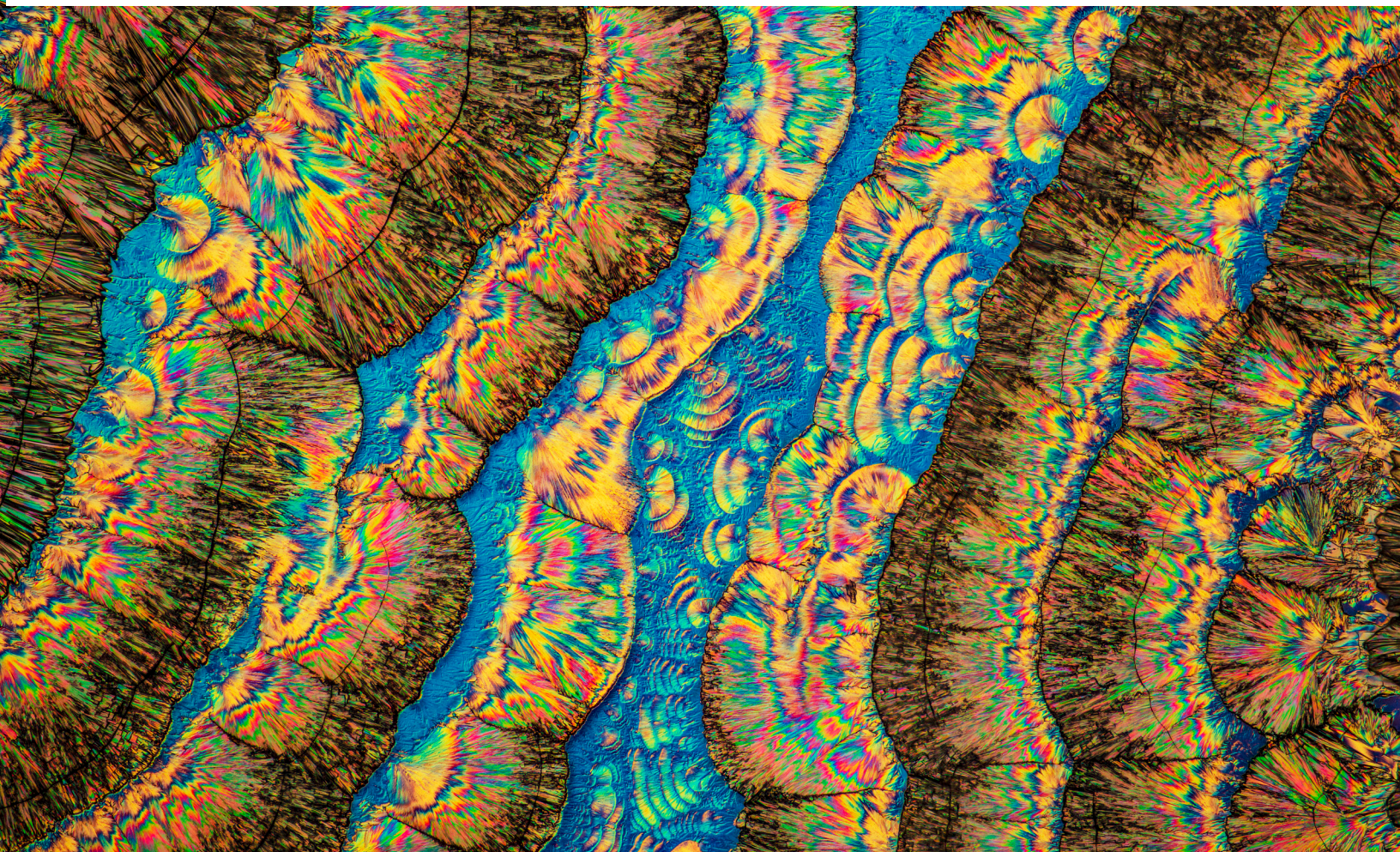


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SUBMISSION DEADLINE: **FEBRUARY 14, 2025**



M&M 2025 **MICROSCOPY & MICROANALYSIS** July 27-31 • Salt Lake City, Utah



<https://mmconference.microscopy.org> for up-to-date meeting information

> See you in Salt Lake City!



M&M 2025
**MICROSCOPY &
MICROANALYSIS**
July 27-31 • Salt Lake City, Utah

QUESTIONS?

TECHNICAL MEETING CONTENT:

2025 Program Chair
James Evans, Pacific Northwest National Laboratory
MM2025ProgramChair@microscopy.org

EXHIBITS & EXHIBITORS:

Exhibits Manager
anna@corcexpo.com

SPONSORS & SPONSORSHIPS:

Sponsorship Manager
mary@corcexpo.com

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mmregistration@microscopy.org

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Meeting Manager
meetingmanager@microscopy.org

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Visit <https://the-mas.org> to find out the benefits of MAS membership.

MICROGRAPHS

ON THE FRONT COVER:

Vitamin C

Nathan Myhrvold, The Cooking Lab, Bellevue, WA



The Microscopy Society of America (MSA) and the Microanalysis Society (MAS), invite you to attend the Microscopy & Microanalysis (M&M) 2025 meeting in Salt Lake City, Utah, from July 27 to July 31, 2025. Salt Lake City offers a unique blend of urban amenities and stunning natural surroundings, making it an ideal meeting destination. With state-of-the-art conference facilities, easy accessibility, and year-round outdoor activities, it provides both convenience and unforgettable experiences for attendees.

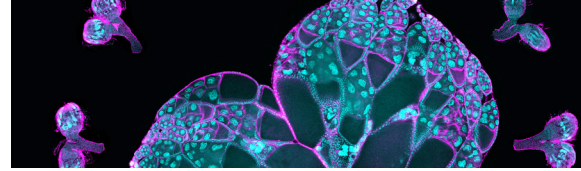
The success of each M&M meeting is thanks to over one hundred symposium organizers who volunteer their time to identify trendy research directions and engage experts worldwide to present their work at our meetings. For M&M 2025, more than 120 symposium organizers have assembled 10 symposia in the physical sciences, 10 in analytical sciences, eight in biological sciences, as well as eight cross-cutting symposia. We highly encourage you to support these symposia by submitting abstracts of your own research and contributing to the platform and poster presentations.

