

DIATOME DIAMOND KNIVES

40 YEARS of development, manufacturing, and customer service

What have we achieved in this period?

ultra 45° the first diamond knife with an absolutely score-free, hydrophilic cutting edge.

Semi the first diamond knife for alternating sectioning ultrathin/semithin.

CTYO the diamond knife for sectioning at low temperature.

histo the first diamond knife for semithin sections for light microscopy.

ultra 35° the diamond knife for optimized sectioning results in almost all applications.

STATIC LINE II the ionizer for eliminating electrostatic charging in ultramicrotomy.

 $\ensuremath{\text{cryo-P}}$ a cryo knife with a patented platform for section pick up.

Cryo immuno the optimized cryo diamond knife for the Tokuyasu technique.

ultra Sonic the oscillating diamond knife for room temperature sectioning.

Cryotrim 45 and 25 optimizing trimming with diamond blades.

ultra AFM & cryo AFM the first diamond knives for AFM at room and low temperatures.

Cryo 25° for sectioning frozen hydrated specimens.

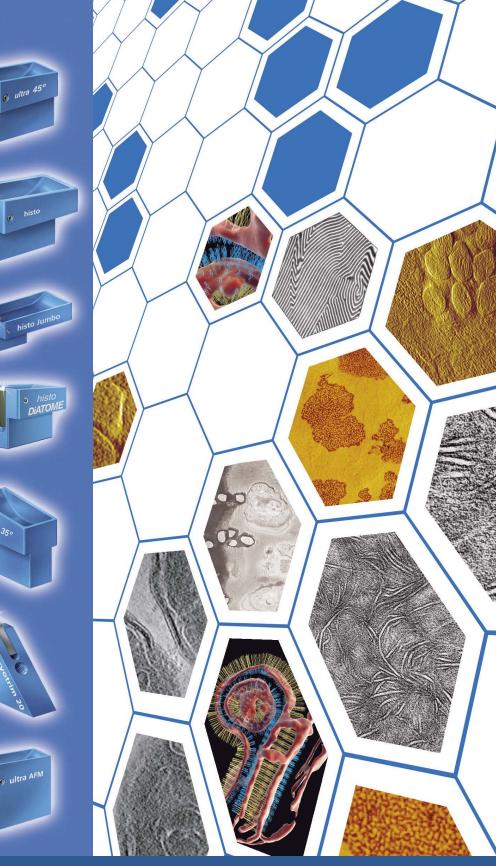
What services can we offer you?

- Technical assistance in all fields of ultramicrotomy.
- Free sectioning tests for all types of samples.
- Make use of our many years of experience in perfecting our knives.
- Custom knives, tools, and boats.
- Special purchase programs.
- Workshops and training.



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





For more information, please call or write us today, or visit us online at: www.emsdiasum.com

