



**MICROSCOPY &
MICROANALYSIS**
August 4 – 8 • Indianapolis, IN

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Microscopy & Microanalysis 2013 Meeting

M&M 2013 will be held August 4-8 at the [Indiana Convention Center](#) in downtown Indianapolis, IN. Please check this site often for updates and new information.

M&M 2013 Mobile App

The "MyItinerary" mobile app is available as both a native iOS (iPhone/iPad) app through the iTunes App Store, or as an HTML5 Web app for all major mobile devices (Android, Blackberry 7 & above). Once either version is downloaded to your device, it can be run without the need for an active internet connection. In addition, you can sync an itinerary that you created online with the app by entering your unique itinerary name

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For optimal use, we recommend: iPhone 3GS, iPod touch (3rd generation+), iPad iOS 4.0 or later
You can download the MyItinerary app by searching for "ScholarOne" in the App Store directly from your mobile device. Alternatively, you can access the link below to access the iTunes page for the app.
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Go to <http://mam2013.abstractcentral.com/planner.jsp> to access the searchable M&M 2013 itinerary planner. You may create an account in a few moments, or continue as a guest. Search for sessions and talks, and plan your week at the meeting!

The Advance Meeting Guide and Schedule is now available! [Click HERE](#) to download a PDF.

The full scientific program is available for download. [Click HERE](#) to download a PDF.

The paper submission deadline and the post-deadline poster deadline have both passed. We look forward to seeing your work submitted for M&M 2014.

Advance and online registration for the meeting are now closed. Please come onsite to the registration desk at the Indiana Convention Center to register, if you have not already.

Online hotel reservations for Indianapolis are now closed. Please contact the hotel of your choice directly to make reservations.

Registration for the meeting is now closed.

[Visit Indy](#) has detailed information on dining, maps, attractions and activities.

Have a question about the scientific program? Contact MM2013ProgramChair@microscopy.org.

Dear Fellow Microscopists, Microanalysts, Students and Friends,

We invite you to join us for Microscopy & Microanalysis 2013, August 4 - 8 in vibrant Indianapolis, Indiana. The annual M&M meeting continues to be the premier meeting for scientists, technologists, and students who use microscopy or microanalysis in their research, with 996 papers presented in 2012.

The Program Committee for 2013 has put together an outstanding scientific program that features the latest advances in the biological and physical sciences, techniques and instrumentation. Complementing the program is one of the largest exhibitions of microscopy and microanalysis instrumentation and resources in the world, attracting well over 100 companies. Educational opportunities include a variety of Sunday short courses, tutorials, evening vendor tutorials, pre-meeting workshops, and in-week intensive workshops. The Opening Reception offers an opportunity to meet new people in the field and renew old acquaintances, and the Monday morning Plenary session features showcase talks from outstanding researchers as well as recognition of the major Society and Meeting award winners. There will be other important awards conferred during the meeting, including daily poster awards to highlight the best student posters in instrumentation & techniques, biological applications of microscopy & microanalysis, and physical applications of microscopy & microanalysis.

Each year, the sponsoring Societies offer a variety of awards and travel funding for outstanding papers from students, post-docs, and technologists. Details regarding each specific award, criteria and prize(s) can be found in the Call for Papers and on the meeting website.



Indianapolis promises to be an inviting and hospitable location for our meeting. It is a city with many dining options (including 18 brew pubs!), historical neighborhoods, and museums, including the Eiteljorg Museum of American Indians and Western Art. And of course, there is the famous Indianapolis Motor Speedway for auto racing fans. For more information, visit <http://visitindy.com>.

Microscopy & Microanalysis 2013 is the one meeting you do not want to miss if you are involved with microscopy and microanalysis. We look forward to seeing you in Indianapolis!

Ernie Hall
President, MSA



Kristin Bunker
President, MAS



Natalio T. Saenz
President, IMS



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Full Symposium Descriptions

Instrumentation & Techniques Symposia

A01 Gertrude Rempfer Memorial Symposium on Advances in Electron Optics and Aberration-Corrected Electron Microscopy

Sergei Rouvimov, Rolf Koenenkamp, Wolfgang Neumann, Teresa Ruiz

Invited Presenters:

- Harald Rose, University of Ulm
- Max Haider, CEOS GmbH
- Angus Kirkland, University of Oxford
- Ute Kolb, University of Mainz
- Alice Dohnalkova, PNNL
- Edgar Rauch, CNRS
- Rob Ward, Portland State University

This symposium will honor the work of Gert Rempfer by presenting and discussing the most recent advances in electron optics and microscopy, including aberration corrected transmission and photoemission electron microscopy. The symposium intends to provide an overview of major milestones in electron optics development, give current status and outline the future trends. Because instrumentation development is intimately related to progress and challenges in science, the symposium will also address a few examples of recent electron microscopy-related advances in materials science and biology. It intends to attract attention of young scientist, especially female researchers, to fast developing areas in electron microscopy. The symposium will feature an introduction by Harald Rose.

A02 The Electron Microscope of the Future: Merging the SEM, the STEM and the Ion Microscope

Raynald Gauvin, David C. Joy, Brendan J. Griffin

Invited Presenters:

- Ludek Frank, Institute of Scientific Instruments ASCR
- Bradley Siwick, McGill University
- Winfried Heichler, SPECS GmbH

We no longer have to build electron microscopes in the same old way. It is amazing that an SEM built now is still recognizably the same machine as the original Oatley instrument from 1950! With STEM results at 30 keV in FE-SEM that can achieve resolution in the 0.2 - 0.3 nm, it is clear that microscopy will change significantly in the next decade. What will be the next microscope? SEM - STEM .1 - 60 keV or with another combination of energy? will the Ion microscope replace the SEM or TEM? or will the dual beam electron - He microscope become the real tool? Might it be possible to do microanalysis with SIMS in a dual-beam machine? What new combinations of techniques could be integrated?

