Volume 21, Number 4 August 2015

# Microscopy Microsinaly



CAMBRIDGE UNIVERSITY PRESS ISSN 1431-9276

# EMS has it! the latest technology for...

# **Electron** Microscopy Sciences

# **CRYO-SEM Preparation**



The PP3010T is a highly automated, easy-to-use, column-mounted, gas-cooled cryo preparation system suitable for most makes and models of SEM, FE-SEM and FIB/SEM. The PP3010T has all the facilities needed to rapidly freeze, process and transfer specimens.

Now, building on the success of the PP3010T cryo-SEM/FIB/SEM preparation system, we are pleased to announce three new related products for ambient and cryo temperature transfer...

# **NOW AVAILABLE: NEW Specimen Transfer Systems**

# PP3004 QuickLok

Ambient temperature airlock for SEM, FIB/SEM, beamline and vacuum platforms



- Rapid specimen exchange
- Vacuum and inert gas transfer
- Field-retrofittable to most systems
- Upgrade path to CoolLok
- Custom designed holders available



# PP3005 SEMCool

Non-airlock cryo cooling for SEM, FIB/SEM, beamline and vacuum platforms



- Temperature range down to -190°C, with stability better than 0.5°C
- Off-column cooling with all-day runtime between fills
- Independent cooling of cold stage and cold trap
- Upgrade path to CoolLok
- 3 year warranty

# PP3006 CoolLok

Cryo transfer systems for SEM, FIB/SEM, beamline and vacuum platforms



- Rapid specimen exchange
- Temperature range down to -190°C with stability better than 0.5°C
- Off-column cooling with all-day runtime between fills
- Independent cooling of cold stage and cold trap
- Vacuum or inert gas transfer
- Rapid specimen freezing option
- 3 year warranty





# See how it works... Learn how to do it...

We've added video content to our website to help you get to know our latest products even better!

Stop by and see what it's all

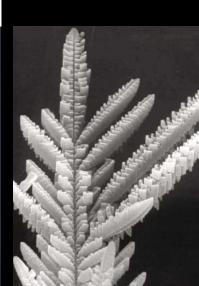


# **CONTACT US FOR** MORE INFORMATION...

# Electron **Microscopy** ciences

P.O. Box 550 • 1560 Industry Rd. Hatfield, Pa 19440 Tel: (215) 412-8400 Fax: (215) 412-8450 email: sgkcck@aol.com or stacie@ems-secure.com

www.emsdiasum.com



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

# **Editor, Scanning Probe Microscopies**

Andrew Magyar Center for Nanoscale Systems Harvard University Cambridge, MA 02138 e-mail: amagyar@cns.fas.harvard.edu

### **Editor, Atom Probe Tomography**

Brian P. Gorman Metallurgical and Materials Engineering Colorado Center for Advanced Ceramics Colorado School of Mines Golden, CO 80401 Email: bgorman@mines.edu

# **Editor, Biological Applications**

William A. Russin Biological Imaging Facility Department of Neurobiology Northwestern University Evanston, IL 60208 e-mail: w-russin@northwestern.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. Edelmann Miami University Oxford, OH 45056 e-mail: edelmare@muohio.edu

### **Proceedings Editor**

Gail Celio University of Minnesota St. Paul, MN 55108 e-mail: celio001@umn.edu

### Administrative Editor

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

# **Editorial Board**

Ralph Albrecht

University of Wisconsin, Madison, Wisconsin

Ilke Arslan

Pacific Northwest Laboratory, Richland, Washington

Grace Burke

University of Manchester, Manchester, England

Barry Carter

University of Connecticut, Storrs, Connecticut

Wah Chiu

Baylor College of Medicine, Houston, Texas

Niels de Jonge INM Institute for New Materials, Saarbrücken, Germany

Alberto Diaspro University of Genoa, Italy

Elizabeth Dickey North Carolina State University, Raleigh

Mark Ellisman University of California at San Diego, San Diego, California

Pratibha Gai University of York, United Kingdom

Marija Gajdardziska-Josifovska University of Wisconsin-Milwaukee, Milwaukee, Wisconsin

