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Microscopy & Microanalysis 2014 Meeting

M&M 2014 Proceedings — USB Drive Update

Cambridge University Press is working to get the updated Proceedings USB drives out to M&M participants as quickly as possible. They hope to mail them out before the end of August. They will be mailed to the address used during the registration process.

Please note — only full meeting, student, daily and emeritus registrants will receive their personal copy of the proceedings. One copy will be sent to each sustaining member company, to the contact individual on file with MSA/MAS. Regular exhibitor personnel and exhibit-hall only participants will not receive a copy unless it was previously ordered.

Email M&M2014@cambridge.org for address changes and USB drive-related questions.



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Full Symposium Descriptions

Instrumentation & Techniques Symposia

A1 Oliver Wells Memorial Symposium on the Scanning Electron Microscope

Lynne M. Gignac, David C. Joy, Brendan J. Griffin

Dr. Oliver C. Wells was one of Sir Charles Oatley's first students to work on the scanning electron microscope (SEM) at Cambridge University and is widely considered one of the pioneers of the commercial SEM. For most of his 60 year career, Dr. Wells studied various aspects of the SEM but had particular interests in "low loss", energy filtered and very high energy (>100 keV) SEM imaging, SEM electron detector design and practical applications, and studying ways to reduce charging in SEM. Dr. Wells passed away in 2013 and this symposium is intended to honor his memory and legacy by soliciting papers on research, development, history and uses of the SEM with a particular emphasis on his research interests.

A2 Advances in Imaging and Spectroscopy in STEM

Nigel D. Browning, Peter D. Nellist, Maria Varela del Arco

In the 25 years since the first demonstration of atomic resolution Z-contrast imaging, STEM has risen from a technique performed only at a select few institutions to a ubiquitous method for atomic scale imaging and analysis. The aim of this symposium is to provide a forum to discuss the key developments that brought us to this stage and how the lessons learned from along the way can enhance the future development and integration of STEM methods. Contributions are encouraged that concern all aspects of the use of STEM - including instrument and technique development for all forms of imaging and spectroscopy and their application to in-situ analysis. Advanced applications of these approaches to solid state materials, nanostructures and biological systems are particularly welcomed.

A3 TEM Phase Contrast Imaging in Biological and Materials Science

Michael Marko, Radostin Danev

Conventional TEM phase-contrast imaging limits maximum information transfer to a narrow band of spatial frequencies. This can be avoided by in-focus imaging with a physical phase plate. The theory, construction, and practical use of phase plates will be explored. In biological cryo-TEM, high-contrast, high-resolution imaging at low electron dose is facilitated. In materials science, the combination of a physical phase plate with tunable Cs offers an unparalleled opportunity for characterization of both atomic details and larger structures. The number of laboratories exploring the use of phase-plates is growing, and this will be a timely opportunity to learn from each other.

A4 Electron Holography at the Atomic Scale and the Nanoscale

Molly McCartney, David J. Smith, Lin Zhou

Electron holography enables convenient access to the phase and amplitude of the electron wave passing through the TEM specimen, allowing both atomic-scale imaging as well as quantitative measurement of nanoscale electrostatic and magnetic fields. This symposium will consider recent advances in electron holography techniques and applications. Platform and poster presentations will include the emergence of novel approaches and instrumentation for electron holography, as well as providing an overview of latest applications to piezoelectric and ferroelectric materials, measurement of charge, magnetic nanostructures, both natural and man-made, and dopant profiling in semiconductor devices.

A5 15 Years of Focused Ion Beams at M&M

Lucille A. Giannuzzi, Keana Scott, Nicholas Antoniou

The first FIB session at M&M 2000 consisted of 20 papers and was dominated by applications of Ga⁺ focused ion beams for TEM specimen preparation. Since then, the use of FIB-based instruments has expanded to 3D analysis, specimen preparation for atom probe tomography and other techniques, nanomachining, and nanodeposition for inorganic materials, organic materials, and biological materials in ambient and cryo conditions. In addition, the development of new ion sources beyond LMIS to GFIS and ICPS using e.g., He⁺, Ne⁺, Xe⁺, and other ions have allowed unique imaging, analytical, milling and deposition capabilities while expanding usable length scales. Papers are encouraged on topics of focused ion beams including instrumentation, theory, and applications.

A6 Super Resolution Microscopic Methods

Angus I. Kirkland, John M. Rodenburg

This symposium will cover the development and applications of super resolution methods in the spatial and temporal domains, using all radiations, including electrons, X-rays and photons. Super resolved methods include developments and applications that use novel experimental dataset geometries in image and diffraction space to extend resolution and the computational methods required to extract and process the information from these. In particular, contributions that describe methods that are generally applicable to multiple radiations in a correlative fashion are welcomed as are applications of these methods to the life and physical sciences.

A7 Microscopy and Spectroscopy for Power Generation and Energy Storage

Eva Olsson, Wolfgang Jaeger

Among our most important challenges are reduction of energy consumption and environmentally friendly power generation and conversion. The performance of materials for energy technology is determined by their structure. This symposium will cover aspects of structure, properties and life-cycle analysis of materials for power generation, energy conversion, renewability, storage and reduced energy consumption. The topics include microscopy and spectroscopy investigations including techniques of Cs aberration corrected



electron microscopy, monochromated spectroscopy and in situ microscopy of photovoltaics, nuclear technology, fuel cells, ion conductors, energy storage, thermoelectrics, correlation between synthesis, structure and properties and specimen preparation for microscopy studies.

A8 Nano-Characterization of Emerging Photovoltaic Materials and Devices

Robert F. Klie, Moon Kim

The efficiency of solar cells and other energy-conversion devices can be further improved if detailed information of how defects behave optically and electronically can be obtained. Aberration-corrected (scanning) transmission electron microscopy is one of the most versatile experimental techniques to explore the structure-property relationships of materials at the nanometer and atomic scale. This symposium will focus on analytical transmission electron microscopy techniques, aberration-correction, monochromated energy-loss spectroscopy, and in-situ methods to characterize energy conversion materials. Presentations are sought from the areas of polycrystalline single-junction solar-cells, next generation multi-junction approaches, superlattice or quantum-dot thermoelectric devices.

A9 Frontiers in Analytical TEM-STEM

Gianluigi Botton, Juan Carlos Idrobo, Ai Leen Koh, Paolo Longo

With recent advancements in electron microscopy, fast spectroscopy detectors, and software for efficient acquisition and analysis of the data acquired, physical and chemical properties of materials can be now explored with unprecedented spatial and spectral resolution. This symposium aims to bring together scientists working at the forefront of spectroscopy in the scanning transmission electron microscopy (S)TEM. The symposium will showcase hardware and algorithmic improvement in EELS, EFTEM, EDS and cathodoluminescence spectroscopy and their applications to both materials and biological sciences. Of particular interest are studies of low-energy transitions, quantitative compositional mapping, fast chemical state mapping and how these data relate to physical properties of the materials.