A03 New Opportunities for In-situ Techniques and Instruments

Thomas W. Hansen, Blythe G. Clark, Klaus Qvortrup

Invited Presenters:

- Kristian Mølhave, DTU Nanotech
- Daniel Kiener, University Leoben
- Niels de Jonge, INM-Leibniz Institute for New Materials
- Khalid Hattar, Sandia National Labs
- Jurgen Plitzko, Max Planck Institute of Biochemistry
- Moritz Helmstaedter, Max Planck Institute of Neurobiology

In order to gain insight into matter in its working state, newly developed and modified tools are being extensively used to allow observation of various interactions with the sample *in situ*. These tools need to be accurate far beyond the sub-micron scale and must operate in a way that does not affect the optical performance of the instruments. The aim of this symposium is to highlight both newly developed capabilities with electron microscopes and new uses of well-established techniques. The symposium will cover all flavors of electron microscopy and bring together scientists from both the materials science and soft matter communities.

A04 Electron Tomography in Life and Material Science

Heiner Friedrich, Montserrat Barcena, Esther Bullitt

Invited Presenters:

- David Mastrorarde, University of Colorado
- Elizabeth Wright, Emory University School of Medicine
- Irene Wacker, Karlsruher Institut für Technologie (KIT)
- Dirk van Dyck, University of Antwerp
- Krijn de Jong, Utrecht University
- Daniel Wolf, Technische Universität Dresden



Advances in sample preparation, instrumentation and methodology have widened the scope of electron tomography (ET) from sub-nanometer details to the micrometer scale. This symposium will address leading scientific and technological developments in the physical and biological sciences, using the widest possible range of ET imaging approaches and their integration with complementary techniques. Applications and developments covering — but not limited to — (aberration-corrected, energy-filtered) TEM and STEM, phase plates, diffraction or holography, are invited. Contributions including complementary approaches such as correlative light-electron microscopy, X-ray tomography, serial-block face SEM/AFM, and novel processing tools are encouraged.

A05 Revisiting Resolution for STEM and TEM

Edgar Voelkl, Rolf Erni, John Silcox, Nasim Alem

Invited Presenters:

- Knut Urban, Research Center Juelich
- Dirk Van Dyck, University of Antwerp
- Pierre Stadelmann, CIME-EPFL
- James Lebeau, North Carolina State University

The development of spherical and chromatic aberration correction voids the definition of conventional "Scherzer" resolution. Live computer assistance provides a variable resolution estimate instead for thin samples. With improved probe size or point spread function, direct image interpretation is tempting but is still problematic. Can resolution be defined for samples that are not "thin"? How thick can a sample be and still allow for direct interpretation? Can object-limited resolution be quantified at all? With increased signal-to-noise ratio and aberration reduction, has the match between simulated and real images actually improved? Decision time: using TEM or STEM for imaging and/or chemical mapping for beam sensitive samples at what voltage?

A06 Applications of MicroCT in Life and Material Sciences

Douglas R. Keene, Daniel S. Perrien, Rebecca Rudolph

Invited Presenters:

- Denton Ebel, American Museum of Natural History
- Anjali Singhal, GE Global Research
- Meghan Faillace, GE Inspection Technologies

With recent advances in hardware and computing power, the cost, speed, and resolution of polychromatic and synchrotron microCT systems makes them a viable option for three dimensional microscopic studies at the micrometer and submicrometer level. This symposium will provide an overview of microCT applications in a variety of fields including biomedical research, geology, archaeology, and engineering/manufacturing. Plenary talks and posters will highlight the development of novel techniques for image acquisition, processing, visualization, or analysis or application of standard techniques to new fields of study. Subjects may also include the utility of combining microCT with other imaging modalities. New studies and contributions from universities, government and industry are welcome.

A07 Mass Spectrometry Imaging (MSI): Applications, Current Challenges and Perspectives

Francisco A. Fernandez-Lima, Christine M. Mahoney

Invited Presenters:

- Paula Clark, Tascon, USA
- Ljiljana Pasa-Tolic, EMSL/PNNL
- Peter K. Weber, LLNL
- Christine Ferreira, Purdue University
- Ingela Lanekoff, EMSL/PNNL
- Kathy Kellersberger, Bruker Daltonics

Comprehensive surface characterization and analysis requires detailed knowledge of the chemical constituents, locations, and dynamics. With the recent advent of novel mass spectrometer and imaging probe designs, data analysis methods, and sample preparation techniques, mass spectrometry imaging provides unrivaled capability for detection, characterization and identification of surface components. This symposium will focus on the state-of-the-art, current challenges and perspectives of mass spectrometry imaging. Topics will include: high spatial resolution imaging and isotopic analysis using mass spectrometry; 2-D/3-D molecular analysis for materials and biomedical applications; novel atmospheric pressure ion sources and their applications; fundamentals on imaging probe/surface interaction and novel instrumentation; and data analysis protocols, strategies and sampling methods.

A08 EBSD, Advanced Electron Diffraction and Automated Mapping Techniques for Geological and Materials Research

Natasha Erdman, Joseph R. Michael

Invited Presenters:

- Adrien Boulineau, CEA-Grenoble
- Sarah Brownlee, Wayne State University"
- Patrick Trimby, Australian Centre for Microscopy & Microanalysis
- Stuart Wright, EDAX/TSL
- Angus Wilkinson, Oxford University
- Tresa Pollock, University of California, Santa Barbara

Orientation mapping of crystalline materials has provided important information resulting in improved understanding of both man-made and geologic materials. This symposium highlights the advances in orientation mapping through EBSD in the SEM and precession diffraction in the TEM, and in particular improvements in resolution and accuracy of these techniques. The recent development and controversy over the use of electron diffraction techniques for elastic and plastic strain mapping is an important area. Topics of interest to this symposium include but are not limited to: EBSD, precession diffraction, transmission Kikuchi diffraction, improvements in resolution, improvements in accuracy, elastic and plastic strain measurement, applications in materials science and geological materials.

A09 Advances in Data Processing in Optical and Electron Microscopy*Edward P. Morris, David Morgan, Jeffrey L. Clendenon*

Invited Presenters:

- Kevin Eliceiri, University of Wisconsin
- James Glazier, Indiana University
- Michael Radermacher, University of Vermont
- Hanspeter Winkle, Florida State University
- Quentin Ramasse, SuperSTEM
- Lewys Jones, University of Oxford

Many advances in microscopy have been driven by developments in software and the availability of affordable high-speed computing. This symposium will focus on software tools for EM and LM that are publically available with an emphasis on analysis after data acquisition. A major topic will be EM software for structural biology (analysis of single particles, helical structures, 2d crystals), TEM/STEM tomography and enhancing information obtained from materials. Another focus will be software developed for LM to process, visualize, segment and measure 3D/4D images.

