

Volume 18, Number 6

December 2012

# Microscopy AND Microanalysis



CAMBRIDGE  
UNIVERSITY PRESS

ISSN 1431-9276

Living up to Life

**Leica**  
MICROSYSTEMS



**NEW!** Leica EM ACE Coaters



Courtesy of Mag. D Gruber, Core Facility of Cell Imaging and Ultrastructure Research, University of Vienna, Austria

## Leica Microsystems Announces the Release of the **NEW** Leica EM ACE Coaters

The ultimate quality of a microscopic image comes from high-quality sample preparation. Leica Microsystems has a full range of innovative instrumentation to deliver perfect preparation for all sample materials.

**NEW! Leica EM ACE.** Coating systems for the preparation of samples for the Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM) and the Field Emission Scanning Electron Microscope (FE-SEM).

- **Fully Automated, One-touch Coating Systems**
- **Low Vacuum or High Vacuum with Optional Cryo**
- **Small Footprint**

Visit [www.leica-microsystems.com/products/electron-microscope-sample-preparation](http://www.leica-microsystems.com/products/electron-microscope-sample-preparation)  
to see the latest sample preparation solutions!



# Microscopy AND Microanalysis

An International Journal for the Biological and Physical Sciences

THE OFFICIAL JOURNAL OF

MICROSCOPY SOCIETY OF AMERICA  
MICROANALYSIS SOCIETY  
MICROSCOPICAL SOCIETY OF CANADA /  
SOCIÉTÉ DE MICROSCOPIE DU CANADA  
MEXICAN MICROSCOPY SOCIETY  
BRAZILIAN SOCIETY FOR MICROSCOPY AND MICROANALYSIS  
VENEZUELAN SOCIETY OF ELECTRON MICROSCOPY  
EUROPEAN MICROBEAM ANALYSIS SOCIETY  
AUSTRALIAN MICROSCOPY AND MICROANALYSIS SOCIETY  
PORTUGUESE SOCIETY FOR MICROSCOPY

PUBLISHED IN AFFILIATION WITH

ROYAL MICROSCOPICAL SOCIETY  
GERMAN SOCIETY FOR ELECTRON MICROSCOPY  
BELGIAN SOCIETY FOR MICROSCOPY  
MICROSCOPY SOCIETY OF SOUTHERN AFRICA

## Editor in Chief

### Editor, Biological Applications

Robert L. Price  
Cell and Developmental Biology and  
Anatomy  
University of South Carolina  
Columbia, SC 29209  
e-mail: Bob.Price@uscmed.sc.edu

### Editor, Materials Applications

David J. Smith  
Department of Physics  
School of Materials  
Arizona State University  
Tempe, Arizona 85287-1504  
e-mail: david.smith@asu.edu

### Editor, Scanning Probe Microscopies

David Bell  
School of Engineering & Applied  
Sciences  
Center for Nanoscale Systems  
Harvard University  
Cambridge, MA 02138  
e-mail: dcb@seas.harvard.edu

### Editor, Atom Probe

Thomas Kelly  
Cameca Instruments, Inc.  
A Business Unit of AMETEK, Inc.  
Madison, WI 53711-4951  
e-mail: Thomas.Kelly@ametec.com

### Editor, Light and Fluorescence Microscopies

Brian Herman  
Cellular and Structural Biology  
University of Texas at San Antonio  
San Antonio, Texas 78284-7762  
e-mail: hermanb@uthscsa.edu

### Editor, Biological Applications

Heide Schatten  
Veterinary Pathobiology  
University of Missouri-Columbia  
Columbia, Missouri 65211-5030  
e-mail: schattenh@missouri.edu

### Editor, Microanalysis

John Mansfield  
Electron Microbeam Analysis Lab  
North Campus, 417 SRB  
University of Michigan  
Ann Arbor, MI 48109-2143  
e-mail: jfmjfm@umich.edu

### Editor, Correlative and Emerging Microscopy Applications

Vinayak P. Dravid  
Materials Science and Engineering  
Northwestern University  
Evanston, Illinois 60208-3105  
e-mail: v-dravid@northwestern.edu

### Editor, Plant Biology Applications

Rosemary White  
CSIRO Plant Industry  
Canberra, ACT 2601, Australia  
e-mail: rosemary.white@csiro.au

### Special Issues and Reviews Editor

Jay Jerome  
Vanderbilt University Medical Center  
Nashville, TN 37232  
e-mail: jay.jerome@vanderbilt.edu

### Book Review Editor

Cynthia S. Goldsmith  
Centers for Disease Control  
Atlanta, GA 30333  
e-mail: csg1@cdc.gov

### M&M Program Guide Editor

Richard E. Edelmans  
Miami University  
Oxford, OH 45056  
e-mail: edelmare@muohio.edu

### Proceedings Editor

John Shields  
University of Georgia  
Athens, GA 30602  
e-mail: jpshield@uga.edu

## Editorial Board

Ralph Albrecht	<i>University of Wisconsin, Madison, Wisconsin</i>
Barry Carter	<i>University of Connecticut, Storrs, Connecticut</i>
Wah Chiu	<i>Baylor College of Medicine, Houston, Texas</i>
Niels de Jonge	<i>INM Institute for New Materials, Saarbrücken, Germany</i>
Alberto Diaspro	<i>University of Genoa, Italy</i>
Elizabeth Dickey	<i>Pennsylvania State University, University Park, Pennsylvania</i>
Alwyn Eades	<i>Lehigh University, Bethlehem, Pennsylvania</i>
Mark Ellisman	<i>University of California at San Diego, San Diego, California</i>
Pratibha Gai	<i>University of York, United Kingdom</i>
Marija Gajdardziska-Josifovska	<i>University of Wisconsin-Milwaukee, Milwaukee, Wisconsin</i>
Dale Johnson	<i>University of South Florida, Tampa, Florida</i>
Paul Kotula	<i>Sandia National Labs, Albuquerque, New Mexico</i>
William Landis	<i>University of Akron, Akron, Ohio</i>
Eric Lifshin	<i>SUNY at Albany, Albany, New York</i>
Charles Lyman	<i>Lehigh University, Bethlehem, Pennsylvania</i>
Dale Newbury	<i>National Institute of Standards and Technology, Gaithersburg, Maryland</i>
Jean-Paul Revel	<i>California Institute of Technology, Pasadena, California</i>
Conly Rieder	<i>Wadsworth Center, Albany, New York</i>
John Silcox	<i>Cornell University, Ithaca, New York</i>
Nestor Zaluzec	<i>Argonne National Laboratory, Argonne, Illinois</i>

