(/MandM/2021/)

Microscopy and Microanalysis (M&M) Meeting Updates

View the Proceedings for M&M2021 (https://msaproceedings.org/)

Presentations will be available July 28 - September 7. Plenary sessions, recorded platform sessions, and poster presentations will be available until September 7, 2021. **Registration is open until September 1, 2021.**

(https://ww2.eventrebels.com/er/Registration/StepRegInfo.jsp?ActivityID=33581&StepNumber=1&v=OGIwOGY2NWItMDExOC00MWRmLTkwZjgtYTBhZTA3N2VjZmEw)

M&M Meeting Update as of July 28, 2021

The M&M meeting is around the corner, and we can't wait to see you all virtually! Our program chairs and symposium organizers have arranged for a spectacular meeting this year, featuring a fantastic lineup of plenary speakers—although we've had an unexpected change, details below, a robust scientific program, and excellent opportunities to interact with exhibitors and colleagues. We encourage you to explore the website and learn more about what awaits you during M&M 2021!

For the **Life Science Plenary Session (https://www.microscopy.org/MandM/2021/program/plenary.cfm#life)**, we must unfortunately announce that Dr. Kizzmekia Corbett is no longer able to participate. However, Dr. Corbett's close collaborator, Dr. Jason McLellan, will still present on his contributions to the COVID-19 vaccines. We are pleased to also announce that Dr. Barney Graham, Deputy Director of the NIH Vaccine Research Center and mentor to both Dr. Corbett and Dr. McLellan, will join us on August 2. He and Dr. McLellan will host a fireside-style chat, discussing their work and answering audience questions.

You can submit your questions **here (https://bit.ly/MM2021QA)** ahead of time, or ask during the Q&A, which will be moderated by Elizabeth Wright, program chair and Henry Lardy Professor of Biochemistry at the University of Wisconsin-Madison.

If you have any questions, please do not hesitate to **contact us (https://www.microscopy.org/MandM/2021/contact.cfm)**. Again, we thank you for your patience, continued support, and understanding in these circumstances. Continue to stay safe and well.

Sincerely,

Peter Crozier, President, Microscopy Society of America
Heather Lowers, President, Microanalysis Society
Elizabeth Wright, M&M 2021 Program Chair

Registration is Now OPEN

CLICK HERE TO REGISTER (https://www.microscopy.org/MandM/2021/registration/index.cfm)

The Virtual Meeting is Now OPEN

Join Virtual Meeting (https://www.eventscribe.net/2021/MandM2021/)

Virtual Exhibit Hall Hours (https://www.eventscribe.net/2021/MandM2021/SearchByExpoCompany.asp?pfp=Browse%20By%20Company)

The Virtual Exhibit Hall and Product Showcase is available until September 7, 2021. Booth representatives are no longer available for video chats, but information can still be requested in the booth listing.

(https://www.microscopy.org/)

(http://www.microbeamanalysis.org/)

11130 Sunrise Valley Drive, Suite 350, Reston, VA 20211 – Tel: (703) 234-4115 – Fax: (703) 234-4147

Email: Association Management (mailto:AssociationManagement@microscopy.org) – Terms of Use (/terms.cfm)

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Full Symposium Descriptions

- Analytical Sciences Symposia
- Biological Sciences Symposia
- Physical Sciences Symposia

Analytical Sciences Symposia

A01 - Diffraction Imaging Across Disciplines

ORGANIZERS:
Andrew Minor, Professor of Materials Science and Engineering, Facility Director of the National Center for Electron Microscopy, Molecular Foundry, Lawrence Berkeley National Laboratory
Jose Rodriguez, Department of Chemistry & Biochemistry, University of California, Los Angeles

Recent advancements in STEM and electron nanobeam technologies allow micron scale mapping of repeat structures to image complex samples with nanometer resolution. These advances take advantage of fast electron detectors to collect diffraction patterns that facilitate the accurate structural analysis of atomic order across materials, including low-Z materials that often present substantial challenges. The scope of problems interrogated by these approaches is broad, ranging from naturally occurring biomaterials to functional and complex microstructures. This symposium will bring together the computational, materials, chemical and biological microscopy communities to discuss recent developments in the broad fields of electron diffraction, diffractive nanoimaging,

and cryoEM to facilitate the study of varied materials, both hard materials studied with high resolution 4D-STEM and materials not typically suited for high resolution structural analysis.

INVITED SPEAKERS

- Koji Yonekura, RIKEN Spring-8 Center, Tohoku University
- Kayla Nguyen, Univerisity of Illinois, Urbana Champaign
- Robert Bucker, University of Hamburg
- Christian Kubel, KIT
- Paul Voyles, University of Wisconsin
- Xiaodong Zou, Stockholm University
- Colin Ophus, Lawrence Berkeley National Laboratory
- Joanna Etheridge, Monash University

A02 - Advances in Focused Ion Beam Instrumentation, Applications and Techniques in and Materials and Life Sciences

ORGANIZERS:

Suzy Vitale, Carnegie Institution for Science

Annalena Wolff, Queensland University of Technology

Joshua Sugar, Sandia National Laboratories

The objective of this symposium is to provide an overview of recent developments of focused ion beam instrumentation, as well as a platform for FIB users to share and discuss novel applications and techniques across multiple scientific disciplines. Our focus will be on innovative approaches to imaging, sample preparation, fabrication, and analytics that go beyond conventional methods in materials and life sciences, and the research that drives these new applications.

INVITED SPEAKERS

- Kirsten Blagg, Colorado School of Mines
- Matthias Schmidt, Helmholtz Centre for Environmental Research
- Joesph R. Michael, Sandia National Laboratories

A03 - Microscopy and Microanalysis for Real World Problem Solving

ORGANIZERS:

Ke-Bin Low, BASF Corporation

Xiaofeng Zhang, Nanosys Inc.

Jeremy Beebe, Dow

Abigail Lindstrom, NIST

Microscopy and microanalysis of real world samples present special challenges. Non-ideal samples may not lend themselves to established methodologies for preparation and analysis. Sample amounts and background information about the material and the problem may be limited, and the time frame for producing results may be very short. This symposium will focus on ways in which biologists, physical and materials scientists develop unique and creative solutions for sample preparation, data acquisition and analysis, providing meaningful results to solve problems in the real world.

INVITED SPEAKERS

- Ruthmara Corzo, NIST
- Stan Petrash, Henkel
- John Foltz, ATI Metals
- Luci Sheridan, Wolfspeed
- Nan Yao, Princeton

A04 - New Frontiers in In-Situ Electron Microscopy in Liquids and Gases (L&G EM FIG Sponsored)

ORGANIZERS:

Huolin Xin, University of California, Irvine

Wei-Chang D. Yang, NIST

Stephen House, University of Pittsburgh

New developments in electron microscopy (EM) instrumentation now enable the observation and measurement of nanoscale processes in liquid and gas environments for in situ/operando studies. These studies, performed at high spatial resolution and under various stimuli such as heat, electric fields, and reactive liquid/gas environments, can provide fundamental insight into the structure, chemistry, and functionality of materials and biological molecules in their native or working conditions. This in-week symposium sponsored by the MSA Electron Microscopy in Liquids and Gases (EMLG) Focused Interest Group will provide a platform for communicating technical challenges and practical knowledge associated with capturing dynamic processes in liquids or gases with EM. We will also draw attention to new approaches and emerging technologies in data acquisition and analysis, focusing on the horizon of the field and discussing future roadmaps that may lead there.

INVITED SPEAKERS

- See Wee Chee, Fritz-Haber-Institut der Max-Planck-Gesellschaft
- Reza Shahbazian-Yassar, University of Illinois, Chicago
- Peter Crozier, Arizona State University
- Bob Sinclair, Stanford University
- Patricia Abellan, Institut des MatÃ©riaux Jean Rouxel, CNRS
- Eric Stach, University of Pennsylvania
- Kinga Unocic, Oak Ridge National Laboratory
- Haimei Zheng, Lawrence Berkeley National Laboratory
- Xiaoqing Pan, UC Irvine

A05 - Advances in Analytical STEM-in-SEM

ORGANIZERS:
Jason Holm, National Institute of Standards and Technology
Dagmar Gerthsen, Karlsruhe Institute of Technology
Hendrix Demers, Hydro-Québec, Center of Excellence in Transportation Electrification and Energy Storage

STEM-in-SEM is attracting significant interest from diverse groups, due to advances in hardware (e.g., pixelated programmable electron detectors, aberration correction, energy loss spectrometers) and methodology (e.g., 4-D STEM, ?-scan dark-field orientation mapping, ptychography, phase contrast imaging, etc.) that are both adaptable to and/or designed specifically for SEM. This symposium will provide an opportunity to discuss advances in instrumentation, simulation methods, analytical techniques, and imaging and diffraction applications that enable materials characterization with transmitted electrons in an SEM. Emphasis will be on new techniques and those that push the boundaries of low voltage scanning transmission microscopy. Target attendees include scientists, engineers, and lab technicians working in materials science, metallurgy, nanotechnology, geology, and biology.