A10 Practical Programming for Microanalysis*Andrew Deal, Philippe T. Pinard, Aaron Torpy*

Invited Presenters:

- John Donovan, University of Oregon
- Ralf Hielscher, Technische Universität Chemnitz
- Paul Shade, U.S. Air Force Research Laboratory

Over the past decade there have been tremendous advancements in the computational resources that are readily available. Integrated and stand-alone computer programs written by microscopists have both advanced the science of microscopy and extended the ability to collect and analyze data. This symposium is intended as a forum for the presentation and discussion of programs and programming practices that enhance our community and science. Contributions in the following areas are welcome: Scripting, APIs, and Task Automation; Quantitation Routines and Data Processing; Microscopy Simulations; Extensible/Robust Code Development; and Open Source Libraries.

A11 Ion Beam Instrumentation and Applications for Physical and Biological Sciences*Keana Scott, Mike Marko, Trevor E. Clark*

Invited Presenters:

- Bruno Humbel, University of Lausanne
- David Joy, University of Tennessee
- Joseph Michael, Sandia National Laboratories
- McLean Echlin, UC Santa Barbara

Focused-ion-beam instruments are available with a widening choice of ions, for new applications involving both imaging and milling. With recent advances in detector technology and analysis techniques, applications span the needs of the semiconductor industry, materials science, and biology. We encourage abstracts on all aspects of ion beam technology including theoretical or experimental work on ion-solid interactions, FIB-based specimen preparation, processing and fabrication methods, and FIB-based 2D and 3D analyses of hard and soft materials. Advances in new instrumentation or methods such as light-ion sources, high-current ion sources, mass-filtered ion sources or low-energy ion milling are also of interest.

A12 Atom Probe Tomography In Correlative Investigations*Baptiste Gault, David J. Larson*

Invited Presenters:

- David Dierks, Colorado School of Mines
- Christian Oberdorfer, University of Münster
- Jim Speck, Materials Department, UCSB
- Brian Geiser, Cameca Inc
- Dieter Isheim, Northwestern University
- Zhijie XU, PNNL
- Williams Lefebvre, University of Rouen
- Michael Miller, Oak Ridge National Laboratories
- Michael Moody, Oxford Materials
- Francois Vurpillot, University of Rouen

This symposium is for researchers who are using atom probe tomography (APT) in correlation with computational methods and/or other microscopy techniques to bring insights into the fundamentals of the techniques or to gain complementary information to enhance materials characterization. The symposium aims to blend experimental and theoretical work, and will capture the most recent developments around atomic-scale correlative microscopy, as well as the combined use of computational methods with APT that include atomistic simulations (DFT, molecular dynamics, Monte-Carlo, etc.) and advanced data treatment. Advances directed toward atomic-scale tomography are encouraged.

A13 Microscopy and Microanalysis for Real World Problem Solving*Stuart McKernan, Elaine F. Schumacher, Janet H. Woodward*

Invited Presenters:

- Deborah Hall, Rush University Medical Center
- Steven Bradley, UOP, LLC, a Honeywell Company
- Philip Howard, NASA

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

A14 New Instrumentation at the Limits: Characteristics and Applications

Ray W. Carpenter, John C. H. Spence, Moon J. Kim

Invited Presenters:

- Jo Verbeeck, University of Antwerp
- Yifan Cheng, UC San Francisco
- Holger Muller, UC Berkeley
- Eric Stach, Brookhaven NL
- Thomas LaGrange, LLNL
- O.L. Krivanek, Nion Co.

This symposium will review new instrumentation and techniques beyond current limits such as new fast electron sources, high efficient detectors and twisty beams for magnetic materials, and also for solving critical issues related to new and emerging advanced materials and devices. The proof of concept experiments as well as practical examples are also within the scope of this symposium.

A15 Low Voltage Transmission Microscopy: Pros and Cons

Max Haider, Rasmus R. Schroeder

Invited Presenters:

- Ute Kaiser, University of Ulm
- David Bell, Harvard University
- Kazu Suenaga, AIST National institute
- Ray F. Egerton, University of Alberta

This Symposium will cover the physical and instrumental aspects as well as the application of Low Voltage TEM & STEM. With this symposium we attempt to find out if there are optimum energies when working with beam sensitive materials and what are the limitations with respect of resolution, applicable dose, achievable contrast and specimen preparation. Analytical aspects at low energies should also be covered. The advantages and disadvantages when working at low energies should be of beam sensitive materials should be compiled.

A16 X-ray Microanalysis in Modern Electron Optical Instruments: Is It Really Quantitative in Today's Diverse Architectures?

Dale E. Newbury, Masashi Watanabe, Nestor J. Zaluzec

Invited Presenters:

- Nicholas Ritchie, National Institute of Standards and Technology
- Toru Hara, National Institute for Materials Science
- Hideuiki Takahashi, JEOL, Ltd
- Alan Sandborg, AMETEK
- Claude Merlet, Université, de Montpellier II

X-ray analysis using electron optical instruments has a long history (Castaing EMPA-1951; Duncumb EMMA-1962) so much so, that the technique is often taken for granted. Today's instruments are not always optimized for precision measurements and frequently are configured to operate under diverse conditions and modes. While analyses can be readily obtained, accurate results require careful that measurement science be performed during sample preparation, instrument operation, spectrum measurement, and concentration calculations. Speakers will consider barriers to accuracy as well as developments needed for further progress in the SEM, EMPA and TEM/STEM/AEM. Contributed presentations in the areas of technology, software, limitations, and hyperdimensional imaging/analysis are welcome.