11

Microscopy and Microanalysis

An International Journal for the Biological and Physical Sciences

THE OFFICIAL JOURNAL OF	MICROSCOPY SOCIETY OF AME	RICA	
	MICROANALYSIS SOCIETY		
	MICROSCOPICAL SOCIETY OF C	CANADA /	
	SOCIÉTÉ DE MICROSCOPIE DU	J CANADA	
	MEXICAN MICROSCOPY SOCIET		
	BRAZILIAN SOCIETY FOR MICROSCOPY AND MICROANALYSIS		
	VENEZUELAN SOCIETY OF ELEC		
	EUROPEAN MICROBEAM ANALY	SIS SOCIETY	
	AUSTRALIAN MICROSCOPY AN	D MICROANALYSIS SOCIETY	
	PORTUGUESE SOCIETY FOR MIC	CROSCOPY	
	ROYAL MICROSCOPICAL SOCIE	TY	
PUBLISHED IN AFFILIATION WITH			
	GERMAN SOCIETY FOR ELECTRO		
	BELGIAN SOCIETY FOR MICROS		
	MICROSCOPY SOCIETY OF SOUTHERN AFRICA		
Editor in Chief	Editor, Biological Applications	Special Issues and Reviews Editor	
Editor, Biological Applications	William A. Russin	Jay Jerome	
Robert L. Price	Biological Imaging Facility	Vanderbilt University Medical Center	
Cell and Developmental Biology and	Department of Neurobiology	Nashville, TN 37232	
Anatomy	Northwestern University	e-mail: jay.jerome@vanderbilt.edu	
University of South Carolina	Evanston, IL 60208		
Columbia, SC 29209	e-mail: w-russin@northwestern.edu	Deals Destaux Editors	
e-mail: Bob.Price@uscmed.sc.edu		Book Review Editor	
e mail: Dobli neeg usemeuseledu	Editor Dialogical Applications	Cynthia S. Goldsmith	
	Editor, Biological Applications	Centers for Disease Control	
Editor, Materials Applications	Heide Schatten	Atlanta, GA 30333	
David Bell	Veterinary Pathobiology	e-mail: csg1@cdc.gov	
School of Engineering & Applied Sciences	University of Missouri-Columbia		
Center for Nanoscale Systems	Columbia, Missouri 65211-5030 e-mail: schattenh@missouri.edu	M&M Program Guide Editor	
Harvard University	e-mail: schattenn@missouri.edu	Richard E. Edelmann	
Cambridge, MA 02138		Miami University	
e-mail: dcb@seas.harvard.edu	Editor, Microanalysis	Oxford, OH 45056	
	John Mansfield	e-mail: edelmare@muohio.edu	
Editor, Scanning Probe	Electron Microbeam Analysis Lab		
Microscopies	North Campus, 417 SRB	Proceedings Editor	
Andrew Magyar	University of Michigan	Gail Celio	
Center for Nanoscale Systems	Ann Arbor, MI 48109-2143	University of Minnesota	
Harvard University	e-mail: jfmjfm@umich.edu	St. Paul, MN 55108	
Cambridge, MA 02138		e-mail: celio001@umn.edu	
e-mail: amagyar@cns.fas.harvard.edu	Editor, Correlative and Emerging		
	Microscopy Applications	A destinistanting T ditag	
Editor, Atom Probe	Vinayak P. Dravid	Administrative Editor	
Thomas Kelly	Materials Science and Engineering	John Shields	
Cameca Instruments, Inc.	Northwestern University	University of Georgia	
A Business Unit of AMETEK, Inc.	Evanston, Illinois 60208-3105	Athens, GA 30602	
Madison, WI 53711-4951	e-mail: v-dravid@northwestern.edu	e-mail: jpshield@uga.edu	
e-mail: Thomas.Kelly@ametek.com			
e man. momas.iveny@ametex.com	Editor Diont Diology Applications		
	Editor, Plant Biology Applications		
	Rosemary White		
	CSIRO Plant Industry		
	Canberra, ACT 2601, Australia		

e-mail: rosemary.white@csiro.au



© MICROSCOPY SOCIETY OF AMERICA 2014

Editorial Board

Ralph Albrecht Ilke Arslan Grace Burke Barry Carter Wah Chiu Niels de Jonge Alberto Diaspro Elizabeth Dickey Mark Ellisman Pratibha Gai Marija Gajdardziska-Josifovska Dale Johnson Paul Kotula William Landis Eric Lifshin Charles Lyman Dale Newbury Iean-Paul Revel David Smith Nan Yao Nestor Zaluzec

University of Wisconsin, Madison, Wisconsin Pacific Northwest Laboratory, Richland, Washington University of Manchester, Manchester, England University of Connecticut, Storrs, Connecticut Baylor College of Medicine, Houston, Texas INM Institute for New Materials, Saarbrücken, Germany University of Genoa, Italy North Carolina State University, Raleigh University of California at San Diego, San Diego, California University of York, United Kingdom University of Wisconsin-Milwaukee, Milwaukee, Wisconsin University of South Florida, Tampa, Florida Sandia National Labs, Albuquerque, New Mexico University of Akron, Akron, Ohio SUNY at Albany, Albany, New York Lehigh University, Bethlehem, Pennsylvania National Institute of Standards and Technology, Gaithersburg, Maryland California Institute of Technology, Pasadena, California Arizona State University, Tempe, Arizona Princeton University, Princeton, New Jersey 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.



Sheep distal femoral condyles with two titanium implant screws of 5mm diameter, scanned in the SkyScan2211 Volume rendering by supplied CTvox software with front top part virtually removed.



BRUKER

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

Microscopy AND Microanalysis

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 double 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 \pounds 1025.00 + VAT elsewhere. Institutions online only: US \$1264.00 in the USA, Canada, and Mexico; UK \pounds 765.00 + VAT elsewhere. Individuals print plus online: US \$522.00 in the USA, Canada, and Mexico; UK \pounds 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.











The New Element SDD: Fast and Efficient Results

EDAX

METEK

The Element Silicon Drift Detector (SDD) is designed to benefit a wide spectrum of industries such as natural resources and energy, automotive and aerospace, pharmaceutical, steel, and semiconductor.