In addition to the 36 symposia, we are excited to announce five PMCs and five Sunday Short Courses. Be sure to register for these pre-meeting sessions as space is limited.

On behalf of MSA, MAS, the M&M 2025 Executive Program Committee, the meeting management team, all the symposium organizers and countless volunteers, we look forward to greeting you in Salt Lake City for an exciting and stimulating Microscopy & Microanalysis 2025.

James Evans

Pacific Northwest National Laboratory
M&M 2025 Program Chair



A01 Advances in Focused Ion Beam Instrumentation, Applications, and Techniques for Materials and Life Sciences

ORGANIZERS:

Matthew Thorseth, Dow

Daniel Perea, Pacific Northwest National Laboratory

Jamie Ford, University of Pennsylvania

Shize Yang, Yale University

Sponsored by the Focused Ion Beams Focus Interest Group

- Latest developments in novel ion and ablation sources, FIB instrumentation, in-situ micromechanical analysis, and analytical detectors (EDS, WDs, EBSD, EBIC, SIMS, TKD, CL, Raman, etc.)
- Innovations in FIB microscopy including automation, nanofabrication, lithography, imaging with charge neutralization, progress in simulation and modeling, strategies that enable correlative multimodal analyses, etc.
- Novel sample geometries, milling strategies, non-standard lift-outs for TEM/STEM and APT, and innovative micro and nano-structure prototyping
- Advances in cryo-FIB in materials and biological sciences and working with beam-sensitive materials, including innovations in targeted liftout and environmentally protected specimen handling and transfer.

A02 Frontiers of Electron Ptychography

ORGANIZERS:

Colum O'Leary, University of California-Los Angeles

Yi Jiang, Argonne National Laboratory

Peng Wang, The University of Warwick, UK

- Recent experimental and algorithmic advances in electron ptychography.
- Breaking conventional resolution, voltage and dose limits of electron microscopy.
- 3D reconstruction using tomographic and multislice methods.
- Pedagogical tools and automated workflows.
- Applications to physical and life sciences.

A03 When 4D-STEM Meets More Dimensions: Deepening Materials Insights with Efficient Experimental Design and Smart Computational Microscopy

ORGANIZERS:

Shelly Conroy, Imperial College London, UK

Stephanie Ribet, Lawrence Berkeley Laboratory

Mingjian Wu, Friedrich-Alexander-Universität, Germany

Benjamin Savitzky, h-Bar Instruments

Sponsored by the Electron Crystallography and Automated Mapping Techniques Focused Interest Group

- 4D-STEM experimental, analytical and computational advances.
- *In situ* 4D-STEM measurements to study structural dynamics of materials under various stimuli;
- Correlative measurements or algorithms.
- 4D-STEM combined with tomography techniques, ptychography resolving z-dimension.
- 4D-STEM with spectroscopic dimensions (e.g., spatial-momentum resolved EELS, data fusion with EDXS, etc.).
- New algorithms and hardware for automation, scan control, live processing schemes; analysis strategies and workflows for large datasets.
- Advances in instrumentation or experimental design for dose-efficient and high fidelity imaging, e.g., precession, beam-shaping with amplitude or phase plates.

A04 Contributions of Analytical Electron Microscopy to Understanding Microstructural Evolution in Materials: James Bentley Memorial Symposium

ORGANIZERS:

Grace Burke, Idaho National Laboratory

Nestor Zaluzec, Argonne National Laboratory

Neal Evans, University of Tennessee

Paul Kotula, Sandia National Laboratories

- Role of AEM in the study of nanoscale segregation and precipitation in materials.
- Contributions of AEM to radiation damage material research.

- Advances in understanding the role of microstructural evolution on materials behavior.
- Applications of STEM-EDXS and STEM-EELS Spectrum Imaging in materials science.

A05 Latest Advances in Atom Probe Tomography

ORGANIZERS:

Daniel Perea, Pacific Northwest National Laboratory

Baishakhi Mazumder, The University at Buffalo

Elizabeth Kautz, North Carolina State University

Allen Hunter, University of Michigan

Sponsored by the Atom Probe Field Ion Microscopy Focused Interest Group

- Microstructural, interfacial, and surface analysis of materials.
- APT in correlative investigations and integration with other analytical techniques.
- Advanced analysis of geological, biological, and environmental materials.
- Recent developments in data analysis, visualization, computational modeling, and instrumentation.

A06 Surface and Subsurface Microscopy and Microanalysis of Physical and Biological Specimens

ORGANIZERS:

Jeffrey Fenton, Honeywell FM&T

Xiao-Ying Yu, Oak Ridge National Laboratory

Ryan Wagner, Purdue University

Vincent Smentkowski, GE

- Recent developments in surface analysis and instrumentation.
- Advances in scanning probe microscopy for quantitative analysis including nano-scale chemical, mechanical, thermal, & electrical analyses, for example, AFM-IR, multifrequency AFM, sMIM, force curves, PFM, etc.
- Applications of ellipsometry, surface topographical analysis, and high energy or synchrotron based XPS.
- Enhancing traditional electron microscopy methods through the use of surface analysis.
- Improved throughput, ease of use, and accuracy in surface analysis and materials science enabled by AI/ML.

MICROGRAPH

Fruit fly ovaries

Wen Lu, Feinberg School of Medicine, Northwestern

A07 Advances in SEM Instrumentation, Application and Techniques

ORGANIZERS:

Ute Golla-Schindler, Aalen University, Germany

Marc Willinger, The Entrepreneurial University, Germany

Dirk Berger, Technical University of Berlin, Germany

- Low Voltage & Low Vacuum SEM: With the development of field emission SEMs the low voltage region down to landing energies of 500 eV has become possible. Today further advancements of instruments enable observation at even lower landing energies. This opens up new capabilities in the study of beam sensitive materials and reveals contrast that need to be understood. Low Vacuum SEM enables observation in controlled environments and expands the capabilities in material and life sciences for the observation of beam-sensitive specimens in their native state or observation of dynamics induced by physical or chemical stimuli.
- Detector strategies, transmission mode and contrast mechanism: Numerous new strategies for simultaneous detection of various signals (SE, BSE, EBAC, etc.) are implemented in SEMs. They deliver complementary information that needs to be correctly interpreted.
- Correlative techniques: To address complex questions in materials science, it is essential to combine findings coming from various investigation techniques. This involves moving from macroscopic investigation methods like computer tomography and light microscopy to SEM at the nanometre scale and combining these results with EDS, WDS, EBSD, mass spectroscopy and Raman studies from the same specimen area.