A17 Vendor Symposium: Latest Developments in Tools for Life and Materials Sciences

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

This symposium provides an opportunity for instrument manufacturers and vendors to showcase new developments and improved products. Topics include:

- New methods and techniques
- Improvements to existing instrumentation
- Innovations for new instrumentation

Biological Sciences Symposia

B01 Developmental Biology and Tissue Engineering: Bridging the Gap through Microscopy

Jay D. Potts, Richard L. Goodwin

Invited Presenters:

- Brenda Rhongish, The University of Kansas Medical Center
- Sandra Rugonyi, Oregon Health Sciences University
- Richard Goodwin, University of South Carolina
- Michael Rubart-von der Lohe, University of Indiana School of Medicine

The field of tissue engineering is one the fastest growing disciplines in science with its union of bioengineering, developmental biology and translational medicine. Principally, the end result of all three creates living, functional tissues. These fields also pose common imaging challenges, as the generation of tissues is a dynamic, 3D process. This symposium

will explore a range of techniques that researchers have used to examine these dynamic processes and to overcome the obstacles associated with studying rapidly changing molecular and structural components of cells and tissues during normal development and engineering of tissues.

B02 AFM-Based Nanoscopies in the Life Sciences

John R. Dutcher, Laurent Kreplak, Christopher M. Yip

Invited Presenters:

- Andrew Pelling, University of Ottawa
- Linda Johnston, NRC
- Peter Lu, Bowling Green State University
- Gilbert Walke, University of Toronto

The aim of this symposium is to highlight recent developments in AFM instrumentation and integration with optical techniques that are opening exciting new avenues in the Life Sciences. Topics covered will include the nanoscale mapping of chemical and mechanical properties of macromolecular assemblies, cells and tissues. Presentations will cover both methodological developments as well as applications to cell biology and medicine.

B03 Structural Biology and Cell Ultrastructure

Paula C. A. da Fonseca, Michael Radermacher, Ingeborg Schmidt-Krey

Invited Presenters:

- David Veesler, The Scripps Research Institute
- Edward Morris, The Institute of Cancer Research
- Beate Rockel, Max-Planck-Institute for Biochemistry
- John Rubinstein, The Hospital for Sick Children, University of Toronto
- Tamir Gonen, Howard Hughes Medical Institute
- Timothy Baker, University of California, San Diego

Our understanding of the 3D structure and function of cells, microorganisms and macromolecular assemblies has experienced great advances through recent developments of EM techniques and hybrid methodologies. This symposium highlights structural and ultrastructural studies of cells, microorganisms and biological 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.

B04 Fluorescence Microscopy of Organelle Dynamics

Darren Boehning, Matt Lord

Invited Presenters:

- Kirill Kiselyov, University of Pittsburgh
- Sharon Rozovsky, University of Delaware
- Sidney Shaw, Indiana University
- Vladimir Sirotkin, SUNY Upstate
- Shane Nelson, University of Vermont

The development of novel fluorescent probes and the discovery of green fluorescent protein has revolutionized the cell biology field. Combined with new imaging methodologies such as multi-photon, TIRF, and super resolution microscopy, it is now possible to visualize cellular processes in living cells with unprecedented spatio-temporal resolution. This symposium will explore how fluorescence microscopy can be exploited to examine cellular function, with an emphasis on subcellular dynamics of organelles and proteins. Topics will include fluorescent techniques for visualizing: mitochondrial structure/function, cytoskeletal dynamics, endocytosis and vesicular trafficking, protein trafficking and degradation, and cell signaling.

B05 Microscopy of Medical Devices and Biomaterials

Gabe M. Lucas, Coralee McNee, Rik Brydson

Invited Presenters:

- Linn Hobbs, Massachusetts Institute of Technology
- Michael Reid, Stryker Orthopaedics
- Scott Lieberman, Exponent
- David Jones, Stryker

Spanning the worlds of engineered materials and organic life, the design and manufacture of medical devices and biomaterials presents a unique set of problems and solutions for the microscopist. This symposium will focus on the microscopy techniques used in evaluating these novel systems from manufacture to implementation and interval evaluation through device failure. Biomedical devices include sensors, orthopedic, cardiovascular and neurological devices, medical instrumentation, endoscopic and minimally invasive devices. Biomaterials are substances engineered to take a form which is used to direct the course of therapeutic or diagnostic procedures by control of interactions with components of living systems. Biomaterial research includes polymer engineering, drug and gene design, immunology and self-assembly at the nanoscale. Contributions are encouraged from developing research to best industrial practices.

B06 Utilizing Microscopy for Research and Diagnosis of Diseases in Humans, Plants and Animals

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

Invited Presenters:

- Jennifer Gaddy, Vanderbilt University School of Medicine

- Charles Humphrey, CDC
- Chang Hyun Khang, University of Georgia
- Xiao-Ming Yin, Indiana University
- Jay Potts, University of South Carolina
- Eric Wartchow, Children's Hospital
- Carrie Phillips, Indiana University

Microscopy is not only useful but critically important in the ongoing research on basic mechanisms for 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.

B07 Microscopy, Microanalysis and Image Analysis in the Pharmaceutical Sciences

Alejandra Camacho, Charles D. Humphrey

Invited Presenters:

- Madeline Dukes, Protochips
- Daniele Musumec, University of Wisconsin-Madison
- Skip Palenik, Microtrace LLC
- John Bruce Green, Baxter Healthcare
- Rober Carlton, GlaxoSmithKline

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

P01 The Art in Microscopy and Microanalysis

Alex D. Ball, John F. Mansfield

Invited Presenters:

- George Vander Voort, Struers Inc
- Carol Hirschmugl, University Wisconsin
- Letizia Monico, University of Antwerp (Belgium); CNR-ISTM/University of Perugia (Italy)

The preservation of cultural historical artifacts is essential in the maintenance of mankind's cultural heritage. Annually, millions of people visit historical cities, archeological sites, museums and libraries around the globe. Maintaining and restoring artifacts in these institutions is a continuous process. Technological advances of both the 20th and early 21st centuries have provided new tools to study the materials, manufacture and deterioration of historical artifacts. This symposium will focus on the application of microscopy and microanalysis techniques to aid cultural heritage research, principally in the areas of conservation, maintenance, provenance and restoration. Materials of study may include: naturally occurring materials, such as wood, stone and minerals; man-made or manipulated materials such as metals, coinage, jewelry, ceramics (porcelain and pottery), glass, textiles, paper, paint and pigments or building materials and structures.