## Editorial Board Representatives from Affiliated Societies

Ian Anderson	<i>NIST, Gaithersburg, Maryland (MAS)</i>
Gautam Kumar Dey	<i>Bhabha Atomic Research Centre (EMSI)</i>
Gema Gonzalez	<i>Venezuelan Institute for Scientific Investigation (Venezuela)</i>
Michael Robertson	<i>Acadia University, Wolfville, Nova Scotia (Canada)</i>
Brendan Griffin	<i>University of Western Australia (AMMS)</i>
Guillermo Solorzano	<i>Pontificia Universidade Catolica, Rio de Janeiro (Brazil)</i>
Clive Walker	<i>Institute for Transuranium Elements, Karlsruhe (EMAS)</i>
Miguel Yacaman	<i>Mexico Institute for Nuclear Research (Mexico)</i>
Henrique Almeida	<i>Universidade do Porto (Portugal)</i>

## Founding Editor

Jean-Paul Revel	<i>California Institute of Technology, Pasadena, California</i>
-----------------	---

## Previous Editors-in-Chief

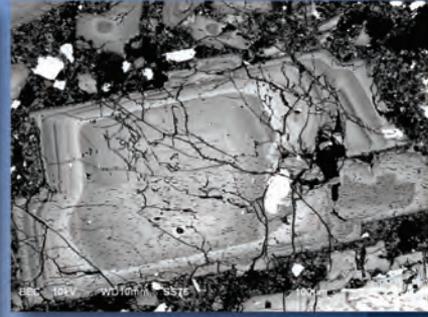
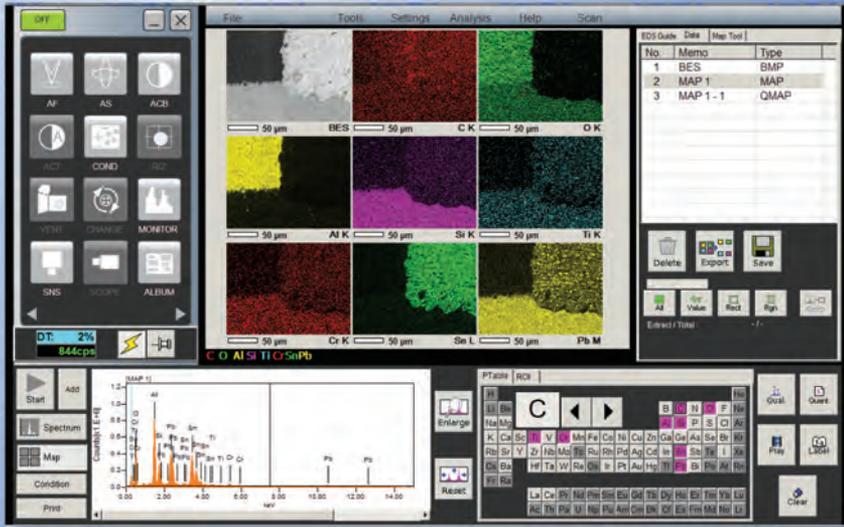
Dale Johnson	<i>University of South Florida, Tampa, Florida</i>
Charles Lyman	<i>Lehigh University, Bethlehem, Pennsylvania</i>

This journal is part of the **Cambridge Journals Online** service. Access to online tables of contents and article abstracts is available to all researchers at no cost. Access to full-text articles online is provided to those with online subscription. Online subscriptions must be activated. Once your subscription is activated, free access to past, present, and forthcoming articles is available at:

**Microscopy and Microanalysis website: [journals.cambridge.org/MAM](http://journals.cambridge.org/MAM).**

Instructions for authors submitting manuscripts may be found at [journals.cambridge.org/MAM](http://journals.cambridge.org/MAM). Select "Further Information" then select "Instructions for Contributors." An abbreviated version of these instructions will be published in the first issue (February) of each volume.

# Defining a New Class of SEM



In  
TouchScope™

- **Portable, affordable, research SEM**
- **Exceptional value**
- **High resolution imaging in HV/LV/SE/BSE**
- **Chemical analysis with integrated EDS**
- **Multi-touch screen control and wireless operation**
- **Fast navigation**
- **Simply fun to use!**

*First in a new class of SEMs from JEOL. Experience it for yourself - send us your samples or schedule a demo. [jeolusa.com/intouch](http://jeolusa.com/intouch)*

# JEOL

Global Solutions Provider for Advanced Technology  
[www.jeolusa.com](http://www.jeolusa.com) • [salesinfo@jeol.com](mailto:salesinfo@jeol.com)  
 978-535-5900

Find us on Facebook and Twitter @jeolusa

Another  
**Extreme Imaging**  
 Solution

**Portable • Affordable • Research SEM**

*Microscopy and Microanalysis* publishes original research papers dealing with a broad range of topics in microscopy and microanalysis. These include articles describing new techniques or instrumentation and their applications, as well as papers in which established methods of microscopy or microanalysis are applied to important problems in the fields of biology or materials science. Microscopy and microanalysis are defined here in a broad sense, and include all current and developing approaches to the imaging and analysis of microstructure. The criteria for acceptance of manuscripts are the originality and significance of the research, the quality of the microscopy or microanalysis involved, and the interest for our readership.

Four types of communications are published in the Journal. **Regular Articles** are of substantial length and describe the findings of an original research project that satisfies the aims and scope of the Journal, described above. **Review Articles** summarize the current status of an important area within the aims and scope of the Journal. **Letters to the Editor** usually contain comments on recent articles that have appeared in the Journal. **Book Reviews** are also published, but these are solicited only through the Book Review Editor.

### Instructions for Contributors

Instructions for authors contributing manuscripts may be found at <http://mc.manuscriptcentral.com/mam> under "Resources: Instructions and Forms." Authors may also visit [http://www.journals.cambridge.org/jid\\_MAM](http://www.journals.cambridge.org/jid_MAM), select "Further Information," and then select "Instructions for Contributors." An abbreviated version of these instructions will be published in the first issue (February) of each volume.

### Copyright Information

Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all coauthors, if any, as well as by the responsible authorities at the institute where the work has been carried out; that, if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the Microscopy Society of America; that the manuscript will not be published elsewhere in any language without the consent of the copyright holders; and that written permission of the copyright holder is obtained by the authors for material used from other copyrighted sources.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g., as offprints), as well as all translation rights. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, video disks, etc., without first obtaining written permission from the publisher.

The use of general descriptive names, trade names, trademarks, etc., in this publication, even if not specifically identified, does not imply that these names lack protection by the relevant laws and regulation.

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Cambridge University Press, provided that the appropriate fee is paid directly to Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, USA (Tel: (508) 750-8400), stating the ISSN (1431-9276), the volume, and the first and last page numbers of each article copied. The copyright owner's consent does not include copying for general distribution, promotion, new works, or resale. In these cases, specific written permission must first be obtained from the publisher.