A08 Next Generation Microanalysis Standards For EPMA and SEM-EDS Calibration

ORGANIZERS:

Paul Carpenter, Washington University in St. Louis

Emma Bullock, Carnegie Institute

Heather Lowers, US Geological Survey

Abigail Lindstrom, NIST

Sponsored by the Microanalytical Standards Focused Interest Group

- Standard materials development for next-generation synthetic glasses and minerals.
- Calibration strategies for EPMA, SEM, uXRF, LA-ICP-MS, CL and other analytical methods.
- Education in microanalysis exemplified by standards-based measurement.
- Improvement in characterization of calibration materials.

A09 Quantitative Electron Diffraction for Materials Analysis, From Transmission Electron Diffraction to EBSD and ECCI

ORGANIZERS:

Jian-Min Zuo, University of Illinois - Urbana-Champaign

Tim Ruggles, Sandia National Laboratories

Julie Marie Bekkevold, Trinity College Dublin, Ireland

- Advances in theory, modeling, collecting, indexing and interpretation of diffraction patterns.
- Use of simulated diffraction to interpret detector data.
- In situ experiments or diffraction data collected with concurrent characterization techniques.
- Data-driven approaches to understand diffraction data or incorporate it into simulations to predict mechanical or physical properties.
- Application of electron diffraction techniques to traditional and non-traditional materials systems across all disciplines.
- 3D diffraction experiments and diffraction tomography.

MICROGRAPH

Intestinal blood vessels

Satu Paavonsalo, University of Helsinki, Helsinki, Finland

A10 Advances in Cryogenic Transmission Electron Microscopy and Spectroscopy for Energy and Quantum Materials and Technologies

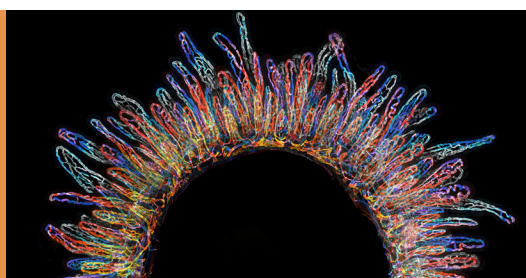
ORGANIZERS:

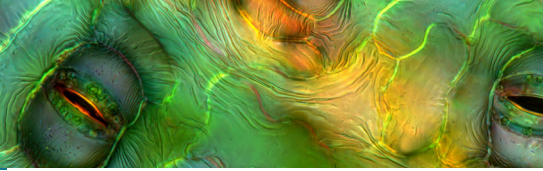
Rosa Diaz, Purdue University

Shelly Conroy, Imperial College London, UK

Yu-Tsun Shao, University of Southern California

- Aiming for student, scientist, faculty from underrepresented at college and university level to present their groundbreaking microscopy research.
- Explore best practices in diversity recruitment.
- Dive into DEI-driven research narratives in microscopy.
- By bridging research frontiers with inclusive practices, we aim to redefine traditional paradigms, celebrate diversity, shape a more representative future for microscopy.





> Biological Sciences Symposia

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

ORGANIZERS:

Teresa Ruiz, University of Vermont
Melanie Ohi, University of Michigan
Cheri Hampton, AFRL/RXAS Wright-Patterson Air Force Base
Edward Eng, New York Structural Biology Center

Sponsored by the 3D-EM in Biological Sciences Focused Interest Group

- Structure and function of macromolecular complexes *in vitro* and *in vivo*.
- Single particle cryo-electron microscopy.
- Cryo-electron tomography.
- Molecular modeling.

B02 Biological Soft X-ray Tomography

ORGANIZERS:

Kenneth Fahy, Sirius XT, Ireland
Carolyn Larabell, University of California-San Francisco

- Soft X-ray microscope instrumentation and biological applications.
- Software for data processing and calculating tomographic reconstructions.
- Modeling image formation in a soft X-ray microscope.
- Specimen handling and cryo-preservation.
- Correlation of soft X-ray tomography data with information from other modalities.

B03 Application of Microscopy Techniques for Research and Diagnosis of Diseases in Humans, Plants and Animals

ORGANIZERS:

Emily Benson, Cleveland Clinic
Marcela Redigolo, West Virginia University

Sponsored by the Diagnostic & Biomedical Microscopy Focused Interest Group

- Use of correlated light and electron microscopy applied to diagnosis.
- Use of microscopy techniques in plant and animal pathology.
- New approaches to diagnosis using electron microscopy and other advanced techniques.
- Microscopic characterization of cellular structure in normal and diseased humans, animals and plants.

B04 Emerging Advances in Light Microscopy of Fixed and Live Samples Below the Diffraction Limit

ORGANIZERS:

Rengasayee Veeraraghavan, Ohio State University
Jay Potts, University of South Carolina Medical School

- Emerging super-resolution light microscopy (SRLM) and super-resolution correlative light and electron microscopy (SR-CLEM) methods.
- New SRLM techniques applicable to live samples.
- SRLM techniques that provide insights at the intramolecular scale.
- Novel methods for robust, quantitative analysis of SRLM data.

B05 Development, Challenges and Biomedical Applications of Tissue Clearing, Expansion Microscopy and Volumetric Imaging

ORGANIZERS:

Yongxin Zhao, Carnegie Mellon University
Alan Watson, University of Pittsburgh
Adam Glaser, The Allen Institute

- Development and applications of tissue clearing technologies in biological specimens.
- Advancement in expansion microscopy technologies and their biomedical applications.
- Progress on tissue staining, advanced tissue preparation methods and hardware advancements inspired by novel tissue preparation protocols.
- Progress on macro imaging systems for large biological specimens (i.e. light sheet, high-speed confocal and tomography approaches).
- Development of computational approaches for storing, processing, visualizing large volumetric image data.

