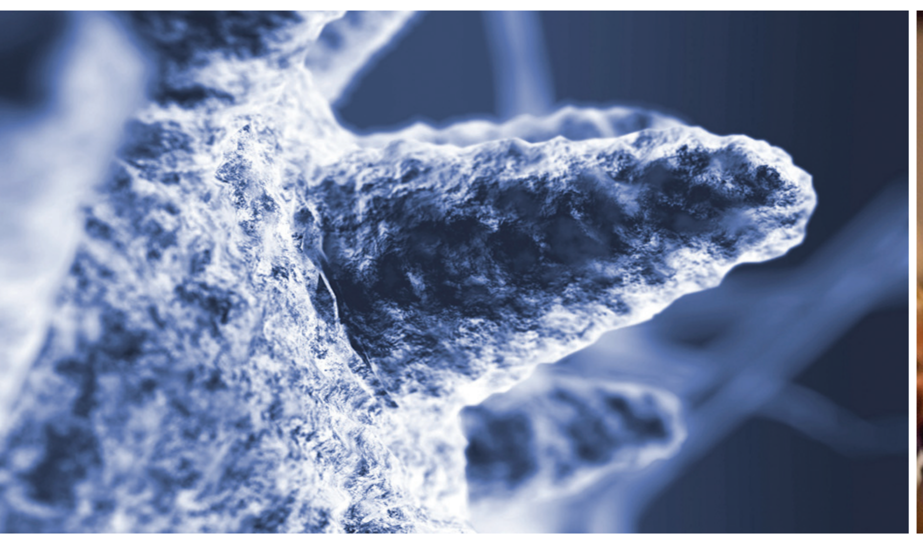
SPIE Scanning Microscopy

Technical Program

Conference + Exhibition: 4-7 May 2009

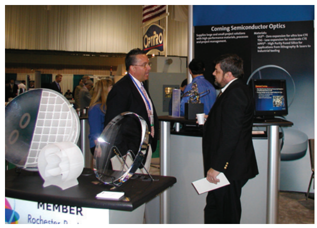
Portola Plaza Hotel · Monterey, California, USA

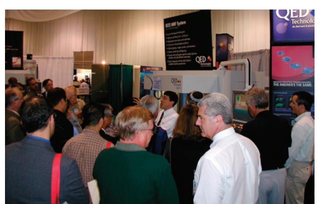


- **Forensic Applications of SEM**
- **Scanning Ion Microscopy (FIB and HIM)**
- **Quality Assurance in SEM and Micro Characterization**
- **Silicon Drift Detectors: The New EDS**
- **Biological Environmental/Variable Pressure SEM: Successes and Limitations**
- **Modeling for Critical SEM and Microanalysis Applications**
- **Scanning Probe Microscopies**
- **Scanning Optical Microscopies**

Technical Co-sponsor:

NIST





About SPIE

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

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Organizing Committee

Michael T. Postek, National Institute of Standards and Technology (United States)

Dale E. Newbury, National Institute of Standards and Technology (United States)

S. Frank Platek, U.S. Food and Drug Administration (United States)

David C. Joy, The Univ. of Tennessee (United States)

Mark Armitage, Southern California Society for Microscopy and Microanalysis (United States)

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Vladimir A. Ukraintsev, Veeco Instruments Inc. (United States)

John S. Villarrubia, National Institute of Standards and Technology (United States)

András E. Vladár, National Institute of Standards and Technology (United States)

Daniel W. van der Weide, Univ. of Wisconsin, Madison (United States)

Oliver C. Wells, IBM Corp. (United States)

Welcome!

WELCOME to SCANNING MICROSCOPY 2009

The organizers of this meeting and SPIE are pleased to have you attend SPIE Scanning Microscopy 2009, formerly known as SCANNING, held here in Monterey, California. We are extremely pleased with the technical content of the meeting with over 100 papers submitted this, the first, year.

Many of you are aware that spring conferences on scanning microscopy have a history going back over 40 years to 1967 with the "Scanning Electron Microscopy" series started by Dr. Om Johari. Following Dr Johari's retirement, the SCANNING series of conferences, organized by Tony Bourgholtzer of the Foundation for Advances in Medicine and Science (FAMS), continued this tradition. Early in 2007, FAMS decided not to sponsor future SCANNING meetings. Following that announcement, a substantial amount of work was done in the background to find a solution to keep the meeting alive. SPIE agreed to manage the meeting and hence, Scanning Microscopy 2009 emerged. Scanning Microscopy 2009 is now the first of this new series. Many of you know that last year, as a bridge to this meeting, a spring scanning microscopy meeting was held at the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland. There was a one-day pre-meeting entitled "Advancements in Electron Microscopy" which was a Hitachi High Technology America, Inc., National Nanotechnology Seminar. The SCANNING 2008 meeting followed the next day with an excellent turnout and technical program.

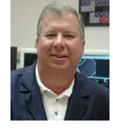
The organizers and SPIE anticipate that the Scanning Microscopy 2009 meeting will bring microscopists from all phases of scanning microscopies (from scanned optics to scanned particle beams) together in a single forum to discuss current research and new advancements in the field. We believe that there are several unique strengths to this meeting such as:

- Forensic Applications of SEM
- Scanning ion microscopy (FIB and HIM)
- Quality assurance in SEM and micro characterization
- Biological Environmental/Variable Pressure SEM: successes and limitations
- Modeling for critical SEM and microanalysis applications
- Scanned probe microscopies
- Scanned optical microscopies

We hope to grow these areas over the next few years. We invite your ideas for topics, session organizers, speakers for specific presentations, and we welcome your active participation.

Conference Chairs

Michael T. Postek, National Institute of Standards and Technology (United States)



S. Frank Platek, U.S. Food and Drug Administration (United States)

Dale E. Newbury, National Institute of Standards and Technology (United States)

David C. Joy, The Univ. of Tennessee (United States)

Room: DeAnza Ballroom I • Tuesday 5 May

Introduction and Welcome

8:30 - 8:40 am

Chairs: **Michael T. Postek,** National Institute of Standards and Technology; **Dale E. Newbury,** National Institute of Standards and Technology; **S. Frank Platek,** U.S. Food and Drug Administration; **David C. Joy,** The Univ. of Tennessee

Plenary Session

8:40 - 10:40 am

Session Chairs: **Dale E. Newbury,** National Institute of Standards and Technology; **S. Frank Platek,** U.S. Food and Drug Administration

8:40 am

New prospects for electron beams as tools for semiconductor lithography

Hans Pfeiffer, HCP Consulting Services (United States)

Abstract: This plenary talk will provide an introduction into the evolution of e-beam lithography techniques employed in the semiconductor fabrication processes from single pixel Gaussian beam exposure to shaped beams and the early development of massively parallel projection of beams. It will illustrate the opportunities and limitations of these e-beam lithography technologies based on examples of early successful applications at IBM as well as current use of leading edge tools for both, mask making and maskless direct write on wafers. It will provide an analysis of the major parameters determining the performance of these systems with particular emphasis on the most stringent limitation: Stochastic Coulomb interaction of individual beam electrons causing trajectory changes which result in image blur as a function of beam current.

Physically separating the beam electrons in multiple beamlets to reduce Coulomb interaction is the approach pursued currently by research and development teams around the world in the form of ‘massively parallel’ beam projection. Several practical examples of these emerging multi-beam approaches under development will be described and their potential for success analyzed and compared. Applications considered for these new lithography tools will be discussed in context of their lithographic capability, their business value and viability. The level of complexity of these various multi-beam techniques will be compared to identify the challenges and opportunities for each approach. The talk has been arranged with a special intent to interest the non-specialist without leaving the expert bored.

Biography: **Dr. Pfeiffer** retired in 2002 as an IBM Fellow after 34 year of service with the IBM Corporation. During his career he established a world class team and played a leading role in the development of IBM’s state-of-the-art e-beam lithography technology. He is recognized for building the industry’s first shaped beam lithography system and more recently invented and pioneered PREVAIL, an e-beam projection lithography (EPL) approach. He is currently consulting in the areas of electron optics for lithography, inspection and test.

9:20 am

XHR SEM: Enabling extreme high resolution scanning electron microscopy

Richard Young, FEI Co. (United States)

Abstract: The scanning electron microscope continues to be a key tool in the imaging, metrology and characterization of nanoscale materials and structures. While the SEM does not have the ultimate imaging capabilities of the transmission electron microscope (TEM), it nevertheless offers benefits in terms of ease of sample preparation and the ability to image surface details and three-dimensional structures, especially at low beam voltages where reduced electron range and interaction volume provides highly surface sensitive information. Recently, the introduction of the XHR SEM has demonstrated that sub-nanometer resolution can be achieved at low beam voltages. Unprecedented information, such as fine surface details and nano-particle distributions, is revealed without any sample preparation [1, 2].