### Disclaimer

The Microscopy Society of America, the other societies stated, and Cambridge University Press cannot be held responsible for errors or for any consequences arising from the use of the information contained in this journal. The appearance of scientific reports and/or workshops, or any other material in *Microscopy and Microanalysis* does not constitute an endorsement or approval by The Microscopy Society of America of the findings, data, conclusions, recommendations, procedures, results, or any other aspect of the content of such articles. The appearance of advertising in *Microscopy and Microanalysis* does not constitute an endorsement or approval by The Microscopy Society of America of the quality or value of the products advertised or any of

the claims, data, conclusions, recommendations, procedures, results, or any other information included in the advertisements.

While the advice and information in this journal is believed to be true and accurate at the date of its going to press, neither the authors, the editors, nor the publisher can accept any legal responsibility for any errors or omissions that may be made.

### Subscription Information

*Microscopy and Microanalysis* is published bimonthly in February, April, June, August, October, and December by Cambridge University Press. Two supplements (*Expo* and *Proceedings*) are published in June and August.

**Society Rates:** Members of the Microscopy Society of America should contact the MSA Business Office for all subscription inquiries: Microscopy Society of America, Hachero Hill, Inc., 11260 Roger Bacon Drive, Suite 402, Reston, VA 20190, Tel.: (703) 964-1240, Ext. 14, E-mail: [nicoleguy@mindspring.com](mailto:nicoleguy@mindspring.com), URL: [www.msa.microscopy.org](http://www.msa.microscopy.org). Members of other affiliated societies should contact their respective society business offices for all subscription inquiries.

**Subscription Rates:** Institutions print and electronic: US \$957.00 in the USA, Canada, and Mexico; UK £577.00 + VAT elsewhere. Institutions online only: US \$790.00 in the USA, Canada, and Mexico; UK £478.00 + VAT elsewhere. Institutions print only: US \$863.00 in the USA, Canada, and Mexico; UK £520.00 + VAT elsewhere. Individuals print and online: US \$359.00 in the USA, Canada, and Mexico; UK £218.00 + VAT elsewhere. Prices include postage and insurance.

**USA, Canada, and Mexico:** Subscribers in the USA, Canada, and Mexico should send their orders, with payment in US dollars or the equivalent value in Canadian dollars, to: Cambridge University Press, Customer Services Department (Journals), 100 Brook Hill Drive, West Nyack, NY 10994-2133, USA. Tel: (845) 353-7500. Fax: (845) 353-4141. Orders may be phoned direct (toll free): (800) 872-7423. E-mail: [journals\\_subscriptions@cup.org](mailto:journals_subscriptions@cup.org).

**Outside North America:** Subscribers elsewhere should send their orders, with payment in sterling, to: Customer Services Department (Journals), Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 8RU, UK. Tel: +44 (0)1223 326070. Fax: +44 (0)1223 325150. E-mail: [journals@cambridge.org](mailto:journals@cambridge.org)

**Change of address:** Allow six weeks for all changes to become effective. All communications should include both old and new addresses (with postal codes) and should be accompanied by a mailing label from a recent issue. Society members should contact their respective society business offices to inform them of address changes.

**Microform editions are available from:** University Microfilms International, 300 North Zeeb Road, Ann Arbor, MI 48106, USA.

### Editorial Office

Robert L. Price, Editor in Chief, Department of Cell and Developmental Biology and Anatomy, School of Medicine, University of South Carolina, 6439 Garner's Ferry Road, Bldg. 1 B-60, Columbia, SC 29209, USA; Tel: (803) 216-3824; Fax: (803) 733-3212; E-mail: [Bob.Price@uscmed.sc.edu](mailto:Bob.Price@uscmed.sc.edu).

### Office of Publication

Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013-2473, USA; Tel: (212) 337-5000; Fax: (212) 337-5959.

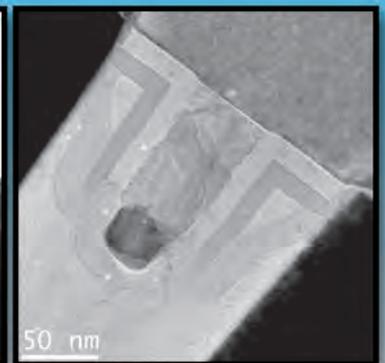
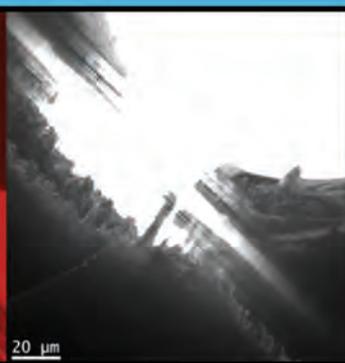
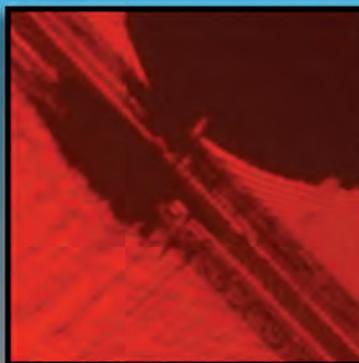
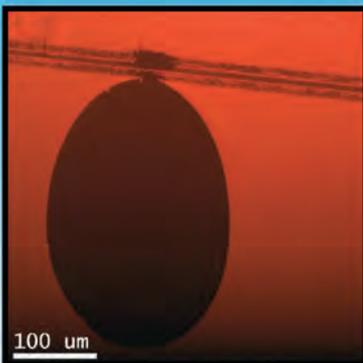
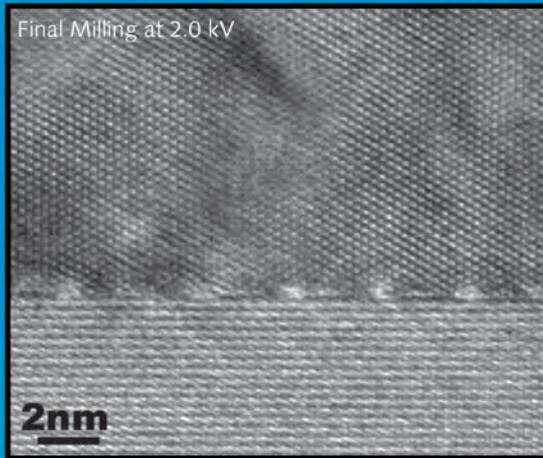
### Advertising Sales & Production

M.J. Mrvica Associates, Inc., 2 West Taunton Avenue, Berlin, NJ 08009, USA; Tel: (856) 768-9360; Fax: (856) 753-0064.