Dale Johnson University of South Florida, Tampa, Florida
Paul Kotula Sandia National Labs, Albuquerque, New Mexico

William Landis
University of Akron, Akron, Ohio
Eric Lifshin
SUNY at Albany, Albany, New York

Charles Lyman Lehigh University, Bethlehem, Pennsylvania

Dale Newbury National Institute of Standards and Technology, Gaithersburg, Maryland

Jean-Paul Revel California Institute of Technology, Pasadena, California

David Smith Arizona State University, Tempe, Arizona
Nan Yao Princeton University, Princeton, New Jersey
Nestor Zaluzec Argonne National Laboratory, Argonne, Illinois

# **Editorial Board Representatives from Affiliated Societies**

Masashi Watanabe Lehigh University (MAS)

Gautam Kumar Dey Bhabha Atomic Research Centre (EMSI)

Gema Gonzalez Venezuelan Institute for Scientific Investigation (Venezuela)

Michael Robertson Acadia University, Wolfville, Nova Scotia (Canada)

Brendan Griffin University of Western Australia (AMMS)

Guillermo Solorzano Pontificia Universidade Catolica, Rio de Janeiro (Brazil)

Mike Matthews Atomic Weapons Establishment, Reading, Great Britain (EMAS)

Miguel Yacaman Mexico Institute for Nuclear Research (Mexico)

Henrique Almeida Universidade do Porto (Portugal)

# **Founding Editor**

Jean-Paul Revel California Institute of Technology, Pasadena, California

# **Previous Editors-in-Chief**

Dale Johnson University of South Florida, Tampa, Florida Charles Lyman Lehigh University, Bethlehem, Pennsylvania

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.

Instructions for authors submitting manuscripts may be found at 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.

# Your Field Emission SEMs for High Contrast, Low Voltage Images From Any Sample

# **ZEISS GeminiSEM Family**



With the ZEISS GeminiSEM family you get a flexible and reliable field emission SEM for your research, industrial lab or imaging facility. You always acquire excellent images from any real world sample. The GeminiSEM family stands for effortless imaging with sub-nanometer resolution and high detection efficiency, even in variable pressure mode. Contact us to schedule your demo at M&M 2015. Or visit the ZEISS booth to learn more.

M&M | August 3 - 6, 2015 | Booth #638





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, 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. Three supplements (Meeting Guide, Program Guide, 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, URL: 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 \$1705.00 in the USA, Canada, and Mexico; UK £1025.00+VAT elsewhere. Institutions online only: US \$1264.00 in the USA, Canada, and Mexico; UK £765.00 + VAT elsewhere. Individuals print plus online: US \$522.00 in the USA, Canada, and Mexico; UK £317.00 + 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.

**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

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.

### **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.

### 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**

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

© 2015 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.



# Isn't it about time you had your own Digital Microscope?

Now you can with the portable, affordable uScopeMXII!

The uScopeMXII is a small digital desktop microscope you can use in your workplace or home office. It captures images from standard glass slides and sends them to your PC.

You can interactively browse slides with full control of focus, image processing, and location. You can also scan regions of

interest creating fully focused image sets.

The industry-standard USB interface makes it simple to plug in and start capturing images. It easily interfaces with your desktop or laptop PC and allows you to view and capture slide images in a wide variety of environments.

The uScopeMXII is manufactured in the United States.

# **Features and Benefits**

- The uScopeMXII has an objective camera for scanning and an overview camera for navigating.
- Automatic Focus
   Images are automatically focused using configurable focus algorithms.
- Portability
  At a weight of about 5 lbs., the uScopeMXII is highly portable.
- Easy to Use
  The uScope Navigator software simplifies scanning and browsing.
- Self-Contained

  The uScopeMXII is self-contained and includes the electronics, cameras, stage, and optics in a device about the size of a large external disk drive.
- Full Imaging Control

  User filters provide complete control over image processing and correction.