We will review the key improvements that have gone into making the XHR SEM possible. By reducing the energy spread of the electron beam the effects of chromatic aberrations at low voltage can be significantly reduced, resulting in a more tightly focused electron beam. This provides significant benefit for surface sensitive imaging.

In addition, it is possible to apply a negative bias to the specimen, to decelerate primary electrons on arrival at the specimen surface [3, 4]. The combination of a magnetic and an electric lens gives a further reduction in the probe size. Furthermore, it enables the use of very low landing energies, without the probe quality deteriorating too much. This gives a further reduction in the penetration depth of the primary electrons and enhanced surface sensitivity. Such stage bias also has benefits in enhancing the collection of low energy secondary and large angle backscattered electrons and so provides an additional parameter for adjusting the contrast within an image.

References

1. R. Gauvin et al, Low Voltage Imaging in the FE-SEM, APMC 2008
2. R. Young et al, Extreme High Resolution SEM: a paradigm shift, Microscopy Today, 2008, Jul. Aug. issue, p. 24-28
3. I. Müllerová and L. Frank, Scanning, 1993. 15: p. 193-201
4. I. Müllerová et al, Surface Science 601 (2007) 4768

Biography: **Richard Young** is Technologist in the NanoElectronics Market Division at FEI, focused on DualBeam™ FIB/SEM and SEM systems used for failure analysis and characterization. He joined FEI in 1991. Richard holds a Ph.D. in Physics from the University of Cambridge, where his research included the application of focused ion beams for TEM sample preparation and gas chemistry. Richard holds several US patents and has published widely on FIB, SEM and DualBeam applications.

spie.org/sg

10:00 am

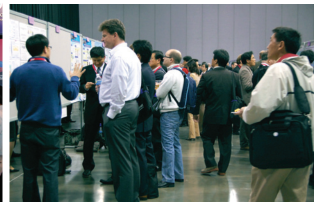
Critical points of materials are a universal property characterizing every element and their compounds: the historical background, theoretical interpretation, and applications

A. J. Tousimis, tousimis® Inc. (United States)

Abstract: The origins of thermodynamics could be traced to other events in the history of modern science; however, the most significant is the work of Charles Cagniard de la Tour1 in 1821-1822. His discovery that the elements and their compounds thereof, have a characteristic pressure, temperature, and volume (now referred to as critical pressure, temperature, and volume at the critical point). At this point changing from one state to another there is no boundary. That is, the density of a liquid is the same as that of its gas, or any pairs of states. Tremendous efforts were made to explain this phenomenon in the 19th century. Most of them simply are approximation equations without any reliable theoretical explanation. One of these is the equation formulated by Van der Waalls and many others. During the 20th/21st centuries new approaches were made. All of these are summarized in this review. The applications of this principal first in gels (1920s)2 and then in biology3 has opened new fields of study in microtechnology and currently has wide applications in the preparation of MEMS, NEMS, and now atomic dimension structures in the new fields of nanotechnology and atom technology.

1. C. Cagniard de la Tour. Ann. Chim. Phys. 2 (21) 127-178 (1822)
2. Samuel S. Kistler. U.S. Patent Number 2,093,454, 9/21 1937
3. Thomas F. Anderson. Trans. N.Y. Academy of Sci. II 13, 130-134 (1957)

Biography: **Dr. Tousimis** is Director of the Biodynamics Laboratory and President and Chief Executive Officer of the Tousimis Research Corporation, Inc. He started his medical studies at the Aristotle University in Thessalonike, Greece, and continued at the University of Pittsburgh. There, he carried out graduate studies in biophysics (M.Sc., 1952) on the biophysical characterization of viruses, and then, at Walter Reed Medical Center, he served in the U.S. Army and carried out research on the biophysical characterization of adenoviruses (1954-1956). After his military service, he started the Biophysics and Cell Pathology Branch (1956-1961) at the Armed Forces Institute of Pathology. Because of his studies on ultrastructural cell pathology, he went back to school (George Washington University) and constructed the first electron probe x-ray microanalyzer for its application to medicine (1957-1963), obtaining a Ph.D. degree in 1964.



Welcome Reception

Room: Lower Atrium

Tuesday 5 May, 6:00 to 7:00 pm

All attendees are invited to relax, socialize, and enjoy refreshments.

Co-sponsored by **Carl Zeiss SMT Inc.**

Particle Beam Workshop

Room: Portola

Thursday 7 May • 1:30 to 3:10 pm

The particle beam interaction modeling workshop has brought experimentalists and modeling experts together for nearly a decade to share information on this exciting topic. This workshop has contributed to an enhanced understanding of the signal generation and imaging process in electron beam instrumentation. Contributed papers will begin the session and a discussion forum will follow.

Forensic Forum

Room: Redwood I

Thursday 7 May • 2:30 to 5:30 pm

Moderators: **Michael A. Trimpe,** Hamilton County Coroner's Lab. **S. Frank Platek,** U.S. Food and Drug Administration

Since its implementation at the 2004 Washington, D.C. SCANNING meeting, the Forensic Forum has been a well attended and most productive group round table discussion of forensic science topics involving scanning microscopy at both a national and international level. The forum has also been an excellent location to discuss analytical problems, sample analysis methods, report language and court testimony in the use of scanning microscopy applications in forensic science. SWGGSR had its origins in the Forensic Forum as well as establishing a core group of dedicated forensic scientists working toward a science-based, consensus approach to the analysis and reporting of gun shot residue (GSR). Networking with other forensic microscopists has proven to be most beneficial to attendees at previous SCANNING meetings. This forum IS NOT solely dedicated to discussion of GSR analysis as any related forensic topic may be discussed. (Examples: Daubert Motion issues, ISO/accreditation items, unique sample analyses and requests, etc.)

Come, bring your experience and your questions and be a part of the Forensic Forum.