© 2012 by Microscopy Society of America. Printed in the United States on acid-free paper. Periodicals postage paid at New York, NY, and additional mailing offices. Return postage guaranteed. Postmaster: Send address changes in the U.S.A. and Canada to *Microscopy and Microanalysis*, Subscription Department, Cambridge University Press, 100 Brook Hill Drive, West Nyack, NY 10994-2133.

# The Ion Mill You Know: Reborn

Low energy ion guns Cold stage Touch screen Automation and recipes  
Live viewing and saving images in Gatan DigitalMicrograph®



Top images: Benefits of low voltage operation: ZnO on Sapphire. Images courtesy of P. Vennégues – CRHEA-CNRS, France.

Bottom images: Series of optical images from Gatan Precision Ion Polishing System II (PIPS<sup>TM</sup>II) viewing camera and low and high magnification TEM images.



ANALYTICAL TEM  
DIGITAL IMAGING  
SPECIMEN PREPARATION  
TEM SPECIMEN HOLDERS  
SEM PRODUCTS  
SOFTWARE

[www.gatan.com](http://www.gatan.com)

**PIPS II**  
Precision Ion Polishing System II



# Explore the Unseen

FEI's annual owner's image contest  
In partnership with National Geographic



FEI is pleased to partner with National Geographic on a giant-screen film tentatively titled "Invisible Worlds". At the same time, we're excited to announce this year's FEI Image Contest, "Explore the Unseen". Inspired by the upcoming film, the FEI Image Contest offers owners and users an opportunity to explore their creativity and share their images with National Geographic's worldwide audience.

For more information go to [www.fei.com/2012-image-contest/](http://www.fei.com/2012-image-contest/)

All images courtesy of FEI and can be found at [www.flickr.com/photos/fei\\_company](http://www.flickr.com/photos/fei_company)

# Microscopy AND Microanalysis

An International Journal for the Biological and Physical Sciences

Volume 18, Number 6

December 2012

## SPECIAL SECTION: CATHODOLUMINESCENCE

Introduction: Cathodoluminescence 1211

*Marion Stevens-Kalceff, Colin McRae, and Scott Wight*

High-Resolution Cathodoluminescence Hyperspectral Imaging  
of Nitride Nanostructures 1212

*Paul R. Edwards, Lethy Krishnan Jagadamma, Jochen Bruckbauer,  
Chaowang Liu, Philip Shields, Duncan Allsopp, Tao Wang, and  
Robert W. Martin*

Three-Dimensional Electron Energy Deposition Modeling of  
Cathodoluminescence Emission near Threading Dislocations in GaN  
and Electron-Beam Lithography Exposure Parameters for a PMMA Resist 1220

*Hendrix Demers, Nicolas Poirier-Demers, Matthew R. Phillips, Niels de Jonge,  
and Dominique Drouin*

Cathodoluminescence Microanalysis of Irradiated Microcrystalline and  
Nanocrystalline Samarium Doped BaFCl 1229

*Marion A. Stevens-Kalceff, Zhiqiang Liu, and Hans Riesen*

Hyperspectral Cathodoluminescence Imaging and Analysis Extending  
from Ultraviolet to Near Infrared 1239

*C.M. MacRae, N.C. Wilson, A. Torpy, and C.J. Davidson*

Shedding New Light on Cathodoluminescence—A Low Voltage Perspective 1246

*Natasha Erdman, Charles Nielsen, and Vernon E. Robertson*

Ionoluminescence in the Helium Ion Microscope 1253

*Stuart A. Boden, Thomas M.W. Franklin, Larry Scipioni, Darren M. Bagnall,  
and Harvey N. Rutt*

High-Resolution Confocal Microscopy with Simultaneous Electron and Laser  
Beam Irradiation 1263

*Jonathan Poplawsky and Volkmar Dierolf*

## Review Article

Application of Cathodoluminescence Microscopy and Spectroscopy  
in Geosciences 1270

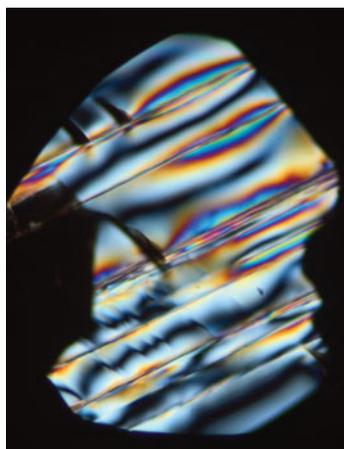
*Jens Götze*

Cathodoluminescence Microscopy and Spectroscopy of Micro- and  
Nanodiamonds: An Implication for Laboratory Astrophysics 1285

*Arnold Gucsik, Hirotsugu Nishido, Kiyotaka Ninagawa, Ulrich Ott,  
Akira Tsuchiyama, Masahiro Kayama, Irakli Simonia, and Jean-Paul Boudou*

Cathodoluminescence of Natural, Plastically Deformed Pink Diamonds 1292

*E. Gaillou, J.E. Post, T. Rose, and J.E. Butler*



**On the Cover:** Polarized light image of a pink diamond. For more information see Gaillou et al., pp. 1292–1302.

**Microscopy and Microanalysis website:** <http://www.journals.cambridge.org/MAM>  
Indexed in Chemical Abstracts, Current Contents, BIOSIS, and MEDLINE (PubMed)

Hyperspectral Cathodoluminescence Examination of Defects in  
a Carbonado Diamond 1303  
*Nicholas C. Wilson, Colin M. MacRae, Aaron Torpy, Cameron J. Davidson,  
and Edward P. Vicenzi*

Using Cathodoluminescence Spectroscopy of Cretaceous Calcareous  
Microfossils to Distinguish Biogenic from Early-Diagenetic Calcite 1313  
*Jens E. Wendler, Ines Wendler, Timothy Rose, and Brian T. Huber*

A Study of Cathodoluminescence and Trace Element Compositional Zoning  
in Natural Quartz from Volcanic Rocks: Mapping Titanium Content in Quartz 1322  
*William P. Leeman, Colin M. MacRae, Nick C. Wilson, Aaron Torpy,  
Cin-Ty A. Lee, James J. Student, Jay B. Thomas, and Edward P. Vicenzi*

## MATERIALS APPLICATIONS

Single Atom Microscopy 1342  
*Wu Zhou, Mark P. Oxley, Andrew R. Lupini, Ondrej L. Krivanek, Stephen J. Pennycook,  
and Juan-Carlos Idrobo*

Mean Atomic Number Quantitative Assessment in Backscattered  
Electron Imaging 1355  
*E. Sánchez, M. Torres Deluigi, and G. Castellano*