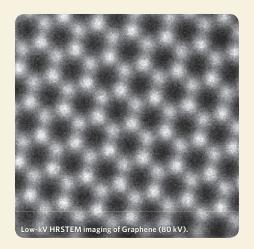
# **Microscopes International, LLC**

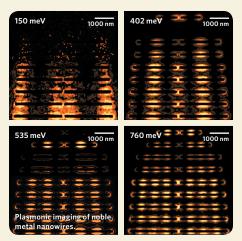
555 Republic Drive, Suite 119 Plano, TX 75074-5498

Phone +1-214-785-2058 FAX +1-214-785-2138 Email sales@uscopes.com support@uscopes.com

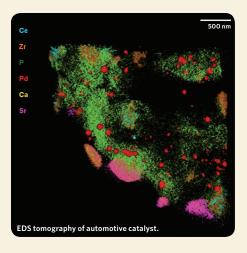


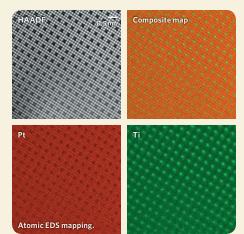
Call us today for a quote or to schedule a demonstration

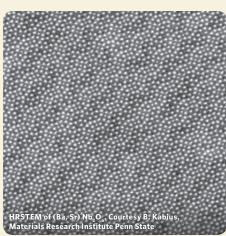














# No compromises

# More applications in one instrument

The Titan Themis<sup>™</sup> scanning transmission electron microscope (S/TEM) combines proven optics and outstanding EDS performance with enhanced software, a 16-megapixel CMOS camera, and an enhanced Piezo stage to deliver more scientific data, faster than ever before, without compromise to quality.





# Microscopy and Microanalysis

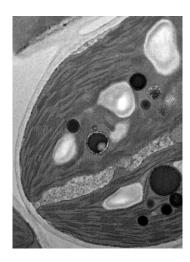
An International Journal for the Biological and Physical Sciences

Volume 21, Number 4

August 2015

# BIOLOGICAL APPLICATIONS AND TECHNIQUES

Iltrastructural Visualization of Vaccine Adjuvant Uptake <i>In Vitro</i> and <i>In Vivo</i> Gabiola Giusti, Anja Seubert, Rocco Cantisani, Marco Tortoli, Ugo D'Oro, Iaria Ferlenghi, Romano Dallai, and Diego Piccioli	791
simultaneous Observation of Cells and Nuclear Tracks from the Boron Neutron Capture Reaction by UV-C Sensitization of Polycarbonate Igustina Portu, Andrés Eugenio Rossini, Silvia Inés Thorp, Paula Curotto, Emiliano César Cayetano Pozzi, Pablo Granell, Federico Golmar, Rómulo Luis Cabrini, and Gisela Saint Martin	796
one Diagenesis and its Implication for Disease Diagnosis: The Relevance of Bone Aicrostructure Analysis for the Study of Past Human Remains andra Assis, Anne Keenleyside, Ana Luísa Santos, and Francisca Alves Cardoso	805
Characterization of the Distance Relationship Between Localized Serotonin Receptors and Glia Cells on Fluorescence Microscopy Images of Brain Tissue  **Tissue On The Communication of the Communicati	826
racing CD34+ Stromal Fibroblasts in Palatal Mucosa and Periodontal Granulation Fissue as a Possible Cell Reservoir for Periodontal Regeneration Alexandra Roman, Emöke Páll, Carmen M. Mihu, Adrian S. Petruţiu, Lucian Barbu-Tudoran, Radu S. Câmpian, Adrian Florea, and Carmen Georgiu	837
Bond Strength of High-Viscosity Glass Ionomer Cements is Affected by Tubular Density and Location in Dentin? Famara K. Tedesco, Ana Flávia B. Calvo, Gabrielle G. Domingues, Fausto M. Mendes, and Daniela P. Raggio	849
Phase and Texture Characterizations of Scar Collagen Second-Harmonic Generation mages Varied with Scar Duration Guannan Chen, Yao Liu, Xiaoqin Zhu, Zufang Huang, Jianyong Cai, Rong Chen, Shuyuan Xiong, nd Haishan Zeng	855
Automatic Evaluation of Collagen Fiber Directions from Polarized Light Microscopy	863



**On the Cover:** New technique for TEM preparation of difficult plant materials. For further information please see Clode pp 902–909.