Discussion of NIST DTSA-II for Spectral Modeling

Room: Portola

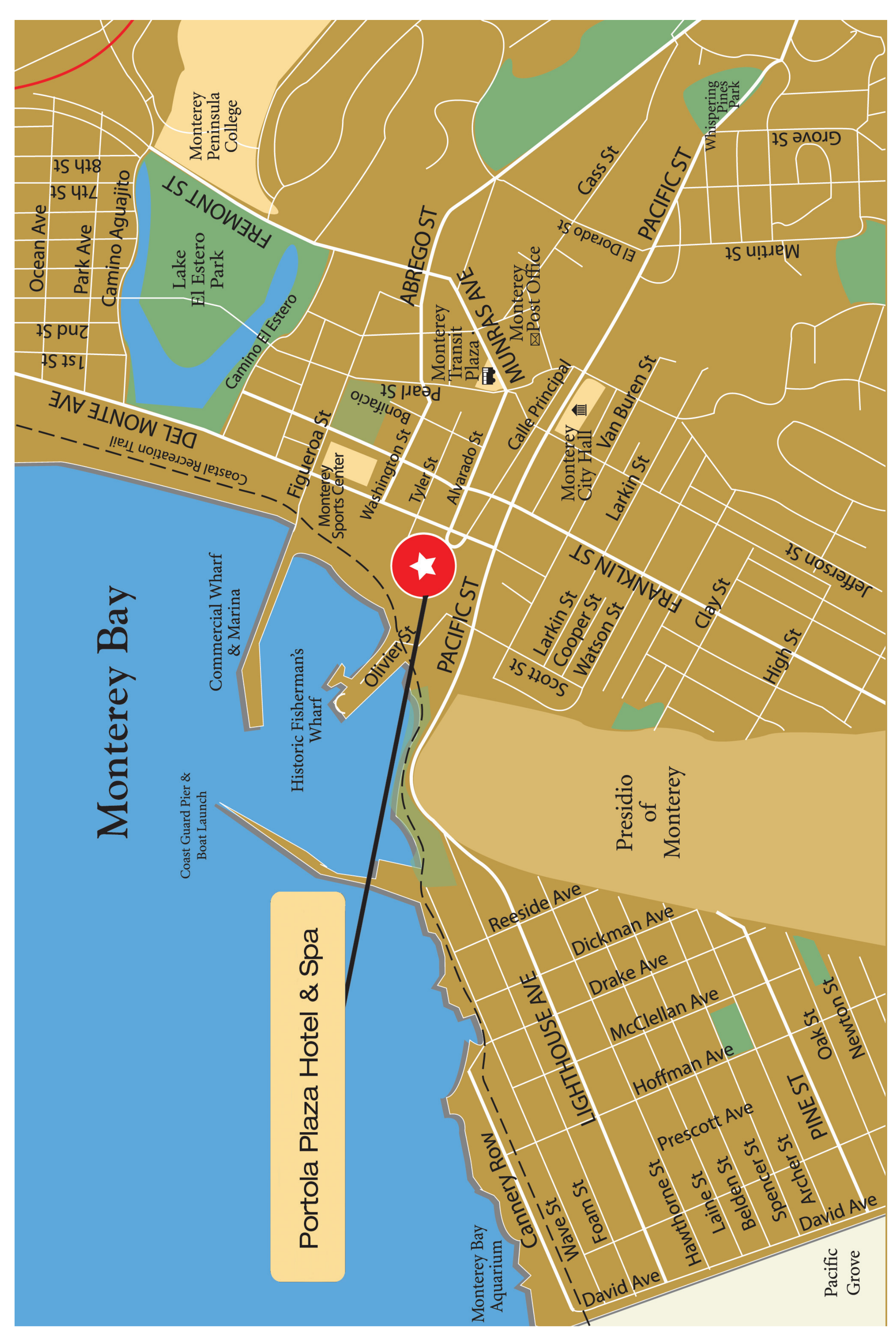
Thursday 7 May • 4:00 to 5:30 pm

This program is platform independant.

Free copies of the software will be made available to all interested.

Scanning Microscopy 2009 At A Glance

Monday 4 May			
Morning			
Afternoon	Registration 1:00 - 4:00 pm		
Tuesday 5 May			
Morning Session 1	Introduction and Plenary Session		
Morning Session 2	Helium Ion Microscopy	Atomic Force and Scanned Probe Microscopies I	Microscopy and Analysis of Biological Materials I
Afternoon Session 1	Helium Ion Microscopy: Even More Gas	Atomic Force and Scanned Probe Microscopies II	Microscopy and Analysis of Biological Materials II
Afternoon Session 2	Sample Preparation Technology	Microscopy and Analysis of Food Microstructures	Microscopy Applications in Environmental Safety and Health
Wednesday 6 May			
Morning Session 1	Focused Ion Beam Microscopy I		Optical Microscopies I
Morning Session 2	Focused Ion Beam Microscopy II		Optical Microscopies II
Afternoon Session 1	Microspectroscopic Characterization with Multiple Probes I		Optical Characterization of Biological Materials
Afternoon Session 2	Microspectroscopic Characterization with Multiple Probes II	Course: SC954: Scanning Microscopy in Forensic Science (separate fee) See p. 17	
Thursday 7 May			
Morning Session 1	Scanning Electron Microscopies I		Applications of Scanning Microscopy to Forensics Science I
Morning Session 2	Scanning Electron Microscopies II		Applications of Scanning Microscopy to Forensics Science II
Afternoon Session 1	Particle Beam Interaction Modeling Workshop		Applications of Scanning Microscopy to Forensics Science III
Afternoon Session 2	Discussion of NIST DTSA-II for Spectral Modeling		Forensics Forum


Monterey Bay
Commercial Wharf & Marina
Historic Fisherman's Wharf
Coast Guard Pier & Boat Launch
Portola Plaza Hotel & Spa
Monterey Bay Aquarium
Cannery Row
Wave St
Foam St
David Ave
Hawthorne St
Laine St
Belden St
Spencer St
Archer St
PINE ST
David Ave
Pacific Grove
Oak St
Newton St
Prescott Ave
Hoffman Ave
McClellan Ave
Drake Ave
Dickman Ave
Reeside Ave
LIGHTHOUSE AVE
Presidio of Monterey
PACIFIC ST
Olivier St
Scott St
Larkin St
Cooper St
Watson St
FRANKLIN ST
Clay St
High St
Jefferson St
Larkin St
Monterey City Hall
Van Buren St
Calle Principal
Alvarado St
Tyler St
Washington St
Monterey Sports Center
Figueroa St
Bonifacio
Pearl St
Monterey Transit Plaza
MUNRAS AVE
Monterey Post Office
ABREGO ST
El Dorado St
Cass St
PACIFIC ST
Martin St
Grove St
Whispering Pines Park
FREMONT ST
Monterey Peninsula College
Lake El Estero Park
Camino El Estero
Camino Aguajito
Ocean Ave
Park Ave
8th St
7th St
2nd St
1st St
DEL MONTE AVE
Coastal Recreation Trail

For more information:
spie.org/sg

SPIE Scanning Microscopy

Exhibition: 5-6 May 2009 · Bonsai Ballroom · Portola Plaza Hotel Monterey, California, USA

Exhibition Dates and Hours:
Tuesday 5 May . . . . 10:00 am to 4:00 pm
Wednesday 6 May . . . . 10:00 am to 4:00 pm

Onsite Registration Information Hours:
Monday 4 May . . . . 1:00 to 4:00 pm
Tuesday 5 May . . . . 10:00 am to 4:00 pm
Wednesday 6 May . . . . 10:00 am to 4:00 pm

Abeam Technologies Inc. #1

5286 Dunnigan Ct, Castro Valley, CA, 94546
510/538-4841
support@abeamtech.com; www.abeamtech.com

New Product: CHARIOT: simulator of SEM; BEAMETR: measurement of e-beam size; XENOS: pattern generator.

Abeam Technologies develops software and chips to simulate and calibrate SEM; to predict and optimize e-beam lithography and dry etch. BEAMETR is test chip and software to measure e-beam size. XENOS is a pattern generator to convert SEM into e-beam lithography system. The company has its headquarters in California, representative companies in Japan, Europe and Korea, and a group of physicists in Russia. Contact: S. Babin, President, sb@abeamtech.com.

Bruker AXS Microanalysis #10

1239 Parkway Ave, Ewing, NJ, 08628
609/771-4400; fax 609/771-4411
info@bruker-axs.com; www.bruker-axs.com

WELCOME RECEPTION

Carl Zeiss SMT Inc. #3

One Corporation Way, Peabody, MA, 01961
978/826-1500
info-usa@smt.zeiss.com; www.smt.zeiss.com

Denton Vacuum, LLC #5

1259 N Church St, Moorestown, NJ, 08057
856/439-9100; fax 856/439-9111
info@dentonvacuum.com; www.dentonvacuum.com

New Product: Desk V Sputter Coater.

Denton Vacuum manufactures a wide variety of thin film deposition equipment, including electron microscopy sample preparation equipment. Contact: John Crowe, Sales Manager, jcrowe@dentonvacuum.com.

TUESDAY MORNING COFFEE BREAK

Edax, Inc. #8

91 McKee Dr, Mahwah, NJ, 07430-2105
201/529-4880; fax 201/529-3156
info.edax@amatek.com; www.edax.com

New Product: Genesis Apex improves the key components: X-ray detector, DPP electronics and analytical software.

EDAX has led the industry as the technical innovator and the world's largest supplier of EDS, EBSD, WDS and Micro-XRF systems. Accurate analytical results require solid foundations and EDAX is the only company to achieve this through Expert ID and the Genesis Apex system. Orbis leads the way with a new standard in analytical flexibility for MicroXRF applications. EDAX products provide a complete solution for whatever your application. Contact: Del Redfern, Sales Manager Americas, del.redfern@ametek.com.

CONFERENCE BAG PEN

FEI Co. #7

5350 NE Dawson Creek Dr, Hillsboro, OR, 97124-5793
503/726-7500; fax 503/726-7509
www.fei.com

New Product: FEI is proud to introduce the world's first Extreme High Resolution SEM...the Magellan XHR SEM.

See beyond with FEI's leading edge SEM, TEM, ESEM and DualBeam™ solutions. FEI's 60 year history of pushing the boundaries of microscope innovation has resulted in instruments delivering sub-nm SEM and sub-Å TEM resolution. Whatever your application in materials or life sciences, FEI delivers the highest performance solution, and puts you at the center of a global community of leading researchers and scientists. Visit us! Contact: Sheri Kurland, Account Manager, sheri.kurland@fei.com; Ted Tessner, Account Manger, ted.tessner@fei.com.