A10 X-ray Imaging

Jeffrey M. Davis, Eric Telfeyan, Richard Wuhrer

This broad ranging symposium will cover all aspects of X-ray imaging in the SEM, electron microprobe, TEM, μ XRF, and synchrotron based methods. We are actively seeking contributions detailing new detector technology, new software, and innovative methods for analyzing complex materials. The goal of this symposium is to bring together a diverse group of experts who can present on everything from hyperspectral data analysis techniques to large area X-ray imaging of cultural heritage objects. We are also actively seeking contributions from students and young professionals interested in presenting new and innovative research.

A11 Frontiers of Electron-Probe Microanalysis

John Armstrong, Paul Carpenter, Hideyuki Takahashi, Mike Jercinovic

EPMA continues to see exciting developments such as FE-EPMA analysis at high resolution and low voltage, applications of SDD EDS and WDS to quantitative analysis, quantitative analysis via hyperspectral x-ray mapping, chemical state determination using low energy x-ray lines, improved automation and instrumental capabilities, and improvements in correction algorithms. This session will highlight invited presentations from the international community. We welcome contributed presentations from the scientific, vendor, and student communities, and encourage presentations on new technologies, problem solving, and practical solutions to analytical problems.

A12 3D Imaging and Microanalysis: Image Analysis and Applications

Paul G. Kotula, Keana Scott

Recent advances in detector technology, microscopy instrumentation and computing resources enable routine 3-dimensional structural, elemental and chemical imaging of materials, providing unexpected insights and better understanding of biological processes and material properties. However, advances in 3D imaging and microanalysis also introduced challenges specific to 3D analysis including multi-dimensional data processing and management problems. In this symposium, we will focus on the new methods and approaches in 3D imaging and microanalysis, novel 3D analysis applications, and data processing topics such as computational, mathematical and computer vision methodologies for characterization of 3D structures in physical and biological sciences.

A13 Practical Applications and Analytical Trends of Metallography and Microstructure

Frauke Hogue, Frank Mücklich

This symposium will draw together metallographers, engineers and researchers working on a wide range of materials produced by many different methods. The session will focus on efforts to reveal and characterize the true microstructure, with a special emphasis on deformation studies. Topics include advances in equipment and consumable technology that enhance the ability to prepare materials so that the true microstructure is revealed. Additionally, this session will address the application of these techniques to both research and industrial samples.

A14 Advances in Cathodoluminescence and Soft X-ray Microanalysis

Colin M. MacRae, Marion A. Stevens-Kalceff, Scott A. Wight

Cathodoluminescence (CL) and soft x-ray microanalysis provide unique high sensitivity information about defect microstructure, bonding and trace chemistry. CL is experiencing a resurgence due to improvements in instrumentation, data analysis, while soft x-ray microanalysis is a rapidly emerging field. With improvements in SDD technology and new WD based spectrometry the detection of ultra-soft x-rays (Li-K α) is now possible. Challenges include surface preparation, detector stability and difficulties in dealing with peaks that reveal the complexity of the Density of States. CL and ultra-soft x-ray detection require a combined approach of measurement and quantum mechanical modelling to interpret both composition and structure. Contributions covering theory and applications are encouraged.

A15 Cs-Correctors: Current State and Ongoing Developments

Max Haider, Rolf Erni

Nowadays, more than 400 spherical aberration correction systems have been installed worldwide and are used frequently for high resolution transmission electron microscopy. This symposium will concentrate on discussions of various aspects of such systems, e.g., the measurement of aberrations and their long-time stability, advanced applications like Lorentz microscopy and holography, etc. The different correction systems and the latest developments as well as the now understood resolution limits of aberration corrected imaging and how to tackle them should be discussed.

A16 Correlative Microscopy and Microanalysis from Macro to Pico

Brian P. Gorman, Christopher J. Gilpin, Mor Baram

Correlative microscopy is where the same sample is analyzed using two or more techniques that typically differ in scales ranging from the macroscopic to the atomic level. The resulting combined data sets can be used for both materials and life sciences in a variety of circumstances, e.g., localization of rare events, determining if small regions are typical of the bulk, and combining imaging and analytical techniques. Examples include optical imaging before FIB specimen preparation, combined SEM and SPM and fluorescence-labeled imaging before TEM specimen preparation, among others. This symposium solicits presentations of multi-scale imaging, analysis and/or innovative correlative technique or instrumentation development in both the physical and biological sciences.

A17 Extended Crystal Defects: Quantification of Strain, Local Atomic Structure and Chemistry

Douglas L. Medlin, Jim Ciston, Yoosuf N. Picard

Extended crystal defects such as dislocations, stacking faults, and grain boundaries strongly influence materials properties and behavior. Our fundamental understanding of such defects has benefited from decades of advances in transmission electron microscopy, while new developments in atomic resolution microscopies, three-dimensional imaging, and diffraction contrast methods are continuing to invigorate the field. This symposium will focus on the application of advanced microscopic methods to the fundamental study of extended crystal defects in materials. We welcome submissions investigating extended crystal defects across the full range of materials classes.

A18 Vendor Symposium: New Tools for Life and Materials Sciences

Alice C. Dohnalkova, Elizabeth R. Wright, Mark A. Sanders

This symposium provides an opportunity for instrument manufacturers and vendors to showcase new developments resulting in improved technology solutions. Topics include: new methods and techniques; new developments and technologies; breakthrough and new instrumentation; and improvements to existing instrumentation.

Biological Sciences Symposia

B1 Dr. Gerard Simon Memorial Symposium on Anatomic Pathology

Sara E. Miller, Pierre-Mathieu Charest

Dr. Gerard Simon, a renowned anatomical pathologist and ultrastructural researcher, specialized in Laboratory Medicine at the University of Geneva, and studied under Dr. Kellenberger in Pathology and Dr. Rouiller in Histology. In 1967, he became EM Laboratory Director at the Banting Institute and in 1979, the EM Laboratories Director at the Faculty of Health Sciences, McMaster University, where he helped found the Canadian Centre for EM. One of the founders of the Microscopical Society of Canada and the Canadian Foundation for the Development of Microscopy, he is considered as a major pioneer in the development of microscopy in biological sciences in Canada. This symposium will concentrate on Anatomic Pathology and Diagnostic EM and will dovetail with the Diagnostic EM FIG program.

B2 Microbes and Microbial Communities

Elizabeth R. Wright, Teresa Ruiz, Gary Dunny

Our understanding of the structure and function of microbes and microbial communities has advanced significantly with the application of EM techniques and correlative methodologies. This symposium highlights structural and ultrastructural studies of bacteria, archaea, fungi, protists, and viruses using electron microscopy techniques singly or combined with other structural methods. Topics will include: microbe architecture and function; microbe-host interactions; species diversity in microbial communities; microbial community structure and function; and interactions, signaling, and sensing in microbial communities.