Element

- Application specific, easy-to-use software with touchscreen capabilities
- Highest performance EDS for the bench top SEM market
- Optimized for low energy X-ray transmission to increase the efficiency of light element detection
- Cost-effective, compact design, easily integrated into an industrial environment

edax.com

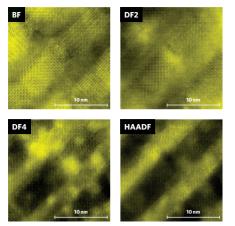




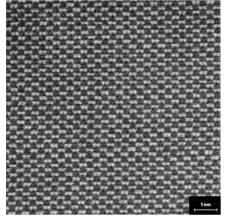
ELEMENT

EDS

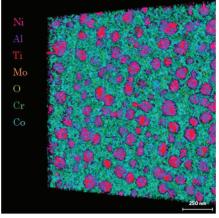
https://doi.org/10.1017/S14319276150 22X Published online by Cambridge University Press



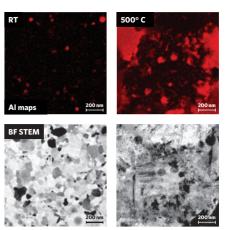
4 channel simultaneous HRSTEM imaging of ${\rm SrTiO}_3$ using 4 STEM detectors.



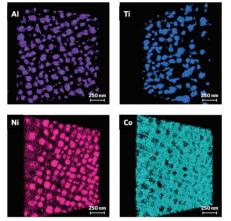
HRSTEM of Si (110) at 200kV.



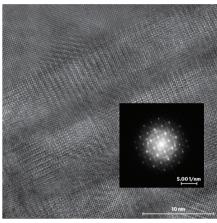
Combined 3D EDS map: Ni, Al, Ti, Mo, Cr, and Co.



Temperature driven Al aggregation in solar cell. Sample courtesy of Dr. S. Kraschewski, U. Erlangen.



3D EDS maps at different angles.



HRTEM image of SrTiO₃ with Ceta 16M camera.

Fast 2D & 3D Imaging and Chemical Analysis with Talos TEM

Whether you work with metals, light elements, or nanoparticles—from macro to atomic scales—Talos gives you insight into structure and composition for a complete understanding of material properties.

High speed 2D and 3D EDS analysis: Fast, multichannel, automated EDS acquisition and precise quantification to obtain multidimensional compositional maps.

Fast navigation and imaging: Highest throughput, highest resolution uncorrected S/TEM images—even for beam sensitive and challenging materials.

Space to do more: FEI TEMs have the space to accommodate additional *insitu* holders for dynamic imaging, diffraction, and tomography applications.



Watch the movie at FEI.com/DiscoverTalos





Explore. Discover. Resolve.

Microscopy and Microanalysis

An International Journal for the Biological and Physical Sciences

Volume 21, Number 1	INTRODUCTION TO SPMICROS SPECIAL SECTION	
February 2015	Introduction to the SPMicros Special Issue from the XLVII Annual Congress António P. Alves de Matos	1
	SPMICROS SPECIAL SECTION	
	The Liturgical Cope of D. Teotónio of Braganza: Material Characterization of a 16th Century Pluviale Teresa Ferreira, Hugo Moreiras, Ana Manhita, Paula Tomaz, José Mirão, Cristina Dias, and Ana T. Caldeira	2
	White Spots on Smoke Rings by Bruce Nauman: A Case Study On Contemporary Art Conservation Using Microanalytical Techniques Ana Cardeira Mafalda, Rodrigo Bettencourt da Câmara, Patrick Strzelec, Nick Schiavon, José Mirão, António Candeias, Maria Luísa Carvalho, and Marta Manso	15
	Microscopy and X-Ray Spectroscopy Analyses for Assessment of Gilding and Silvering Techniques of Portuguese Illuminated Manuscripts Agnès Le Gac, Isabel D. Nogueira, Mauro Guerra, José Carlos Frade, Stéphane Longelin, Marta Manso, Sofia Pessanha, Ana Isabel M. Seruya, and Maria Luisa Carvalho	20
	Micro-Analytical Study of a Rare Papier-Mâché Sculpture Marta Manso, Ana Bidarra, Stéphane Longelin, Sofia Pessanha, Adriana Ferreira, Mauro Guerra, Jo Coroado, and Luisa Carvalho	56
	Analytical and Microbiological Characterization of Paper Samples Exhibiting Foxing Stains Margarida Nunes, Cátia Relvas, Francisca Figueira, Joana Campelo, António Candeias, Ana T. Caldeira, and Teresa Ferreira	63
	Characterizing Microbial Diversity and Damage in Mural Paintings Tânia Rosado, José Mirão, António Candeias, and Ana Teresa Caldeira	78
	Microanalysis Characterization of Bioactive Protein-Bound Polysaccharides Produced by Amanita Ponderosa Cultures	84
	Cátia Salvador, M. Rosário Martins, and A. Teresa Caldeira	
	A Study on the Digestive Physiology of a Marine Polychaete (<i>Eulalia viridis</i>) through Microanatomical Changes of Epithelia During the Digestive Cycle Ana P. Rodrigo, Maria H. Costa, António Pedro Alves de Matos, Francisco Carrapiço, and Pedro M. Costa	91
	Cellulose Films: Designing Template-Free Nanoporous Cellulose Films on Semiconducting Surfaces	102
· · · · · · · ·	Ana P. Carapeto, Ana Maria Ferraria, Pedro Brogueira, Sami Boufi, and Ana Maria B. Do Rego	
	Room Temperature Synthesis of Cu ₂ O Nanospheres: Optical Properties and Thermal Behavior	108
11 M Start West	Daniela Nunes, Lídia Santos, Paulo Duarte, Ana Pimentel, Joana V. Pinto, Pedro Barquinha, Patrícia A. Carvalho, Elvira Fortunato, and Rodrigo Martins	
	Microstructural Changes in Copper-Graphite-Alumina Nanocomposites Produced by Mechanical Alloying	120
	Ivan Rodrigues, Mafalda Guedes, and Alberto C. Ferro	
Cover: Cross section of marine	Microscopy and Micrographic wassity http://www.journals.comhridgo.org/MAM	