B06 Microscopic Analysis of Fungi: Their Interactions with Humans, Plants, Microbes and the Environment

B07 Cryo-Electron Tomography: Progress and Potential

ORGANIZERS:

Danielle Grotjahn, The Scripps Institute
Grant Jensen, Brigham Young University
Ben Barad, Oregon Health & Science University (OHSU)

- Cryo-ET makes it possible to visualize large, macromolecular machines inside intact cells and build integrative atomic models of very large complexes.
- Artificial intelligence is elevating the throughput, feasibility, and applicability of cryo-electron tomography imaging, ushering in a new era for visualizing subcellular structures at an unprecedented level of resolution.
- This symposium will highlight recent biological results and technological developments (especially in the application of AI) as well as remaining challenges.

B08 Advances in Cryo-EM Technology

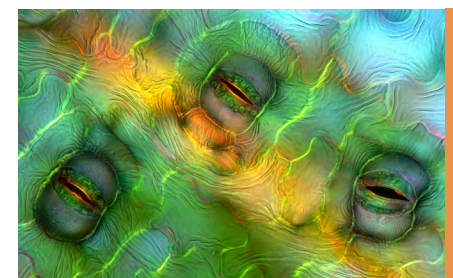
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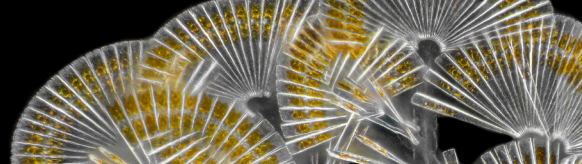
Anchi Cheng, Chan Zuckerberg Imaging Institute
Alberto Bartesaghi, Duke University
Tim Grant, University of Wisconsin-Madison

- Method development in single-particle cryo-EM, cryo-ET and MicroED.
- Low-dose cryo-EM (TEM or STEM) methods and strategies for tilted data collection.
- Advances in specimen preparation and optimization.
- Advances in instrumentation, sample screening and high-throughput imaging.
- New data processing approaches and tools to study heterogeneity.

MICROGRAPH

Stomata
Marek Mis, Marek Mis Photography, Suwalki, Poland





> Cross-Disciplinary Sciences Symposia

C01 Microscopy and Microanalysis of Interfaces and/or Interactions Among Organic and Inorganic Matter

ORGANIZERS:

Donggao Zhao, University of Missouri-Kansas City

Nan Yao, Princeton University

Liza-Anastasia DiCecco, Penn State University

Linduo Zhou, University of Illinois - Urbana-Champaign

- Tooth's enamel-dentin junction and bone-muscle interface
- Bacterial infections and colonizations associated with implanted biomaterial and medical devices
- Embedded foreign fragments in human or animal body
- Hybrid organic-inorganic materials for optical, electronic, energy and medical applications
- Biocorrosion and Biomineralization
- Organic-mineral interfaces in terrestrial and extraterrestrial materials

C02 Lens on Diversity: Empowering Diversity in Microscopy Sciences

ORGANIZERS:

Rosa Diaz, Purdue University

Martha McCartney, Arizona State University

Shery Chang, University of New South Wales, Australia

- Aiming for student, scientist, faculty from underrepresented at college and university level to present their groundbreaking microscopy research.
- Explore best practices in diversity recruitment.
- Dive into DEI-driven research narratives in microscopy.
- By bridging research frontiers with inclusive practices, we aim to redefine traditional paradigms, celebrate diversity, shape a more representative future for microscopy.

MICROGRAPH

Colonial diatoms

*Jan van IJken, Leiden, Netherlands**

C03 Microscopy and Microanalysis in Industry

ORGANIZERS:

Christa Gonzales, Altria

Amy Rue, INEOS

- Discuss microscopy solutions for routine testing and/or problems in product design, product testing, manufacturing/manufacturability, customer support/complaints, etc.
- Discuss microscopy solutions for any interesting or unusual problems that occur in product design, product testing, manufacturing/manufacturability, customer support/complaints, etc.
- Discuss all other areas of microscopy in industry that may be of interest.

C04 Best Papers from MSA Publications Portfolio

C05 Interamerican Committee of Societies for Electron Microscopy (CIASEM)

C06 Advancements in Generative Artificial Intelligence and Automation for Electron Microscopy

ORGANIZERS:

Huolin Xin, University of California-Irvine

David Cullen, Oak Ridge National Laboratory

Binbin Wang, Intel

Mehrdad Abbasi, Intel

- Innovative automation and AI integration for multi-scale imaging, diffraction, and spectroscopic (EELS, EDS, etc.) analysis
- Application of artificial general intelligence (AGI), multi-modal large language models, and their deployment to edge or near-edge devices.
- Automated imaging and AI-enabled in-line data analysis tailored for precision and efficiency.
- Exploration of human-agent, human-co-scientist, human-co-operator collaboration for optimized control and decision-making and data security.
- Machine learning solutions to challenges of applying AI-driven EM for real-world problem solving.