B3 Nuclear Architecture and Chromatin Structure: 40 Years after the Nucleosome

Ada L. Olins, Donald E. Olins

Nuclear architecture is dynamic in 3D organization and composition. Cycling cells must continually and repeatedly reconstruct the interphase nucleus. Epigenetic markers, associated proteins, RNA and lipids modify the fundamental nucleosomal "string of beads" structure. How do these modifications influence higher order organization, including polynucleosome folding, chromatin domains and chromosome territories? This session will explore innovative electron microscopy methods and high-resolution light microscopy, which augment genetic and biochemical information, in an effort understand nuclear architecture at all levels. Young people with fresh ideas are encouraged to participate.

B4 Advances in Sample Preparation for Cryo-EM Studies

Isabelle Rouiller, Howard Young

Electron cryo-microscopy (cryoEM) is an exciting technique to understand the function of macromolecular complexes. This symposium highlights advances in preparation methods to address the challenges of studying flexible complexes and to allow the study of complexes in native membranous environments (using detergents, nanodiscs, amphipols and other systems, either by single particle or two-dimensional crystallization methods) or cellular environments (using cryo-sectioning, cryo-milling/FIB and correlative light and electron microscopy). Topics will include applications in a range of subjects of molecular and cellular biology, such as eukaryotic and prokaryotic architecture, cell division, protein expression, cellular signaling, and host-pathogen interactions.

B5 Structural Biology and Ultrastructure

Michael Radermacher, Paula da Fonseca, Ingeborg Schmidt-Krey, Caroline Miller

Recent developments on EM methodologies have greatly enhanced our understanding of the 3D structure and function of biological systems. This symposium highlights structural and ultrastructural studies of cells, microorganisms and macromolecules using electron microscopy techniques (e.g. single-particle analysis, tomographic methods; helical reconstruction, crystallographic methods) singly or combined with other structural methods (e.g. X-ray methods; atomic force microscopy). Topics will include: structure and function of macromolecular assemblies, virus structure and virus-host interactions; eukaryotic and prokaryotic cell architecture; cellular metabolism; cell division and protein translation; cellular secretion, adhesion and motility; cell-cell communication and signaling.

B6 Microanalysis of Biological Materials

Peta L. Clode, Richard D. Leapman

This session will encompass all aspects of elemental and isotopic microanalysis of cells, tissues and biominerals across electron, ion and X-ray platforms. Topics will focus on advances in instrumentation, as well as novel methods for sample preparation and data

analysis. Techniques will include: energy-filtered TEM (EFTEM), electron energy-loss spectroscopy (EELS), electron probe x-ray microanalysis, x-ray nanoprobe analysis, and secondary ion mass spectrometry (SIMS). Papers will also cover a wide range of applications from the biomedical sciences to basic biology, as well as agricultural and plant sciences, and bionanotechnology. Submissions are encouraged from experts through to students, with the view to inspiring interaction between biologists and microanalysts.

B7 Light Sheet and Multi Photon Imaging

Peter Santi, Thomas Stroh

Fluorescence microscopy provides high contrast and specificity imaging, while being compatible with live imaging. The environment of a cell is crucial for many biological processes and disease development. Whole organism and in vivo models as well organ cultures are highly suitable to elucidate complex mechanisms underlying these processes. However, their size and tissue density represent a special challenge for light microscopy. This session will discuss how multi-photon and light sheet microscopy address these issues. Applications adapted to time-resolved, live imaging and especially in the context of highly dynamic processes will be presented.

B8 Optical, Confocal, and Fluorescence Imaging

Judith Lacoste

The instrumentation for conducting microscopy-based experiments has developed significantly over the last years. Indeed the diffraction limit was broken by different optical and computational methods. It remains however that microscopy is not just about an instrument. The sample of interest needs to be prepared according to the goal of the research and the type of imaging required. This session will discuss recent advances in the development of fluorescent probes and tissue clearing techniques. These new tools, in combination with different microscope modalities, allows for significant improvement in the ability of researchers to image more challenging samples such as dynamic processes and deep tissues.

B9 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants, and Animals

W. Gray Jerome, Patricia E. Kysar, Michael P. Goheen

Microscopy is not only useful but critically important in the ongoing research, detection, diagnosis and treatment of disease. Advances that improve rapid and accurate detection and treatment often involve the use of various microscopic techniques. These varied techniques provide us with an improved ability to diagnose and research the origins, development and response of diseases in human, plant and animal specimens. This is an opportunity to share information on the investigation of pathogenic cells, tissues and entire organisms in clinical, diagnostic and research laboratories. Emphasis will be placed on both rapid detection and improvements in methodologies.

B10 Microscopy, Microanalysis and Image Analysis in the Pharmaceutical Sciences

Lynn DiMemmo, Alejandra Camacho

Pharmaceutical research and development presents unique challenges that have led to the development of highly specialized analytical methods. This symposium will present applications of microscopy associated techniques to biological and materials science problems that arrive during drug discovery, vaccine research, formulation and production. In addition to presentations by invited speakers, an informal forum will be provided for sharing of thoughts and strategies related to regulatory, throughput, archiving and other issues faced in our laboratories. Contributed papers for platform or poster presentation on related topics are also welcome.

Physical Sciences Symposia

P1 Analytical Techniques and Their Application for the Study of Deformed Microstructures

Michael B. Matthews, Frederick Meisenkothen, Stefan Zaefferer

This symposium will draw together technicians, engineers and researchers who are working in fields related to the study of deformation of materials. The session will focus on the latest efforts within the microscopy and microanalysis community to study structure-mechanical property relationships and to reveal and characterize the true microstructure produced in materials during deformation. Included within this focus are progress and advances in instruments, equipment, methodologies, and analytical and computational tools. Additionally, this session will address the application of these developments to both research and industrial samples. We invite and welcome contributed presentations from the scientific community. A special emphasis will be made to highlight student research.

P2 Advances in In-situ Microscopy

David A. Muller, Haimei Zheng, Adam P. Hitchcock, Thomas LaGrange

In situ electron and x-ray microscopies are playing an increasingly important role in addressing key scientific questions in materials science, chemistry and biology. The aim of this symposium is to provide a forum for scientists from diverse fields to discuss the latest advances in high-resolution in-situ microscopy. Areas of interest include but are not limited to environmental, dynamic, electrochemical cell TEM/STXM, in situ straining, in situ x-ray imaging, microdiffraction, etc. Topics on technical developments, such as specialized holders, detectors and microscopes, data quantification for in-situ experimentation, or applications of in-situ methods for catalysis, corrosion, batteries, material transformations, nanoparticle nucleation and growth, and biological processes are welcome.

