4:00 PM	<u><i>Scott P. Lockledge</i></u> Tiptek Improved Transfer Needles for Manipulation of FIB-formed Lamellae
4:00 PM - 4:15 PM	<i>Zachary A. Giannuzzi</i> ¹ , <i>Kathleen A. Gehoski</i> ² , <i>William J. Mahoney</i> ² , <u><i>Lucille A. Giannuzzi</i></u> ¹ ¹ EXpressLO, ² Pennsylvania State University 3D-Printed Lift Outs For EXLO/INLO Practice and Training
4:15 PM - 4:30 PM	<u><i>Joel Mancuso</i></u> , <i>Kirk J. Czymmek</i> ZEISS Research Microscopy Solutions ZEISS Targeted Tomography - Correlative Microscopy enables a High Content Cryo Workflow
4:30 PM - 4:45 PM	WRAP-UP DAY 1
5:00 PM - 7:00 PM	Happy Hour at CIRCA at Foggy Bottom (within 1 block from Science & Engineering Hall)

FIB SEM 2019 Agenda - Day 2

Tuesday, May 7th, 2019

Science & Engineering Hall, B1 Level

7:30 AM - 9:00 AM *BREAKFAST*

Morning Session (Lehman Auditorium)

9:00 AM - 9:15 AM *B. Winiarski*^{1,2}, *B. Van Leer*³, *G. Pyka*¹, *R. Geurts*⁴, *S.J. Randolph*³
¹Thermo Fisher Scientific, Brno, ²University of Manchester, U.K., ³Thermo Fisher Scientific, Hillsboro, ⁴Thermo Fisher Scientific, Eindhoven
[Advances in Multi-ion FIB-SEM for 3D Correlative Microscopy](#)

9:15 AM - 9:30 AM *S. Hummel*¹, *P. Frank*¹, *S. Andany*², *J. Sattelkov*³, *R. Winkler*³, *G. Hlawacek*⁴, *G.E. Fantner*², *H. Plank*³, *C.H. Schwalb*¹
¹GETec Microscopy GmbH, Vienna, Austria, ²Laboratory for Bio and Nano-Instrumentation, Institute for Bioengineering, EPFL, Switzerland, ³Institute for Electron Microscopy and Nanoanalysis, Graz University of Technology, Austria, ⁴Helmholtz Center Dresden, Germany
[In-Situ Correlative AFM/SEM/FIB analysis ion-beam treated samples](#)

9:30 AM - 9:45 AM *P. Parlanti*^{1,2}, *A.W. Oaks*², *C.A. Brantner*¹, *A.S. Popratiloff*^{1,2}, *M.C. Manzini*²
¹Department of Pharmacology and Physiology and Integrative Systems Biology, George Washington University, ²Nanofabrication and Imaging Center, George Washington University
[Correlative workflow from fluorescence to 3D ultrastructural reconstruction of intracellular organelles via FIB-SEM imaging](#)

9:45 AM - 10:00 AM *C. Clarkson-Paredes*^{1,2}, *A. Popratiloff*¹, *R.H. Miller*²
¹Nanofabrication and Imaging Center, George Washington University, ²Department of Anatomy and Regenerative Biology, George Washington University
[Discovering the Snail Cells in the Wounded Adult Brain](#)

10:00 AM - 10:15 AM *Christelle Guillermier*¹, *Fouzia Khanom*¹, *Jean Nicolas Audinot*²
¹Carl Zeiss, SMT, ²Luxembourg Institute of Science and Technology (LIST)
[In situ correlative Secondary Electron and elemental imaging on the ZEISS ORION NanoFab](#)

10:15 AM - 11:00 AM *COFFEE BREAK*

11:00 AM - 12:00 PM **TUTORIAL 2**
FIB-SEM imaging: a 3-D window into cell biology at the nanoscale
Kedar Narayan, NCI/NIH & Frederick National Laboratory for Cancer Research