C07 Towards Functional Imaging of Materials: Advances and Insights from Phase Contrast Techniques

ORGANIZERS:

Julie Marie Bekkevold, Trinity College Dublin, Ireland

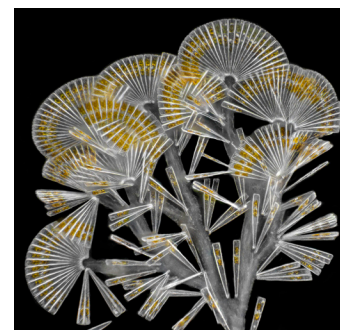
Stephanie Ribet, Lawrence Berkeley National Laboratory

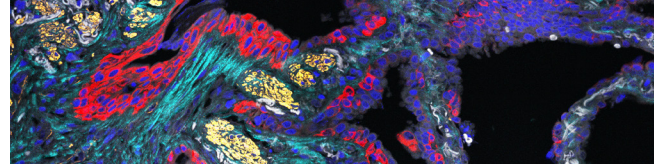
Rafal E. Dunin-Borkowski, Jülich Research Center

Steven Zeltmann, Cornell University

- Phase imaging of fields across length scales with various techniques including differential phase contrast, off-axis electron holography, Lorentz S/TEM, and 4D-STEM based phase retrieval approaches.
- Advances in methods and algorithms for characterisation of functional materials given realistic sample limitations, such as dose-sensitive structures and strongly scattering samples.
- Hardware and software advances enabling new insights into structures for phase retrieval techniques, including detectors, beam splitters, tunable phase plates, and scan systems.
- Real-space imaging of various phenomena in two and three dimensions across length scales including magnetic and electric fields, and thermal effects such as diffuse scattering.
- High temporal resolution in-situ observation of dynamical processes in functional materials.
- Phase retrieval techniques for imaging weakly-scattering samples, such as electrostatic scattering of light atoms and scattering from antiferromagnetic ordering.

C08 Vendor Symposium





P01 Advanced Characterization of Nuclear Fuels and Materials

ORGANIZERS:

Yaqiao Wu, Boise State University
 Janelle P. Wharry, Purdue University
 Colin Judge, Idaho National Laboratory
 Sooyeon Hwang, Brookhaven National Laboratory

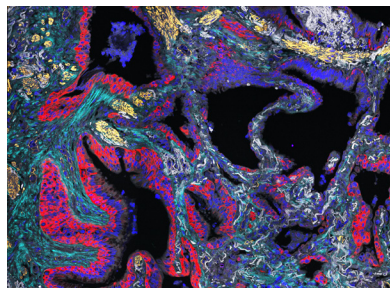
- Atomic and subatomic structure characterization of defects, order/disorder, and phases in nuclear materials.
- In situ and in operando SEM/TEM mechanical testing, irradiation, corrosion, etc.
- Multidimensional and multiscale characterization of nuclear fuels and materials.
- Coupling of advanced characterization techniques (TEM, FIB, XRD (XCT), tomography, EPMA, SIMS (nano-SIMS), XPS, etc) for nuclear fuels and materials.
- Machine learning and artificial intelligence in characterization of nuclear and irradiated materials.
- Automation of microscopy in nuclear materials science and technology.

P02 Electron Microscopy for Ferroic Materials: From Atomic-scale Imaging to in-situ Control

ORGANIZERS:

Myung-Geun Han, Brookhaven National Laboratory
 Lin Zhou, Iowa State University
 Leopoldo Molina-Luna, Technical University of Darmstadt, Germany

- Quantitative electric and magnetic field mapping.
- Novel instrumentation and techniques for in situ observations.
- Atomic-scale imaging and spectroscopy of ferroic materials.
- Novel ferroelectric, magnetic and multiferroic materials, and phenomena.
- Dynamic switching behaviors of ferroic materials.



P03 Characterization of Collective Excitations by Electron Microscopy with High Spatial, Energy, Momentum, and Temporal Resolutions

ORGANIZERS:

Haihua Liu, Argonne National Laboratory
 Jon P. Camden, University of Notre Dame
 David Masiello, University of Washington

- Plasmons, Phonons, Exciton-polaritons, Phonon-polaritons, Noble metal and doped semiconductor nanoparticles, 2D periodic quantum materials, 2D periodic nanophotonic materials, High spatial, energy and temporal resolutions, Electron energy loss spectroscopy, Photon-induced near field electron microscopy, Scanning transmission electron microscopy, Ultrafast electron microscopy, Momentum-resolved electron energy loss spectroscopy.

P04 Energy Materials: Transport Pathways, Interfaces, & Durability for Performance

ORGANIZERS:

Sooyeon Hwang, Brookhaven National Laboratory
 Katherine Jungjohann, National Renewable Energy Laboratory
 Yuzhang Li, University of California-Los Angeles

- Energy materials including but not limited to batteries, fuel cells, supercapacitors, electrocatalysts, photovoltaics, piezoelectric, and thermoelectric materials.
- In-situ/ operando electron, x-ray, optical, scanning probe microscopy studies to understand evolution mechanisms under working conditions.
- Methods for preparing and observing specimens while preserving their natural environment, including low dose and/or cryo-sample preparation & cryo-microscopy.
- Novel techniques for energy materials: multimodal, spectroscopy, 4D-STEM, advanced or automated data acquisition, and AI/ML or other advanced data analysis methods.

P05 Advances in Imaging and Spectroscopy Beyond Ambient Conditions

ORGANIZERS:

Robert Klie, University of Illinois-Chicago
 Juan-Carlos Idrobo, University of Washington

- Hardware developments (e.g. field-free objective lens, fast detectors).
- Development of novel stages for photo-stimulated measurements or cathodoluminescence.
- Ptychographic and differential phase contrast imaging modes.
- Electron energy loss-spectroscopy towards the single meV energy regime and beyond.
- 4D EELS, e.g., nanoscale mapping of phonon dispersions as a function sample condition.
- Data analytics.

P06 Multimodal Data Acquisition and Analysis of Materials Under Real-World Conditions Using Advanced Electron Microscopy

ORGANIZERS:

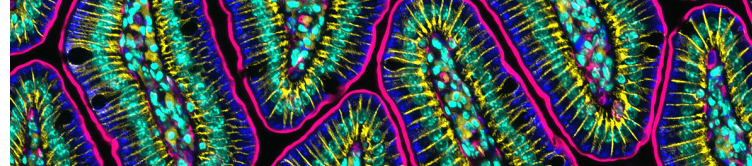
Xiaobing Hu, Northwestern University
 Sriram Vijayan, Michigan Technological University
 Shize Yang, Yale University
 Jungwon Park, Seoul National University, Korea

Sponsored by the Electron Microscopy in Liquids and Gases Focused Interest Group

- Development on in-situ and operando electron microscopy methods that use new specimen holders and detection technologies.
- Advances in designing and fabrication of MEMS chips for operando applications.
- Advances in liquid cell TEM including membranes or other technical development and applications
- Explore new ways to apply external stimuli to specimens, such as cooling, heating, biasing, photons, ions, liquids, and gases.
- Analyze electron microscopy data with multiple modalities: time-series images, hyperspectral imaging with energy-dispersive X-ray and electron energy-loss spectroscopy, mass spectrometry, cyclic voltammetry, mechanical testing, cathodoluminescence, electron beam-induced current.