P02 Structure and Composition Analysis of Nanoparticulate Systems

Miaofang Chi, Chris J. Kiely, Jimmy Liu

Invited Presenters:

- Beth Guiton, U. Kentucky
- Larry Allard, Oak ridge National Laboratory
- Gianluigi Botton, McMaster
- Miguel José-Yacamán, University of Texas"
- Alexandre Gloter, Laboratoire de Physique des Solides, Orsay, Paris.
- Paul Midgely, U. Cambridge
- Renu Sharma, NIST
- Robert Schlogl, Fritz Haber - Berlin
- Stig Helveg, Haldor Topsoe

Our understanding of nanoparticles and nanoparticulate systems has been greatly improved due to the recent advance in microscopy techniques, especially aberration-corrected electron microscopy and associated in-situ or chemical analysis techniques. This symposium aims to provide a platform to discuss recent progresses and current limitations on our understanding of the properties of individual nanoparticles and nanoparticulate systems. This symposium welcomes contributions from all aspects of advanced EM characterization of nanoparticles, with special emphasis on: Imaging and chemical analysis of nanoparticles with atomic-scale resolution; investigation of surface and sub-surface structures of nanoparticles; New approaches (e.g. low-voltage, low-dose, low-temperature) to minimize beam-induced effects in nanoparticulate systems, advanced image/spectrum processing and simulation methods for nanoparticles, and complementary in-situ techniques for analyzing nanoparticles under working conditions.

P03 Imaging the Hard/Soft Materials Interface: Challenges and Solutions

David C. Bell, Emmanuelle A. Marquis

Invited Presenters:

- Antonio Nanci, University of Montreal Dental School
- John Bartlett, The Forsyth Institute

- Derk Joester, Northwestern University
- V. K. Berry, Dow Chemical
- Ray Egerton, University of Alberta
- Juan-Carlos Hernandez-Garrido, Universidad de Cadiz

The issues of imaging the hard /soft materials interface has been around for many years, damage to soft materials and lack of contrast being one of the many issues. Advances now enable this regime to be imaged with usable contrast as not previously possible. The design and discovery of such new hybrid materials is becoming increasingly important, new developments in microscope design and improvements to existing technologies will be covered. The platform will focus on the high spatial and spectroscopic advantages of electron microscopy techniques as well as the challenges of damage in regards to the characterization of hard/soft interfaces materials.

P04 Deriving Fundamental Catalyst Properties from Electron Microscopy

Ilike Arslan, Larry F. Allard, Abhaya K. Datye

Invited Presenters:

- Chris Kiely, Lehigh University
- Jimmy (Jingyue) Liu, Arizona State University
- Krijn de Jong, Utrecht University
- Wharton Sinkler, UOP LLC
- Robert Schlögl, Fritz-Haber-Institut der Max-Planck-Gesellschaft
- Libor Kovarik, Pacific Northwest National Laboratory

Catalysis is an extremely complex science. In order to be able to design the next generation of catalysts that provide exceptional activity or selectivity, their fundamental properties must be understood at the atomic, electronic, and 3-D scales, and under in situ operating conditions. With the recent advancements in environmental microscopes and stages, understanding of catalysts is reaching new levels, including the observation of atomic motion in gas environments. We solicit contributions on applications of TEM, especially using aberration-corrected imaging, electron tomography, in situ imaging, and spectroscopic methods that advance our understanding of catalytic materials and provide clues for the optimized design of future catalyst systems.

P05 Microstructural Characterization of Metals — 150 Years After Sorby

George F. Vander Voort, James E. Martinez

Invited Presenters:

- Joseph Goldstein, University of Massachusetts
- Arun Gokhale, University of Georgia Tech
- Alexander Kazakov, St. Petersburg State Politechnical University
- Scott Sitzman, Oxford Instruments America, Inc
- Clem Forget, Clemex Technologies Inc.
- David Williams, The Ohio State University
- Stefan Zaefferer, Max Planck Institute for Iron Research

On 28 July 1863, Henry Clifton Sorby announced to the world that he had observed the microstructure of iron and steel specimens and had identified (correctly) seven of the main constituents. Sorby was the first person to successfully prepare iron and steel specimens damage-free so that he could properly observe and characterize the structure. To document what he saw, hand-drawn sketches were the only option. On the centennial of this momentous event, six societies in the UK organized a symposium in Sheffield and four societies in the US organized a symposium in Cleveland. 2013 will mark the sesquicentennial of this historical event. Papers are being sought discussing the growth of microstructural characterization since 1963 in the area of metallography, and relating to the developments over the last fifty years in scanning electron microscopy, electron backscattered diffraction, electron microprobe analysis and transmission electron microscopy, as they relate to microstructural characterization and quantification of metals.

P06 Failure Analysis of Structural Materials: Microscopy, Metallography and Fractography

Brett A. Miller, Daniel P. Dennies

Invited Presenters:

- Nick Cherolis, Rolls Royce Corporation
- Eric Guyer, Exponent, FaAA
- William Kane, Exponent, FaAA
- Quinn Horn, Exponent, FaAA
- Paul DeVries, The Boeing Company

Failure analysis of structural materials is an essential component of any design, manufacturing or research endeavor. Observable microstructures and fractographic morphology provide clues to prior material processing and changes to the material due to service or research, as well as identifying anomalies and flaws. Prevention of additional failures and research advancements are very often contingent on correct identification of material characteristics through microscope evaluation. The aim of this symposium is to highlight the use of metallographic and microscopic characterization techniques to provide insight into failures of metallic and nonmetallic materials during service applications or research.

P07 Special Problems and Solutions: Coatings, Ceramics and Polymers

John Sauer, Richard E. Chinn

Invited Presenters:

- Earl Sanford, Corning, Inc.
- Brian Gorman, Colorado School of Mines
- Lucille Giannuzzi, L.A. Giannuzzi & Associates LLC

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.

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Additional Topics for Papers

Organizers: Executive Program Committee

Potential additional session topics in the three categories (Instrumentation & Techniques, Biological Sciences, and Physical Sciences) are listed below. Papers submitted to a topic that corresponds to an organized symposium otherwise listed in the Call for Papers will be moved to that session. If a sufficient number of submissions on a topic are received, the Executive Program Committee will organize a special session on that topic; if not, the papers will be redirected to the closest topical area.