Three-Dimensional Characterization of Iron Oxide ( $\alpha$ -Fe<sub>2</sub>O<sub>3</sub>) Nanoparticles:  
Application of a Compressed Sensing Inspired Reconstruction Algorithm  
to Electron Tomography 1362  
*Niven Monsegue, Xin Jin, Takuya Echigo, Ge Wang, and Mitsuhiro Murayama*

Three-Dimensional Structural Characterization of Nonwoven Fabrics 1368  
*Lalith B. Suragani Venu, Eunkyong Shim, Nagendra Anantharamaiah, and  
Behnam Pourdeyhimi*

Nanomorphology of P3HT:PCBM-Based Absorber Layers of Organic Solar Cells  
after Different Processing Conditions Analyzed by Low-Energy Scanning  
Transmission Electron Microscopy 1380  
*Marina Pfaff, Michael F.G. Klein, Erich Müller, Philipp Müller, Alexander Colsmann,  
Uli Lemmer, and Dagmar Gerthsen*

Correlation between the Grain Orientation Dependence of Color Etching  
and Chemical Etching 1389  
*Attila Bonyár and Peter J. Szabó*

Contribution of a New Generation Field-Emission Scanning Electron Microscope  
in the Understanding of a 2099 Al-Li Alloy 1393  
*Nicolas Brodusch, Michel Trudeau, Pierre Michaud, Lisa Rodrigue, Julien Boselli,  
and Raynald Gauvin*

A Method for Directly Correlating Site-Specific Cross-Sectional and Plan-View  
Transmission Electron Microscopy of Individual Nanostructures 1410  
*Daniel K. Schreiber, Praneet Adusumilli, Eric R. Hemesath, David N. Seidman,  
Amanda K. Petford-Long, and Lincoln J. Lauhon*

## BIOLOGICAL APPLICATIONS

### Review Article

Single-Molecule Localization Super-Resolution Microscopy: Deeper and Faster 1419  
*Sébastien Herbert, Helena Soares, Christophe Zimmer, and Ricardo Henriques*

Centrosome Fine Ultrastructure of the Osteocyte Mechanosensitive  
Primary Cilium 1430  
*R.E. Uzbekov, D.B. Maurel, P.C. Aveline, S. Pallu, C.L. Benhamou, and G.Y. Rochefort*

The Zona Pellucida Porosity: Three-Dimensional Reconstruction of Four Types of Mouse Oocyte Zona Pellucida Using a Dual Beam Microscope <i>Sergi Novo, Leonardo Barrios, Elena Ibáñez, and Carme Nogués</i>	1442
Morphological and Histochemical Characterization of Gill Filaments of the Brazilian Endemic Bivalve <i>Diplodon expansus</i> (Küster, 1856) (Mollusca, Bivalvia, Hyriidae) <i>Larissa Rosa Nogarol, Ana Luiza Brossi-Garcia, José Augusto de Oliveira David, and Carmem Silvia Fontanetti</i>	1450
Comparison of Anatomy and Composition Distribution between Normal and Compression Wood of <i>Pinus Bungeana</i> Zucc. Revealed by Microscopic Imaging Techniques <i>Zhiheng Zhang, Jianfeng Ma, Zhe Ji, and Feng Xu</i>	1459
Effects of Natural Radiation, Photosynthetically Active Radiation and Artificial Ultraviolet Radiation-B on the Chloroplast Organization and Metabolism of <i>Porphyra acanthophora</i> var. <i>brasiliensis</i> (Rhodophyta, Bangiales) <i>Zenilda L. Bouzon, Fungyi Chow, Carmen S. Zitta, Rodrigo W. dos Santos, Luciane C. Ouriques, Marthiellen R. de L. Felix, Luz K.P. Osorio, Claudiane Gouveia, Roberta de Paula Martins, Alexandra Latini, Fernanda Ramlov, Marcelo Maraschin, and Eder C. Schmidt</i>	1467
Resistance to Degradation of Resin-Dentin Bonds Produced by One-Step Self-Etch Adhesives <i>Manuel Toledano, Inmaculada Cabello, Monica Yamauti, Marcelo Giannini, Fátima S. Aguilera, Estrella Osorio, and Raquel Osorio</i>	1480
<b>BOOK REVIEW</b>	
<i>Confocal Raman Microscopy</i> , Edited by Thomas Dieing, Olaf Hollricher, and Jan Toporski <i>Sebastian Schlücker</i>	1494



Cooling Stages

Recirculating Heaters and Chillers

Sputter Coaters

SEM/TEM Carbon Coaters

Vacuum Evaporators

Glow Discharge Systems

RF Plasma Etchers/  
Plasma Reactors

Critical Point Dryers

Freeze Dryers

Cryo-SEM Preparation  
Systems

Vacuum Pumps & Accessories

Evaporation Supplies

**and more...**

## well equipped...

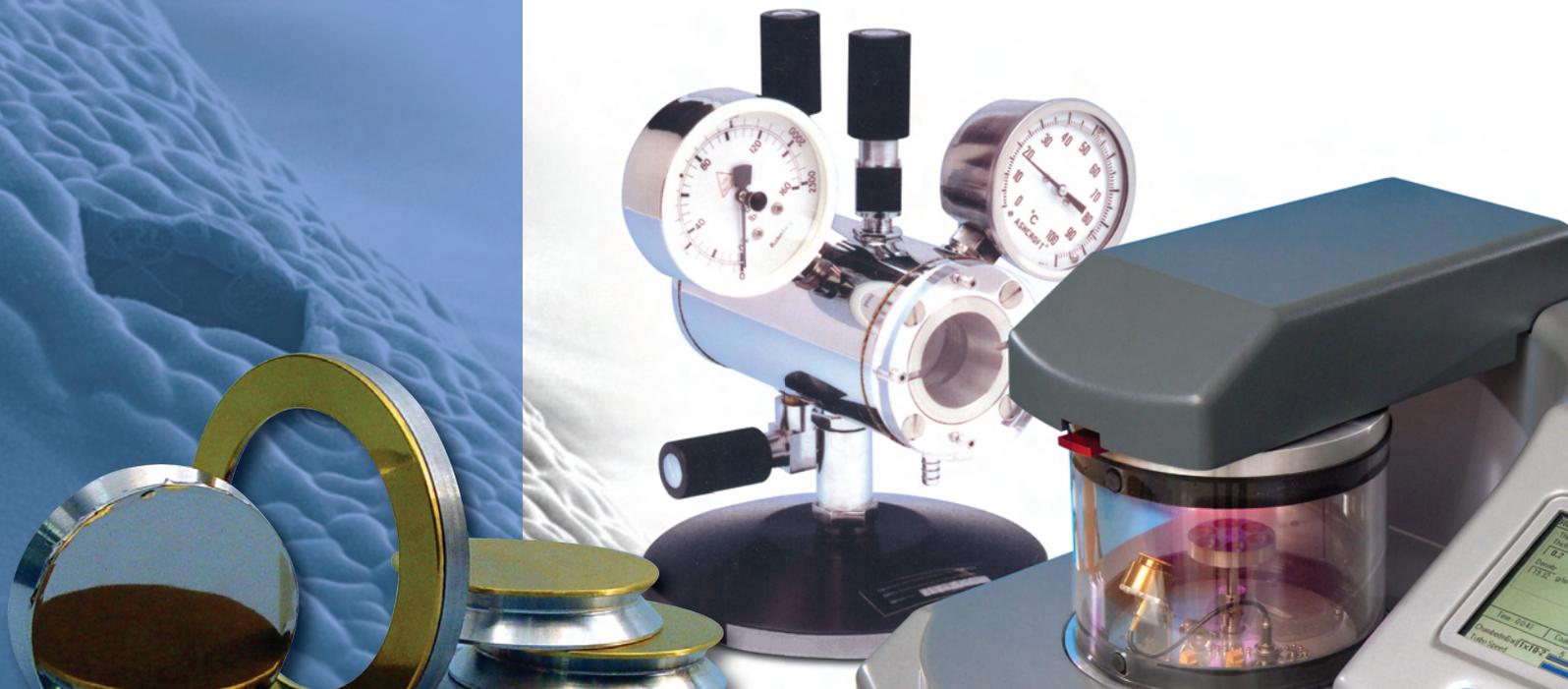
Electron Microscopy Sciences is pleased to announce our new full line catalog, your comprehensive source for high-end Vacuum Equipment. EMS is committed to providing the highest quality products along with competitive pricing, prompt delivery and outstanding customer service.