12:00 PM - 1:30 PM *LUNCH & POSTER SESSION*

John Notte, *Brett Lewis*
Carl Zeiss SMT
[Thermal Effects of Light Ion Beams in Thin Films](#)

Peng Dong¹, Ali Allahverdi², Hui Yuan¹, Nabil D. Bassim¹
¹McMaster University, ²Iran University of Science and Technology
Plasma Focused Ion Beam Microscopy to Reveal Pore Characteristics of OPC Mortar

Christopher W. Schankula¹, Christopher K. Anand¹, Nabil D. Bassim²
¹Department of Computing and Software, McMaster University,
²Department of Materials Science and Engineering, McMaster University
Accelerated Algorithm for Plasma Focused Ion Beam Curtaining Artifact Correction

C. Wong, A. Knights, N. Bassim, M. Vuk, D. Hagan
McMaster University
FIB Applications in Silicon Photonics

Weiwei Zhang, Lis Melo, Adam P. Hitchcock, Nabil Bassim
McMaster University
Beam damage by Xe plasma FIB and SEM imaging studied by scanning transmission X-ray microscopy and heat transfer simulation

Julie C Savage^{1,2}, Sammy Weiser Novak³, Marie-Eve Tremblay^{1,2}
¹Centre de Recherche du CHU de Québec-Université Laval, ²Département de médecine moléculaire, Université Laval, ³Salk Institute for Biological Sciences
Imaging and Reconstructing Microglia in 3 Dimensions Using FIB-SEM

Mark McLean, Brian Bush, Will A. Osborn
Material Measurement Laboratory, National Institute of Standards and Technology
Electron Beam Induced Deposition of Pt and W for HR-EBSD Backgrounds

Rajaprakash Ramachandramoorthy¹, Jakob Schwiedrzik¹, Laszlo Petho¹, Damian Frey², Jean-Marc Breguet², Johann Michler¹
¹Laboratory for Mechanics of Materials and Nanostructures, EMPA, Thun, Switzerland, ²Alemnis AG, Thun, Switzerland
Dynamic plasticity of fused silica micropillars

Afternoon Session (Lehman Auditorium)

1:30 PM - 1:45 PM Jamil J. Clarke¹, Yoshihisa Orai², Xin Man³, Tsuyoshi Onishi²
¹Hitachi High-Technologies America, ²Hitachi High-Technologies Corp.,
³Hitachi High-Tech Science Corp.
Site-specific Atom Probe Tomography Sample Preparation Method by Orthogonal FIB-SEM Column Layout

1:45 PM - 2:00 PM I. Martin, H. Francois Saint Cyr, K.P.Rice, Y.Chen, T.J. Prosa
CAMECA Instruments
Revisiting the Atom Probe Specimen Preparation by Ion Milling

2:00 PM - 2:15 PM Jiancun Rao¹, Sz-Chian Liou¹, Nancy Rizzo², Wen-An Chiou¹
¹AIM Lab, Maryland NanoCenter, University of Maryland, ²Leica Microsystems
Application of Cryo-FIB/SEM Technology in Materials Research

2:15 PM - 2:30 PM S. Norris, N.D. Bassim

Department of Materials Science and Engineering, McMaster University
[Characterization of Gallium and Xenon Ion Beam Damage](#)

2:30 PM - 2:45 PM

[A.V. Steele](#)¹, [Andrew Schwarzkopf](#)¹, [J. J. McClelland](#)², [B. Knuffman](#)¹
¹zeroK NanoTech, ²National Institute of Standards and Technology
[Cs+ Ion Source for FIB and SIMS](#)

2:45 PM - 3:00 PM

BREAK

3:00 PM - 4:00 PM

TUTORIAL 3
Nano Patterning Concepts & Factors Affecting the Limits of FIB-SEM Beam Control
[Mike Phaneuf](#), [FIBICS](#)

4:00 PM

WRAP-UP