Instrumentation & Techniques

- C01 Technologists' Forum
- C02 Advances in Instrumentation and Techniques — General
- C03 Transmission Electron Microscopy
- C04 Scanning Transmission Electron Microscopy
- C05 Analytical Electron Microscopy
- C06 Electron Energy-Loss Spectroscopy/Energy-Filtered TEM
- C07 Convergent Beam Electron Diffraction
- C08 Scanning Electron Microscopy
- C09 Variable Pressure/Environmental SEM
- C10 X-ray Microscopy & Spectroscopy (TXM/STXM)
- C11 Imaging, Diffraction, Holography, Spectroscopy
- C12 Surface Analysis Techniques (excluding SIMS)
- C13 Scanning Probe Microscopy (excluding AFM in life science)
- C14 Stereology
- C15 Infrared and Raman Microscopy and Microanalysis
- C16 Remote Microscopy and Collaboration
- C17 Education in Microscopy and Microanalysis
- C18 Forensic Science
- C19 Quality Systems and Standards
- C20 Core Facility Management

Biological Sciences

- C21 Biological Sciences — General
- C22 Specimen Preparation for Biological Sciences
- C23 Biomimetics
- C24 Blood/Immunology
- C25 Botany
- C26 Cytoskeleton
- C27 Developmental/Reproductive Biology
- C28 Entomology
- C29 Histology and Cytochemistry
- C30 Microbiology
- C31 Neurobiology
- C32 Parasitology

Physical Sciences

- C33 Physical Sciences — General
- C34 Specimen Preparation for Materials Sciences
- C35 Amorphous Materials
- C36 Alloys and Composites
- C37 Engineered Materials



- C38 Geology/Mineralogy
- C39 Interfaces
- C40 Magnetic, Superconducting & Ferroelectric Materials
- C41 Modulated Structures
- C42 Oxidation/Corrosion
- C43 Phase Transformations
- C44 Porous Materials
- C45 Self-Assembly
- C46 Semiconductors

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Plenary Session Speakers

Monday, August 5, 2013

Indianapolis Convention Center — Sagamore Ballroom

Professor Harald Rose

Carl Zeiss Senior Professor, Ulm University, Ulm, Germany

"The Long-Lasting Struggle to Achieve Atomic-Resolution Microscopy by Correcting the Aberrations of Electron Lenses"

Professor Rose has been a distinguished leader in theoretical electron optics, with emphasis on aberration correction, theory of electron scattering, and image formation in electron microscopy. Prof. Rose will give a special talk covering an overview of the history of electron microscopy, and provide key insights into the challenges of electron microscopy in the future.

Professor Joris Dik

Professor — Materials Science, Technical University of Delft, The Netherlands

"Looking Through Paintings"

With a background in Art History, Chemistry and Materials Sciences, Professor Dik brings a unique perspective to the study of paintings and masterworks, combining insights from both the science and the art worlds. His most recent accolade is the development of a transportable atomic particle accelerator (synchrotron) for museum use, which will permit many of the world's great masterworks to be examined in situ, without having to be transported to public laboratories.



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Tutorials, Tech Forum, and Outreach Sessions

Technologists' Forum Special Topic: Energy Dispersive Spectrometry

X30 EDS Revisited — Basics and Advances

Valerie Woodward, E. Ann Ellis

The Technologists' Forum will be revisiting energy dispersive x-ray spectrometry (EDS) at M&M 2013. If you haven't updated your system in the past 10 years, or you are new to the discipline, the TF special topics session is the place to be. This session will consist of invited talks, but if you have a contributed paper that fits the descriptions below, please submit it for consideration for a supporting poster session.

- What is EDS and how does it differ from other "X" methods
- State of the art in detectors
- Quantitative and qualitative analysis, peak overlaps, artifacts and misconceptions
- X-ray mapping and spectrum imaging
- Preparation and applications in life and materials sciences

Physical Sciences Tutorials

- One (1) Continuing Microscopy Education Unit is available for each Tutorial attended (fee \$10/members; \$50/non-members).

X40 Practical Processing of Spectrum Imaging Datasets by Multivariate Statistical Analysis: Advantages and Disadvantages

Masashi Watanabe

Spectrometry techniques such as X-ray energy dispersive spectrometry and electron energy-loss spectrometry are very powerful approaches for materials characterization using electron microscopes. However, these spectrometry techniques are not very efficient since signal generation and collection are limited in comparison to other imaging approaches. Multivariate statistical analysis (MSA) in combination with a spectrum imaging method may handle data with limited signals very efficiently and is now commonly used in electron microscopy. Although this MSA approach is very useful, it may create unexpected artifacts, which mislead results. In this tutorial, advantages and disadvantages of the MSA approach will be discussed.

X41 State-of-the-Art Microanalysis at the nm-Scale and Smaller: Going from Pretty Pictures to Quantitative Analysis of Hyperspectral Data

Paul G. Kotula

With the recent advent of commercially available state-of-the-art analytical electron microscopes we now have the ability to collect high-resolution x-ray microanalytical data quickly and efficiently. Indeed atomic-resolution x-ray microanalysis has been recently demonstrated. The question then becomes how to process and interpret such high-resolution microanalytical data. This tutorial will cover aspects of the instrumentation including new electron sources, aberration correction, and large solid angle x-ray detectors as well as data processing efforts to quantify the resulting hyperspectral x-ray data sets. Examples from microelectronic, alloy and ceramic systems will be used to demonstrate approaches to quantification as well as remaining challenges.

X42 Practical Aspects of Atom Probe Tomography in Materials Science

David Seidman

- Atom-probe tomography (APT) in conjunction with aberration-corrected electron microscopy and electron energy loss spectroscopy
- Applications of atom-probe tomography to metals, semiconductors, ceramics and biominerals to solve specific scientific and technological problems

Biological Sciences Tutorials

- One (1) Continuing Microscopy Education Unit is available for each Tutorial attended (fee \$10/members; \$50/non-members).