FLIR Infrared Cameras #4

SPIE Corporate Member

25 Esquire Rd, N. Billerica, MA, 01862
978/901-8000; fax 978/901-8532
info@flir.com; www.goinfrared.com

New Product: FLIR's new IR Microscopy Kit is designed for small targets, like PCBs and trace level components.

FLIR offers the most advanced infrared thermography systems for research, thermal testing, and product validation applications. FLIR's ThermaCAM SC Series IR cameras are used to capture and record thermal distribution and variations in real-time – allowing scientists to see and accurately measure heat patterns in products and processes. These IR cameras combine extremely high imaging performance and precise temperature measurements, with powerful tools and software for analyzing and reporting. Contact: Steve Chisholm, Inside Sales Manager, steve.chisholm@flir.com.

HORIBA Scientific #9

SPIE Corporate Member

3880 Park Ave, Edison, NJ, 08820
732/494-8660; fax 732/549-5125
info.sci@horiba.com; www.jobinyvon.com

New Product: XRF Microscope w/10µm resolution, SEM/Raman, XploRA Raman microscope, SLICE database/archiving software.

Don't just take an image, get the whole picture! HORIBA Scientific (formerly HORIBA Jobin Yvon), the leader in spectroscopic analysis offers many solutions extending your understanding of your samples. Our 10µm resolution XRF Microscope combined with SLICE Software from Xk, Inc. is a complete materials identification system. We are also the world leader in Raman, including SEM/Raman solutions. Our XploRA Raman microscope brings legendary HORIBA performance to a new level of affordibility. Contact: John Enterline, Sales Manager, john.enterline@horiba.com; Sergey Mamedov, Applications Scientist, sergey.mamedov@horiba.com.

Novelx, Inc. #2

3746 Mt. Diablo Blvd Ste 100, Lafayette, CA, 94549
925/962-0889; fax 925/962-3885
info@novelx.com

New Product: The mySEM is the only compact FESEM available for low-voltage imaging and sub-10nm resolution.

Novelx builds the only compact field emission SEM for imaging and characterizing nanoscale objects and materials. In a compact design that installs easily, the mySEM is optimized for low-voltage operation and delivers sub-10nm imaging capabilities previously only available in high-end field emission SEMs, at a fraction of the cost. With no need to coat non-conductive samples, the mySEM is an ideal choice for imaging a wide variety of energy-sensitive samples, biomaterials and thin films. Contact: Jim Rynne, VP, Marketing and Business Development, rynne@novelx.com; Lawrence Muray, CEO, muray@novelx.com.

Thermo Fisher Scientific #6

5225 Verona Rd, Madison, WI, 53711
800/532-4752
analyze.us@thermo.com; www.thermo.com

Conference 7378A	Conference 7378B	Conference 7378C
Room: Portola	Room: De Anza 1	Room: Redwood 1
Tuesday-Thursday 5-7 May 2009	Tuesday 5 May 2009	Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378A	Proceedings of SPIE Vol. 7378B	Proceedings of SPIE Vol. 7378C

DeAnza Ballroom 1

Plenary Session

Introduction and Welcome
Tuesday 5 May

Room: DeAnza Ballroom 1 . . . . Tues. 8:30 to 8:40 am

Session Chairs: **Michael T. Postek,** National Institute of Standards and Technology; **Dale E. Newbury,** National Institute of Standards and Technology; **S. Frank Platek,** U.S. Food and Drug Administration; **David C. Joy,** The Univ. of Tennessee

Plenary Presentations

Room: DeAnza Ballroom 1 . . . . .Tues. 8:40 to 10:40 am

Session Chairs: **Dale E. Newbury,** National Institute of Standards and Technology; **S. Frank Platek,** U.S. Food and Drug Administration

8:40 am: **New prospects for electron beams as tools for semiconductor lithography**, Hans C. Pfeiffer, HCP Consulting Services (United States) . . . . [7378A-500]

9:20 am: **XHR SEM: Enabling extreme high resolution scanning electron microscopy**, Richard Young, FEI Co. (United States); Gerard van Veen, Sander Henstra, FEI Co. (Netherlands) . . . . [7378A-501]

10:00 am: **Critical points of materials are a universal property characterizing every element and their compounds: the historical background, theoretical interpretation, and applications**, A. J. Tousimis, tousimis® Inc. (United States). . . . . [7378A-502]

Coffee Break . . . . 10:40 to 11:00 am

Technical Conferences: Tuesday · 5 May

Conference 7378A continued
Room: Portola

Scanning Microscopy 1
Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378A

SESSION 1
Room: Portola . . . .Tues. 11:00 am to 12:20 pm

Helium Ion Microscopy I

Session Chairs: **Clarke Fenner,** Carl Zeiss SMT Inc.; **András E. Vladár,** National Institute of Standards and Technology

11:00 am: **Application of Helium ion microscopy to semiconductor technologies**, David C. Bell, Harvard Univ. (United States); Mark A. Jepson, The Univ. of Sheffield (United Kingdom). . . . . [7378A-01]

11:20 am: **Energy deposition, lithography, and beam induced currents in the He ion microscope**, David C. Joy, Ranjan Ramachandra, The Univ. of Tennessee (United States) . . . . [7378A-02]

11:40 am: **Material contrast in Ga+ FIB secondary electron images and SEM images**, Lucille A. Giannuzzi, FEI Co. (United States); Mark Utlaut, Univ. of Portland (United States) . . . . [7378A-03]

12:00 pm: **Recent progress in understanding the imaging and metrology using the Helium ion microscopy**, Michael T. Postek, András E. Vladár, Bin Ming, National Institute of Standards and Technology (United States) . . . . . . [7378A-04]

Lunch Break . . . . 12:20 to 1:30 pm

Conference 7378B continued
Room: De Anza 1

Scanning Microscopy 2
Tuesday 5 May 2009
Proceedings of SPIE Vol. 7378B

SESSION 11
Room: Redwood 2.Tues. 11:00 am to 12:20 pm

Atomic Force and Scanned Probe Microscopies I

Session Chairs: **Joseph Fu,** National Institute of Standards and Technology; **Vladimir A. Ukraintsev,** Nanometrology International, Inc.

11:00 am: **Automated atomic force microscope measurements using a-priori-knowledge**, Christian Recknagel, Helmut-Schmidt Univ. (Germany); Hendrik Rothe, Helmut-Schmidt Univ. (United States). [7378B-48]

11:20 am: **Identification of scanning probe microscopes sensor heads and validation of a mechanical model by a laser vibrometer**, Bernd R. Arminger, Bernhard G. Zagar, Johannes Kepler Univ. Linz (Austria). . . . . [7378B-49]

11:40 am: **Kelvin probe force microscopy: measurement data reconstruction**, Torsten Machleidt, Erik Sparrer, Tim Kubertschak, Karl-Heinz Franke, Technische Univ. Ilmenau (Germany); Rico Nestler, Zentrum für Bild- und Signalverarbeitung e.V. (Germany) . . . . [7378B-50]

12:00 pm: **A hysteresis correction on AFM images by cross correlation method**, Joseph Fu, Wei Chu, Ronald Dixson, George Orji, Theodore V. Vorburger, National Institute of Standards and Technology (United States) . . . . [7378B-51]

Lunch Break . . . . 12:20 to 2:00 pm

Conference 7378C continued
Room: Redwood 1

Scanning Microscopy 3
Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378C

SESSION 14
Room: Redwood 1.Tues. 11:00 am to 12:20 pm

Microscopy and Analysis of Biological Materials I

Session Chairs: **Tim K. Maugel,** Univ. of Maryland, College Park

11:00 am: **Approaches for enhanced selectivity and sensitivity in bioimaging**, Christopher W. Szakal, Timothy M. Brewer, Greg Gillen, Christine Mahoney, National Institute of Standards and Technology (United States) . . . . [7378C-61]

11:20 am: **Dissection of large viruses with AFM**, Alexander McPherson, Yuri A. Kuznetsov, Univ. of California, Irvine (United States) . . . . . . [7378C-63]

11:40 am: **Characterization of some biological specimens using TEM and SEM**, Nabarun Ghosh, West Texas A & M Univ. (United States); Don Smith, Univ. of North Texas (United States). [7378C-64]

12:00 pm: **Mineralization in long bones, hardening of blood vessel walls, destruction of solid malignant tumors: a review of studies using TEM, STEM, SEM and electron diffraction: a new interpretation**, A. J. Tousimis, tousimis® Inc. (United States). . . . . . [7378C-105]

Lunch Break . . . . 12:20 to 1:30 pm

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Conference 7378A continued
Room: Portola

Scanning Microscopy 1
Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378A

SESSION 2
Room: Portola . Tues. 1:30 to 3:10 pm
Helium Ion Microscopy II

Session Chairs: **András E. Vladár,** National Institute of Standards and Technology; **Clarke Fenner,** Carl Zeiss SMT Inc.