INVITED SPEAKERS

- Milena Hugenschmidt, Karlsruhe Institute of Technology (KIT)
- Nicolas Brodusch, McGill University
- Robert Keller, NIST
- Ilona MÃ¼llerovÃ¡, Institute of Scientific Instruments CAS
- Andras Vladar, NIST

- Erdmann Spiecker, University of Erlangen-Nuremberg
- Luyang Han

A06 - Full System and Workflow Automation for Enabling Big Data and Machine Learning in Electron Microscopy

ORGANIZERS:

Andrew Barnum Barnum, Thermo Fisher Scientific

Joerg Jinschek, Ohio State University

Wouter Van den Broek, Humboldt University of Berlin

Cutting-edge research in life science and materials science, in industry and academia requires not only state-of-the-art instrumentation, but also innovative approaches to integrating digital science with system, workflow and data analysis automation. Over the past several years, a critical mass of new computing and microscope technologies has formed, poised to enable revolutionary changes in data collection and analysis using both fully automated microscopes and feedback loops as well as machine learning approaches. This symposium will feature recent progress towards creating complete automation workflows ranging from sample preparation through to data correlation and reporting, including system integration with experiment automation and data analysis, methodology for abstracting user-microscope interaction, and the use of novel methods to provide on-line feedback of system parameters.

INVITED SPEAKERS

- Steven Spurgeon, Pacific Northwest National Laboratory
- Uri Manor, Salk Institute
- Christoph Gatel, CEMES
- Auralee Edelen, SLAC
- Andrew Wagner, Intel

A07 - Vendor Symposium

ORGANIZERS:

Jay Potts, University of South Carolina

Lena Kourkoutis, Cornell University

This symposium is a forum for vendors to highlight important breakthroughs in technology and methodology developed by companies working at the cutting edge of microscopy, microanalysis, and image processing. It covers new instrumentation, technologies and

methods that advance all fields of microscopy and microanalysis for both physical and biological sciences. It will provide an open forum for the exchange of ideas and best practices.

A08 - Data Management, Version Control, and Multiformat Analysis in Electron Microscopy

ORGANIZERS: Josh Sugar, Sandia National Laboratories

Suzy Vitale, Carnegie Institution for Science

Joe McKeown, Lawrence Livermore National Laboratory

Microscopy labs have the difficult task of storing and managing image, spectrum, and diffraction data in multiple dimensions, which fills several terabytes of drive space after only months of operation. The ability for multiple users to (re)analyze that data, while keeping track of the original raw data and using multiple proprietary file formats, is a challenging problem that needs innovative solutions. The goal of this symposium is to provide a forum where new ideas can be presented on how to solve these data management issues, including storage, transfer, version control, analysis, and proprietary formats that are incompatible on multiple platforms.

INVITED SPEAKERS

- Xiaowei Jia, University of Pittsburgh
- Mike Marsh, Object Research Systems (ORS)

A09 - Moon dust, Minerals and Microscopy

ORGANIZERS:

Kate Burgess, U.S. Naval Research Laboratory

Michelle Thompson, Purdue University

Jessica Barnes, University of Arizona

The analysis of earth and planetary materials through microscopy and other microanalytical techniques is fundamental to improving our understanding of the formation and evolution of Earth and other planets across the solar system. These techniques are especially important in the wake of renewed interest in returning to the Moon, and past, present, and future sample return missions to other planetary bodies. The proposed session solicits papers focused on state-of-the-art sample analysis and preparation techniques for terrestrial and extraterrestrial materials.

INVITED SPEAKERS

- Jennika Greer, University of Chicago
- Romy Hanna, University of Texas, Austin
- Timmons Erickson, Johnson Space Center
- Sarah Valencia, Goddard Space Flight Center

A10 - Unresolved Challenges in Quantitative X-ray Microanalysis

ORGANIZERS:

Aaron Torpy, CSIRO Mineral Resources, Clayton, Australia
Nick Wilson, CSIRO Mineral Resources, Clayton, Australia
Hendrix Demers, Hydro-Québec's Center of Excellence in Transportation Electrification and Energy Storage, Varennes, Canada
Aurélien Moy, Department of Geoscience, University of Wisconsin-Madison, Madison, WI, USA

X-ray spectrometry was developed over a century ago (Bragg, 1914), and its use in quantitative microanalysis is entering its 7th decade (Castaing, 1951). In the intervening years, x-ray microanalysis has developed into an enormously powerful analytical technique, with the ability to detect the elements from Li to Pu, quantify their abundance with ppm precision, and do so with spatial resolution ranging from the micro- to atomic scales. This symposium will discuss the current challenges in x-ray microanalysis, and explore approaches to further improve the resolution, sensitivity, reliability, applicability, and practicality of the technique.

INVITED SPEAKERS

- Xavier Llovet, Universitat de Barcelona
- Nicholas Ritchie, NIST
- Colin MacRae, CSIRO
- Philipp Pöml, European Commission - Joint Research Centre
- Heather Lowers, USGS

A11 - Portable- and Laboratory-based Approaches to Analysis in Cultural Heritage

ORGANIZERS:

Thomas Lam, Smithsonian Institution, Museum Conservation Institute, Suitland, MD
Barbara Berrie, National Gallery of Art, Washington, DC

Scientific analysis of heritage objects is critical to learning about the technologies used for their manufacture and providing information about their meaning to previous cultures. It involves analysis of the macro/microstructure and the distribution of chemical phases within objects. This knowledge informs their conservation and public exhibition, and increases our understanding of other cultures. A range of portable and laboratory approaches for non-destructive or minimally invasive techniques is available. This symposium explores the applications and results obtained using different analytical instruments through invited and contributed presentations from students, conservators, conservation scientists, and other interested researchers in the field.

INVITED SPEAKERS

- Edward Vicenzi, Smithsonian Institution
- Andrea Centrone, National Institut of Standards and Technology (NIST)
- Aaron Shugar, Bufffalo State College
- Admir Masic, Massachusetts Institute of Technology (MIT)
- Alice Knaf, Yale University
- Joan Walker, National Gallery of Art (NGA)

A12 - Microscopy and Microanalysis of Biomineralized and Biomimetic Materials and Structures

ORGANIZERS:

Kenneth Livi, Johns Hopkins University

Sue Okerstrom, Lichen Labs LLC

Nature builds functional systems with a handful of materials that have emergent properties at different scales. Calcite crystals form both the self-sharpening teeth sea urchins grind into rock and armor protection on exoskeletons of some ants. Organic molecules are assembled to produce structural color in butterfly wings and peacock feathers, super-hydrophobic lotus leaves, low friction sharkskin, and super-adhesive gecko's feet. In addition, minerals grown with biological influence are important archives of Earth history and offer new frontiers for materials biomimicry research. Microscopy and microanalysis are important in characterizing material structure and chemistry to elucidate biomineralization mechanisms and the processes responsible for properties emergent on the macroscopic scale. This symposium aims to bring together analysts from broad perspectives to share successes and difficulties of measurement of both hard and soft materials from natural, biomimetic, or engineered materials utilizing a variety of radiation sources and detection systems.

INVITED SPEAKERS

- Ali Dhinojwala, University of Akron
- Ming Xiao, Harvard
- Deyanira Cisneros Lazaro, EPFL (École polytechnique fédérale de Lausanne)
- William Murphey, University of Wisconsin

Biological Sciences Symposia

B01 - 3D Structures: From Macromolecular Assemblies to Whole Cells (3DEM FIG)

ORGANIZERS:

Melanie Ohi, University of Michigan Life Sciences Institute

Teresa Ruiz, University of Vermont

Cheri Hampton, UES, Inc., AFRL/RXAS Wright-Patterson Air Force Base

William Rice, NYU Langone Health

Our understanding of the 3D structure and functional subtleties of complex biological systems has skyrocketed due to recent advances in EM imaging technology and hybrid methodologies. This symposium will highlight structural studies of macromolecules, microorganisms, cells, and tissues using state-of-the-art high-resolution techniques. These techniques include single particle cryo-EM, cryo-electron tomography, helical reconstruction, STEM; AFM, X-ray crystallography, and molecular modeling. Biological topics of interest include: cellular architecture, metabolism, trafficking, communication, and division; gene regulation, transcription, and translation; host-pathogen interactions and virus structure; In situ studies using TEM and SEM, and all aspects of structure-function studies of biological assemblies.

INVITED SPEAKERS

- Pamela Bjorkman, Caltech
- Wei Dai, Rutgers University
- Min Xu, Carnegie Mellon University
- Micah Rapp, Columbia University
- Natalie Strynadka, University of British Columbia
- Willy Wriggers, Old Dominion University

B02 - Cryo-electron Tomography: Present Capabilities and Future Potential

ORGANIZERS:

Grant Jensen, Caltech

Yi-Wei Chang, University of Pennsylvania

Danielle Grotjahn, Scripps Research Institute

Matt Swulius, Penn State College of Medicine

In the last several years cryo-electron tomography (cryo-ET) has made it possible to visualize large macromolecular assemblies inside intact cells in a near-native, "frozen-hydrated" state in 3-D to a few nanometers resolution. Increasingly, atomic models of individual proteins and smaller complexes obtained by X-ray crystallography, NMR spectroscopy, or other methods can be fit into cryotomograms to reveal how the various pieces work together inside cells. A few good cryotomograms is therefore sometimes all that is really needed to distinguish between competing models. The range of cellular samples that cryo-ET can inspect is dramatically expanding to both larger and smaller objects, and its power is being amplified by correlated light and electron microscopy (CLEM) targeting. Further technical advances are making cryo-ET faster and higher resolution. Symposium speakers will show examples of current results and technical developments expanding the power and applicability of the method.