P3 Mineral Analyses from Laboratory to Spacecraft

Rhonda M. Stroud, Zack Gainsforth

Mineral analyses can provide both economically valuable information regarding natural resources, and scientifically vital information regarding the formation and evolution of the solar system. The technical requirements for these analyses frequently push the limits of microanalysis. Current challenges include: How much chemical, structural, and isotopic information can be obtained from a single nanoparticle? With what certainty can a mineral mixture be identified with field or spacecraft instrumentation? What does the 3D microstructure reveal about a sample's geological history? Papers are solicited that address technical advances in microanalysis methods and/or novel applications of established methods for Earth and planetary materials research.

P4 Carbon Nanomaterials and Related Counterparts: Recent Results and Challenges

Raul Arenal, Kazu Suenaga

Fullerenes, nanotubes, nanodiamond and graphene are promising nanostructures for potential applications due to their unique properties. Most of these nanostructures are pristine carbon materials, but there is also a significant interest in related carbon-doped nano-objects and counterparts, e.g., layered materials such as BxCyNz, WS2 or MoS2. TEM techniques have provided major

advances in the study of these materials, including at the atomic scale by aberration corrected TEM. This symposium will focus on the state-of-the-art, current challenges and perspectives of TEM studies in these materials. Studies employing other characterization techniques, including Raman and infrared spectroscopy, XPS, photoluminescence, cathodoluminescence and scanning probe microscopy are also welcomed.

P5 Microanalysis of Irradiated Materials: Preparation, Instrumental Development, and Analysis

Karen E. Wright, Olivier Dugne, Philipp Poeml, Adam Robinson

Understanding the properties and behavior of nuclear materials as components or fuels throughout all stages of the fuel cycle (as fabricated, in-pile, accidental conditions or long-term storage conditions), requires a set of thermomechanic, neutronic or thermodynamic modeling tools. Data for such modeling arises from the microanalysis of these materials, which requires complex analytical techniques and equipment. Such techniques and equipment are difficult to develop, test, and implement, particularly when handling irradiated materials. This symposium will highlight approaches to addressing these challenges including sample preparation techniques, analytical approaches, facility and equipment set-up and modification, modeling, and data interpretation.

P6 Failure Analysis of Structural Materials: Microscopy, Metallography and Fractography

Daniel P. Dennies, Ronald J. Parrington

This symposium is intended to be a forum for the exchange of information and knowledge regarding the use of microscopy, metallography and fractography in structural materials-related failure analysis. Invited papers would include those involving failure investigations where microstructures, metallography and fractography are critical to identifying the root cause. Of particular interest are unique, innovative, and/or challenging applications of microscopy, metallography, fractography, and sample preparation in failure analysis for industrial or research applications. Target attendees will include engineers and scientists from all levels of analytical expertise and all related backgrounds, not just materials engineers.

P7 Microscopy and Characterization of Ceramics, Polymers, and Composites

S.K. Sundaram, James E. Martinez

Compositions, fabrication processes and applications are continually under development in the ceramic, plastic, and coatings worlds with the aid of conventional imaging of microstructures and experimental analysis. Emerging imaging techniques often reveal mechanisms and other details of these developments, especially when at least one dimension is on the micro or nano scale. This session showcases what is new in ceramography, plastography and coating analysis.

P8 Imaging and Analysis of Cultural Heritage Materials

Edward P. Vicenzi, Marc Walton, Loïc Bertrand

Cultural heritage researchers have benefited enormously from a number of recently developed and significantly improved imaging and analysis capabilities. Topics in this symposium will cover a range of methods used to characterize materials, from cutting-edge tools for the examination of ultra-precious and one-of-a-kind objects, to proven imaging and microanalysis techniques for documenting specimen condition and alteration. Contributions from researchers, conservation scientists, conservators, and students interested in applications to cultural heritage are welcome.

P9 Surface & Subsurface Microscopy & Microanalysis in Materials & Biological Systems

Vincent S. Smentkowski, John A. Chaney, Chanmin Su

Surface properties (composition, uniformity, thickness, topography, etc) dictate the performance of many materials and biological systems. The surface analyst is asked to detect & image species present in ever-lower concentrations & within ever-smaller spatial and depth dimensions. This symposium will emphasize state of the art surface analytical instrumentation including all aspects of surface mass spectrometry and scanning probe microscopy including nano-scale chemical analysis via TERS and IR; advanced data analysis tools; the use of complementary surface analytical instrumentation to perform a complete analysis of complex materials &/or biological systems; and surface analytical challenges. Contributed papers on surface analysis are solicited for both platform and poster presentations.

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Additional Topics for Papers

Instrumentation & Techniques

- C01 Advances in Instrumentation and Techniques — General
- C02 Convergent Beam Electron Diffraction
- C03 Variable Pressure/Environmental SEM
- C04 Imaging, Diffraction, Holography, Spectroscopy
- C05 Stereology
- C06 Infrared and Raman Microscopy and Microanalysis
- C07 Remote Microscopy and Collaboration
- C08 Education in Microscopy and Microanalysis
- C09 Forensic Science
- C10 Quality Systems and Standards
- C11 Core Facility Management

Biological Sciences

- C12 Biological Sciences — General
- C13 Specimen Preparation for Biological Sciences
- C14 Biomimetics
- C15 Blood/Immunology
- C16 Botany
- C17 Cytoskeleton
- C18 Developmental/Reproductive Biology
- C19 Entomology
- C20 Histology and Cytochemistry
- C21 Microbiology
- C22 Neurobiology
- C23 Parasitology

Physical Sciences

- C24 Physical Sciences — General
- C25 Specimen Preparation for Materials Sciences
- C26 Amorphous Materials
- C27 Alloys and Composites
- C28 Engineered Materials
- C29 Interfaces
- C30 Magnetic, Superconducting & Ferroelectric Materials
- C31 Modulated Structures
- C32 Oxidation/Corrosion
- C33 Phase Transformations
- C34 Porous Materials
- C35 Self-Assembly
- C36 Semiconductors
- C37 Atom Probe

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Plenary Session Speakers

Monday, August 4, 2014

"How Cutting-Edge Atomic Resolution Microscopy Can Help to Solve Some of the World's Energy Problems"

Professor Humphreys is Director of Research in the Department of Materials Science and Metallurgy, University of Cambridge. He is also the Director of the Cambridge Centre for Gallium Nitride and the Rolls-Royce/Cambridge University Technology Partnership for Advanced Aerospace Materials. His early work in electron microscopy focused on using electron diffraction theory to interpret the images of defects in a wide range of materials and he also developed new electron microscope techniques. More recently he has used electron microscopy and atom probe tomography (APT) for the advanced characterization of materials. In this talk he will show how atomic resolution electron microscopy and APT can be used to help to solve some of the world's energy problems and can also enable the commercial exploitation of materials.