On the Cover: Cross section of marine polychaete esophagus. For further information see Rodrigo et al., pp 91–101.

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

TEM and HRTEM Characterization of TiAl Diffusion Bonds Using Ni/Al Nanolayers Sónia Simões, Filomena Viana, Ana S. Ramos, Maria T. Vieira, and Manuel F. Vieira	132
MATERIALS APPLICATIONS	
<i>In Situ</i> TEM Imaging of Defect Dynamics under Electrical Bias in Resistive Switching Rutile-TiO ₂	140
Ranga J. Kamaladasa, Abhishek A. Sharma, Yu-Ting Lai, Wenhao Chen, Paul A. Salvador, James A. Bain, Marek Skowronski, and Yoosuf N. Picard	
Single- and Multi-Frequency Detection of Surface Displacements via Scanning Probe Microscopy	154
Konstantin Romanyuk, Sergey Yu. Luchkin, Maxim Ivanov, Arseny Kalinin, and Andrei L. Kholkin	
Effects of Preheating and Cooling Durations on Roll-to-Roll Hot Embossing Seyoung Kim, Youngsu Son, Heechang Park, Byungin Kim, and Dongwon Yun	164
Imaging Samples in Silica Aerogel Using an Experimental Point Spread Function Amanda J. White, and Denton S. Ebel	172
B IOLOGICAL AND B IOMATERIALS A PPLICATIONS	
Osseointegration of Ti-6Al-4V Alloy Implants with a Titanium Nitride Coating Produced by a PIRAC Nitriding Technique: A Long-Term Time Course Study in the Rat Guy Sovak, Irena Gotman, and Anna Weiss	179
Micro-Topography and Reactivity of Implant Surfaces: An <i>In Vitro</i> Study in Simulated Body Fluid (SBF)	190
M. G. Gandolfi, P. Taddei, F. Siboni, V. Perrotti, G. Iezzi, A. Piattelli, and C. Prati	
Morphological and Chemical Comparative Analysis of The Human and Bovine Dentin-Adhesive Layer	204
Luís Eduardo Silva Soares, and Ana Maria do Espírito Santo	
Bond Strength and Bioactivity of Zn-Doped Dental Adhesives Promoted by Load Cycling	214
Manuel Toledano, Fátima S. Aguilera, Estrella Osorio, Inmaculada Cabello, Manuel Toledano-Osorio, and Raquel Osorio	
X-Ray Microscopy as an Approach to Increasing Accuracy and Efficiency of Serial Block-Face Imaging for Correlated Light and Electron Microscopy of Biological Specimens	231
Eric A. Bushong, Donald D. Johnson Jr., Keun-Young Kim, Masako Terada, Megumi Hatori, Steven T. Peltier, Satchidananda Panda, Arno Merkle, and Mark H. Ellisman	
A Robust Generic Method for Grid Detection in White Light Microscopy Malassez Blade Images in the Context of Cell Counting	239
Ambroise Marin, Emmanuel Denimal, Stéphane Guyot, Ludovic Journaux, and Paul Molin	
Validating Whole Slide Digital Morphometric Analysis as a Microscopy Tool Robert B. Diller, and Robert S. Kellar	249
Measuring Sperm Movement within the Female Reproductive Tract using Fourier Analysis	250
Philip R. Nicovich, Erin L. Macartney, Renee M. Whan, and Angela J. Crean	
Fish Erythrocytes as Biomarkers for the Toxicity of Sublethal Doses of an Azo Dye, Basic Violet-1 (Cl: 42535)	264
Kirandeep Kaur, and Arvinder Kaur	
BOOK REVIEW	
Ultrastructure Atlas of Human Tissues	274
Alois Lametschwandtner	
Erratum	276