INVITED SPEAKERS

- Martin Pilhofer, ETH Zurich
- Alex de Marco, Monash University
- Muyuan Chen, Baylor College of Medicine
- Julia Mahamid, EMBL
- Jun Liu, Yale University

B03 - From Images to Insights: Working with Large Multi-modal Data in Cell Biological Imaging

ORGANIZERS:

Kedar Narayan, NIH/NCI & FNL

Cam Robinson, St. Jude Children's Research Hospital

Jonathan Lefman, nvidia

"So, you've collected these massive multi-modal image data sets. Now what?" Biological imaging is producing ever larger data sets but is also quickly becoming multi-modal, with disparate imaging technologies being often utilized. Yet the ability to handle and analyze these data often lags far behind, especially in smaller labs and core facilities. Appropriate integration and correlation of disparate data streams at various scales, and portability of automated solutions remain daunting. This symposium aims to address issues and solutions stemming from large and multi-modal image data in cell biology, including image processing, correlation, segmentation/visualization and analysis, especially in the context of open-source options.

INVITED SPEAKERS

- Christian Tischer, EMBL
- Gerard Kleywegt, EBI
- Wei-Chung Lee, FM. Kirby Neurobiology Center, Harvard Medical School, Boston Children's Hospital
- Bryan Jones, Moran Eye Center, University of Utah
- Josh Moore, University of Dundee

B04 - Michael Rossmann Memorial Symposium

ORGANIZERS:

S. Saif Hasan, Department of Biochemistry and Molecular Biology, University of Maryland school of Medicine, Baltimore MD

Terje Dokland, Department of Microbiology, University of Alabama at Birmingham, Birmingham AL

Michael G. Rossmann was a pioneer in the field of structural biology. His contributions to X-ray crystallography and application of hybrid methods to electron microscopy revolutionized biomolecular structure determination. Michael pushed the boundaries of structural biology by developing methodologies such as the molecular replacement method and determining some of the first structures of entire viruses. Michael published nearly 600 papers during a career that spanned over half a century. This symposium will feature talks by researchers who likewise develop and apply cutting-edge structural biology approaches to the study of viruses, viral proteins, enzymes and other systems.

INVITED SPEAKERS

- Hao Wu, Harvard Medical School
- Rui Zhao, University of Colorado School of Medicine

- Chuan (River) Xiao, University of Texas El Paso

B05 - Imaging, Microscopy, and Micro/Nano-Analysis of Pharmaceutical, Biopharmaceutical, and Medical Health Products — Research, Development, Analysis, Regulation, and Commercialization (FIG associated)

ORGANIZERS:

Daniel Skomski, Merck & Co. Inc.

Annie Muske-Dukes, Thermo Fisher Scientific

This symposium, sponsored by the Pharmaceuticals Focused Interest Group (FIG), will present diverse content related to the research, development, manufacture, and use of pharmaceuticals, medical products, and devices. The intent is to connect subject matter experts dealing with the application of microscopy, imaging, and micro/nano-analysis towards problems of interest to the pharmaceutical, biopharmaceutical, medical, device, and health fields. In-depth technical presentations will address the unique problems that arise during drug discovery and development, method development and optimization, vaccine research, formulation, biocompatibility, production, product life cycle management, and eventual patient use. Addressed topics in the research include material design and properties, physiochemical characterization (actives, excipients, contaminants, small molecule/large molecule/intermediate, polymorphs, particles), product performance, pharmacology, manufacturing, failure modes, biocompatibility, stability, shelf-life, sterility, etc. Also of interest is an understanding of regulations and data integrity concerns as applied to the pharmaceutical industry. Vendors and service providers are encouraged to submit abstracts which describe the use of their technologies as they apply to pharmaceutical industry problems.

INVITED SPEAKERS

- Dan Fu, University of Washington
- Shawn Zhang, DigiM Solution LLC
- Youlong Ma, USFDA

B06 - Multi-Modal Multi-Dimensional Microscopy

ORGANIZERS:

James Fitzpatrick, Washington University School of Medicine

Xiao-Ying Yu, Pacific Northwest National Laboratory

Si Chen, Argonne National Laboratory

Ben Giepmans, University Medical Center Groningen, Groningen, NL

Microscopy has evolved from a disparate set of imaging approaches to a cohesive array of tools used to investigate both the structure and dynamic function of complex systems. However, to comprehensively elucidate both spatial and dynamic aspects, it has become necessary to combine multiple imaging modalities. Innovations in correlative microscopy have led to advancements in both soft materials and biomedical research. This symposium aims to highlight technical innovations in sample preparation, handling and transfer of cryo specimens in correlative imaging workflows and instrument hardware development along with novel applications of CLEM, volume EM, analytical spectroscopy / SIMS and X-Ray imaging & analysis, including big-data management and artificial intelligence-based analysis pipelines.

INVITED SPEAKERS

- Vivian Merk, Florida Atlantic University
- Tanja Ducic, Alba Synchrotron Light Source
- Tom Wirtz, Luxemborg Institute for Science and Technology
- Jennifer Lippincott-Schwartz, HHMI Janelia Research Campus

B07 - Challenges and Advances in Electron Microscopy Research and Diagnosis of Diseases in Humans, Plants and Animals (FIG associated)

ORGANIZERS:

Claudia Lopez, Oregon Health & Science University

Marcela Redigolo, West Virginia University

Ru-Ching Hsia, University of Maryland

Han Chen, Penn State

This symposium covers diverse content related to the research and diagnosis of diseases in human, animal and plants. The application of microscopy techniques to study genetic, metabolic or infectious diseases faces many challenges including specimen preservation, preparation, data collection and analysis. Often these workflows are specific to the tissue type or model. Importance is placed on techniques and protocols developed to use on both research and clinical laboratories. Presentations generally address the unique challenges related to the use of advanced microscopy to the detection and diagnosis of a disease. Target attendees include scientists from all levels of bio-imaging expertise and related backgrounds.

INVITED SPEAKERS

- Bingyun Li, West Virginia University

- Jonathan Franks, Univ. of Pittsburgh
- Justin Taraska, NHLBI, NIH
- Zuzana Tatarova, Oregon Health & Science University
- Cynthia Goldsmith, Centers for Disease Control and Prevention
- Jeffrey Caplan, Univ. Delaware
- Yongxin (Leon) Zhao, Carnegie Mellon Neuroscience Institute
- Kristina Micheva, Stanford University

B08 - Cryo-EM in Drug Discovery

ORGANIZERS:
Leah Frye, Schrodinger
Giovanna Scapin, NanoImaging Services
Christel Verboven, Thermo Fisher Scientific

Recent advances in cryo-EM technology have resulted in the ability to obtain structures of pharmaceutically relevant proteins with atomic level resolutions in a timely fashion. Importantly, cryo-EM greatly expands the availability of structures for large protein assemblies and membrane bound proteins which have been difficult to access via X-ray crystallography. This symposium will focus on the use of cryo-EM in drug discovery. Presentations will describe projects utilizing cryo-EM structures to drive structure-based drug discovery efforts for the optimization of potency and selectivity, including selectivity against ADMET targets, in projects from both industrial and academic groups.

INVITED SPEAKERS

- Matthew Franklin, Regeneron Pharmaceuticals, Inc.
- Sarah Hymowitz
- Corey Strickland

B09 - To fix or not to fix? A question for biological samples

ORGANIZERS:
Alice Dohnalkova, Pacific Northwest National Laboratory
Gail Celio, University of Minnesota

Whether we use a robust, time-honored chemical fixation or advanced cryo-preparation methods, it's important to define the desired information before we embark on specimen preparation for light and/or electron microscopy. It could be an urgent, high-throughput imaging stream, or the quest for obtaining the absolute value and ultrastructure. We need

to make decisions that will produce the best results for the project outcome. So regardless if you reach for a microwave or a Dewar, we invite you to discuss the pros and cons with us, and share your optimized sample preparations and meaningful results that worked for you.

INVITED SPEAKERS

- Doug Keene, Shriners Hospitals for Children
- Elaine Humphrey, University of Victoria
- DeAna Grant, University of Missouri

B10 - Cryo-EM at local, regional, and national cryo-EM centers

ORGANIZERS:
Claudia Lopez, Oregon Health & Science University and Pacific North West CryoEM Center (PNCC)
Elizabeth Wright, University of Wisconsin-Madison
Clint Potter, New York Structural Biology Center and National Center for CryoEM Access and Training (NCCAT)

This symposium covers diverse content related to the access of cryoEM technology by novice and advanced practitioners. Over the past decades, scientific manuscripts presenting cryoEM data have been growing at a fast pace. With the installation of cutting-edge microscopes all over the globe, this technology is booming. Nevertheless, scientific researchers are struggling to access such instrumentation due to elevated costs and/or lack of adequate training. In the United States, use of this technology has increased largely to the creation of NIH-funded cryoEM/ET centers which include instrument access, hands-on training and learning materials. Across the globe, similar national and international centers have been established to meet the demand for access to cryoEM/ET instrumentation and expertise. In this symposium, importance is placed on user experience and scientific advances obtained at these cryoEM/ET centers. Presentations will also address the unique challenges related to the use of advanced microscopy. Target attendees include scientists from all levels of expertise and related backgrounds.