Prof. Colin Humphreys,
University of Cambridge,
UK

"Living Images from the Birth of Microscopy"

Every microscopist revels in the secret world that our instruments reveal. Yet one mystery remains — what was seen by our first predecessors? Attempts to recreate the earliest views have failed: television documentaries have broadcast faint, grey images lacking in definition, which compounds the mystery of how the pioneering discoveries could have been made. The realities of the cell; the discovery of the nucleus; living spermatozoa; free-swimming bacteria ... none of these has been revealed to us as it was to the first microscopists. In today's extensively illustrated presentation, we will see — for the first time — exactly what Leeuwenhoek himself saw in the 1600s. We will follow Hooke as he recognizes the cell and Brown as he identifies the cell nucleus. The stunning video images show us what was seen centuries ago. When compared with the conventional reconstructions, these meticulous demonstrations leave a breath-taking impression. Here we are witnessing the dawn of science, recreated for today's microscopists to savor.

Professor Ford's books have appeared in over 100 editions around the globe, and his papers appear in magazines including *Scientific American*, *New Scientist*, *British Medical Journal*, *Nature*, and *The Cell*. His research on the living cell has revolutionized our views on life, and he is in much international demand as a lecturer. He is currently based in Cambridge, England.



Prof. Brian J. Ford,
Cambridge, UK



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Tutorials, Tech Forum, and Outreach Sessions

Physical Sciences Tutorials

X40 STEM_CELL: (S)TEM Software for Supercell Manipulation and Image Analysis

Vincenzo Grillo

X41 Imaging of Magnetic Structures in Scanning and Conventional TEM

Peter Schattschneider

Biological Sciences Tutorials

X50 Filling the Missing Wedge

Juha T. Huiskonen

X51 Getting the Most from your Direct Detection (DD) Camera for Low Dose Transmission Electron Microscopy

Anchi Cheng

X52 Super-Resolution: What Technique Should I Use?

Michael Davidson

Technologists' Forum

X30 Tech Forum Special Topic: Technical Approaches to Wide Field Fluorescence and Laser Scanning Confocal Microscopy

Lee Cohen-Gould, Frank Macaluso

Fluorescence microscopy is widely used in the biological sciences and in some areas of materials science. Both wide-field and confocal fluorescence techniques have characteristics that may make one more appropriate for answering a scientific question than the other. Each has its use, and it is not always clear which technique to use. This symposium will address issues that researchers new to the field encounter, as well as explore cutting edge applications. We encourage submissions for a poster session that will accompany the platform sessions.

X31 Tech Forum Roundtable Discussion: Doing Great Science on a Tight Budget

John P. Chandler

A panel of scientists and technical staff will discuss the challenges of doing great science on a tight budget. Even with adequate funding, it is sometimes difficult to decide how to best use those resources. Most labs will, at times, face difficult decisions about how to spend their available funds. Strategies can include finding the least expensive supplies, pooling resources with other research groups to maximize purchasing power and finding the most cost effective mechanism to maintain equipment. Please join us with your experiences and ideas and be prepared to share and learn.

Microscopy Outreach Sessions

X90 Microscopy in the Classroom — Strategies for Education and Outreach

Alyssa Calabro, Craig Queenan, David Becker

Local educators and registered conference attendees are invited to participate in presentations, round table discussions, and demonstrations of effective strategies for microscopy outreach and education at all levels. This session will show how microscopy in education serves as an important learning tool for inspiring our current and future STEM professionals. Those involved in microscopy education or educational outreach are encouraged to submit an abstract about their successful program or lesson for poster presentation.

X91 It's a Family Affair

Elaine Humphrey, Frauke Hogue, Stuart McKernan

This exciting session will pique the scientific interest of children of all ages - no previous microscopy experience needed!

- Program designed for the delegates' families and friends
- Hands-on activities and demonstrations will prove that science is fun
- Solve the mystery using clues left at the scene of the crime using electron microscopes on the exhibit floor

Delegates who wish to attend in order to develop outreach opportunities at their home institutions are encouraged to attend.

X92 Project MICRO Workshop

Elaine Humphrey, Caroline Schooley, Stuart McKernan



Do you want to introduce K-8 students to microscopes and the micro-world? This hands-on workshop uses the middle school teacher's manual, Microscopic Explorations, part of the highly acclaimed GEMS series from the Lawrence Hall of Science.

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Sunday Short Courses

Organizer: *Mike Marko*

- These full-day courses run from 8:30 AM to 5:00 PM on Sunday, August 3.
- A certificate of participation will be issued to each participant.
- Two Continuing Microscopy Education Units are available (registration fee \$10).
- Morning and afternoon coffee breaks are included.
- Lunch is on your own from on-site vendors

Course fees:

\$219 - Member, early registration
\$299 - Member, regular
\$219 - Non-member, early registration
\$299 - Non-member, regular

SUNDAY SHORT COURSES IN BIOLOGICAL SCIENCES

X-10 Cryo-preparation for Biological EM

Kent McDonald, Richard Webb

- Observation and use of some of the newest equipment and techniques for low-temperature sample preparation
- The best strategies for cryo-immobilization and cryo-substitution
- Demonstrations of high-pressure freezing, plunge freezing, and cryosectioning
- Low-cost alternatives for some biological specimen-preparation methods

In this course, we will briefly review why cryo-techniques for specimen preparation are superior to conventional methods. We will discuss some low-cost-alternative cryo-methods, as well as demonstrate some of the latest equipment and techniques for high-pressure freezing, plunge freezing, cryosectioning, cryoSEM, and freeze fracturing. The Tokuyasu method for immunolabeling will also be covered briefly. Persons taking this course should leave with a better understanding of these cryotechniques and their role in different applications such as EM tomography, vitreous cryosectioning, and EM immunolabeling, as well as their routine use for the best-available preservation of cellular fine structure.

X-11 Immunolabeling Technology for Light and Electron Microscopy

Caroline Miller, Rick Powell, Steven Goodman

- Specimen preparation considerations for optimizing morphological preservation and labeling efficiency for either light microscopy, electron microscopy, or both
- Consideration of the location of the antibody target within the cell or on its surface
- Matching the localization technique to the antigen of interest
- Correlative techniques bridging light and electron microscopy

The requirements for successful immunohistochemical and immunocytochemical labeling vary widely with different biological systems. The optimal techniques for light-microscope labeling often differ greatly from those needed for electron microscopy. The basics of immunolabeling at the light- and electron-microscope levels will be presented, illustrated with examples from several different biological systems. Some of the more complex methods and applications used in electron microscopy will be discussed in depth. The course will cover specimen preparation, immunogold labeling and enhancement methods, multiple labeling and correlative LM/EM techniques.

X12 3D Electron Microscopy of Macromolecular Assemblies

Teresa Ruiz, Michael Radermacher, Edward Morris

- Sample preparation: deep stain, vitreous ice
- Imaging conditions, low-dose imaging, tilt-pair data collection
- Alignment techniques and multivariate statistical analysis
- 3D reconstruction methods
- X-ray structure docking
- Techniques described have applications in both biological and material science

This short course will provide a comprehensive description of the methods used for 3D structure determination from electron micrographs of macromolecular complexes or weakly scattering specimens available in multiple copies. Specimen-preparation techniques for single particles (deep stain, vitreous ice) will be presented, followed by selection of optimal imaging conditions, including low-dose imaging. Next, a detailed explanation of image-processing techniques, with special emphasis on the random-conical reconstruction technique, will be presented. Finally, structure interpretation and docking of X-ray structures to 3D EM densities will be demonstrated. The techniques described could be applied to both biological and materials science specimens.