X50 Correlative Imaging of Tissues: The Potential of Large Volume Array Tomography

Irene Wacker

The application of a range of methods for imaging serial sections in the SEM is providing unprecedented opportunities for the reconstruction of large volumes at ultrastructural resolution. We are examining the possibilities for combining these methods with different light microscopic modalities. Current efforts are also focused on the automation of sample preparation and data recording workflows. Examples will be presented to illustrate different workflow requirements that range from single cells to complex tissues such as the neuromuscular junction. The potential to develop hierarchical workflows that allow data collection to be focused on relevant features will be discussed.

X51 Biomedical Applications of microCT in Hard and Soft Tissues — Going Beyond the Bone

Daniel S. Perrien



This tutorial will cover:

- Basic concepts of microCT image acquisition and analysis
- Advantages and limitations of microCT
- Common applications of microCT to skeletal analysis
- Techniques for imaging and analysis of soft tissue and vasculature
- Considerations and methods for matching the technique to specific biological questions

X52 Chemically Sensitive Imaging Using Scanning Transmission X-ray Microscopy (STXM)

Adam Hitchcock

This tutorial will cover:

- STXM instrumentation and capabilities
- Sample preparation
- Data acquisition strategies
- Data analysis approaches
- Examples (as time permits)

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 from K-12 and beyond. This session will show how microscopy in education serves as an important learning tool for inspiring our 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.

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In-Week Intensive Workshops

Organizer: *Mike Marko*

- These in-depth courses will be held Monday-Thursday from 1:00 PM to 5:00 PM.
- A certificate of participation will be issued *to each participant after the meeting, upon request.*
- Four (4) Continuing Microscopy Education Units are available (fee \$10/members; \$50/non-members).
- Additional fees and registration required.
- The registration fee includes full *registration to M&M 2013.*
- [Click here](#) for details regarding registration fees.

X19 Introduction to SEM Imaging and X-ray Compositional Analysis

David Joy, Brad Thiel

This introductory-level workshop will involve classroom lectures and live demonstrations. The SEM topics will be taught by David Joy and will cover basic instrument operation and imaging modes. The EDS topics will be taught by Brad Thiel and will cover basic compositional analysis using SEM with an energy dispersive x-ray spectrometer. The lessons in the lectures will be complemented with hands on demonstrations of SEM operation and x-ray microanalysis. Demonstrated topics will include the effects of working distance, accelerating voltage, probe size, imaging detector, detector bias, probe current, dead time, detector choice, sample geometry, etc.

X20 Specimen Preparation for Biological Microscopy

Mark Sanders

Lecture material will provide information on the basic components of specimen-processing systems, the basics of live-cell incubation using fluorescent probes, biological specimen preparation for light, electron and super-resolution microscopy, strategies and protocols for antibody labeling, and an overview of advanced applications, including in-situ hybridization and decalcification. There will be a special focus on the advantages of microwave-assisted processing. The workshop will include a hands-on component as well as lectures from experts in the field of sample preparation for live, fixed-cell and tissue imaging.

X21 Nanomaterial Microscopy & Microanalysis: Tools and Preparation

Phillip Russell, Lou Germinario

With the wide variety of analytical instrumentation available, the selection of the correct tool for analysis of nanomaterials is critical. By introducing various microscopy and microanalysis methods, this workshop should provide a solid foundation for nanomaterial characterization for the beginning to intermediate investigator. The importance of choosing the proper preparation technique, to minimize introduction of artifacts and to ensure that representative samples are identified for subsequent analysis, will also be discussed.



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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 4.
- Additional fees and registration required.
- A certificate of participation will be issued to each participant after the meeting, upon request.
- Two (2) Continuing Microscopy Education Units are available (fee \$10/members; \$50/non-members).
- Morning and afternoon coffee breaks are included.
- Lunch is on your own.
- [Click here](#) for registration fee details.

BIOLOGICAL SCIENCES

X10 Cryo-preparation for Biological EM

Kent McDonald

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.

X11 Immunolabeling Technology for Light and Electron Microscopy

Caroline Miller, Rick Powell, Steven Goodman

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

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 SCIENCES

X13 Electron Tomography in Life and Material Sciences

Ariane Briegel, Christian Kübel, Heiner Friedrich

This short course will explain the basics of electron tomography, the experimental setups, and the instrumental prerequisites, 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 applications, and low-dose cryo imaging for biological samples and soft materials applications. A variety of reconstruction algorithms will be introduced, as well as a survey of 3-D analysis and visualization methods. 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.

X14 Imaging and Analysis with Variable Pressure or Environmental SEM

Brendan J. Griffin, Matthew Phillips

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.

X15 Advanced Focused Ion Beam Methods

Lucille Giannuzzi, Joseph Michael

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.

X16 Practical Considerations for Quantitative Image Analysis

James Grande

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.

PHYSICAL SCIENCES

X17 Practical Fractography

Ronald J. Parrington

Fractography, the science of examining fracture surfaces, is the most valuable tool available to the failure analyst. This short version of the popular 2-day ASM class will provide the participants with a comprehensive overview of fractography, with an emphasis on understanding the fundamental principles and identifying fracture features that characterize the important failure mechanisms. Numerous case histories will be used to demonstrate practical tips and techniques for performing fractography on the macro-scale (with the unaided human eye, macro-photography and stereomicroscopy) and on the micro-scale with the scanning electron microscope.

X18 Transmission Electron Microscopy of Materials

Alwyn Eades, Michael Kaufman, Bob Field

This course will provide an introduction to the characterization of materials and defects, with particular emphasis on crystalline materials. Transmission electron microscopy is very powerful and can provide highly valuable information about materials. However, much of the current literature focuses on the very newest techniques and overlooks the value of basic methods using standard instruments. It is those basic methods that will be the focus of this course.

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Pre-Meeting Congress

Opportunities, Challenges and Outlook for *In-situ* Experiments in Liquids and Gases using Electron-Optical Instruments

- Sunday, August 4, 2013; 8:30 am - 5:00 pm
- Registration and separate fee required — register along with your M&M registration.
- \$219 members/\$299 non-members (early rate)
- Breakfast, coffee and lunch included.