INVITED SPEAKERS

- David Bhella, University of Glasgow
- Irina Novikova, Pacific Northwest cryoEM Center
- Eric Hanssen, The University of Melbourne
- Corey Hecksel, Stanford-SLAC Cryo-EM Center

- Christina Zimanyi, National Center for CryoEM Access and Training
- Andreas Hoenger, University of Colorado Boulder
- Farzad Jalali-Yazdi, Oregon Health & Science University
- Elizabeth Wright, University of Wisconsin-Madison
- Gira Bhabha, NYU School of Medicine

B11 - Frontiers in Fluorescence Lifetime and Super-resolution Imaging of Biological Structures and Dynamics

ORGANIZERS:

Michelle Digman, University of California Irvine

Matthew Lew, Washington University in St. Louis

Kevin Welsher, Duke University

Andreas Gahlmann, University of Virginia

Fluorescence lifetime imaging microscopy (FLIM) and super-resolution microscopy (SRM) have become powerful tools in bioimaging to map protein interactions or identify environmental conditions of fluorescent probes through fluorophores' excited state lifetimes or emission properties. Recently there have been remarkable developments in bioimage FLIM data analysis, use of patterned excitation light, and feedback for SRM with single nanometer resolution, as well as imaging the emission spectra and/or orientation of fluorophores for probing hydrophobicity and chemical composition. This symposium features the newest developments in FLIM and SRM combined with novel biological applications across cancer, neurodegeneration, and cellular and molecular biophysics.

INVITED SPEAKERS

- Suliana Manley, École polytechnique fédéÃ©rale de Lausanne
- Scott Howard, University of Notre Dame
- Rupsa Datta, Morgridge Institute for Research; University of Wisconsin-Madison
- Francisco Balzarotti, Research Institute of Molecular Pathology

Physical Sciences Symposia

P01 - Advanced Imaging and Spectroscopy for Nanoscale Materials Characterization

ORGANIZERS:

Lin Zhou, Ames Laboratory

David Cullen, Oak Ridge National Laboratory

Ping Lu, Sandia National Laboratories

Multimodal imaging and spectroscopy provide an unprecedented opportunity for materials characterization by using a combination of high-speed, high-sensitivity detectors and spectrometers. The chemistry and structure of crystals, interfaces, and defects down to the atomic-scale can now be directly determined under proper experimental conditions. Such capabilities offer a unique perspective to understand the structure-property relationships and pave the way towards material functionality manipulation from the atomic scale. This symposium is intended to facilitate the exchange of information on the latest developments, challenges, and outlooks in the application of advanced imaging and spectroscopy methods on resolving structures and chemistry in various materials systems, including metals, oxides, and semiconductors.

INVITED SPEAKERS

- Hongbin Yang, Rutgers University
- Katie MacArthur, Forschungszentrum, Jülich
- Sean Collins, University of Leeds
- Quentin Ramasse, SuperSTEM Laboratory
- Peter Crozier, Arizona State University
- Sophia Betzler

P02 - Many Detectors Make Lights Work: Advances in Microanalysis of Light Elements in Synthetic and Natural Materials

ORGANIZERS:

Anette von der Handt, University of Minnesota

Jed Mosenfelder, University of Minnesota

Owen Neill, University of Michigan

Jamie Weaver, National Institute of Standards and Technology

Measurement of light elements (hydrogen through fluorine, Z=1-9) presents unique challenges not encountered when measuring elements Z > 9, but is nonetheless critical for a variety of applications, across a range of disciplines. Various techniques are available (WDS, EDS, EELS, SIMS, FTIR, neutron activation, etc.), all with their own advantages and disadvantages. Sample preparation is often a critical component for its analytical success.

This symposium will highlight advances in the measurement of light elements in the materials, energy, biological and natural sciences. Presentations showcasing new technologies for the detection of light elements, improvements to existing methods, and old and new methods to analyze light elements are all welcome.

INVITED SPEAKERS

- Maitrayee Bose, Arizona State University
- Christopher Marvel, Lehigh University
- Charles Titus, Stanford University

P03 - Exploring Beam-sample Interactions for Uncovering the Atomic or Dynamic Nature of Matter

ORGANIZERS:

Joe Patterson, University of California, Irvine

Stig Helveg, Technical University of Denmark

Jennifer Cookman, University of Limerick

In high resolution electron microscopy objects are actively altered by the intense electron beam irradiation. For the accurate and precise measurement of a structure or process, it is essential that the role of the electron beam is interpretable or negligible. This symposium welcomes contributions from those that exploit the electron beam to deliberately initiate or modify a structure or process or obtain an understanding of a structure or process by imaging below a damage threshold. Contributions are especially encouraged for new theories, experimental set-ups, data collection and image processing.

INVITED SPEAKERS

- Fu-Rong Chen, City University of Hong Kong
- Heiner Friedrich, TU Eindhoven
- Dwayne Miller, University of Toronto
- Demie Kepaptsoglou, SuperSTEM
- Qian Chen, University of Illinois Urbana-Champaign
- Matthew Boebinger

P04 - Emerging Low-Dimensional Nanomaterials and Their Heterostructures

ORGANIZERS:

Moon Kim, University of Texas at Dallas

Zonghoon Lee, Ulsan National Institute of Science and Technology (UNIST) / Institute

for Basic Science (IBS)

New materials and devices can lead to disruptive advances in nano-electronics, energy, and environmental sectors. For example, carbon-based materials and devices have made significant progress, and yet still more need to be accomplished. The recent advent of 2D TMDs and MXenes is stimulating new applications in many new areas. This symposium focuses on analytical transmission electron microscopy techniques, aberration-correction, spectroscopy, and in-situ methods to characterize these emerging low dimensional materials of interest. Presentations are sought from the areas of various forms of carbon, other novel nanomaterials, and their heterostructures.

INVITED SPEAKERS

- Kwanpyo Kim, Yonsei University
- Myung-Geun Han, Brookhaven National Lab
- Toshihiro Aoki, UC Irvine

P05 - Evaluation of Materials for Nuclear Applications

ORGANIZERS:
Mukesh Bachhav, Idaho National Laboratory
Assel Aitkaliyeva, University of Florida
Jing Wang, Pacific Northwest National Laboratory

The response of fuels and materials to radiation is critical to the performance of advanced nuclear systems. Key to understanding material performance in a nuclear environment is the microstructural characterization of materials irradiated using test reactors and ion beam facilities. This symposium will focus on recent results produced from irradiation programs around the world and advances made in microscopy, with an emphasis on application of latest-generation methods of microscopy and microanalysis such as atom probe tomography, transmission electron microscopy, aberration-corrected microscopy, transmission Kikuchi diffraction, plasma FIB, advanced data analytics, scanned probe microscopy and nano-mechanics, in situ microscopy, and other new methods.

INVITED SPEAKERS

- Charlyne Smith, UF
- Andrew London, UKAEA
- Kevin Field, Umich
- Elizabeth Kautz, PNNL

- Kayla Yano, PNNL
- Madhavan Radhakrishnan, UNM
- Casey McKinney, ORNL
- Khalid Hattar, SNL

P06 - Defects in Materials: How We See and Understand Them

ORGANIZERS:

Jinwoo Hwang, The Ohio State University

Tyler Grassman, The Ohio State University

Honggyu Kim, University of Florida

Controlling defects in next-generation materials is crucial as they critically affect the materials' important properties. Investigating atomic to nanoscale defects, however, poses significant challenges due to the small size and often elusive nature of those defects. The role of modern electron microscopy in determining atomic to nanoscale defects has become more important than ever as it provides both spatial and time resolution unmatched by others. This symposium will focus on recent studies investigating static and dynamic nature of atomic to nanometer scale defects that directly govern the emergent properties of a broad range of new generation electronic, functional, and structural materials.

INVITED SPEAKERS

- Randi Holmestad, NTNU
- Ryo Ishikawa, University of Tokyo
- Huolin Xin, University of California Irvine
- Yuanyuan Zhu, University of Conneticut
- Kunal Mukherjee, Stanford University
- Pinshane Huang, University of Illinois Urbana Champaign
- Antonius van Helvoort, NTNU
- Nasim Alem, Penn State University
- Julia Deitz

P07 - Quantum Materials Probed by High Spatial and Energy Resolution in Scanning/Transmission Electron Microscopy

ORGANIZERS:

Nasim Alem Alem, Penn State University

Mary Scott, University of California Berkeley

This symposium will focus on the recent advancements in probing nanostructures and quantum materials using high energy and/or spatial resolution in Scanning/Transmission electron microscopy. By bringing together imaging and spectroscopy at high spatial and energy resolutions, this symposium aims to directly connect the role of structure to local properties and further uncover their underlying physics and chemistry. This symposium includes recent advancements in high resolution imaging of the defects and interfaces in nanostructures and their relaxation effects, probing their local chemical/electronic structure, understanding the phonon and plasmon resonances at the defects, interfaces, and surfaces in nanostructures, and studies of topological, skyrmionic, superconducting and other quantum materials.