## and more...

Not just Vacuum Equipment, EMS also offers:

Laboratory Microwave Ovens • Automated Tissue Processors • Oscillating Tissue Slicers • Vibrating Microtomes • Rapid Immersion Freezers • Tissue Choppers • Desiccators and Desiccants • Centrifuges, Tubes, and Racks • Stirrers, Stirring Hotplates, and Digital Hotplates • Stirring Bars, Stirring Rods, and Hand Mixers • Vortex Mixers, Microplate Mixers, and Magnetic Stirrers • Tissue Rotators, Mixer Vortexes, and Rotator/Rockers • Dri Baths • Oven/Incubators • Cooling Chambers • Ultraviolet Lamps • Lab Jacks

For catalog requests, please visit our website at [www.emsdiasum.com](http://www.emsdiasum.com)

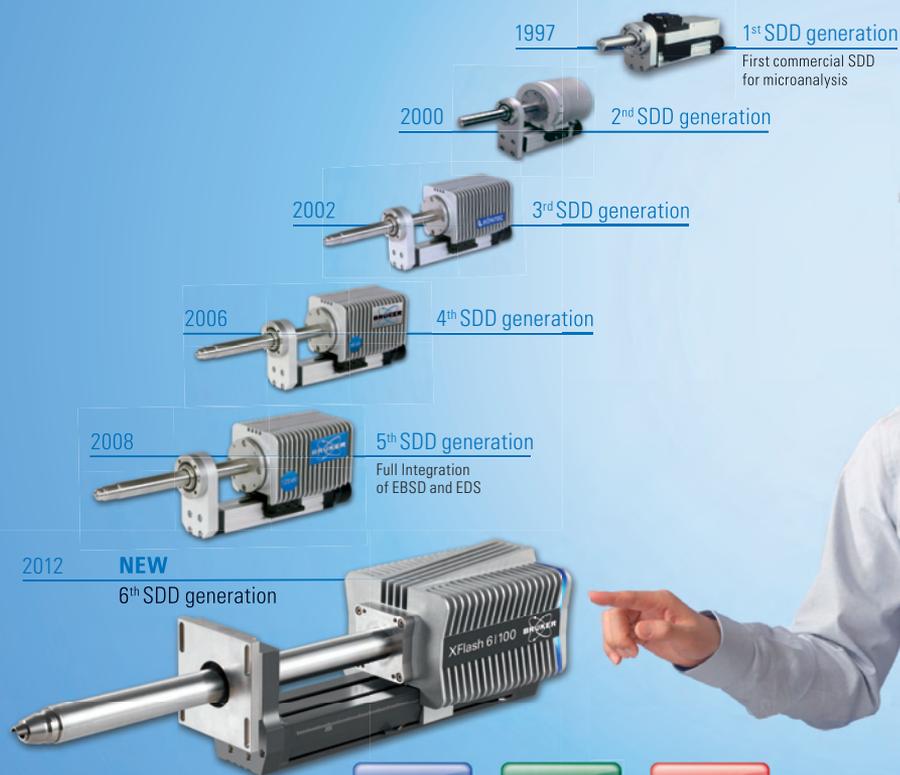


**Electron  
Microscopy  
Sciences**

**Electron Microscopy Sciences**  
P.O. Box 550 • 1560 Industry Rd. • Hatfield, Pa 19440  
Tel: (215) 412-8400 • Fax: (215) 412-8450  
email: [sgkcock@aol.com](mailto:sgkcock@aol.com) • [www.emsdiasum.com](http://www.emsdiasum.com)

# Count on Us!

## Best EDS Performance with the **NEW** Slim-line XFlash® 6



### You can count on the **NEW** XFlash® SDD generation:

- Best solid angle – optimum geometry and active areas from 10 mm<sup>2</sup> to 100 mm<sup>2</sup>
- Best throughput – up to 600,000 cps output at 1,500,000 cps input
- Best energy resolution – 121 eV at Mn K $\alpha$ , 47 eV at F K $\alpha$ , 38 eV at C K $\alpha$  (FWHM, exceeds ISO 15632:2002 requirements)

[www.bruker.com](http://www.bruker.com)

# Preparation Equipment and Microscopy Supplies

The single source for All your microscopy supplies and specimen preparation equipment.



- Vacuum Coating Systems
- Calibration Standards
- PELCO® easiGlow™ Glow Discharge Unit
- SEM Sample Holders and Mounts
- Silicon Nitride TEM Membranes
- PELCO BioWave Pro® Tissue Processor
- TEM Support Films



- AFM Supplies
- Quality Laboratory Tweezers
- Vacuum Pick-up Systems
- Digital Stereo Microscopes
- Conductive Adhesives
- FIB Supplies



Complete line of compact Cressington EM Sample Coaters.