863 Kamil Novak, Stanislav Polzer, Michal Tichy, and Jiri Bursa A Refined Single-Particle Reconstruction Procedure to Process Two-Dimensional 876 Crystal Images from Transmission Electron Microscopy Qie Kuang, Pasi Purhonen, Thirupathi Pattipaka, Yohannes H. Ayele, Hans Hebert, and Philip J.B. Koeck Reliable Detection and Smart Deletion of Malassez Counting Chamber Grid in 886 Microscopic White Light Images for Microbiological Applications Emmanuel Denimal, Ambroise Marin, Stéphane Guyot, Ludovic Journaux, and Paul Molin Cryostat Slice Irregularities May Introduce Bias in Tissue Thickness Estimation: Relevance for Cell Counting Methods 893 Anna Puigdellívol-Sánchez, Albert Giralt, Anna Casanovas, Jordi Alberch, and Alberto Prats-Galino A Method for Preparing Difficult Plant Tissues for Light and Electron Microscopy 902 Peta L. Clode

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

# MATERIALS APPLICATIONS AND TECHNIQUES

Will Extited Till Electricity And Teeliniques	
Voltage and Dopant Concentration Measurements of Semiconductors using a Band-Pass Toroidal Energy Analyzer Inside a Scanning Electron Microscope Avinash Srinivasan and Anjam Khursheed	910
Electron Backscatter Diffraction and Transmission Kikuchi Diffraction Analysis of an Austenitic Stainless Steel Subjected to Surface Mechanical Attrition Treatment and Plasma Nitriding	919
Gwénaëlle Proust, Delphine Retraint, Mahdi Chemkhi, Arjen Roos, and Clemence Demangel	
Characterization of Sputtered CdTe Thin Films with Electron Backscatter Diffraction and Correlation with Device Performance	927
Matthew M. Nowell, Michael A. Scarpulla, Naba R. Paudel, Kristopher A. Wieland, Alvin D. Compaan, and Xiangxin Liu	
The Internal Structure of Macroporous Membranes and Transport of Surface-Modified Nanoparticles  Sang J. Lee, Kiwoong Kim, and Sungsook Ahn	936
Accurate Nanoscale Crystallography in Real-Space Using Scanning Transmission Electron Microscopy	946
J. Houston Dycus, Joshua S. Harris, Xiahan Sang, Chris M. Fancher, Scott D. Findlay, Adedapo A. Oni, Tsung-ta E. Chan, Carl C. Koch, Jacob L. Jones, Leslie J. Allen, Douglas L. Irving, and James M. LeBeau	
Solid State Reaction Mechanism and Microstructure Evolution of Ni-Al Powders during High Energy Ball Milling Revisited by TEM  Guohua Fan, Lin Geng, Yicheng Feng, Xiping Cui, and Xudong Yan	953
Characterization of Darai Limestone Composition and Porosity Using Data- Constrained Modeling and Comparison with Xenon K-Edge Subtraction Imaging	961
Sheridan C. Mayo, Sam Y.S. Yang, Marina Pervukhina, Michael B. Clennell, Lionel Esteban, Sarah C. Irvine, Karen K. Siu, Anton S. Maksimenko, and Andrew M. Tulloh	
Evaluating Deformation-Induced Grain Orientation Change in a Polycrystal During In Situ Tensile Deformation using EBSD Thomas E. Buchheit, Jay D. Carroll, Blythe G. Clark, and Brad L. Boyce	969
EBSDinterp 1.0: A MATLAB® Program to Perform Microstructurally Constrained Interpolation of EBSD Data  Mark A. Pearce	985
Quantitative Chemical Mapping of InGaN Quantum Wells from Calibrated High-Angle Annular Dark Field Micrographs  Daniel Carvalho, Francisco M. Morales, Teresa Ben, Rafael García, Andrés Redondo-Cubero, Eduardo Alves, Katharina Lorenz, Paul R. Edwards, Kevin P. O'Donnell, and Christian Wetzel	994
iSpectra: An Open Source Toolbox For The Analysis of Spectral Images Recorded on Scanning Electron Microscopes  *Christian Liebske**	1006
Multiplexed TEM Specimen Preparation and Analysis of Plasmonic Nanoparticles Sean K. Mulligan, Jeffrey A. Speir, Ivan Razinkov, Anchi Cheng, John Crum, Tilak Jain, Erika Duggan, Er Liu, John P. Nolan, Bridget Carragher, and Clinton S. Potter	1017
Electron Correlation Microscopy: A New Technique for Studying Local Atom Dynamics Applied to a Supercooled Liquid  Li He, Pei Zhang, Matthew F. Besser, Matthew Joseph Kramer, and Paul M. Voyles	1026
Theory and New Applications of Ex Situ Lift Out Lucille A. Giannuzzi, Zhiyang Yu, Denise Yin, Martin P. Harmer, Qiang Xu, Noel S. Smith, Lisa Chan, Jon Hiller, Dustin Hess, and Trevor Clark	1034
BOOK REVIEWS	
Practical Materials Characterization Fumiya Watanabe	1049
Optical Nanoscopy and Novel Microscopy Techniques  Guy Cox	1050