1:30 pm: **A brief users guide to He ion interactions with materials**, Ranjan Ramachandra, The Univ. of Tennessee (United States); Brendan J. Griffin, The Univ. of Western Australia (Australia); David C. Joy, The Univ. of Tennessee (United States) . . . . [7378A-05]

1:50 pm: **Nanofabrication with scanning helium ion beam lithography (SHIBL)**, Diederik J. Maas, Emile van Veldhoven, TNO Science and Industry (Netherlands); Vadim Sidorkin, Emile W. J. M. van der Drift, Kavli Institute of Nanoscience (Netherlands) . . . . [7378A-07]

2:10 pm: **Application of helium ion microscopy to study nanoscaled semiconductors and insulators**, Oleg F. Vyvenko, St. Petersburg State Univ. (Russian Federation). . . . . [7378A-104]

2:30 pm: **Application of He ion microscopy in material analysis**, Frank Altmann, Fraunhofer-Institut für Werkstoffmechanik (Germany) . . . . [7378A-09]

2:50 pm: **Preliminary results from the new Orion installation at Southampton University**, Harvey N. Rutt, Univ. of Southampton (United Kingdom). . . . . [7378A-10]

Coffee/Poster Viewing Break . . . . 3:10 to 4:00 pm

Poster— Tuesday
Room: Portola

Nondestructive micro and nanoscale 3D structural characterization of ceramics, composites and carbon based materials with a novel CT, S. H. Lau, Xradia, Inc. (United States); Luke L. Hunter, Xradia Inc. (United States); Jeff Gelb, Xradia, Inc. (United States); Kenneth Labuschagne, Pebble Bed Modular Reactor (Pte.) Ltd. (South Africa) . . . . [7378A-100]

Conference 7378B continued
Room: De Anza 1

Scanning Microscopy 2
Tuesday 5 May 2009
Proceedings of SPIE Vol. 7378B

SESSION 12
Room: Redwood 2. Tues. 2:00 to 3:40 pm
Atomic Force and Scanned Probe Microscopies II

Session Chairs: **Vladimir A. Ukraintsev,** Nanometrology International, Inc.; **Joseph Fu,** National Institute of Standards and Technology

2:00 pm: **Compensation for cross-axis coupling of piezotube scanners in tapping-mode SPM imaging**, Jian Shi, Veeco Metrology Inc. (United States); Ying Wu, Iowa State Univ. (United States); Chanmin Su, Veeco Metrology Inc. (United States); Qingze Zou, Iowa State Univ. (United States). [7378B-52]

2:20 pm: **Energy dissipation, frequency shift and measurement error of an inclined microcantilever measuring a biomaterial in fluid**, Shueei-Muh Lin, Kun Shan Univ. (Taiwan) . . . . [7378B-53]

2:40 pm: **Enabling Accurate Gate Profile Control With Inline 3D-AFM**, Tianming Bao, Dean J. Dawson, Veeco Instruments Inc. (United States). [7378B-55]

3:00 pm: **Automated 3D-AFM as a key metrology technique for thin film head manufacturing and process development**, Andrew Lopez, Veeco Metrology Inc. (United States). [7378B-56]

Coffee Break . . . . 3:20 to 3:50 pm

Conference 7378C continued
Room: Redwood 1

Scanning Microscopy 3
Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378C

SESSION 15
Room: Redwood 1 . Tues. 1:30 to 4:40 pm
Microscopy and Analysis of Biological Materials II

Session Chairs: **Tim K. Maugel,** Univ. of Maryland, College Park

1:30 pm: **Electrostatic force microscopy of biological self assembly structures**, Casper H. Clausen, Winnie E. Svendsen, Danmarks Tekniske Univ. (Denmark) . . . . [7378C-65]

1:50 pm: **Investigation of cell surfaces and bio-marker mapping using microplasma assisted desorption/ionization mass spectrometry** *(Invited Paper)*, Thomas M. Orlando, Josh Symonds, Facundo M. Fernandez, John McDonald, Georgia Institute of Technology (United States). [7378C-66]

2:10 pm: **Mineralization in long bones, hardening of blood vessel walls, destruction of solid malignant tumors; a review of studies using TEM, STEM, SEM and electron diffraction: a new interpretation**, A. J. Tousimis, tousimis(r) Inc. (United States) . . . . . . [7378C-67]

2:30 pm: **Construction of a new type of low-energy, scanning electron microscope with atomic resolution**, Derek A. Eastham, Univ. of Salford (United Kingdom) . . . . [7378C-68]

2:50 pm: **Biological applications of imaging desorption electrospray ionization (DESI)**, Demian R. Ifa, Chunping Wu, Allison L. Dill, Nicholas E. Manicke, R. Graham Cooks, Purdue Univ. (United States) . . . . [7378C-69]

Coffee Break . . . . 3:10 to 3:40 pm

3:40 pm: **High brightness plasma ion source for analysis and fabrication at the micro and nanoscale**, Paul P. Tesch, Noel S. Smith, Noel P. Martin, Oregon Physics, LLC (United States). [7378C-98]

4:00 pm: **Multiscale 3D bioimaging: from cell, tissue to whole organism**, S. H. Lau, Xradia, Inc. (United States); Ge Wang, Virginia Polytechnic Institute and State Univ. (United States); Margam Chandrasekeran, Bio-scaffold International Pte Ltd. (Singapore); Hauyee Chang, Jeff Gelb, Michael Feser, Xradia, Inc. (United States) . . . . [7378C-101]

4:20 pm: **Imaging supported membranes by mass spectrometry** *(Invited Paper)*, Steven Boxer, Stanford Univ. (United States). . . . . . . [7378C-62]

Conference 7378A continued
Room: Portola

Scanning Microscopy 1
Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378A

SESSION 3
Room: Portola .Tues. 4:00 to 4:40 pm

Sample Preparation Technology

Session Chairs: **Tim K. Maugel,** Univ. of Maryland, College Park

4:00 pm: **Coatings for semiconductor device imaging**, David C. Joy, The Univ. of Tennessee (United States). [7378A-11]

4:20 pm: **Novel choices for formulating embedding media kits**, Jose A. Mascorro, Tulane Univ. (United States) . . . . [7378A-14]

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Conference 7378B continued
Room: De Anza 1

Scanning Microscopy 2
Tuesday 5 May 2009
Proceedings of SPIE Vol. 7378B

SESSION 13
Room: Redwood 2. Tues. 3:50 to 4:50 pm

Microscopy and Analysis of Food Microstructures

Session Chairs: **Dennis A. Margosan,** USDA Agricultural Research Service

3:50 pm: **Seed surface and seed anatomy with light and scanning electron microscopy on four leguminous genera**, Nabarun Ghosh, West Texas A & M Univ. (United States); Don Smith, Univ. of North Texas (United States) . . . . [7378B-57]

4:10 pm: **Fresh fruit: microstructure, texture and quality**, Delilah F. Wood, Syed H. Imam, William J. Orts, Gregory M. Glenn, U.S. Dept. of Agriculture (United States). [7378B-59]

4:30 pm: **Microstructure and nutrient distribution in oats: influence on quality**, Shea Miller, Judith Frégeau-Reid, Agriculture and Agri-Food Canada (Canada) . . . . [7378B-60]

Conference 7378C continued
Room: Redwood 1

Scanning Microscopy 3
Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378C

SESSION 16
Room: Redwood 1 . Tues. 4:40 to 6:00 pm

Microscopy Applications in Environmental Safety and Health

Session Chairs: **R. David Holbrook,** National Institute of Standards and Technology; **Keana Scott,** National Institute of Standards and Technology

4:40 pm: **How does scanning electron microscopy assist in the characterization of chemical/physical properties in nanotechnology**, Richard Pleus, Intertox Inc. (United States). . . . . [7378C-102]

5:00 pm: **Quantum dot conjugates for SEM of bacterial communities**, Jay L. Nadeau, McGill Univ. (Canada); Randall Mielke, Jet Propulsion Lab. (United States). . . . . [7378C-70]