 **TED PELLA, INC.**  
Microscopy Products for Science and Industry

[sales@tedpella.com](mailto:sales@tedpella.com)

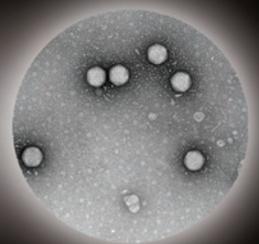
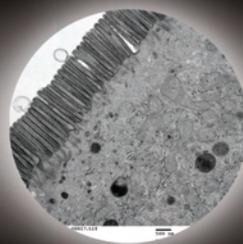
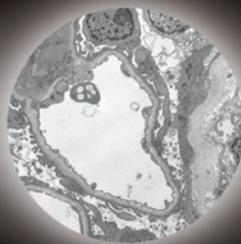
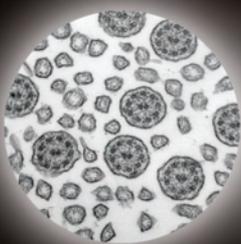
800-237-3526

[www.tedpella.com](http://www.tedpella.com)



High Definition Digital  
TEM Cameras with  
1 to 16 Megapixels

- AMT SOLUTIONS
- Life Science Cameras
- Material Science Cameras
- Easy To Use Software
- Reliability and Services
- TEM Integration
- Extensive Support



3 Electronics Avenue, Danvers, MA 01923 • Phone: 978.774.5550 • [www.amtimaging.com](http://www.amtimaging.com)



# UCIRVINE

University of California, Irvine-

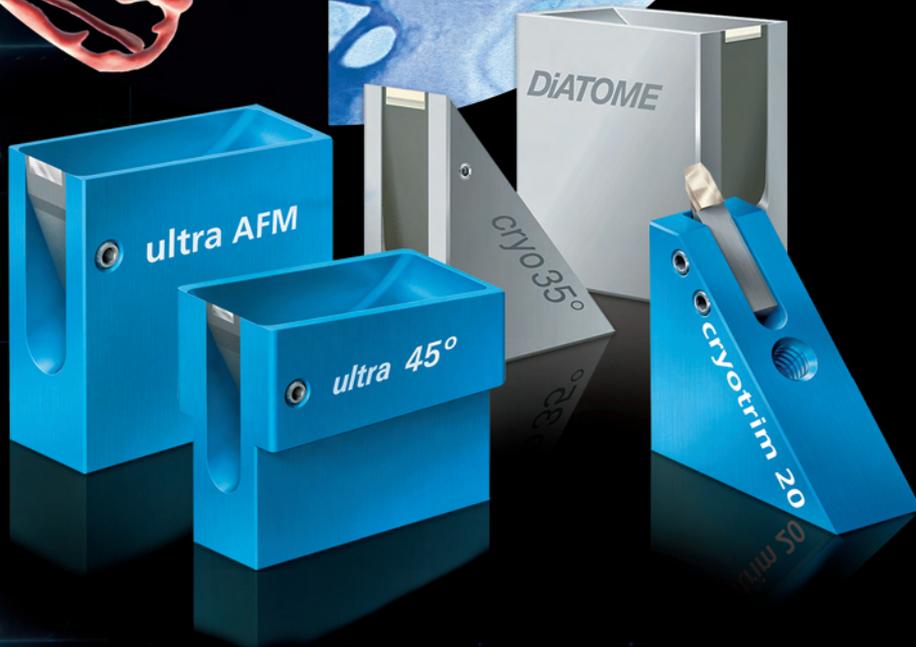
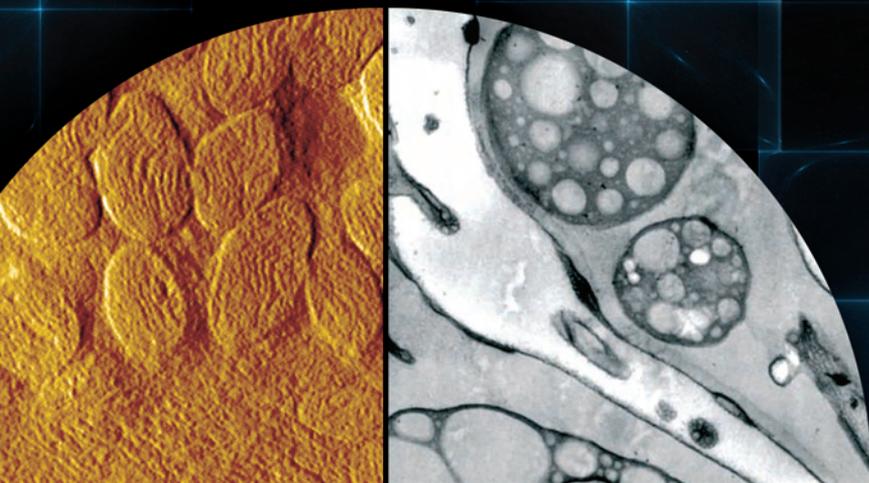
## **SENIOR PROFESSOR IN MATERIALS ENGINEERING, PHYSICS, OR CHEMISTRY**

The Henry Samueli School of Engineering and the School of Physical Sciences at the University of California, Irvine announce an endowed chair faculty search at the senior level in the field of experimental materials science. We are seeking a distinguished scientist and educator who directs a field-leading research program in materials engineering, physics, or chemistry in which transmission electron microscopy plays an integral roll. In addition this individual will lead the build-out of our campus-wide materials characterization infrastructure, including the establishment of a state-of-the-art facility for transmission electron microscopy. A record of teaching excellence at the undergraduate and graduate levels is required. The successful candidate will occupy either the Henry Samueli Endowed Chair in the Henry Samueli School of Engineering or the Donald Bren Chair in the School Physical Sciences.

Founded in 1965, the University of California, Irvine is at the forefront of education and research in the science and engineering disciplines that will shape the future of the nation and the world. In 2012, US News & World Report ranked UC Irvine 45th among national universities and 13th among public universities in the US. Graduate programs that were ranked in that report included: organic chemistry (11), information systems (11), physical chemistry (12), theoretical chemistry (18), experimental psychology (19), chemistry (26), aerospace engineering (29), computer science (29), physics (29), mechanical engineering (30), civil engineering (31), biological sciences (32), environmental engineering (34), biomedical engineering (40), engineering (41), medicine (41), materials science engineering (45), mathematics (47), and electrical engineering (49). NRC rankings, based upon 2006 data, place Chemistry, Earth System Science, Mathematics, and Physics & Astronomy in the top quartile nationally. An analysis by *Times Higher Education*, released in May 2012, ranked UCI first in the U.S. and fourth in the world among the 100 best universities less than 50 years old. The "100 Under 50" list aims to show institutions poised to become future world leaders.