# TAKEAFRESH APPROACHTOSEM

Intuitive multi-touch screen interface • High spatial resolution • Unprecedented analytical versatility Easy navigation and operation • Fast imaging and data acquisition





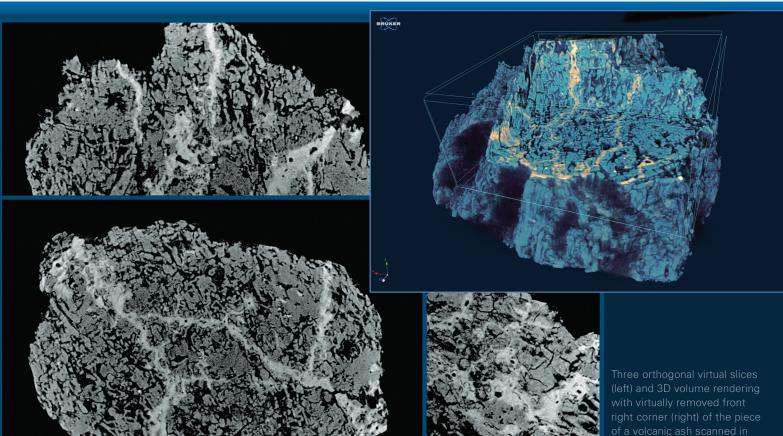
www.jeolusa.com/fresh

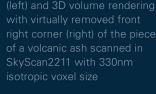














# SKYSCAN 2211 **MULTISCALE X-RAY NANOTOMOGRAPH**



The new MULTISCALE X-ray nanotomograph SkyScan 2211 covers the widest range of object sizes and spatial resolutions in one single instrument. It opens unique possibilities for 3D imaging and exact modelling of geological materials, biomaterials, composites, implants, etc

- Up to 8Kx8K pixels in every virtual slice, up to 2300 such slices can be reconstructed after a single scan,
- Object size up to 204mm in diameter, submicron resolution for small samples, 100nm nominal resolution,
- 20-190kV X-ray source, flat-panel sensor and cooled CCD camera to cover wide range of magnifications,
- World's fastest hierarchical 3D reconstruction (InstaRecon®) with 20x...100x speed-up,
- Software for 2D/3D image analysis, task lists, user plug-ins, surface and volume rendering,
- The results can be exported to iPhone / iPad / Androids for 3D rendering by supplied software.

bruker-microct.com

microtomography

Innovation with Integrity

# ALL OPTIONS. ALL-INCLUSIVE. ONLY IXRF.



**UPGRADES** 

**ANY SEM** 

PHASE ANALYSIS

**IMAGING** 

**STAGES** 

**AUTOMATION** PARTICLE ANALYSIS

MAP STITCHING

DRIFT CORRECTION

DETECTORS

STAGE MAPPING

VISIT US AT M&M BOOTH #960

https://doi.org/10.1017/S1431927615014968 Published online by Cambridge University Press



**EDS** 



# **DIATOME** diamond knives

ultra 45° • cryo • histo ultra 35° • histo jumbo cryo immuno • ultra sonic ultra AFM & cryo AFM trimtool 20 • trimtool 45 trimtool 90

# 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.

# trimtool 90

Many requests from customers doing FIB cutting of biological and technical sample blocks have motivated us to relaunch the trim 90 blade.