5:20 pm: **Integration of syntheses, characterization, and biological evaluation of polymeric and metal nanocolloids, designed for theranostic applications**, Dipanjan Pan, Washington Univ. School of Medicine (United States); Ewald Roessl, Jens-Peter Schlomka, Philips Research Europe (Germany); Angana Senpan, Eric T. Choi, Washington Univ. School of Medicine (United States); Shelton Caruthers, Washington Univ. School of Medicine (United States) and Philips Healthcare (United States); Michael J. Scott, Washington Univ. School of Medicine (United States); Patrick J. Gaffney, St. Thomas Hospital (United Kingdom); Roland Proksa, Philips Research Europe (Germany); Samuel A. Wickline, Gregory M. Lanza, Washington Univ. School of Medicine (United States). [7378C-71]

5:40 pm: **Dispersion of TiO2 nanoparticle agglomerates by Pseudomonas aeruginosa**, Allison M. Horst, Andrea C. Neal, Univ. of California, Santa Barbara (United States); Patrick R. Sislian, Univ. of California, Los Angeles (United States); Won Hyuk Suh, Univ. of California, Santa Barbara (United States); Lutz Madler, Univ. of Bremen (Germany); Galen Stucky, Patricia A. Holden, Univ. of California, Santa Barbara (United States). [7378C-72]

Conference 7378A continued
Room: Portola

Scanning Microscopy 1

Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378A

SESSION 4
Room: Portola .Wed. 8:30 to 9:50 am

Focused Ion Beam Microscopy I

Session Chairs: **Eva M. Campo,** Ctr. Nacional de Microelectrónica (Spain); **Keana Scott,** National Institute of Standards and Technology

8:30 am: **Methodologies for the preparation of soft materials using cryo-FIB SEM**, Debbie J. Stokes, Mike F. Hayles, FEI Co. (Netherlands). [7378A-15]

8:50 am: **FIB preparation of cross-sectional polymer thin film TEM samples** *(Invited Paper)*, Andrew M. Minor, Univ. of California, Berkeley (United States) . . . . [7378A-16]

9:10 am: **FIB/SEM cell sectioning for intracellular metal granules characterization**, Claudia Brundu, Marziale Milani, Grazia Santisi, Univ. degli Studi di Milano-Bicocca (Italy). . . . . [7378A-17]

9:30 am: **Low-damage preparation techniques of carbonaceous materials for TEM sections using the focused ion beam** *(Invited Paper)*, Nabil D. Bassim, Bradley De Gregorio, Naval Research Lab. (United States); Keana Scott, National Institute of Standards and Technology (United States); Tsengming Chou, FEI Co. (United States); Rhonda M. Stroud, Naval Research Lab. (United States). . . . . [7378A-18]

Coffee Break . . . . .9:50 to 10:30 am

SESSION 5
Room: Portola . . . . .Wed. 10:30 to 11:50 am

Focused Ion Beam Microscopy II

Session Chairs: **Lucille A. Giannuzzi,** FEI Co.; **Christopher W. Szakal,** National Institute of Standards and Technology

10:30 am: **Implementation on ion-beam techniques in microsystems manufacturing: opportunities in cell biology**, Eva M. Campo, Ctr. Nacional de Microelectrónica (Spain). . . . . [7378A-19]

10:50 am: **Sample preparation methods for 3-dimensional x-ray microanalysis using focused ion beam scanning electron microscopy (FIB SEM)**, Keana Scott, National Institute of Standards and Technology (United States) . . . . [7378A-20]

11:10 am: **Visible-frequency left-handed metamaterials sculpted by focused-ion-beam milling: negative refraction and negative radiation pressure** *(Invited Paper)*, Henri J. Lezec, Kenneth J. Chau, National Institute of Standards and Technology (United States) . . . . [7378A-21]

11:30 am: **Precise TEM sample preparation using the Hitachi NB5000 focused ion/electron beam system**, Toshihide Agemura, Hitachi High-Technologies Corp. (Japan); Jamil Clarke, Hitachi HighTechnologies America, Inc. (United States); Akinari Morikawa, Takahiro Sato, Mitsuru Konno, Tsuyoshi Onishi, Hitachi High-Technologies Corp. (Japan) . . . . [7378A-22]

Lunch Break . . . . .11:50 am to 1:50 pm

Conference 7378C continued
Room: Redwood 1

Scanning Microscopy 3

Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378C

SESSION 17
Room: Redwood 1. . . . . .Wed. 8:50 to 10:10 am

Optical Microscopies I

Session Chairs: **Amit Varma,** KLA-Tencor Corp.

8:50 am: **Infrared cameras for inspection of PCBs and semiconductor substrates: how to get good data in a maze of materials**, Dennis McCabe, Ross Overstreet, FLIR Systems, Inc. (United States) . . . .[7378C-74]

9:10 am: **A novel confocal line scanning sensor**, Sirichanok Chanbai, Georg Wiora, Mark A. Weber, NanoFocus AG (Germany); Hubert J. Roth, Univ. Siegen (Germany) . . . .[7378C-75]

9:30 am: **High numerical aperture singular beam scanning microscopy**, Boris Spektor, Alexander Normatov, Joseph Shamir, Technion-Israel Institute of Technology (Israel) . . . .[7378C-76]

9:50 am: **Modulation confocal microscope with enhanced background rejection**, Ke Si, Wei Gong, Colin J. R. Sheppard, National Univ. of Singapore (Singapore) . . . .[7378C-77]

Coffee Break . . . . 10:10 to 10:40 am

SESSION 18
Room: Redwood 1. . . . . Wed. 10:40 am to 12:00 pm

Optical Microscopies II

Session Chairs: **Hong-Zhou Ma,** Thorlabs; **Amit Varma,** KLA-Tencor Corp.

10:40 am: **High aspect ratio microstructures (HARMs) analysis using white light interferometry**, Amit Varma, KLA-Tencor Corp. (United States). . . . .[7378C-78]

11:00 am: **Hybrid FDTD-Fresnel modeling of the scanning confocal microscopy**, Bartlomiej Salski, Warsaw Univ. of Technology (Poland) . . . .[7378C-79]

11:20 am: **Three-dimensional image formation under single-photon ultra-short pulsed illumination**, Debabrata Goswami, Arijit K. De, Indian Institute of Technology Kanpur (India). . . . .[7378C-80]

11:40 am: **Transmission type laser scanning angle deviation microscopy with NA=0.65**, Ming-Hung Chiu, Chin-Fa Lai, Chen-Tai Tan, National Formosa Univ. (Taiwan) . . . .[7378C-81]

Lunch Break . . . . .12:00 to 1:30 pm

Conference 7378A continued
Room: Portola

Scanning Microscopy 1
Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378A

SESSION 6

Room: Portola . . . . .Wed. 1:50 to 3:10 pm

Microspectroscopic Characterization with Multiple Probes I

Session Chairs: **Dale E. Newbury,** National Institute of Standards and Technology; **Keana Scott,** National Institute of Standards and Technology

1:50 pm: **Advanced methods in scanning x-ray microscopy**, Andreas Menzel, Martin Dierolf, Cameron M. Kewish, Pierre Thibault, Oliver Bunk, Franz Pfeiffer, Paul Scherrer Institut (Switzerland) . . . . [7378A-23]

2:10 pm: **Solving the 'micro-to-macro' spatial scale problem with milliprobe X-ray fluorescence/X-ray spectrum imaging**, Dale E. Newbury, National Institute of Standards and Technology (United States) . . . [7378A-24]

2:30 pm: **Characterizing heterogeneous particles with SEM/SDD-EDS mapping and NIST Lispix**, Dale E. Newbury, Nicholas W. Ritchie, David S. Bright, National Institute of Standards and Technology (United States). . . . . [7378A-26]

2:50 pm: **Ga+ focused ion beam induced x-rays of stainless steel**, Lucille A. Giannuzzi, FEI Co. (United States); Brian P. Gorman, Univ. of North Texas (United States). . . . . [7378A-27]

Coffee Break . . . . .3:10 to 3:40 pm

SESSION 7

Room: Portola . . . . .Wed. 3:40 to 4:40 pm

Microspectroscopic Characterization with Multiple Probes II

Session Chairs: **Keana Scott,** National Institute of Standards and Technology; **Christopher W. Szakal,** National Institute of Standards and Technology

3:40 pm: **The deposition of nanocrystalline TiO_2 thin film on silicon using Sol-Gel technique and its characterization using AFM**, Mukesh Kumar, Dinesh Kumar, Kurukshetra Univ. (India). . . . . [7378A-29]