Judith Yang, Raymond Unocic, Dean Miller, Renu Sharma

This one-day congress will provide a forum for discussion of the latest advances, applications and practical challenges of electron microscopy performed in liquid and gaseous environments. Recent advances in instrument and sample holder designs have opened up new avenues for *in situ* microscopy of both hard and soft materials, with diverse applications in the physical and biological sciences. The program will feature invited and contributed platform presentations, a poster session and a lunchtime keynote presentation by past MSA President Prof. Emeritus Wilbur C. Bigelow, in recognition of his 90th birthday, entitled "In situ gas reaction studies in the early days." All platform presentations will be intentionally kept short (~15-20 minutes) to maximize interaction among attendees. Invited presentations will introduce recent innovations and current challenges in this rapidly developing field. Contributions are solicited to highlight applications, as well as practical experiences and solutions to problems encountered during the application of environmental electron microscopy.



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Pre-Meeting Workshop

Advanced Materials Failure Analysis (AMFA) Workshop

- Sunday, August 4, 2013; 8:30 am - 5:00 pm
- Registration and separate fee required — register along with your M&M registration.
- \$219 members/\$299 non-members (early rate)
- Breakfast, coffee and lunch included.

Tom Moore, Cheryl Hartfield, Chris Henderson, Ed Cole, Jerry Walraven, Gay Samuelson

The AMFA workshop is a forum developed to encourage cross-pollination of ideas across disciplines that use similar techniques and have similar goals — the characterization and resolution of phenomena and problems. We invite high-quality speakers to discuss leading edge topics, in a "Gordon Conference" extended presentation format where we strongly encourage and expect audience participation. The AMFA workshop has a mixture of academic, industry and vendor presentations to generate thoughtful, insightful discussion and discovery. We deliberately craft a broad, material and failure analysis forum so that attendees can come to learn about and exchange ideas on recent developments in the semiconductor, nanomaterial and biological characterization worlds.



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LATE-BREAKING POSTERS – INFORMATION

- The deadline for submitting a Post-Deadline poster has passed. We look forward to reviewing your work next fall for M&M 2014.
- Post-Deadline posters are not included in the program proceedings and are not considered "published".
- Post-Deadline poster papers are available for review and download (PDF) on the M&M 2013 site around July 19 (see below).
- Authors have been notified of their Post-Deadline (PD) poster number and presentation day around July 18.
- No travel support is available for Post-Deadline posters.
- Post-Deadline posters will be presented on Monday, August 5, 2013 in the Exhibit Hall from 3 pm - 5 pm.
- All Post-Deadline poster presenters will need to register for the meeting – either a Full registration or a One-Day registration. This can be done onsite in Indianapolis, or in advance by clicking on the "REGISTER NOW" button to the left (advance registration is open until Monday, July 22).
- Questions? Contact the Meeting Manager at meetingmanager@microscopy.org.

LATE-BREAKING POSTER ABSTRACT

Post-Deadline (PD) Poster Number	A/B/P	Paper Title	Author(s)
PD-1	A	Effects of Impurities on Crystal Growth in Sucrose Crystallization Using the Photomicroscopic Technique	L. D. Shiau and F. Y. Hsu
PD-2	A	In Situ Probing of IgG Conjugated Gold Nanoparticles in Liquids by SEM and ToF-SIMS	Xiao-Ying Yu1, Li Yang2, Zihua Zhu2, Eugene Rodek3, Theva Thevuthasan2, and James Cowin
PD-3	A	An Alternative Image Alignment Method Based on Reconstructed Cross-section Image Correlations	Sachihiko Tomonaga1, Daiki Kato1, Misuzu Baba2, and Norio Baba1
PD-4	A	Atomic Resolution Electron Tomography for 3D Imaging of Dislocations in Nanoparticles	Chien-Chun Chen1,2, Chun Zhu1,2, Edward R. White1,2, Chin-Yi Chiu2,3, M. C. Scott1,2, B. C. Regan1,2, Laurence D. Marks4, Yu Huang2,3 & Jianwei Miao1
PD-5	A	New Ion Source for Focused Ion Beam Nanomachining Applications	A.V. Steele1, J. J. McClelland2, and B. Knuffman1
PD-6	A	Toward Optimization of Experimental Parameters and Specimen Preparation Factors for Atom-Probe Tomography (APT) of Copper	R. Prakash Kolli1, Frederick Meisenkothen2, and Ian M. Anderson2
PD-7	A	SEM-EDS Automated Particles Analysis – "INCA Mineral" – Mineral Compositions of Koujaku Granite and Hakkoda Pyroclastic Flow Deposition	H.Muto1, A.Shimada2, T.Kaneko1, N.Erdman3 and C.Nielsen3
PD-8	A	In-situ TEM observation of electrochemical copper deposition on metal surfaces	Y. Oshima*
PD-9	A	Advanced Depth Profiling Characterization of Mixed Organic/Inorganic Layers Using X-ray Photoelectron Spectroscopy (XPS) and a Combined Monatomic and Gas Cluster Ion Source (MAGCIS)	B. R. Strohmeier1, R. G. White2, T. S. Nunney2, P. Mack2
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MSA Micrograph Competition

Sponsored by Microscopy Society of America

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. ¼" 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 8½" 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 Indianapolis and mounted on the display boards by 12:00 noon on Monday, August 5, 2013.**
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.

Diatome Awards

Sponsored by Diatome

Criteria:

- 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

Meeting Awards

The M&M paper submission site and awards applications process are now CLOSED for 2013.

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.

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 the following additional memorial scholarships conferred by MSA (please see Society website for full details):

Eric Samuel Scholarship:

Both student and postdoctoral researchers eligible; preference will be given to papers that demonstrate advances in nanoanalysis.

Raleigh and Clara Miller Scholarship:

Both student and postdoctoral researchers eligible; preference will be given to papers emphasizing biological sciences.

Robert P. Apkarian Scholarships:

Postdoctoral researchers eligible; two scholarships are awarded annually, one designated for biological sciences and one designated for materials sciences, education, or instrumentation. Applicant must be an MSA member, current in his or her dues for the year of the meeting, to be eligible.

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, with the exception of the Eric Samuel Scholarship where the award is up to \$1,500 for travel. 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.

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