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.



 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

www.uscopes.com

Visit the website often for details on Symposia, Exhibits, Biological and Physical Sciences Tutorials, In-Week Intensive Workshops, Posters, Sunday Short Courses and Pre-Meeting Congress!

MICROSCOPY& MICROANALYSIS August 2-6 • Portland, OR

http://microscopy.org/MandM/2015

TIMES SQUARE SM. C. ASABLANDA SM. C. ASABLANDA





Program Information | Information for Students | Meeting Awards | Exhibitor List & Floor Plan Online Registration (opens February 2015) | Portland Hotel Information (reservations available February 2015)

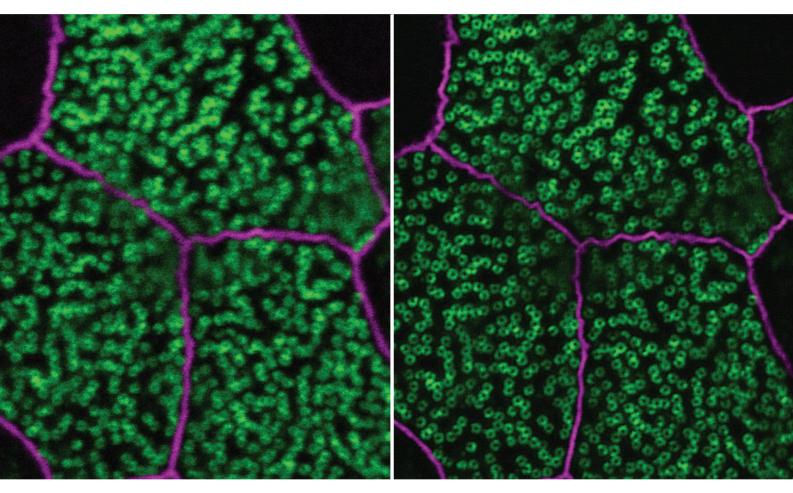








See More. Clearly.



Avoid second guessing the details of your images. At nearly two times the resolution, upgrading any FV1000 or FV1200 confocal system with the new Olympus Super Resolution will help you see those critical fine structures in your samples. Quick, flexible and affordable, FV-OSR allows you to look deeper into your samples – not your budget.

See more. Discover more.

Your Science Matters

For further information, please visit: YourScienceMatters.com

Sample: Trachea multi-ciliated epithelial cells (Culture) Images courtesy of Graduate School of Frontier Biosciences and Graduate School of Medicine Osaka University: Hatsuho Kanoh, Elisa Herawati, Sachiko Tsukita, Ph.D.

Microscopy AND Microanalysis

Microscopy and Microanalysis is published bimonthly and contains papers that report original research from the entire interdisciplinary range of microscopy and microanalysis: new microscopy methods and instrumentation and their applications to biological or materials microstructures for determination of structure or chemistry. Four categories of communications are published in the Journal.

Regular articles contain reports of new instrumentation and new methods and their applications to microstructural analysis in biology and materials science. **Reviews** have broader technical content than regular articles. Authors contemplating review articles are encouraged to discuss their plans with the appropriate editor. Articles are accepted for publication with the understanding that they, or their substantive contents, have not been and will not be submitted to any other publication.

Readers may send **Letters to the Editor** for publication in the Journal. These must address a specific technical point or points in a published article and must be clearly written and concise. The corresponding author of the paper commented upon will be invited to reply. The author of the Letter to the Editor will not be sent the reply prior to publication. Both the Letter to the Editor and the Reply will be published together. No subsequent letters or replies by the same persons concerning that particular paper will be considered for publication. The Editor-in-Chief will make any necessary decisions concerning suitability for publication of particular Letters to the Editor or Replies. **Book Reviews** are also published, but these are solicited only through the Book Review Editor.