MULTI-DISCIPLINARY SUNDAY SHORT COURSES

X-13 Electron Tomography in Life and Material Sciences*Ilke Arslan, Cindi Schwartz*

- Basic principles of data collection and reconstruction
- Matching the sample preparation and imaging mode to the application
- Analyzing and visualizing the results

This short course will explain the basics of electron tomography, the experimental setups, and the hardware prerequisites (including direct detection cameras), illustrated by a broad range of application examples. Bright-field, energy-filtered, and scanning TEM tomographic methods will be discussed, emphasizing high resolution for hard materials, and cryo imaging for biological samples and soft materials. A variety of reconstruction algorithms will be introduced, as well as a survey of 3-D analysis, visualization methods, and sub-tomogram averaging. We intend the course to be of interest to both beginners and already-experienced users of electron tomography from the fields of biology and materials science.

X-14 Imaging and Analysis with Variable Pressure or Environmental SEM*Brendan J. Griffin, Matthew Phillips*

- Imaging with SE, BSE, CL, and EDX detectors
- Monitoring and optimizing instrument performance
- Use of charge-related contrast mechanisms
- Use of hot, cool, and cold stages
- Imaging uncoated specimens with ultra low kV and other beams (He, Ga)

This short course aims to take the challenge out of imaging in variable-pressure SEM mode. We will sequentially address VPSEM column components and operation: electron (SE and BSE), and light (CL) imaging and x-ray analysis strategies and detectors for both biological and materials samples. Procedures for monitoring instrument performance and optimizing image quality will then be presented. Examples of the novel charge-related contrasts available in VPSEM will also be discussed. The appropriate use of hot, cool and cold stages is included. The course will conclude with invited manufacturer presentations on new developments and a final lecture comparing VPSEM with conventional SEM. Lecture pdfs will be available online.

X-15 Advanced Focused Ion Beam Methods*Lucille Giannuzzi, Joe Michael*

- Use of FIB for TEM and SEM sample preparation
- Basics of ion/solid interactions
- 3-D imaging and analysis
- Nanofabrication

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 are so important for a user of FIB instrumentation to understand. We will then discuss techniques of sample preparation for SEM and TEM, using conventional liquid-metal Ga⁺ ion FIBs. We will introduce liquid-metal alloy sources, the gas field-ionization source, the plasma-ion source, and the various ions that are now commercially available to benefit differing applications. The course will conclude with discussions of 3D applications and nanofabrication.

X-16 Practical Considerations for Quantitative Image Analysis*James Grande*

- Practical use of image analysis tools
- Image analysis as a problem solving tool
- Multiple imaging programs demonstrated
- Many real world examples

This workshop covers a wide range of practical topics that are encompassed within the field of image analysis. The subjects will be covered in an easy-to-understand format so that users with little or no experience can comprehend the concepts of how image analysis can provide extensive quantitative measurements that may lead to better understanding of material performance. Topics covered range from cameras and other input devices to image-processing algorithm overviews and how best to extract quantitative data. Treating image analysis as a problem-solving tool along with discerning key metrics within a microstructure is discussed through several real-life examples.

SUNDAY SHORT COURSES IN PHYSICAL SCIENCES**X17 Metallography for Failure Analysis***Frauke Hogue*

- Learn preparation techniques to solve challenges in failure analysis
- Discover the importance of selecting the appropriate etching solution
- Correlate microstructure features to failure modes through case studies
- Receive an extensive notebook of annotated images

This course is beneficial for anybody involved in metallurgical failure analysis – technician, metallurgist, or engineer. Special, very practical techniques such as making very large mounts, grinding to a specific location, cleaning and replication will be discussed. The most important structures of various alloy groups, failure modes, and manufacturing methods are illustrated. More than two dozen case studies are presented to demonstrate the importance and use of optical metallography in failure analysis.

X-18 Advanced Electron Crystallography and Automated Crystal Mapping for Materials Applications*Jim Zuo, Laurie Marks, Peter Moeck, Sergei Rouvimov*

- Introduction to modern electron diffraction/electron crystallography techniques and theory
- Instrumentation for precession electron diffraction and automated electron diffraction data acquisition
- Nano electron diffraction and automated crystal orientation mapping and their application to nano-materials
- Crystallographic image processing
- Applications of modern electron diffraction and electron crystallography in materials sciences

Advances in Electron Diffraction and Electron Crystallography Techniques associated with recent progress in TEM instrumentation and fast computing resulted in enhanced capabilities for structure analysis at nanometer level. This paves the base for reliable metrology for structure characterization at nano-scale which meets the requirements for development of novel electronic materials and nano-structures. Course will cover basic principles of electron diffraction and electron crystallography as well as advances in automated data acquisition, crystal orientation and phase mapping, crystallographic image processing and their applications for materials research. Both lectures and exercises on structure analysis based on the electron diffraction and electron crystallography will be included.

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Pre-Meeting Congress

- Sunday, August 3, 8:30 am - 5 pm
- Registration and additional fee required (register online along with your M&M registration)
- Breakfast, lunch & breaks included.

Opportunities, Artifacts and Interpretation of Quantitative Aberration-Corrected Electron Microscopy

This one-day pre-meeting workshop, organized by the MSA Aberration-Corrected Electron Microscopy (ACEM) Focused Interest Group, will be a forum for the discussion of the latest advances and solutions to problems associated with application of aberration-correction technology in transmission/scanning electron microscopy with an emphasis on quantitation. The format will consist of platform presentations by both invited and contributed speakers, together with a working lunch & poster session.

Please check back for more details and program topics.



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Post-Deadline Posters

Information regarding post-deadline posters will be provided around March 1, 2014.

- Deadline for submission has passed. We look forward to receiving your submission for M&M 2015 in December!
- Submit your post-deadline poster by emailing in 2-page paper format (.doc; .docx; .pdf) to: MM2014ProgramChair@microscopy.org
- Post-Deadline posters are not included in the program proceedings and are not considered "published".
- Post-Deadline poster papers will be available for review and download (PDF) on the M&M 2014 site around July 20 (see below).
- No travel support is available for Post-Deadline posters.
- Post-Deadline poster presentation will be Monday, August 4 from 3-5 pm.
- Notifications of acceptance of post-deadline posters will be made on Friday, July 11.
- Post-deadline poster presenters will need to register for the meeting for at least the day of their presentation.
- Questions? Contact the Meeting Manager at meetingmanager@microscopy.org.