MICROGRAPH

Idiopathic pulmonary fibrosis
 Frédéric Feroq, National Museum of Natural History, Paris, France



P07 High-Resolution Microscopy and Microanalysis of Materials Subjected to Extreme Environments

ORGANIZERS:

Timothy Lach, Oak Ridge National Laboratory

Mukesh Bachhav, Idaho National Laboratory

Elizabeth Kautz, North Carolina State University

Daniel Schreiber, Pacific Northwest National Laboratory

- Fission and fusion energy materials, accelerator materials, and space materials: metals and alloys, ceramics, composites, polymers, semiconductors, nuclear waste materials, etc.
- Materials subjected to one or more extreme conditions: high radiation dose with varying dose rates, high stress, high strain rates, oxidation and corrosion, transmutation, very high or very low temperatures, etc.
- Damage phenomena: dislocation loops, segregation and precipitation, phase transformations, bubbles and void nucleation, oxidation, dealloying, etc.
- Analytical microscopy via scanning electron microscopy (SEM), transmission electron microscopy (TEM), aberration-correction, scanning probe, in-situ microscopy, etc.
- Microanalysis via microprobe, atom probe tomography (APT), mass spectrometry, etc.
- Modeling and machine learning approaches that automate or aid in interpretation of microscopy data of these phenomena

P08 Advanced Imaging, Diffraction, and Spectroscopy of Structurally or Chemically Disordered Materials

ORGANIZERS:

Jinwoo Hwang, Ohio State University

Mary Scott, University of California-Berkeley

Honggyu Kim, University of Florida

Mingwei Zhang, University of California-Davis

- Revelation of structure-property relationships in high entropy materials with chemical disorder or amorphous and glassy materials with structural disorder using novel electron microscopy, diffraction, and spectroscopy techniques, as well as machine learning assisted data analysis.
- New ways to acquire reliable information on atomic bonding, short range ordering, and medium range ordering that dictate important and emergent properties of structurally and chemically disordered materials.
- In situ, time-resolved experiments on phase transitions, relaxation, and dynamic changes in disordered and heterogeneous structures.
- Connection of structure and dynamics to properties and processes including mechanical response, electronic transport, optical properties, and crystallization behavior.
- Materials include oxide and metallic glasses, amorphous and multiphase thin films, chalcogenides, organic and polymer glasses, biomaterials, and high-entropy alloys/ceramics.

P09 Unconventional Electron Probes

ORGANIZERS:

Kayla Nguyen, University of Oregon

Spencer Reisbick, Brookhaven National Laboratory

Fehmi Yasin, Riken, Japan

Thomas LaGrange, EPFL, Switzerland

- Applications of TEM and STEM techniques employ unconventional electron probes such as ultrafast TEM/STEM, uncorrected ptychography, STEM-holography, Lorentz 4D-STEM and more.

- Structuring the electron beam in time and space using ultrafast electron wavepackets and structured probes such as vortex beams or aberrated probes.
- Experiments, simulations and theory for ultrafast, PINEM, interferometric, and Lorentz microscopy capabilities and emergent electron ptychographic techniques.

P10 Innovative in-situ Imaging Techniques for Material Characterization, Synthesis, and Processing

ORGANIZERS:

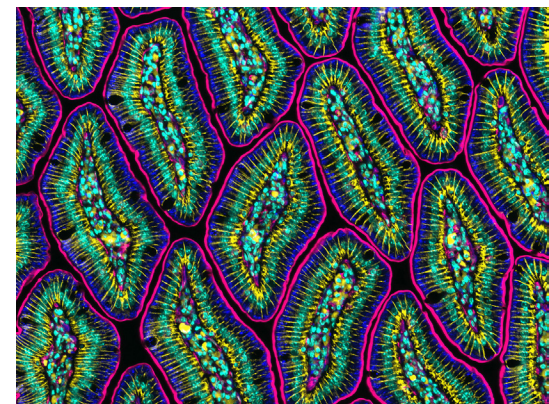
Fehmi Yasin, Riken, Japan

Darius Pohl, Technical University of Dresden, Germany

Qian Chen, University of Illinois - Urbana-Champaign

Jungwon Park, Seoul National University, Korea

- Innovative in-situ imaging in the electron microscope
- In-situ biasing, cooling and heating experiments
- New experimental setups including e.g. transport of magnetic materials in the TEM
- Advances in theory and simulation of material response to external stimuli while under electron illumination.
- Crystal growth and assembly, Chemical and electrochemical reactions
- Interface-driven processes and interface dynamics in gases and liquids

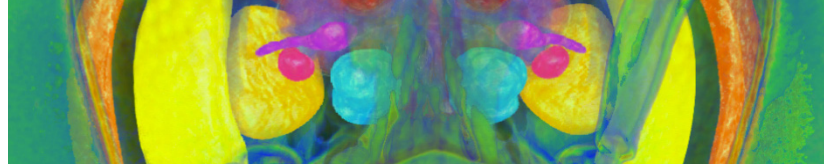


MICROGRAPH

Mouse intestine

Amy Engevik, Medical University of South Carolina, Charleston, SC

> Technologists' Forum



X30 Tech Forum – Team of One

ORGANIZERS:

Page Baluch, Arizona State University

Sponsored by the Facility Operation and Management Focused Interest Group

- Strategies in managing a core by yourself
- Resources available to assist low staff facilities
- Suggestions on how to work with your university to increase staff support

X31 Tech Forum - Working with Image Data (Basic to Advance)

ORGANIZERS:

Page Baluch, Arizona State University

- Review the fundamentals of digital imaging, including key decisions and trade-offs involved in data generation.
- Explore advanced techniques for managing and processing large datasets effectively.
- Discuss practical tips and strategies for efficiently storing and organizing the large volumes of data generated by high-powered microscopes.