INVITED SPEAKERS

- Mathieu Kociak, Université Paris-Sud
- Judy Cha, Yale University
- Juan Carlos Idrobo, Oak Ridge National Lab
- Lena Kourkoutis, Cornell University
- Matthieu Bugnet
- Maureen Joel Lagos

P08 - Advanced Characterization of Components Fabricated by Additive Manufacturing

ORGANIZERS:

Isabella van Rooyen, Idaho National laboratory

Subhashish Meher, Idaho National Laboratory

Federico Sciammarella, MXD USA

Contributions are invited from researchers developing or leveraging advanced characterization methods for understanding of components fabricated by additive manufacturing (AM) techniques. The second edition of this symposium is intended to be an information exchange forum for cutting-edge microscopy and microanalysis techniques to assess the microstructural design aspects of existing materials and novel materials by various AM method types.

INVITED SPEAKERS

- Bharat Gwalani, Pacific NorthWest National Laboratory
- P. Chris Pistorius, Carnegie Mellon University
- Jeffrey King, Colorado School of Mines
- Peter Hosemann, University of California Berkeley
- Lingfeng He

P09 - Nanoscale x-ray and Electron Microscopy Techniques and Applications in Material Science

ORGANIZERS:

Xianghui Xiao, Brookhaven National Laboratory

Hanfei Yan, Brookhaven National Laboratory

Huolin Xin, University of California, Irvine

A material's chemical and physical properties are closely related to its structural and compositional variations at atomic and nanometer scales, while at the device level, a system's performance depends on the interactions amongst its components. Therefore, a characterization tool suite that can cover multiple length scales is critically important to the material science community. The proposed symposium will cover both techniques and applications of two types of ubiquitous microscopy modalities, electron and x-ray microscopy. The emphasis focuses on utilizing the combined characterizations to reveal the correlations between the fundamental material properties and system-level properties.

INVITED SPEAKERS

- Yijin Liu, SLAC National Accelerator Laboratory
- Philip Withers, The University of Manchester
- Yuzi Liu, Argonne National Laboratory
- Eric Stach, University of Pennsylvania

P10 - Investigating Phase Transitions in Functional Materials and Devices by In Situ/Operando TEM

ORGANIZERS:

Michele Conroy, University of Limerick

Trevor Almeida, Université Grenoble Alpes, CEA, LETI

Leopoldo Molina-Luna, TU Darmstadt

Judy Cha, Yale

The possibility to control phase transitions in functional materials and devices within the TEM provides fundamental insight into dynamic, localised processes that were previously inaccessible. The development of in-situ TEM capabilities (heating, biasing, cooling, magnetic fields, etc.) and their combination with advanced TEM techniques (phase-related, spectroscopy, 4D-STEM etc.) enables operando studies to characterize the physical properties of materials at the highest resolution while simultaneously measuring their functional performance. These innovative investigations provide a wealth of information that opens a plethora of opportunities to study functional materials and devices in a range of new applications. This proposed symposium invites in-situ (S)TEM experiments that utilise not only applied stimulus via in-situ TEM holders, but also controlled electron-beam-induced transitions. The main goal is to bring together experimental and theoretical TEM researchers that employ a range of in-situ/operando methods to understand the fundamental physics governing the nano- to atomic-scale phase transitions of functional materials and devices.

INVITED SPEAKERS

- David Cooper, University of Grenoble • CEA LETI
- Andras Kovacs, Forschungszentrum Juelich GmbH
- Sadegh Yazdi, University of Colorado Bolder
- Miaofang Chi, Oak Ridge National Laboratory
- Andrew Minor, Berkeley National Laboratory
- Qian Chen, University of Illinois at Urbana-Champaign
- Lena Kourkoutis, Cornell University
- Martial DuChamp, Nanyang Technological University
- Frances Ross, MIT
- Xiaoqing Pan, University of California Irvine
- Mitra Taheri, John Hopkins

P11 - Fast and Ultrafast Dynamics Using Electron Microscopy

ORGANIZERS:

Ilke Arslan, Argonne National Laboratory, Center for Nanoscale Materials

David Flannigan, University of Minnesota, Dept. of Chemical Engineering and Materials Science

Pietro Musumeci, University of California, Los Angeles, Physics Dept.

This symposium will focus on advances in the study of fast and ultrafast physical, chemical, and materials dynamics (structural, electronic, and magnetic) with scanning and transmission electron microscopy instrumentation and methods. In addition to communicating technology developments and the new scientific advances resulting from ultrafast electron microscopy (UEM) experiments, a goal of this symposium is to stimulate discussions on future directions of fast and ultrafast EM and to foster the formation of new collaborations and exciting emerging research directions within the community.

INVITED SPEAKERS

- Renske van der Veen, University of Illinois at Urbana-Champaign
- June Lau, NIST
- Yimei Zhu, Brookhaven National Lab
- Ido Kaminer, Technion - Israel Institute of Technology

P12 - Microscopy & Spectroscopy of Energy Conversion and Storage Materials

ORGANIZERS:
Lianfeng Zou, Pacific Northwest National Laboratory
Katherine Jungjohann, Sandia National Laboratories
pengfei yan, Beijing University of Technology, China
Michael Zachman, Oak Ridge National Laboratory

A rich variety of electron, X-ray, and neutron imaging, diffraction, spectroscopy, and tomography techniques have become powerful tools for enabling multimodal characterization of nanomaterials related to energy conversion and storage. This symposium focuses on the developments of advanced techniques and their applications in studying the physical and chemical properties, phase transitions, degradation mechanisms, and electronic and mass transport of energy-related materials. Ex situ (post mortem), in situ (exposed to external stimuli), and operando (under synthesis/working/processing conditions) characterizations of batteries, solar energy, nuclear energy, fuel cells, thermoelectrics, ferroelectrics, piezoelectrics, and catalysts are of interest for this symposium.

INVITED SPEAKERS

- Matthew McDowell, Georgia Institute of Technology
- Zewen Zhang, Stanford University
- Shirley Meng, University of California San Diego
- Chongmin Wang, Pacific Northwest National Laboratory

- Huolin Xin, University of Irvine
- Jianyu Huang, Yanshan University
- Joshua Vincent, Arizona State University
- Raymond Unocic, Oak Ridge National Laboratory
- Lena Kourkoutis, Cornell University

P13 - Advanced Application of Atom Probe Tomography: Specimen preparation, Instrumentation, and Data analysis

ORGANIZERS:

Daniel Perea, Pacific Northwestern National Labs, Richland, Washington, USA

James Douglas, Dept of Materials, University of Oxford, Oxford, UK

Daniel Haley, Dept of Materials, University of Oxford, Oxford, UK

Atom probe tomography (APT) continues to be an invaluable analytical technique to provide near-atomic scale 3D composition and structure mapping in metallic and semiconductor systems. However, new advancements in specimen preparation, experimental protocols and instrumentation, and data analysis are allowing a broader scope of application to previously unexaminable material systems. Complementary analytical microscopy and spectroscopy techniques and emerging tools for advanced specimen preparation, such as plasma-FIB, provide new avenues for sample processing, but also pose new challenges. Additionally, traditional methods for analyzing APT data are often insufficient to resolve ambiguities (e.g. convolution of mass peaks) or extract desired information from datasets to allow the best utilization of the acquired data.

This symposium will focus broadly on the latest developments related to specimen preparation, hardware and instrumentation, as well as computation and data analysis that enable advance characterization, material design, and discovery within novel and emerging material system.

INVITED SPEAKERS

- Jeramy Zimmerman, Colorado School of Mines
- Ingrid McCarrol, University of Sydney
- Jonathan Houard, Univ. Rouen
- Charles Fletcher, Oxford
- Tong Li, University of Bochum
- Frederick Meisenkothen, National Institute of Standards and Technology

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Plenary Speakers

- **Physical Science Plenary Speakers**
- **Life Science Plenary Speakers**

Physical Science Plenary Speakers

2020 Kavli Awardees

The 2020 Kavli Prize in Nanoscience was awarded to Maximilian Haider, Ondrej Krivanek, Harald Rose, and Knut Urban for sub-ångström resolution and chemical analysis using electron beams.

Read the press release. (/news/pr_070621-PhysicalScience.pdf)

Ondrej Krivanek, PhD

Ondrej Krivanek is a physicist of Czech and British nationality, resident in the United States. Born in Prague, he moved to the UK in the late 1960s where he obtained a degree at the University of Leeds, before moving to Cambridge to work on his PhD in electron microscopy with Archie Howie.

After Cambridge, Krivanek had postdoctoral positions in Kyoto, at Bell Labs and at UC Berkeley. During his time in Berkeley he became interested in electron energy loss spectroscopy and built his own spectrometer. He became an assistant professor and associate director of the NSF HREM Facility at Arizona State University in 1980, and at the same time started collaborating with Gatan Inc., first as a consultant, before moving permanently to the company and becoming its R&D director.

In 1995 he went back to Cambridge with a grant from the Royal Society to work with Mick Brown and Andrew Bleloch on aberration correction of electron lenses. His advances enabled him and Niklas Dellby to start Nion Co. in 1997, a company of which he is still president. With Niklas Dellby and IBM's Phil Batson, he obtained sub-ångström resolution with a scanning transmission electron microscope, with the results published in 2002.

Ondrej Krivanek is one of the major experts in electron microscopy and electron energy loss spectroscopy. He has received several awards, including the Duddell Medal and Prize of the British Institute of Physics, and the Cosslett Medal from the International Federation of Microscopy Societies. He is a fellow of the Royal Society, the Institute of Physics, the Microscopy Society of America, and of the American Physical Society, and an honorary fellow of the Royal Microscopical Society.