Manuscript Submission and Review

All manuscript submissions to *Microscopy and Microanalysis* must be made electronically via Manuscript Central, at the following website address:

http://mc.manuscriptcentral.com/mam

Complete instructions are provided on this website. Please follow the instructions on the website to avoid delays. The instructions will prompt the author to provide all necessary information, including the corresponding author's contact information, which includes complete mailing address, phone and fax numbers, and an e-mail address. The website also requests preferred reviewers. Please provide the names and email addresses of at least two preferred reviewers. List names of individuals you do not wish to review your manuscript in the Cover Letter.

The website will automatically acknowledge receipt of the manuscript and provide a manuscript reference number. The Editor-in-Chief will assign the manuscript to an Editor who will choose at least two other reviewers. Every effort will be made to provide the author with a rapid review. If the Editor requests that revisions be made to the manuscript before publication, a maximum of 3 months will be allowed for preparation of the revision.

Manuscript Preparation

General information. Manuscripts must be formatted in Word or LaTex. Do not submit manuscripts as a PDF. Manuscripts must be submitted in English. Authors should follow generally accepted rules of grammar and punctuation. Because articles on microscopy attract broad ranges of readers with diverse backgrounds, jargon should not be used; acronyms and abbreviations must be clearly defined the first time they are used and then used consistently thereafter throughout the manuscript.

Format. All manuscripts **must** be typed double-spaced, including title page, abstract, text, references, tables, and figure legends, in 12 point type. Pages should have margins of about 1 inch (about 2.5 cm). Pages should be numbered at the bottom center.

All manuscript title pages **must** contain:

• A complete title.

- A brief title to be used as a running head.
- Authors' names listed by full given and last names.

Instructions for Contributors

- Primary institutions where the research was performed.
- Other institutions involved for each author.
- Permanent or new addresses of all authors. Note: Institutional addresses **must** include the full institutional and department/ center name, city, state, postal code, and country.
- A complete corresponding (mailing) address for the author to whom all correspondence should be sent.
- Corresponding author's telephone number, fax number, and e-mail address.

All manuscripts **must** include:

- An abstract not to exceed 200 words and 6 to 10 keywords for indexing.
- The following sections: Introduction, Materials and Methods, Results, Discussion, Conclusions, Acknowledgments, References, tables, figure legends, figures. Sections may be subdivided to increase clarity.

Chemical names and mathematical expressions. Chemical names and methods should be spelled out the first time they are used, followed by the abbreviation in parentheses. After first mention the abbreviation may be used alone. SI units should be used. Mathematical expressions need to be carefully presented, with all symbols defined. Use a type font that clearly differentiates between zero and capital letter O. Equations containing algebraic fractions should use numerator over denominator, separated by a horizontal line, and not typed on a single line separated by a slash. Indicate vector symbols; they will be printed in **bold**.

References. References **must** be inserted in the text at the place they are used, by the author's surname and year of publication. All references included in the reference list **must** be cited in the text. References to personal communications, unpublished data, and manuscripts either in preparation or submitted for publication are unacceptable. If essential, such material may be incorporated in the appropriate place in the text. For citations with more than two authors use the first author's surname followed by "et al." and if there is more than one reference in the same year by a single author(s), use *a*, *b*. **For example**: (Roberts, 1981); (Roberts & Johnson, 1983); (Jones et al., 1986); (Johnson, 1998*a*, 1998*b*).

All authors **must** be included in the reference list; "et al." is unacceptable here. The alphabetical list of references begins a new page and must be typed double-spaced. List works by different authors who are cited within the same parentheses in chronological order, beginning with the earlier work according to the *CBE Manual for Authors, Editors, and Publishers.* Abbreviate journal names according to the Chemical Abstracts Service Source Index (CASSI). Only published articles and articles in press should appear in this list. Responsibility for the accuracy of references cited lies with the authors. Brief examples:

Journal Articles

HOGAN, J. & PATTON, C. (1976). Variation in intramembrane components of *Trypanosoma brucei* from intact and X-radiated rats: A freeze-cleave study. *J Protozool* **23**, 205–215.

Entire Book

RAPPAPORT, R. (1996). *Cytokinesis in Animal Cells*. Cambridge, UK: Cambridge University Press.

Chapter in an Edited Book

GARDNER, R.L. & PAPAIOANNOU, V.E. (1975). Differentiation in trophectoderm and inner cell mass. In *The Early Development* of *Mammals*, Balls, M. & Wild, A.E. (Eds.), pp. 107–132. Cambridge, UK: Cambridge University Press.