X32 Tech Forum – Mental Health in Microscopy

ORGANIZERS:

Page Baluch, Arizona State University

Sponsored by the TBD Focused Interest Group

- Identify mental health issues by recognizing its symptoms and causes
- Finding ways to reduce stress and develop coping strategies
- How to find resources for mental health counseling
- Building a supportive network

MICROGRAPH

Bee brain

Denise Yamhure Ramire,
University of California-Davis, Davis, CA



> Pre-Meeting Congresses

SATURDAY, JULY 26, 2025 • 8:30 AM - 5:30 PM

Separate registration required – see registration form (Spring 2025)

X60 Annual Pre-Meeting Congress for Students, Post-Docs, and Early-Career Professionals in Microscopy and Microanalysis

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

SUNDAY, JULY 27, 2025 • 8:30 AM - 5:30 PM

Separate registration required – see registration form (Spring 2025)

X61 Transformative High-Resolution Cryo-Electron Microscopy

Organized by the 3D Electron Microscopy in Biological Sciences (3DEM) Focused Interest Group

X62 Industrial Applications of Advanced Imaging and Deep Learning-based Image Analysis

Organized by the Pharmaceuticals Focused Interest Group

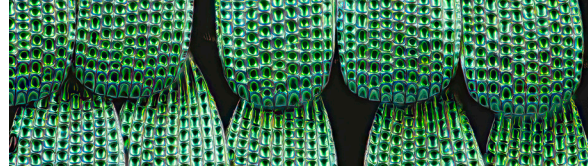
X63 Management Training for Local Affiliated Society Leadership

Organized by the Microscopy Society of America Local Affiliated Societies Focused Interest Group

X64 Progress in Focused Ion Beam Technology and Practical Aspects for Cryo, Multi Modal, and Beam-Matter Interactions

Organized by the Focused Ion Beam Focused Interest Group

> Meeting Awards



HOW TO APPLY FOR M&M MEETING AWARDS:

Apply for M&M meeting awards during the online paper submission process. Applicants must check the box during submission to have their paper considered for an award. 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 added bold for effect 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/technicians 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:

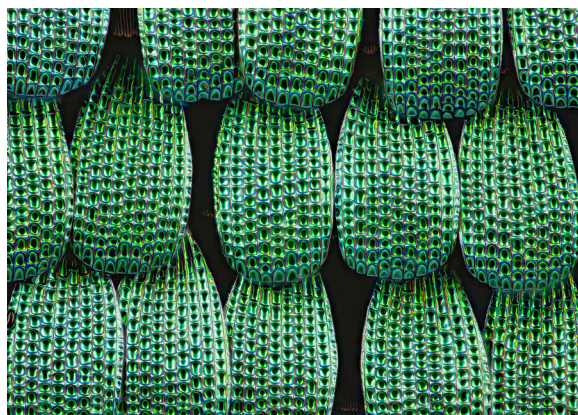
All award applicants will be notified of their award status approximately eight weeks following the Call for Submissions deadline. Unsuccessful applicants will be permitted to withdraw their papers, should their ability to attend the meeting be contingent on the award, within one week following notification.

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.

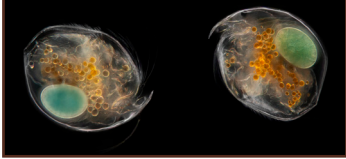
MICROGRAPH

Butterfly wing
Dariusz Pawlik, photography enthusiast,
Bytom Odrzański, Poland

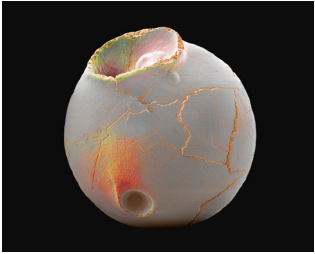


MICROGRAPH

Zooplankton
Jan van IJken, Leiden, Netherlands



> Meeting Awards cont.



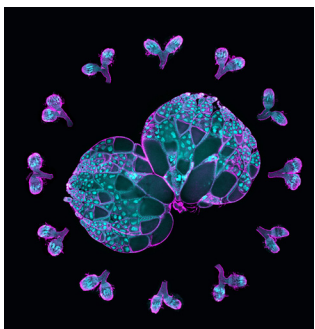
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Miniature iron meteorite
Bernd Podratzke, Frankfurt am
Main, Germany



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Carpet beetle
David Bird, Chalford, England, UK



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Fruit fly ovaries
Wen Lu, Feinberg School of
Medicine, Northwestern

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 – physical, analytical, and biological).



CIASEM M&M Travel Award

MSA, in collaboration with the **IFSM**, is pleased to offer a travel award to encourage CIASEM members (students and post-doctoral research associates) to participate at M&M 2025. You must be a current CIASEM member to be eligible for this award. This **IFSM/MSA**-sponsored award consists of \$1,000 USD reimbursement to cover travel expenses, and registration to M&M 2025. Reimbursement must be submitted for expenses following MSA's Travel Award Guidelines.

Ultramicrotomy Awards

These awards are sponsored by Diatome US.

Posters that wish to be considered for the Ultramicrotomy awards should indicate this in their online paper submission. Ultramicrotomy awards consist of a trip to Switzerland from first place and a Swiss watch for second place.

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.



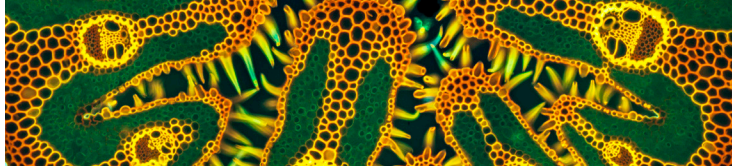
Microscopy Today Micrograph Awards

Scientifically significant micrographs:

- **Published** category (*images published in 2024*)
- **Open** category (*unpublished images*)
- **Video** category (*movies and 3-D reconstructions*)

Deadline for submission is February 14, 2025

Prizes awarded at M&M 2025 in Salt Lake City.