Please contact us for more information.

# DiATOME manip

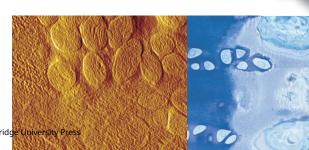
Our new tool for an easy handling and mounting of section ribbons!

Over 40 years of development, manufacturing, and customer service

# DIATOME U.S.

P.O. Box 550 • 1560 Industry Rd. • Hatfield, Pa 19440 Tel: (215) 412-8390 • Fax: (215) 412-8450

email: sgkcck@aol.com • www.emsdiasum.com https://doi.org/10.1017/51431927615014968 Published online by Cambridge University Press





Your small contamination is our big priority.





detector window!





# Transmission for Low Z Elements

Be	13%
В	19.7%
Li	29%
С	43.9%
N	59.2%
0	62%
F	69%
Ne	72.9%
Na	75.1%
Mg	77.3%
Al	80.3%
Si	81.8%

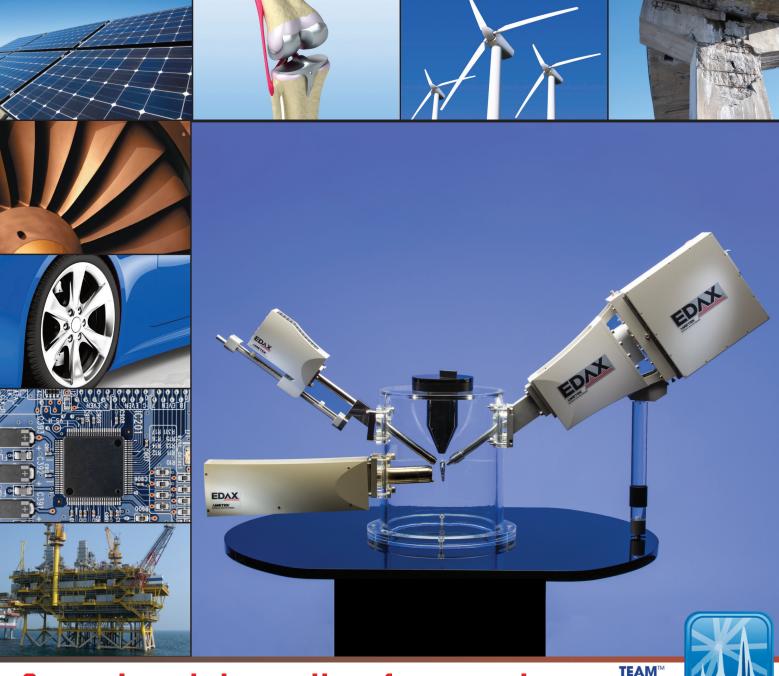
Amptek's FAST SDD® detector for EDS use with SEMs utilizes new technology "C2 Series" X-ray windows (Si3N4) and has a excellent low energy response. Its high intrinsic efficiency makes it ideal for EDS XRF. See why Amptek detectors are the #1 choice of OEMs worldwide.

OEM's #1 Choice



www.amptek.com

AMETEK®
MATERIALS ANALYSIS DIVISION



# Seamless integration for smart results

- EDS, EBSD and WDS seamlessly integrated with a single user interface
- Built-in Smart Features facilitate set-up, guide analysis and automate reporting
- Proven algorithms guarantee quality results
- Streamlined workflows drive productivity with fast and accurate results in three clicks
- The ultimate solution for every materials analysis challenge

