Applications should contain a cover letter and a complete curriculum vita including publication list, a list of references, and summary of research funding. Completed applications should be sent electronically, via the Web at <https://recruit.ap.uci.edu>. To ensure full consideration, applications and supporting materials should be received by January 1, 2013. The University of California, Irvine is an equal opportunity/affirmative action employer committed to excellence through diversity. UC Irvine has an active ADVANCE Gender Equity Program.

**the highest quality...  
the most precise sectioning...  
incomparable durability**



#### **Free Customer Service**

Sectioning tests with biological and material research specimens of all kinds. We send you the sections along with the surfaced sample, a report on the results obtained and a recommendation of a suitable knife. Complete discretion when working with proprietary samples.

#### **Re-sharpening and Reworking Service**

A re-sharpened Diatome diamond knife demonstrates the same high quality as a new knife. Even knives purchased in previous years can continue to be re-sharpened. The knives can be reworked into another type of knife for no extra charge, e.g. ultra to cryo or 45° to 35°.

#### **Exchange Service**

Whenever you exchange a knife we offer you a new Diatome knife at an advantageous price.

40 years of development,  
manufacturing, and  
customer service

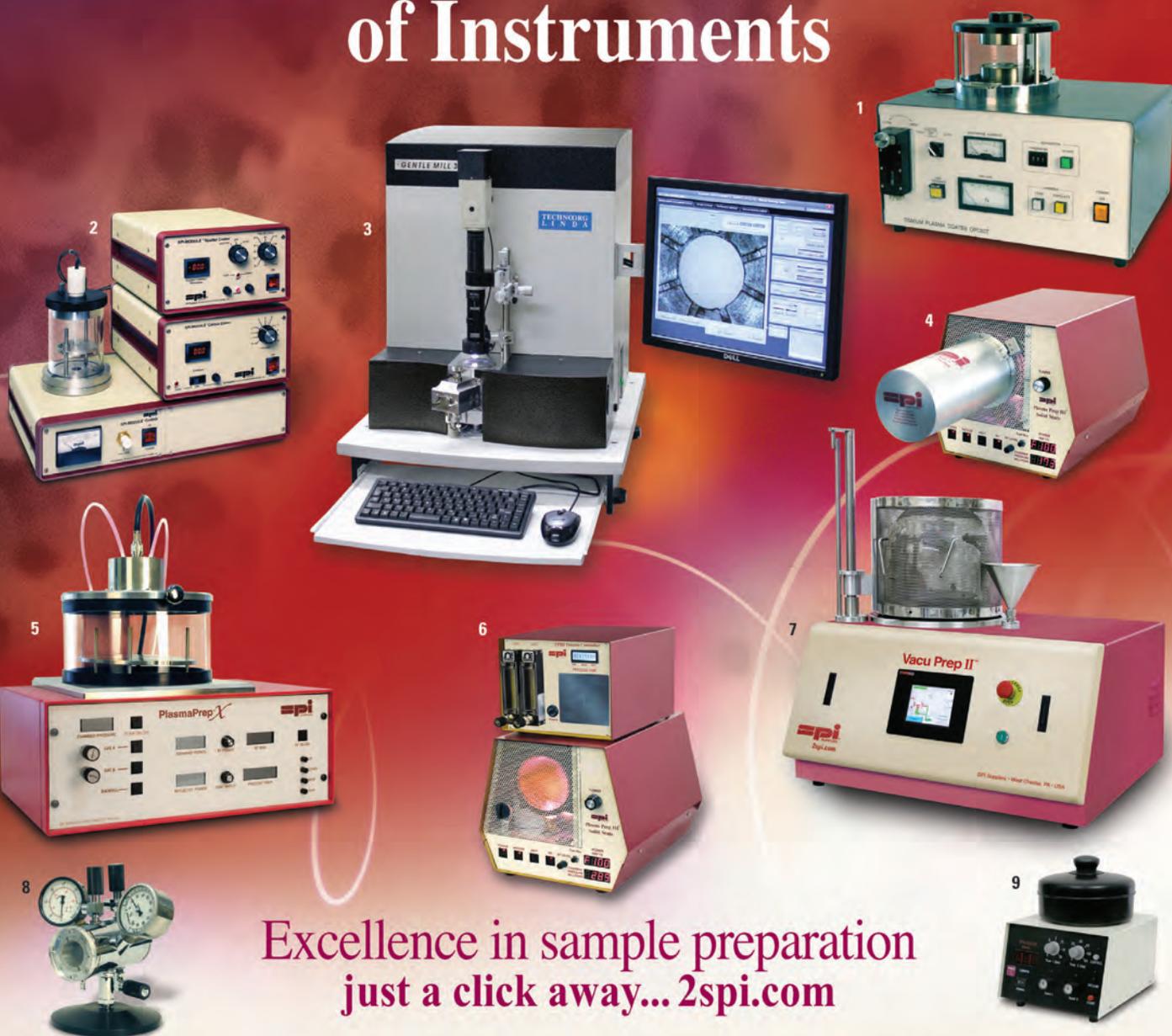
***DiATOME***  
diamond knives

ultra 45° • cryo • histo • ultra 35° • STATIC LINE II  
cryo-P • cryo immuno • ultra sonic  
cryotrim 45 and 25 ultra • AFM & cryo AFM • cryo 25°

**DiATOME US** • P.O. Box 550 • 1560 Industry Rd. • Hatfield, Pa 19440

Tel: (215) 412-8390 • Fax: (215) 412-8450 • email: [sgkcck@aol.com](mailto:sgkcck@aol.com) • [www.emsdiasum.com](http://www.emsdiasum.com)

# The SPI Supplies Family of Instruments



Excellence in sample preparation  
just a click away... [2spi.com](http://2spi.com)

Your results will never be better than your sample preparation. See how SPI Supplies can help you deliver the highest quality results for all your SEM/EDS, TEM and FESEM applications.

1. Osmium Plasma Coaters for FESEM Applications
2. SPI-MODULE™ Sputter/Carbon Coater Module
3. Gentle Mill™ Ion Milling System
4. Plasma Prep™ III Solid State Plasma Cleaner for cleaning TEM holders

5. Plasma Prep™ X Parallel Plate Plasma Etcher
6. Plasma Prep™ III Plasma Etcher with PPIII Process Controller
7. Vacu Prep™ II Turbo Pump Evaporation System
8. SPI-DRY™ Critical Point Dryer
9. Precision Spin Coater Spin coater



SPI Supplies Division of STRUCTURE PROBE, Inc.

P.O. Box 656 • West Chester, PA 19381-0656 USA  
Phone: 1-610-436-5400 • 1-800-2424-SPI (USA and Canada) • Fax: 1-610-436-5755 • [2spi.com](http://2spi.com) • E-mail: [sales@2spi.com](mailto:sales@2spi.com)