Life Science Plenary Speakers

COVID-19 Vaccine Developers

Read the press release. (/news/pr_070621-LifeSciences.pdf)

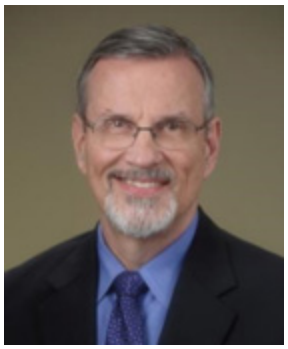
Barney Graham, M.D., Ph.D.

Deputy Director, Vaccine Research Center
Chief, Viral Pathogenesis Laboratory and Translational Science Core

Dr. Graham serves as Deputy Director of the NIAID Vaccine Research Center and assists the Director in establishing and focusing the scientific direction for the VRC as a premier intramural research organization. As Chief of the Viral Pathogenesis Laboratory, Dr. Graham also leads the development efforts for COVID-19 vaccines and universal influenza vaccines. In addition, he supports VRC product development through strategic advice on vaccine design as well as pre-clinical and clinical evaluation.

Dr. Graham is an immunologist, virologist, and clinical trials physician whose primary interests are viral pathogenesis, immunity, and vaccine development. His laboratory is focused on respiratory viral pathogens, pandemic preparedness, and emerging viral diseases. He applies structural biology, protein engineering, and other new technologies to create vaccines for unmet needs and emerging threats advancing the principles of precision vaccinology. He has been involved in the clinical evaluation of candidate vaccines for more than 30 years and has an ongoing interest in science education and expanding research opportunities for underrepresented minorities.

After graduating from Rice University in 1975, he obtained his MD from the University of Kansas School of Medicine in 1979. From 1979 to 1984 he served as intern, resident, and chief resident in internal medicine and from 1984 to 1986 was a clinical fellow in infectious diseases. He earned a PhD in microbiology and immunology at Vanderbilt University School of Medicine in 1991 and then rose to the rank of professor of medicine with a joint appointment in the department of microbiology and immunology. At Vanderbilt, Dr. Graham directed an R01-funded laboratory focused on RSV pathogenesis and was head of the Vanderbilt AIDS Vaccine Evaluation Unit, one of the original sites for the international clinical trials network funded by NIH designated for evaluating candidate HIV vaccines. In 2000, Dr. Graham was recruited as one of the founding investigators for the VRC.



Jason McLellan, PhD

Jason McLellan earned a BS in chemistry with an emphasis in biochemistry from Wayne State University in Detroit, Michigan. Afterward, he obtained his PhD from the Johns Hopkins University School of Medicine in Baltimore, Maryland in the laboratory of Dr. Daniel Leahy. He then carried out postdoctoral research at the National Institutes of Health's Vaccine Research Center in the laboratory of Dr. Peter Kwong and in collaboration with Dr. Barney Graham. In the Fall of 2013, he joined the faculty at the Geisel School of Medicine at Dartmouth in the Department of Biochemistry, and in January 2018 he moved his laboratory to the University of Texas at Austin and became a member of the Department

of Molecular Biosciences. His lab is interested in elucidating the molecular mechanisms of hostâ€“pathogen interactions and leveraging the resulting information for the development of vaccines and immunotherapies. Jason's laboratory has been working collaboratively with others to understand the structure and function of coronavirus spike proteins. They have leveraged this information to design novel vaccine antigens that are in four out of the five leading COVID-19 vaccine candidates. Jason's group rapidly determined the cryo-EM structure of the SARS-CoV-2 spike protein and used that information into the design of second-generation spikes that are more stable and express better than initial variants. His work highlights the importance of basic science research prior to pathogen emergence and demonstrates how structure-based design can be used to rapidly produce vaccine antigens.

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Pre-Meeting Congresses

X60 — Annual Pre-Meeting Congress for Students, Post-Docs, and Early Career Professionals in Microscopy & Microanalysis (/MandM/2021/program/congress_x60-2021.cfm)

Organized by the Microscopy Society of America Student Council (StC)

X61 — Contemporary Electron Microscopy Advances in Biomedical Research (/MandM/2021/program/congress_x61-2021.cfm)

This PMC will no longer be held in conjunction with the M&M 2021 Virtual meeting

X62 — Recent Developments in Advanced Imaging and Spectroscopy (/MandM/2021/program/congress_x62.cfm)

Organized by the MSA Aberration-Corrected Electron Microscopy Focused Interest Group

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Microscopy Outreach Sessions

X91: Microscopy Explorations for Families and Kids of All Ages

(formerly "Family Affair")

Organizers:

Elaine Humphrey, University of Victoria, Canada

Pat Connelly, National Institutes of Health

Please check back on the M&M 2021 website ("Scientific Program" – "Outreach") for updated information about this session.

X92: Project MICRO

Organizers:

Elaine Humphrey, University of Victoria, Canada

Janet Schwarz, University of Vermont

Pat Connelly, National Institutes of Health

The Outreach booth is part of the MSA Megabooth and is available every day the exhibit hall is open. Learn how to set up different stations in a classroom and share your fun microscopy outreach classroom experiences! See different microscope systems in action for use in a classroom; peruse a selection of books suitable for elementary school-age children; and put your name into the draw for a daily door prize.

X94: STEM Roundtable: Building Skills for the Future

Organizer:

Lori Harvey, Hitachi High Technologies America

We will explore how to integrate varied resources to have broader, sustainable impacts in STEM education, including bridging K-12 outreach with undergraduate and graduate education, and emphasizing the importance of diversity and inclusion which will lead to a stronger workforce for everyone. In response to education changes in 2020, ***The HTA Inspire STEM Education Outreach Program*** has put forth a plan to provide an opportunity to make quality in-person and virtual experiences easily accessible to teachers as they create the classrooms of tomorrow now. The program is continuing its work with local, national, and international partners to provide flexible access to easy to use content and technology that can be used in the following learning scenarios: *Brick to Click Learning, Click to Brick Learning , Blended Learning and Online Learning*.

Session is open to all — no separate registration fee required.

Participants are welcome from the following areas: Academia, Education, all levels of Government, Business/Industry, and change leaders within Science, Technology, Engineering, and Math sectors.

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Sunday Short Courses

Sunday, August 1, 2021

- **All short courses start at 8:30 AM and end by 5:30 PM.**
- **Separate registration fee required — see registration form.**
- **A certificate of attendance will be emailed to each participant.**

X-12 Guidelines for Performing 4D-STEM Characterization from the Atomic to >Micrometer Scales: Experimental Considerations, Data Analysis and Simulation

LEAD INSTRUCTORS:

David Muller, Cornell University

Colin Ophus, Lawrence Berkeley National Laboratory

With modern electron detector technology, it is now possible to record full images of a converged STEM probe while scanning it over the sample surface, resulting in a 4D-STEM dataset. Because the atomic-scale scattering information contained in an atomic-scale STEM probe is decoupled from the step size between STEM probe positions, 4D-STEM can be used for experiments ranging from sub-Angstrom resolution phase contrast imaging to statistical characterization of functional materials over large length scales. In this course, we will give tutorials on how to perform 4D-STEM experiments, analyze the (potentially very large!) resulting datasets, and perform 4D-STEM simulations.

X-15 Data Analysis in Materials Science

LEAD INSTRUCTORS:

Eric Prestat, University of Manchester and SuperSTEM Laboratory, United Kingdom

Joshua Taillon, National Institute of Standards and Technology

This short course will introduce the use of HyperSpy and related Python libraries (atomap, pixStem, pyXem) for analysis of microscopy datasets. No prior Python knowledge is required. Attendees will learn how to perform basic machine learning, multi-dimensional curve fitting for EELS and EDS quantification, atomic resolution image analysis and big data processing (such as 4D STEM) on desktop computers.

For this hands-on and interactive short course, attendees will need to install software on their own laptop in advance and bring it with them to the short course (instructions will be provided).

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Physical Sciences Tutorials

X41 - Entrepreneurship in the Microscopy Community

Several entrepreneurs from the microscopy community will be in attendance for a round table Q&A with tutorial attendees on topics including, but not limited to:

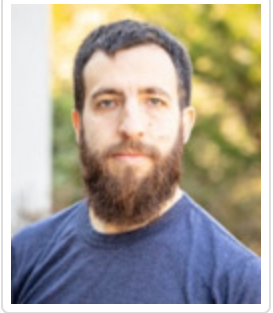
- Instrumentation development and commercialization
- Practical steps to take when starting your own microscopy based business
- Panel discussion on business start-up best practices
- Role of local affiliated microscopy societies in bringing microscopists and businesses together

X42 - Probing Ultralow Energy Excitations at Ultrahigh Spatial Resolution with Monochromated Electron Energy Loss Spectroscopy

PRESENTER:

Dr. Jordan A. Hachtel, *Oak Ridge National Laboratory*

- Introduction to monochromated EELS
- Alignment and tuning in a monochromated Nion UltraSTEM
- Different types of monochromated EELS experiments: Aloof EELS, off-axis EELS, momentum-resolved EELS
- Post-acquisition processing and analysis of ultralow-loss EELS data



Jordan Hachtel is a staff scientist at Oak Ridge National Laboratory. His research focuses on applications of ultralow-loss monochromated EELS to optical, biological, and quantum materials. Beyond this wide class of applications, he has also focused on using novel techniques, unique to ultralow-loss EELS, to access new aspects of the nanoscale infrared response in such systems.