Post-Deadline (PD) Poster Number	Paper Title	Author(s)
PD-1	Microscopic characterization of Activated Carbon for Fluoride Removal	J. Dominguez-Mendoza ¹ , G. Gonzalez-Sánchez ² , L. M. del Razo ³ , C. González-Horta ¹ , L. Ballinas-Casarrubias ¹
PD-2	"TomViz: Open-Source Visualization and Analysis Platform for 3D Reconstructions of Materials"	Robert Hovden ¹ , Marcus Hanwell ² , Utkarsh Ayachit ² , David A. Muller ^{1,3}
PD-3	Color Calibration of Digital Brightfield Microscope Images Using Colorimetry with a Color Standard Slide	Mark Clymer, Hong Wei
PD-4	Hepatoprotective effects of Silymarin on TNF- α /D-GalN induced Liver Damage	Mustafa CENGİZ, H. Mehtap KUTLU, Adnan AYHANI
PD-5	Imaging of Hydrogen in Zirconium Alloy with Secondary Ion Mass Spectrometry (SIMS) : Time of Flight and Quadrupole SIMS Methods	N. Mine ¹ , S. Portier ¹ , J-P. Barnes ² and M. Martin ¹
PD-6	Morphological Changes on H-Ras 5RP7 Cells Caused by Vanadyl Sulphate	Djanan Vejselova ¹ , Hatice Mehtap Kutlu ² , Mustafa Cengiz ³
PD-7	Morphology characterization of TiO ₂ nanotubes by scanning transmission electron microscopy	M. Andrzejczuk ¹ , A. Roguska ² , M. Pisarek ² , M. Lewandowska ¹ , K. J. Kurzydłowski ¹
PD-8	Expanding Lab Capabilities with Customizable Analysis Tools	Michael R. Funk, Joel Alexa, Robert G. Bryant
PD-9	Compositional and Structural Analysis of Al-doped ZnO Multilayers by LEAP	A. D. Giddings ¹ , Y. Wu ² , M. A. Verheijen ² , T. J. Prosa ¹ , F. Roozeboom ² , D. J. Larson ¹ , and W. M. M. Kessels ²
PD-10	Color Calibration of Digital Brightfield Microscope Images Using Colorimetry with a Color Standard Slide	Mark Clymer, Hong Wei
PD-11	"Visualizing and Correcting Dynamic Specimen Processes in TEM Using a Direct Detection Device"	Benjamin E Bammes ¹ , Michael S Spilman ¹ , Zhao Wang ² , Corey Hryc ² , Joanita Jakana ² , Dong-Hua Chen ² , Liang Jin ¹ , Robert B. Bilhorn ¹ , and Wah Chiu ²
PD-12	Polymer-Derived Ceramics Investigated by Means of Pair Distribution Function from Electron Diffraction in TEM	Stefania Hapis ¹ , Hans-Joachim Kleebe ¹ , Yan Gao ² , Ralf Riedel ² , Jochen Rohrer ² , Xiaoke Mu ^{3/4} , Peter van Aken ³

PD-13	Antennal Cleaner of the Workers and Reproductives of <i>Solenopsis invicta</i> , Red Imported Fire Ant (HymenopteraFormicidae)	1Gerald T. Baker, 2Amanda Lawrence, 1Richard Brown
PD-14	Rapid Processing of <i>Bacillus subtilis</i> for 3D Analysis by FIB-SEM.	Erin S. Stempinski ¹ , Kedar Narayan ² and Christine A. Brantner ¹
PD-15	SEM-EDS: A Faster and Convenient Tool for Complete Elemental Profiling of Refinery Hydroprocessing Catalysts	"Vijai S. Balachandran ¹ , Amit A. Deshmukh ² , Satyanarayana Reddy Akuri ² , Vidyasagar Guggilla ² , Jose Nehemiah ² , Rajeshwer Dongara ² , Vishnupriya Bhaktavatsalam ¹ , and Philip Angevine ¹ "
PD-16	Characterization of Oxidation on Rhenium and its Effects upon Thermal Ionization Mass Spectrometry	Michael E. Summer ¹ , Matthew S. Wellons ¹ , Charles R. Shick, Jr. ¹ and Glenn A. Fugate ¹
PD-17	ARGONNE NATIONAL LABORATORY'S POST-TEST FACILITY FOR ANALYSIS OF LITHIUM-ION BATTERY MATERIALS	N. Dietz Rago, J. Bareño, and I. Bloom
PD-18	Magnetic Imaging with a Novel Hole-Free Phase Plate.	Shawn Pollard ¹ , Marek Malac ^{2,3} , Marco Beleggia ⁴ , Masahiro Kawasaki ⁵ , Yimei Zhu ¹
PD-19	Nanoscale strain measurements in TEM for electron devices: dual lens dark field electron holography, high angle annular dark field scanning transmission electron microscopy and nano-beam electron diffraction	"W. Weng*, Y.Y. Wang*, F.H. Baumann*, M.A. Gribelyuk*, D. Cooper**, A. Pofelski*** and L. Grenouillet****"
PD-20	In-situ TEM Observation of Boundary Migration between Li-rich and Li poor phases in a Single LiMn ₂ O ₄ Nanowire Battery	Soyeon Lee ^{1,2} , Yoshifumi Oshima ^{2,3} , Eiji Hosono ⁴ , Haoshen Zhou ⁴ , Kyungsu Kim ⁵ , Hansen M. Chang ⁵ , Ryoji Kanno ⁵ and Kunio Takayanagi ^{2,6}
PD-21	Microscopic Methods for Evaluating Ceria Nanoparticles in Thin Tissue Sections	Chen Wang ¹ , Alan Dozier ¹ , M. Eileen Birch ¹ , Uschi Graham ² and Michael Tseng ³
PD-22	"Pistachio Bushy Top Syndrome: The Association Between <i>Rhodococcus</i> sp. and Clonal UCB-1 Rootstock in Arizona and California"	J. Kilcrease, R. Stamler, J. Randall
PD-23	Optimization of secondary electron imaging of zeolite materials using in-lens techniques	Yuan Zhao* and Dogan Ozkaya**
PD-24	Thermally Optimized Design of Cooling Stage for in situ ESEM Experimentation	Xiaoda Sun*, Zhenquan Liu**, and K. Rykaczewski*
PD-25	The use of branched DNA ISH (RNAscope™) to characterize the systemic spread of RNAi effects throughout the body of western corn rootworm larvae	Andrew J. Bowling ¹ , Heather E. Pence ¹ , Murugesan Rangasamy ¹ , Huarong Li ¹ , and Ken Narva ¹
PD-26	Quantitative strain analysis of a creep damaged hydrogen reformer tube made out of high alloyed austenitic stainless steel using EBSD and quantitative NDE to enable remaining life prediction.	Sai Vadlamani ¹ , J.E.Indacochea ¹ , Didem Ozevin ¹ and Travis Rampton ²
PD-27	Nanobeam Beam Diffraction (NBD) in the TEM for Drift-corrected Strain Mapping in Semiconductor Devices	Frieder H. Baumann
PD-28	Ultra-thin Graphene Window for airSEM	"Yimo Han ¹ , Kayla Nguyen ² and Yonghun Lee ¹ Justin Richmond Decker ¹ Jiwoong Park ² David A Muller ¹ "
PD-29	Prevention of heavy charging of silicon nitride membrane of liquid cells with phase contrast observation	Goshu Tamura ^{1, 2} , Utkur Mirsaidov ^{1, 3} and Paul Matsudaira ^{1, 2, 4}
PD-30	Liquid Electrochemical Cell for in-situ TEM Studies of Batteries	Khim Karki ¹ , Peng Gao ¹ , Wei Zhang ¹ , Daan Hein Aalsem ² , Norman Salmon ² , and Feng Wang ¹
PD-31	Cryo-STEM for Energy Materials Research	Michael J. Zachman ¹ , Jennifer L. Schaefer ² , Lynden A. Archer ² , Lena F. Kourkoutis ^{1,3}
PD-32	Direct Visualization of The Jahn-Teller Effect Coupled to Na Ordering in Na ₅ /8MnO ₂	Xin Li ¹ , Xiaohua Ma ¹ , Dong Su ² , Lei Liu ¹ , Robin Chisnell ³ , Shyue Ping Ong ¹ , Hailong Chen ¹ , Alexandra Toumar ¹ , Juan-Carlos Idrobo ⁵ , Yuechuan Lei ¹ , Jianming Bai ⁶ , Feng Wang ⁷ , Jeffrey W. Lynn ⁴ , Young S. Lee ³ , Gerbrand Ceder ¹
PD-33	Core Facility Management at the Intersection of Academia and Industry - How to Connect and Not Collide Along the Cutting Edge of Scientific Research	Guy DeRose ¹ , Melissa Melendes ¹
PD-34	Investigation of KTP and BTO Ferroelectric Domain Behavior Through In-situ TEM Biasing	James Hart ¹ , Andrew Lang ¹ , Hessam Ghessami ¹ , Miryam Arredondo ² , Mitra L. Taheri ¹
PD-35	The Distribution of DCOIT and a Fluorescent Tracer Dye in Southern Yellow Pine	Peter Eastman ¹ , Christoph Schauwecker ² , David Laganella ³
PD-36	"Using focused ion beam to fabricate anodic aluminum oxide arrays arranged in custom-designed geometry for manufacturing metamaterials"	Pai-Chia Kuo ¹ , Kun-Tong Tsai ² , Jessie Shiue ¹ , and Yuh-Lin Wang ²