4:00 pm: **IR analysis of polyvinylidene floide doped with transition metal halides**, Somia M. El-Hefnawy, Mervet Abo el-khayr, Hamed Abd el-kader, Mansoura Univ. (Egypt) . . . . [7378A-30]

4:20 pm: **X-ray analysis of polyvinylidene floide doped with transition metal halides**, Somia M. El-Hefnawy, Mansoura Univ. (Egypt) . . . . [7378A-31]

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Conference 7378C continued
Room: Redwood 1

Scanning Microscopy 3
Tuesday-Thursday 5-7 May 2009
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SESSION 19

Room: Redwood 1 . . . . Wed. 2:00 to 3:00 pm

Optical Characterization of Biological Materials

Session Chairs: **Amit Varma,** KLA-Tencor Corp.; **Chun Hong Low,** Naval Postgraduate School

2:00 pm: **Microspectroscopic method for determination of size and distribution of protein complexes in vivo**, Valerica Raicu, Univ. of Wisconsin, Milwaukee (United States). . . . . [7378C-83]

2:20 pm: **Applying confocal scanning laser microscopy to the investigation of the behavior of human pathogenic microbes on produce**, Maria T. Brandl, USDA Agricultural Research Service (United States) . . . . [7378C-84]

2:40 pm: **Transport imaging via near field scanning optical microscopy**, Chun Hong Low, Goon Hwee Ang, Nancy M. Haegel, Naval Postgraduate School (United States). . . . . [7378C-85]

Coffee Break . . . . 3:00 to 3:30 pm

Conference 7378A continued
Room: Portola

Scanning Microscopy 1
Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378A

SESSION 8
Room: Portola . . . . .Thurs. 8:30 to 10:10 am

Scanning Electron Microscopies I

Session Chairs: **Oliver C. Wells,** IBM Corp.; **David C. Joy,** The Univ. of Tennessee

8:30 am: **Recent developments in ultra-low kV SEM imaging and microanalysis**, Natasha Erdman, Vern Robertson, Naoki Kikuchi, Charles Nielsen, JEOL USA Inc. (United States) . . . . [7378A-32]

8:50 am: **Extreme high resolution scanning electron microscopy (XHR SEM) and beyond**, Laurent Y. Roussel, FEI Co. (United States) . . . [7378A-33]

9:10 am: **Some experiments with SEM detector systems**, Oliver C. Wells, IBM Corp. (United States); Stephen V. Boettcher, Marquette Univ. (United States); Carol Bohnenkamp, U.S. Environmental Protection Agency (United States); John Bruley, IBM Thomas J. Watson Research Ctr. (United States). . . . . [7378A-34]

9:30 am: **The role of oxygen in secondary electron contrast of doped semiconductors in LVSEM**, Mohamed M. El Gomati, Christopher G. Walker, James A. Matthew, The Univ. of York (United Kingdom); Fatima N. Zaggout, 7th October Misurata Univ. (Libyan Arab Jamahiriya). . . . . [7378A-35]

9:50 am: **Recent developments in the understanding and application of backscattered and secondary electrons in the SEM**, Christopher G. Walker, Mohamed M. El Gomati, James A. Matthew, Christopher Bonet, Steven Tear, The Univ. of York (United Kingdom) . . . . [7378A-36]

Coffee Break . . . . .10:10 to 10:40 am

SESSION 9
Room: Portola . . . . Thurs. 10:40 am to 12:00 pm

Scanning Electron Microscopies II

Session Chairs: **András E. Vladár,** National Institute of Standards and Technology; **Lucille A. Giannuzzi,** FEI Co.

10:40 am: **Variable probe current using a condenser lens in a miniature electron beam column**, Charles S. Silver, James P. Spallas, Lawrence P. Muray, Novelx, Inc. (United States). . . . . [7378A-38]

11:00 am: **Carl Zeiss NTS FE-SEM technology overview**, Heiner Jaksch, Carl Zeiss AG (Germany) . . . . [7378A-39]

11:20 am: **Russian standards for dimensional measurements for nanotechnologies**, Valeriy P. Gavrilenko, A. M. Prokhorov General Physics Institute (Russian Federation); Michail N. Filippov, N.S. Kurnakov Institute of General and Inorganic Chemistry (Russian Federation); Yury A. Novikov, Alexander V. Rakov, Pavel A. Todua, A. M. Prokhorov General Physics Institute (Russian Federation) . . . . [7378A-40]

11:40 am: **Reference objects for automatized dimensional measurements**, Michail N. Filippov, N.S. Kurnakov Institute of General and Inorganic Chemistry (Russian Federation); Valeriy P. Gavrilenko, Yury A. Novikov, Alexander V. Rakov, Pavel A. Todua, A. M. Prokhorov General Physics Institute (Russian Federation) . . . . [7378A-41]

Lunch Break . . . . .12:00 to 1:30 pm

Conference 7378C continued
Room: Redwood 1

Scanning Microscopy 3
Tuesday-Thursday 5-7 May 2009
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SESSION 20
Room: Redwood 1. . . . . .Thurs. 10:10 to 10:30 am

Applications of Scanning Microscopy to Forensics Science I

Session Chairs: **S. Frank Platek,** U.S. Food and Drug Administration; **Michael A. Trimpe,** Hamilton County Coroner's Lab.

10:10 am: **Forensic applications of the SEM/FIB dual beam technique**, Gabriele M. Gorzawski, Erica Krupicka, Federal Criminal Police Office (Germany) . . . .[7378C-89]

SESSION 21
Room: Redwood 1. . . . . Thurs. 10:30 am to 12:10 pm

Applications of Scanning Microscopy to Forensics Science II

Session Chairs: **S. Frank Platek,** U.S. Food and Drug Administration; **Michael A. Trimpe,** Hamilton County Coroner's Lab.

10:30 am: **Use of a scanning optical profilometer for toolmark characterization**, L. Scott Chumbley, David Eisenmann, Song Zhang, Iowa State Univ. (United States) . . . .[7378C-91]

10:50 am: **Forensic document analysis using scanning microscopy**, Douglas K. Shaffer, U.S. Dept of Homeland Security (United States). . . . .[7378C-92]

11:10 am: **Technical improvements in GSR analysis with SEM/EDX**, J. P. Kruesemann, FEI Co. (Netherlands) . . . .[7378C-93]

11:30 am: **Gunshot residue inserted under hair scales as a result of a muzzle blast**, Bryan Burnett, Meixa Tech (United States) . . . .[7378C-94]

11:50 am: **SEM-EDX analysis of an unknown 'known' white powder found in a shipping container from Peru**, Douglas Albright, US FDA Forensics (United States). . . . .[7378C-95]

Lunch Break . . . . .12:10 to 1:30 pm

Conference 7378A continued
Room: Portola

Scanning Microscopy 1
Tuesday-Thursday 5-7 May 2009
Proceedings of SPIE Vol. 7378A

SESSION 10

Room: Portola . . . . .Thurs. 1:30 to 3:10 pm

Particle Beam Interaction Modeling Workshop

Session Chairs: **András E. Vladár,** National Institute of Standards and Technology; **Dale E. Newbury,** National Institute of Standards and Technology; **John S. Villarrubia,** National Institute of Standards and Technology

The particle beam interaction modeling workshop has brought experimentalists and modeling experts together for nearly a decade to share information on this exciting topic. This workshop has contributed to an enhanced understanding of the signal generation and imaging process in electron beam instrumentation. Contributed papers will begin the session and a discussion forum will follow.

1:30 pm: **On the relationship between hidden Markov models and functional transforms for simulating scanning probe microscopy**, Omolabake A. Adenle, Univ. of Cambridge (United Kingdom) . . . . . .[7378A-45]

1:50 pm: **Optimization of accurate SEM imaging by the use of artificial images**, Petr Cizmar, András E. Vladár, Michael T. Postek, National Institute of Standards and Technology (United States) . . . .[7378A-43]

2:10 pm: **Monte Carlo simulation to determine the measurement uncertainty of a metrological scanning probe microscope measurement**, Philipp Kreutzer, Nataliya Dorozhovets, Eberhard Manske, Roland Füssl, Gerd Jäger, Rainer Grünwald, Technische Univ. Ilmenau (Germany) . . . . .[7378A-44]

2:30 pm: **Optimization of SEM imaging through 3D modeling of beam and sample**, Martin Oral, András E. Vladár, National Institute of Standards and Technology (United States). . . . .[7378A-47]

2:50 pm: **Modeling of charge and discharge in scanning electron microscopy**, Sergey Babin, Sergey Borisov, Andrey Ivanchikov, aBeam Technologies (United States) . . . .[7378A-103]

Discussion. . . . . .3:10 to 3:30 pm

Coffee Break . . . . .3:30 to 4:00 pm

Discussion of NIST DTSA-II for Spectral Modeling

Room: Portola . . . . .Thurs. 4:00 to 5:30 pm

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Conference 7378C continued
Room: Redwood 1

Scanning Microscopy 3
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SESSION 22

Room: Redwood 1. . . . . Thurs. 1:30 to 2:30 pm

Applications of Scanning Microscopy to Forensics Science III

Session Chairs: **S. Frank Platek,** U.S. Food and Drug Administration; **Michael A. Trimpe,** Hamilton County Coroner's Lab.