X43 - X-Ray Imaging & Computed Tomography

PRESENTERS:

Tara Selly, *Assistant Professor of Research, Univ. of Missouri*

Jim Schiffbauer, *Associate Professor, Geological Sciences, Univ. of Missouri*

- Introduction to X-Ray microscopy and computed tomography
- How spot size, detector pixel size and geometrical magnification affect resolution
- Reconstruction strategies for isosurface determination
- Example applications in the geological sciences

Biological Sciences Tutorials

X44 - Cryo-EM Structure Determination of Small Proteins

PRESENTER:

Dr. Deb Kelly, *Professor of Biomedical Engineering, Pennsylvania State University*

- Isolating proteins from COVID-19 patients
- Affinity-capture using alternative substrates
- Low-dose Image Acquisition in Milli-seconds (LIAM)
- Reconstructing small proteins (~50 kDa range)

Dr. Kelly's research focuses on innovative approaches to study biological systems, ranging from human viruses to cancer. Central to their work is high-resolution imaging, primarily cryo-Electron Microscopy (EM). Dr. Kelly's team has developed a tunable microchip toolkit to study low-molecular weight proteins at high-resolution. Using these new tools, they expect to determine strategic insights for "Structural Oncology" applications.

X45 - Traversing Spatial Scales with Correlative Microscopy

PRESENTER:

James A.J. Fitzpatrick, Ph.D., *Scientific Director, Center for Cellular Imaging, Professor of Neuroscience and Cell Biology & Physiology, Washington University School of Medicine.*

- Introduction to Multi-Modal imaging and concept of Correlative Microscopy
- Discussion of current CLEM, CXREM and Cryo-CLEM methods

- Practical use of different algorithms for correlating multi-modal data
- Examples of Correlative Microscopy in Studies of Disease Pathogenesis

James Fitzpatrick is a Professor at Washington University School of Medicine in St. Louis and the inaugural Scientific Director of the Center for Cellular Imaging. His research focuses on the development and application of multi-modal correlated imaging approaches and AI-based image analysis methods to study the pathogenesis of cancer and neurodegenerative disease.

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Technologists' Forum

X30 - Technologists' Forum Roundtable: Histology Helpline

ORGANIZERS:

Page Baluch, *Arizona State University*

Ben Gonzalez, *Arizona State University*

- Where to find answers to technical questions
- Available networks to find laboratory or clinical experts
- Where to get advice when shopping for laboratory equipment
- How to find labs that provide specialized histological/lab services

X31 - Technologists' Forum Roundtable: Technical Careers in Microscopy — PhD Not Required

ORGANIZERS:

Page Baluch, *Arizona State University*

Richard Martens, *UES Inc.*

- There are many careers in advanced analytical and scientific fields that do not require a PhD.
- Learn about careers from professionals that entered the microscopy community with skills and expertise garnered from previous employment, effective networking and military service
- Commercial technical careers in microscopy include instrument technicians, service engineers, applications, sales, marketing and account managers
- Gather advice that can help in pursuing a new or different career path

X32 - Technologists' Forum Workshop — Technique Tips: Special Stains and Serial Sectioning

ORGANIZERS:

Page Baluch, *Arizona State University*

Ru-Ching Hsia, *University of Maryland*

- Training in the use of special stains is usually provided on the job but not as part of a formal training program so many technicians feel unprepared
- Learn new techniques using serial sectioning and array tomography
- Learn about stains that are common in quantification-based research
- This session will be useful to histologists at all levels by providing protocols and technical advice regarding techniques in special stains and serial sectioning/array tomography

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For Authors & Presenters

The M&M 2021 submission portal is now CLOSED.

Please whitelist or mark this email (**mmspeakers@conferencemanagers.com (mailto:mmspeakers@conferencemanagers.com)**) as a safe sender so you can receive all official communications from Meeting Management! Don't let it get caught in spam!

Click on the appropriate link below for more information:

- **Platform Presenters**
- **Poster Presenters**

For Platform Presenters

This year, we will be using an online presenter portal, which is designed with tasks specific to our speakers. We have provided you with Log In information that allows you to log on to your individual profile and complete your required tasks. Please log on and complete your tasks by the due date indicated.

Access Presenter Portal (https://www.conferenceharvester.com/harvester2/login.asp?EventKey=WLEZBHLZ)

All platform presentations will be pre-recorded and available in the virtual platform for attendees to view. Attendees will have the opportunity to ask questions while watching your presentation video through a text chat Q&A box. The conference schedule is in eastern time zone.

Presentation Recording Options

This year, our virtual platforms tasks make it easier for speakers to record and upload their presentations. You have 2 Options for recording your presentation video. You will choose **ONLY ONE** of the options and complete those tasks only.

OPTION 1 - If your presentation slides DO have slide animations or embedded videos, you will need to record your presentation via Zoom, PowerPoint, or other recording options, then you will upload your video file into the task (instructions below in the Task section).

Each presentation will be presented/available as individual videos. Below are the instructions for recording your presentation for **OPTION 1**.

- You will need to record both your video (face) or audio (if you don't want to be on video for your presentation) along with your presentation slides, in 1 combined video. We are not able to accept *separate* video and slide uploads – they must be combined.
- Your presentation video time limit is listed in your presenter portal, under the Presentation Information section.
- You can easily record your presentation with Microsoft PowerPoint, Zoom or Apple Keynote.

- Your final video file will need to be in the .MP4 format, and MUST be **UNDER 2GB**. You can use a free video file compressor **here (https://www.freeconvert.com/video-compressor)**, if needed.
- Once you record your video and you are ready to submit, please follow the OPTION 1 Task instructions below for uploading your video in the OPTION 1 task only.

OPTION 2 - If your presentation slides **DO NOT** have slide animations or embedded videos, you can record your video through the OPTION 2 tasks, directly in the presenter portal. A step-by-step instruction manual can be accessed through the link **HERE (https://www.mycadmium.com/uploads/Documents/439-Slot1.pdf)**. More instructions are also below in the Task section below.

Your presentation video is due **Monday, July 19th**. We will not be able to extend this deadline, and the tasks will lock at 11:59 PM ET on that date. If your video is not submitted to the task by the deadline, we will have to withdraw your presentation from the meeting.

Presentation Tasks

Your Presenting Author tasks are listed below with a description of each. Please review the instructions at the top of each task page before completing the task.

- **Review Submission for Proceedings (due Monday, June 7)**
  - This task gives you the opportunity to review your entire abstract. This is the only opportunity you will have to update your abstract for the official meeting Proceedings Publication. No changes will be accepted after the deadline of June 7th.
- **Update Profile Information (due Monday, July 19)**
  - This task allows you to review and update your profile information.
- **Add Your Biography (due Monday, July 19)**
  - This task allows you to add a short biography that will be shown on the virtual platform.
- **Upload Your Headshot Photo (due Monday, July 19)**
  - This task allows you to add a photo of yourself that will be shown on the virtual platform.
- **OPTIONS 1 & 2 for Recording and Uploading your Presentation Video (due Monday, July 19)**
  - There are two options for recording and uploading your presentation video. You need to pick **ONLY ONE OF THE OPTIONS, NOT BOTH** and complete only the tasks for the option you choose.
    - **OPTION 1** - Upload Your Presentation Video: after you record your presentation on your own, you will upload the .MP4 video file to your presentation here. **Your video file must be under 2GB.**
    - **OPTION 2 a** - Upload Your Presentation Slides: this task must be completed first for Option 2. You will upload your presentation slides here.
    - **OPTION 2 b** - Record Your Presentation Video: after your slides have been uploaded, you can start recording your presentation to each slide. A step-by-step instruction manual can be accessed through the link HERE.
- **Presentation Available Post-Conference (due Monday, July 19)**
  - This task asks if you would like your presentation video to be available to all M&M attendees for 1 month after the conference.

Registration

All speakers must register for the conference using the **LINK HERE (https://www.microscopy.org/MandM/2021/registration/index.cfm)** in order to gain access to the virtual conference platform. Your abstract submission does not automatically register you for the conference. If you are an invited speaker, you should have received an email with a registration code. If you did not receive this email, please reach out to **mmspeakers@conferencemanagers.com (mailto:mmspeakers@conferencemanagers.com)**.

For Poster Presenters

We will be using an online poster portal, which is designed with tasks specific to our presenters. We have previously provided your Log In information that will allow you to log on to your individual profile and complete your required tasks. Please log on and complete your tasks by the due date indicated.

Access Poster Portal (https://www.conferenceharvester.com/harvester2/login.asp?EventKey=ZEEAMDFH)

Presentation Information

Your scheduled session date/time will be indicated once you log on. **The conference schedule is in eastern time zone.** All poster presentations will be pre-recorded and available in the virtual platform for attendees to view. Attendees will have the opportunity to ask questions while viewing your poster PDF and listening to the audio through a text chat Q&A box.

Poster Presentation Tasks

Your Presenting Author tasks are listed below with a description of each. Please review the instructions at the top of each task page before completing the task.