Proceedings Paper

WOOD, J.E., WILLIAMS, D.B. & GOLDSTEIN, J.I. (1981). Quantitative X-ray microanalysis in the analytical electron microscope. In *Quantitative Microanalysis with High Spatial Resolution*, Jacobs, M.H., Lorimer, G.W. & Doig, P. (Eds.), pp. 24–33. London: The Metals Society. **References to material published online**: These should follow the journal's style, with the URL included at the end of the reference. Authors are requested to print out and keep a copy of any online-only information, in case the URL changes or is no longer maintained, in which case the date accessed should be entered. Examples follow:

- WORLD HEALTH ORGANIZATION (2011). WHO Fact Sheet No. 317—Cardiovascular diseases (CVDs). Available at www.who.int/ mediacentre/factsheets/fs317/en/24-05-11.
- FIORI, C.E. & SWYT-THOMAS, C.R. (1991). U.S. Patent number 5,299,138, accepted 1994. Desk top spectrum analyzer. Free version available at http://www.cstl.nist.gov/div837/Division/ outputs/software.htm.
- CHANTLER, C.T., OLSEN, K., DRAGOSET, R.A., CHANG, J., KISHORE, A.R., KOTOCHIGOVA, S.A. & ZUCKER, D.S. (2005). X-ray form factor, attenuation and scattering tables (version 2.1). Gaithersburg, MD: National Institute of Standards and Technology. Available at http://physics.nist.gov/ffast.

Tables. Tables **must** be uploaded individually at the website. Number tables consecutively using Arabic numbers and include concise titles and column headings. Type footnotes under the tables. All tables **must** be cited consecutively in the text.

Guidelines for Figure Preparation

Figures **must** be uploaded individually at the website. Figures should be professionally drawn and prepared according to the guidelines below. Symbols, letters, numbers, and scale bars should be of sufficient size to be clearly recognizable when the figure is reduced to publication size, usually one column width (84 mm). Figure captions **must** be double-spaced and appear on a separate page in the text document. All figures **must** be cited in the text. Photographs in which human subjects are identifiable must be accompanied by written permission for publication.

Note the following specifications:

- Black and white figures: Raster (scanned) images should be submitted in grayscale mode for continuous-tone images and as bitmaps for line art.
- **Color figures:** Color images should be submitted in CMYK color mode. Do not submit files in RGB color. Files should be free of color functions, including PostScript color management, transfer curves, halftone screen assignments, and black generation functions.

- Digital resolution: Raster (scanned) image files should be:
 - at least 300 dpi for continuous tone images (grayscale or color);
 - at least 900 dpi for monochrome (1-bit) line art.
- **Image size/crop:** Digital art files should be cropped to remove nonprinting borders. Lettering and axis labels for graphs should remain legible when reduced to an image width of 84 mm. Letters within a word should not touch at this reduction. The submitted image orientation should be the same as intended for print.
- Lines: Lines or rules should not be defined as hairline width. The recommended minimum line width is 1/4 point when the file is supplied at the same size as the final print; thicker lines must be used if the figure is to be reduced.
- File format: Do not submit figures as JPG or PDF files or embedded in a Powerpoint or Word document. Rastered image files (continuous tone or line art) should be submitted only in ".tif", ".eps", or ".psd" format. For vector ".eps" or ".ai" files, fonts should be embedded or converted to outlines. Images should be flattened prior to submission; this means that files should not contain layers and/or transparent objects.
- **Submission:** Each figure must be uploaded separately from the text document of the manuscript.

Supplementary File Submission Requirements

Audio Files

- Preferred formats: mp3 or mp4
- Accepted formats: AAC, AIFF, or WAV
- Maximum file size 15Mb

Video Files

Video files should be submitted according to the following specifications.

- Preferred formats: mpg/mpeg, mp4, or mov
- Acceptable formats: .mov or .avi
- Maximum file size: 15Mb
- Minimum dimensions: 320 pixels wide by 240 pixels deep
- Verify that the videos are viewable in QuickTime or Windows Media Player

For each video, provide a citation in the appropriate place in the manuscript text and include a title and pertinent copy, preferably limited to 20 words.

Permissions. All previously published material included in your manuscript **must** be accompanied by permission forms or letters documenting that permission has been obtained to reprint the material in your article in this journal.

Submitting a manuscript to this journal is easy. Just go to the following website:

http://mc.manuscriptcentral.com/mam

Once at the login page, you will be asked to register with a User ID and password. Your manuscript can be submitted by following seven simple steps displayed at the site. A help menu in orange (upper right) provides several ways to get support if you have difficulty.

get more glow for your dough...