X10 EM Data Analysis with the HyperSpy Ecosystem

LEAD INSTRUCTORS:

Joshua Taillon, NIST

Eric Prestat, United Kingdom Atomic Energy Authority

Carter Francis, Direct Electron

This short course will cover the basics of data processing and analysis using the open-source HyperSpy ecosystem and show example workflows for electron microscopy datasets. No prior Python knowledge is required, and the following topics will be covered:

- Introduction to HyperSpy and related Python libraries for multi-dimensional image and spectra processing and analysis.
- Curve fitting of multi-dimensional datasets.
- Machine learning.
- Big data analysis strategies.
- EELS and EDS analysis.
- Introduction to analysis using HyperSpy extensions, including 4D-STEM, EBSD, nanoparticle, holography, luminescence spectroscopy, and electron tomography data.

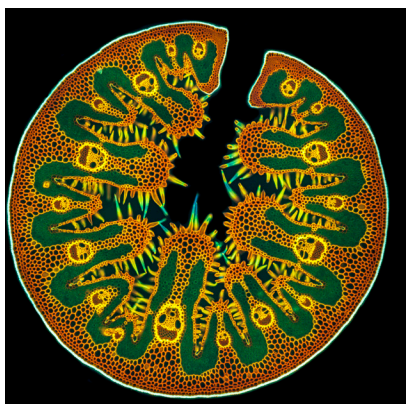
X11 Cryo-EM for Materials Sciences: Hardware, Applications and Data Acquisition

LEAD INSTRUCTORS:

Ismail El Baggari, Harvard University

Myung-Geun Han, Brookhaven National Laboratory

Michael Zachman, Oak Ridge National Laboratory



MICROGRAPH

Oat leaf

Gerd Günther, private laboratory, Düsseldorf, Germany

Cryogenic electron microscopy (Cryo-EM) has been instrumental in propelling research in energy and quantum materials. The recent surge in Cryo-EM usage underscores the growing demand for advancements in both instrumentation and workflows, aimed at high-resolution analysis at controlled temperatures and sample environments. This short course is aimed to provide both beginners and current researchers with the basic knowledge and hands-on skills of Cryo-EM. The course will also cover the historical developments, recent developments, and prospects of Cryo-EM in materials science, guided by our invited instructors.

Course topics include:

- Understanding the basics and instrumentation of Cryo-EM
- Cryo-EM workflow: specimen preparation, specimen transfer, Cryo-FIB, etc.
- Atomic-scale imaging and spectroscopy at controlled cryogenic temperatures
- Cryo-EM data analysis methods

X12 Focused Ion Beam Theory and Methods

LEAD INSTRUCTORS:

Lucille Gianuzzi, ExpressLO, LLC

Joseph Michael, Sandia National Laboratory (ret.)

The use of FIB instruments in materials- and biological-science laboratories is growing rapidly. The versatility and capabilities of these tools are also rapidly improving. This course will first cover ion/solid interactions, which must be understood for successful application of these tools. The attendees will learn of the variety of commercial ion sources and ion species available in FIB instruments, and explore their benefits for a range of applications. Applications of femtosecond laser micromachining in conjunction with FIB will be discussed. Techniques of sample preparation for SEM and TEM, 3D applications, micro- and nano-fabrication and cryo-methods will be presented.

Course topics include:

- Theory of ion-solid interactions
- A review of ion sources: LMIS (Ga and others), PFIB (Xe and others), and other commercial ion sources.

- 2D and 3D (FIB SEM tomography) sample preparation
- TEM and APT specimen preparation
- Cryo FIB TEM specimen preparation
- Micro and nano-fabrication using ion beams

X13 Automated Experiments in Electron Microscopy

LEAD INSTRUCTORS:

Sergei Kalinin, University of Tennessee, Knoxville

Maxim Ziatdinov, Oak Ridge National Lab

Kevin Roccapriore, Oak Ridge National Lab

- Machine learning driven design of workflows in electron microscopy and spectroscopy based on the chosen experimental objective
- Myopic and non-myopic workflows: rewards, policies, and value functions - neural networks for real time data analysis in EM
- Structured Gaussian Processes and deep kernel learning: co-discovery of physical mechanisms and optimization - from myopic optimization to reinforcement learning
- Automated experiment forensics and human in the loop AE

X14 From Obscure to Clear: A Dive into Tissue Clearing and Expansion Microscopy

LEAD INSTRUCTORS:

Yongxin (Leon) Zhao, Carnegie Mellon

Alan Watson, University of Pittsburgh

Adam Glaser, Allen Institute for Neural Dynamics

- Overview of tissue clearing and expansion microscopy, highlighting their significance and complementary nature.
- Detailed exploration of popular tissue clearing methods and imaging techniques, with practical tips and troubleshooting.
- Introduction to expansion microscopy, including key reagents, protocols, and recent advancements.
- Practical session on managing and analyzing large datasets from cleared and expanded tissues using advanced tools.
- Interactive demo on software tools for visualizing and interpreting cleared and expanded tissue data.



EXPECTATIONS AND POLICIES FOR M&M PROCEEDINGS

If your submission/abstract (Contribution) is accepted to the M&M 2025 meeting, it will be published in the Microscopy & Microanalysis Proceedings 2025 online, with a digital object identifier (DOI), and published by Oxford University Press (OUP).

No Contribution will be published unless a License to Publish (LTP) form has been signed. As the author(s), copyright in the Contribution remains yours (or your employer's if your employer claims copyright in your work).

When submitting your Contribution, you need to warrant to MSA and Oxford University Press (OUP) that all of the following statements are true (if applicable) about your submission:

- That your Contribution is your own original work and does not duplicate any previously published work, including your own;
- Your Contribution has not previously been published (in print or electronic format), and is not currently under consideration by another publication;
- You have obtained ALL the permissions required (for print and electronic use) for any material you have used from other copyrighted publications in your submission;
- Your submission is accurate and does not contain anything which is libelous, or obscene, or infringes on anyone's copyright, right of privacy, or other rights.

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<https://mmconference.microscopy.org/License-to-Publish>



MICROGRAPH

Larval stage of midge fly
Karl Gaff, Art of Science Photography, Dublin, Ireland

> Thank you to our Sustaining Members

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