1:30 pm: **Quality assurance aspects of GSR analysis by SEM/EDX: a report of first-hand experiences**, Sebastien Charles, Didier Dehan, Bart P. Nys, National Institute for Criminalistics and Criminology (Belgium) . . . . [7378C-96]

1:50 pm: **A European study on the prevalence of GSR in random population and selected professional groups** *(Invited Paper),* John McCullough, The Forensic Science Lab. (Ireland); Rüdiger Schumacher, Ludwig H. Niewoehner, Bundeskriminalamt Wiesbaden (Germany); Amalia Brouwer-Stamouli, Ministerie van Justitie (Netherlands); Zuzanna Brozek-Mucha, Institute of Forensic Research (Poland); Lawrence Gunaratnam, National Bureau of Investigati (Finland). . . . . [7378C-97]

Forensic Forum

Room: Redwood 1 . . . . Thurs. 2:30 to 5:30 pm

Moderators: **Michael A. Trimpe,** Hamilton County Coroner's Lab.; **S. Frank Platek,** U.S. Food and Drug Administration

Since its implementation at the 2004 Washington, D.C. SCANNING meeting, the Forensic Forum has been a well attended and most productive group round table discussion of forensic science topics involving scanning microscopy at both a national and international level. The forum has also been an excellent location to discuss analytical problems, sample analysis methods, report language and court testimony in the use of scanning microscopy applications in forensic science. SWGGSR had its origins in the Forensic Forum as well as establishing a core group of dedicated forensic scientists working toward a science-based, consensus approach to the analysis and reporting of gun shot residue (GSR). Networking with other forensic microscopists has proven to be most beneficial to attendees at previous SCANNING meetings. This forum IS NOT solely dedicated to discussion of GSR analysis as any related forensic topic may be discussed. (Examples: Daubert Motion issues, ISO/accreditation items, unique sample analyses and requests, etc.)

Come, bring your experience and your questions, and be a part of the Forensic Forum.

Scanning Microscopy in Forensic Science

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CEU .65 $470 / $570 USD
Wednesday 8:30 am to 5:30 pm

This short course is devoted to scanning electron microscopy analysis of many types of forensic samples. Specific topics to be covered include particulate trace evidence analysis, gunshot residue (GSR) analysis, and instrument calibration concerns and procedures. A trace evidence section in forensic sample processing will be presented first. Topics discussed include collection, handling, transfer, mounting, storage and micro-manipulation of particles. With the increased efforts of most forensic laboratories moving toward certification and accreditation (ISO, ASCLD, etc.), a second section of this short course will be devoted to SEM/EDS calibration issues and the many pitfalls of blindly trusting instrument readings. Understanding what causes these problems will teach attendees what your instrument is telling you, what you need to know to calibrate your instrument and what you may need to be able to explain as the expert witness. A third section will be devoted to GSR analysis and the methods of collection, instrumental analysis by SEM/EDS, and the interpretation and reporting of results. A final segment will cover a variety of actual case-related applications of scanning microscopy in a number of forensic cases. The course will be instructed by forensic scientists and microscopists, each a specialist in his/her respective area of expertise, and will include a group question-and-answer session.

LEARNING OUTCOMES

This course will enable you to:

- use a variety of techniques (many being very simple) to collect, isolate, and process suspect trace evidence particles and fibers for SEM/EDS analysis
- take back to your laboratory a number of effective tips and tricks on small particle handling techniques
- list critical factors related to SEM/EDX calibration and how they relate to the accuracy of your measurements and subsequent analyses
- learn the state-of-the-art procedures in the analysis of GSR data by SEM/EDS
- learn the current guidelines in interpretation of GSR data
- relate your personal forensic case work to presented case analyses and compare results

INTENDED AUDIENCE

This course is directed at the laboratory analyst using scanning electron microscopy and energy dispersive x-ray spectrometry analyses in forensic case work including trace evidence and gun shot residue analyses. Individuals employed in other related fields including quality control, geology, environmental particle and microchemical analyses may find this course beneficial. All microscopists using SEM/EDS, regardless of their discipline, will find this course interesting and learn how forensic SEM/EDS analyses are really done compared to how they are portrayed by many television crime investigation shows.

INSTRUCTORS

S. Frank Platek is a Team Leader in the Microscopy / Microanalysis Group for the U.S. Food and Drug Administration's Forensic Chemistry Center. Prior to his 19 years with the FDA, he served 15 years as a research biologist with the National Institute for Occupation Safety and Health (NIOSH) specializing in SEM/TEM/EDS analysis of fine particles and fibers. Since 1993, he has served as a member of the editorial review board of the Journal, SCANNING and chairperson for the Scanning Microscopy in Forensic Science Session and Short Course for the International SCANNING meeting. He has served as the national touring speaker for the Microbeam Analysis Society and the Microscopy Society of America. Mr. Platek is also a lecturer in Forensic Science Applications of Scanning Electron Microscopy at the Lehigh Microscopy School at Lehigh University and has taught SEM/EDS analysis as an adjunct faculty instructor at Northern Kentucky University for more than 27 years. He is a member of the American Academy of Forensic Science (AAFS), Mid-Western Association of Forensic Science (MAFS), Microscopy Society of America (MAS) and Microscopy Society of the Ohio River Valley (MSORV).

Michael Trimpe has worked at the Hamilton County Coroner's Lab for 29 years. He is a Past President of the Midwestern Association of Forensic Scientists and received the Distinguished Scientist Award. He conducted the FBI GSR Symposium in 2005. He is the founder and chairman of the International Scientific Working Group for Gunshot Residue. He is a Fellow member of the American Academy of Forensic Sciences, and his other scientific memberships include the European Network of Forensic Scientists, TWGFEX, and the International Association of Arson Investigators. Mr. Trimpe has taught the analysis of gunshot residue all over the country and has frequently been asked to speak at GSR Seminars all over the world.

Faye Springer is a Criminalist IV at the Sacramento County District Attorney's Laboratory of Forensic Services in Sacramento, California. She graduated from the University of California, Davis, in 1970 with a degree in Biochemistry and began her career as a Forensic Laboratory Technician. After two years, Ms. Springer became a Criminalist for the State of California. She has worked 24 years for the State of California, and has been a Criminalist at the Sacramento County laboratory since 1996. Over the past 38 years, she has worked on thousands of homicide cases and has developed special expertise in the area of trace evidence. She has used scanning electron microscopy in forensic case work since the mid 1980s. She has presented numerous papers to a variety of professional organizations in trace evidence and physical evidence aspects of homicide investigations. She is a regular instructor for the University of California, Davis, Master of Forensic Science program, the California Criminalistics Institute, the California District Attorney's Association, and the ICI Homicide School in California.

Michael Postek is the Chief of the Precision Engineering Division and has been the Program Manager of the Nanomanufacturing Program in the Manufacturing Engineering Laboratory at the National Institute of Standards and Technology (NIST). Dr. Postek was the Assistant to the NIST Director for Nanotechnology and is both a nationally and internationally recognized expert in nanometrology and scanning electron microscope (SEM) critical dimension (CD) metrology.

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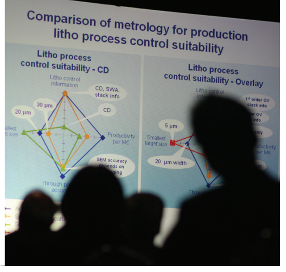

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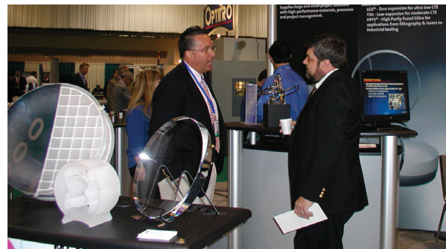

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