EMS IS PROUD TO INTRODUCE ...

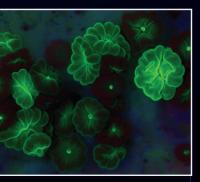
NIGHTSEATM



Fluorescing YFP-transgenic *C. elegans* photographed using the NIGHTSEA Stereo Microscope Fluorescence Adapter. Photograph © NIGHTSEA/Charles Mazel



GFP-tagged *Drosophila* larva. Photograph © NIGHTSEA/ Charles Mazel



Coral Polyps — Fluorescence. © Wade Cooper

FLUORESCENCE VIEWING SYSTEMS

Fluorescence has become the tool of choice for studying many animal models on upright and inverted research stands. New technology from NIGHTSEA[™] now extends fluorescence to standard routine stereo microscopes, where its specificity and sensitivity provide an ideal assist for life science applications.

THIS SIMPLE SYSTEM IS EXCELLENT FOR:

- Quick screening of your fluorescent genotypes *Drosophila*, zebrafish, *C. elegans*, ...
- Genotype sorting
- Fluorescence-aided dissection, injection, or micromanipulation
- Freeing up your research-grade fluorescence microscopes for more demanding work
- New faculty start-up budgets
- Bringing fluorescence into the teaching laboratory

please contact us for more information



NIGHTSEA™ Stereo Microscope Fluorescence Adapter



Adapt your existing lab stereo microscopes for fluorescence

NIGHTSEA[™] Fluorescence Excitation Flashlights

Rapid screening of your fluorescent transgenic experiments



NIGHTSEA DFP-1[™] Dual Fluorescent Protein Flashlight



NIGHTSEA BlueStar™

NIGHTSEA™ Barrier Filter Glasses



Multiple styles available

Electron Microscopy Sciences

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

www.emsdiasum.com



Model 1080 PicoMill® TEM specimen preparation system

FIRST TIME RIGHT

MODEL 1080

PicoMill

Achieve ultimate specimen quality free from amorphous and implanted layers

©2014 E.A. Fischione Instruments, Inc. All rights reserved. The PicoMill TEM specimen preparation system is the subject of United States Patent Nos. 7,132,673 and 7,504,623. Other patents pending. PicoMill is a registered trademark of E.A. Fischione Instruments, Inc

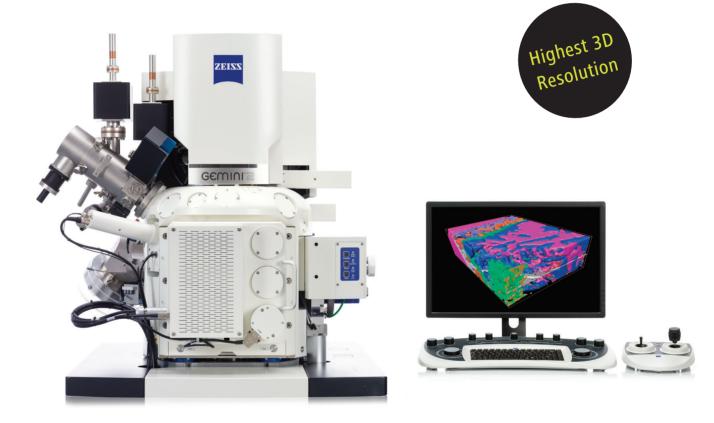
- Complements focused ion beam (FIB)
- In situ imaging with ions and electrons
- Advanced detector technology for imaging and precise endpoint detection
- Microscope connectivity for risk-free specimen handling
- Adds capacity and capability
- Fast, reliable, and easy to use

Learn more about the PicoMill system at **www.fischione.com/PicoMill**.

://doi.org/10.1017/S143192761500029X Published online by Cambridge University Press



Your FIB-SEM for High Throughput Nanotomography and Nanofabrication **ZEISS Crossbeam 340 and 540**



Enjoy High Productivity with an Open 3D Nano-Workstation

With ZEISS Crossbeam 340/540 you experience an outstanding combination of imaging performance and analytical power. Process and prepare any sample on a nanoscopic scale with the nextgeneration FIB. Observe your process in parallel with the superb optics of the GEMINI column. Enjoy demanding experiments with your Crossbeam especially designed for long-term stability. Find out more and book a hands-on demonstration in one of our ZEISS Microscopy Labs now.



www.zeiss.com/crossbeam