- **Review Submission for Proceedings (due Monday, June 7)**
  - This task gives you the opportunity to review your entire abstract. This is the only opportunity you will have to update your abstract for the official meeting Proceedings Publication. No changes will be accepted after the deadline of **June 7th**.
- **Update Profile Information (due Monday, July 19)**
  - This task allows you to review and update your profile information.
- **Add Your Biography (due Monday, July 19)**
  - This task allows you to add a short biography that will be shown on the virtual platform.
- **Upload Your Headshot Photo (due Monday, July 19)**
  - This task allows you to add a photo of yourself that will be shown on the virtual platform.
- **Upload Your Poster PDF (due Monday, July 19, 2021)**
  - This is where you will upload your final poster PDF file. For publishing purposes, the poster upload must be a PDF file at highest resolution possible. The aspect ratio (ratio of width to height) should ideally be set to '16:9'. The complete poster is limited to one slide only. That means one single page for your PDF file. Fonts should be sans-serif (e.g., Arial, Calibri, etc.) and minimum font size should not be smaller than 6pt.
- **Record Your Poster Audio (due Monday, July 19, 2021)**
  - This is where you will record the audio presentation that goes along with your poster PDF. The poster PDF must be upload first before you can record your audio presentation. Your audio recording has a time limit of 3 minutes maximum.
- **Presentation Available Post-Conference (due Monday, July 19)**
  - This task asks if you would like your poster PDF and audio to be available to all M&M attendees for 1 month after the conference.

Your poster PDF and presentation audio is due Monday, July 19th. We will not be able to extend this deadline, and the tasks will lock at 11:59 PM ET on that date. If your PDF and audio is not submitted to the task by the deadline, we will have to withdraw your poster presentation from the meeting.

Registration

All speakers must register for the conference using the **LINK HERE (/MandM/2021/registration/index.cfm)** in order to gain access to the virtual conference platform. Your abstract submission **does not** automatically register you for the conference. If you are an invited speaker, you should have received an email with a registration code. If you did not receive this email, please reach out to **mmspeakers@conferencemanagers.com (mailto:mmspeakers@conferencemanagers.com)**.

If you have any questions or need your portal access key, please reach out to Nicole Seely, Program-Meeting Manager, at **MMspeakers@conferencemanagers.com (mailto:MMspeakers@conferencemanagers.com)**.

(https://www.microscopy.org/)

(http://www.microbeamanalysis.org/)

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(/MandM/2021/)

MEETING AWARDS

How to Apply For an M&M Meeting Award:

As part of the on-line paper submission process, an applicant must flag their paper for award consideration. Only one paper may be designated per applicant.
The applicant must appear as first author and presenter of the paper submitted for award.
The applicant must provide the name, title, institution, and e-mail address of their supervisor, who will be contacted to provide a supporting letter and confirmation of applicability for the indicated award category (e.g. student, post-doc, or technical staff).

GENERAL CONSIDERATIONS:

Award applicants will automatically be considered for memorial scholarships, conferred by MSA based on the generous support of society sponsors. Applicants who have previously received an M&M Meeting Award will not be considered for a second award in the same category.

STUDENTS:

All students in good standing enrolled at accredited academic institutions are eligible. High school, undergraduate, and graduate students are encouraged to apply. Applicants are not required to be members of the sponsoring society. If an applicant is not a full-time student, their submitted work ***MUST*** have been done at their academic institution in their role as student. Student applicants are required to provide their advisor's name and email address during the application process.

POSTDOCTORAL RESEARCHERS:

All postdoctoral researchers are eligible. Applicants are not required to be members of the sponsoring society. If an applicant is not a full-time researcher, their submitted work

MUST have been done at their institution in their role as post-doc researcher. Postdoctoral researchers are required to provide their advisor's name and email address during the application process.

PROFESSIONAL TECHNICAL STAFF MEMBERS:

Full-time technologists are eligible. In addition, the applicant must be a member of the sponsoring society, current in their dues for the year of the meeting.

AMOUNT OF AWARD:

M&M Meeting Awards and memorial awards consist of full meeting registration and up to $1,000 for travel-related expenses. Original receipts must be provided to receive travel reimbursement. All award winners also receive an invitation to the Presidents' Reception, held on the Tuesday evening of the meeting.

NOTIFICATION OF AWARD:

All award applicants will be notified of their award status approximately eight weeks following the Call for Submissions deadline. Unsuccessful applicants will be permitted to withdraw their papers, should their ability to attend the meeting be contingent on the award, within one week following notification.

REQUIREMENTS OF AWARD:

All award winners must present their paper in person at the M&M meeting in order to receive their award. Awardees are expected to attend and participate in the entire meeting, which runs from Sunday evening's opening reception through late Thursday afternoon. Awardees are required to attend the Monday morning plenary session, at which their award will be conferred. Awards or award monies are non-transferable.

ONSITE AWARDS

The M&M meeting's co-sponsoring societies confer competitively judged awards at the meeting.

MSA Student Poster Awards

We believe poster presentations are an excellent format for all participants to engage in intensive discussion with other researchers in the field. To especially encourage students to take advantage of this opportunity and submit papers for poster presentation, MSA provides cash awards to the most outstanding student posters (first author) each day (up to one in each of three categories).

Diatome Poster Awards

All posters illustrating the use of diamond knife ultramicrocrotomy are eligible. Prizes include cash and Swiss watches.

MAS Best Paper Awards

MAS annually confers awards for papers presented at the M&M meeting deemed to be best in four categories.

Each comes with a cash award generously provided by MAS Sustaining Members.

Microscopy Today Micrograph Awards

Scientifically significant micrographs:

Published category (images published in 2021)

Open category (unpublished images)

Video category (movies and 3-D reconstructions)

Deadline for submission is February 25, 2021

Prizes awarded at M&M 2021 in Pittsburgh, Pennsylvania!

MSA Microscopy Society of America (https://www.microscopy.org/)

MAS Microanalysis Society (http://www.microbeamanalysis.org/)

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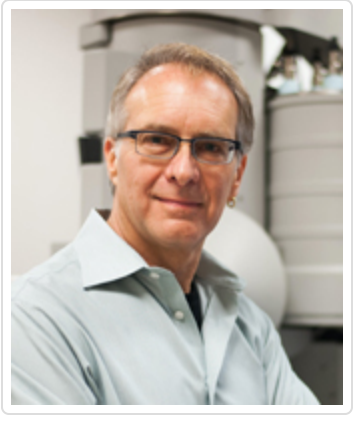
(/MandM/2021/)

2021 Society Awards Recipients

Distinguished Scientist Awards

These Awards recognize preeminent senior scientists from both the Biological and Physical disciplines who have a long-standing record of achievement during their career in the field of microscopy or microanalysis.



Distinguished Scientist

Biological Sciences

David Agard (/awards/bios/dsa_biological_2021.cfm)

Distinguished Scientist

Physical Sciences

Maximilian Haider (/awards/bios/dsa_physical_2021_haider.cfm)

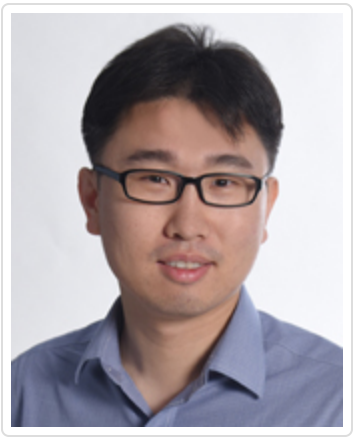
Distinguished Scientist

Physical Sciences

Knut W. Urban (/awards/bios/dsa_physical_2021_urban.cfm)

Burton Medal

The Burton Medal was initiated to honor the distinguished contributions to the field of microscopy and microanalysis of a scientist who is less than 40 years of age on January 1st of the award year.



Burton — Physical

Huolin Xin (bios/burton_physical_2021.cfm)

Burton — Biological

Reto Fiolka (/awards/bios/burton_biological_2021.cfm)

Outstanding Technologist Awards

These Awards honor technologists from both the Biological (Hildegard H. Crowley Award) and Physical Sciences (Chuck Fiori Award) who have made significant contributions such as the development of new techniques which have contributed to the advancement of microscopy and microanalysis.

Hildegard H. Crowley Award

Trace A. Christensen (/awards/bios/crowley_2021.cfm)

Chuck Fiori Award

Karen Bustillo (/awards/bios/fiori_2021.cfm)

Morton D. Maser Distinguished Service Award

This Award was initiated to recognize outstanding volunteer service to the Society as exemplified by Mort Maser, who served the Society for many years with great dedication. This award is made to honor an MSA member who has provided significant volunteer service to the Society over a period of years.

Leona Cohen-Gould (/awards/bios/maser_2021.cfm)

The George Palade Award

The George Palade Award was initiated to recognize the distinguished contributions to the field of microscopy and microanalysis in the life sciences of a postdoctoral fellow of not more than 6 years' standing (since doctoral graduation).

Yong Zi Tan (/awards/bios/palade_2021.cfm)

The Albert Crewe Award

The Albert Crewe Award was initiated to recognize the distinguished contributions to the field of microscopy and microanalysis in the physical sciences of a postdoctoral fellow of not more than 6 years' standing (since doctoral graduation).

Wenpei Gao (/awards/bios/crewe_2021.cfm)

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