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Meeting Awards

[Reimbursement forms for Award recipients are available, click here .](#)

All "Meeting Award" applications (involved with the paper submission process) are now closed. Award notifications will be sent in the last week of March 2014. Onsite (poster and micrograph) awards are still available; details below.

The Microscopy Society of America (MSA) and the Microanalysis Society (MAS) annually sponsor awards for outstanding papers contributed to the Microscopy & Microanalysis (M&M) meeting, competitively judged based upon the quality of the submitted paper. These awards are provided to students, postdoctoral researchers, and professional technical staff members to help defray travel, lodging and other costs of attending the meeting. All awardees must fit the award criteria, as described below, at the time of the M&M meeting.

How to Apply For an M&M Meeting Award:

1. As part of the on-line paper submission process, an applicant must flag his or her paper for award consideration. Only one paper may be designated per applicant.
2. The applicant must appear as first author of the paper submitted for award.
3. The applicant must provide the name, title, institution, and e-mail address of his or her 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).

STUDENTS:

All full-time students 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.

POSTDOCTORAL RESEARCHERS:

All full-time postdoctoral researchers are eligible. Applicants are not required to be members of the sponsoring society.

PROFESSIONAL TECHNICAL STAFF MEMBERS:

- Full-time technologists are eligible. In addition, the applicant must be a member of the sponsoring society, current in his or her dues for the year of the meeting.
- Award applicants will automatically be considered for memorial scholarships conferred by MSA based on the generous support of society sponsors.
- Applicants who have already been conferred an M&M Meeting Award will not be considered for a second award in the same category.

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 Papers 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.

Other Awards

The M&M meeting's co-sponsoring societies confer competitively judged awards at the meeting, in addition to those associated with paper submission. For full details, go to the meeting web site and click on "Awards & Scholarships."

Poster Awards

MSA Student Poster Awards:

Sponsored by Microscopy Society of America

MSA believes that 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 (one in each of three categories).

Diatome Awards*Sponsored by Diatome*

Presented for the posters illustrating the best use of diamond knife ultramicrotomy in either biological or physical sciences.

- First Prize: One week, all-expense-paid trip to Switzerland
- Second Prize & Third Prize: Swiss watches

G rard T. Simon Award for Student Poster*Sponsored by Microscopical Society of Canada*

Student members of the Microscopical Society of Canada are eligible for the G.T. Simon Award for best poster presentation.

Please find more information here: <http://www.msc-smc.org/english:awards:start>

Micrograph Competitions**IMS Metallographic Contest:***Sponsored by the International Metallographic Society*

This annual contest solicits micrographs that illustrate problem-solving using a variety of imaging techniques, with cash prizes awarded in each of several classes.

MSA Micrograph Competition:*Sponsored by Microscopy Society of America*

The winner of the MSA Micrograph Competition is featured in the following year's Call for Papers.

Held at the M&M Meeting each year, this micrograph competition promotes the innovative blending of art and science. Open to all forms of microscopic imaging, winners of this competition are selected on the basis of artistic merit and general audience appeal. A maximum of three (3) awards will be presented; First Prize: \$200; Two Second Prizes: \$50 each.

Criteria:

- Entries must be scientifically significant
- Entries must contain novel information useful in resolving a scientific issue, and/or
- Present established information in a way that dramatically enhances its comprehension or interpretation.

Rules:

1. Any individual may submit a maximum of two (2) entries (one award per entrant).
2. Entries must have overall dimensions of 11" x 14" (horizontal or vertical), and be affixed to a stiff lightweight support (e.g. 1/4" foam board). Micrographs may be mounted so that they have borders.
3. Each entry must have a separate text sheet with the title and a 200-word (max) description of the image, including the technique and its scientific significance. Text is recommended to be printed in 14-pt Times New Roman font on a separate 8 1/2" x 11" sheet. Entrant's name, address and image title shall be posted on the back of the mounted entry(ies).
4. Entries must be brought to the meeting in Hartford and mounted on the display boards by 12:00 noon on Monday, August 4, 2014.
5. Non-winning entries must be removed Thursday afternoon by 3:00 PM. Micrographs remaining after that time will be discarded.
6. Winners will be announced at the meeting. Submitted micrographs remain the property of the entrants subject to the conditions above.

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.

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