# Volume 15, Number 5 October 2009 Microscopy Microana



CAMBRIDGE UNIVERSITY PRESS ISSN 1431-9276

## Microscopyand Microanalysis

### An International Journal for the Biological and Physical Sciences

THE OFFICIAL JOURNAL OF		4			
	MICROBEAM ANALYSIS 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	
					PORTUGUESE SOCIETY FOR MICROSCOPY
	PUBLISHED IN AFFILIATION WITH	ROYAL MICROSCOPICAL SOCIETY			
		GERMAN SOCIETY FOR ELECTRON			
		BELGIAN SOCIETY FOR MICROSCOPY			
	MICROSCOPY SOCIETY OF SOUTHERN AFRICA				
Editor in Chief	Editor, Light and Scanning Probe	Special Issues and Reviews			
Editor, Biological Applications	Microscopies	Jay Jerome			
Robert L. Price	Brian Herman	Vanderbilt University Medical			
Department of Cell and Developmental	Cellular and Structural Biology	Nashville, TN 37232			

Biology and Anatomy School of Medicine University of South Carolina 6439 Garner's Ferry Road, Bldg. 1 B-60 Columbia, SC 29209 Phone: (803) 733-3392 Fax: (803) 733-3212 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 Phone: (480) 965-4540 Fax: (480) 965-9004 e-mail: david.smith@asu.edu

### **Editor, Materials Applications**

Elizabeth Dickey Materials Science and Engineering Pennsylvania State University 223 MRL Building University Park, PA 16802-7003 Phone: (814) 865-9067 Fax: (814) 863-8561 e-mail: ecd10@psu.edu

### University of Texas at San Antonio 7703 Floyd Curl Drive

San Antonio, Texas 78284-7762 Phone: (210) 567-3800 Fax: (210) 567-3803 e-mail: hermanb@uthscsa.edu

### **Editor, Biological Applications**

Heide Schatten Veterinary Pathobiology University of Missouri-Columbia 1600 E. Rollins Street Columbia, Missouri 65211-5030 Phone: (573) 882-2396 Fax: (573) 884-5414 e-mail: schattenh@missouri.edu

### **Editor**, Microanalysis

John Mansfield Electron Microbeam Analysis Lab North Campus, 417 SRB University of Michigan 2455 Hayward Ann Arbor, MI 48109-2143 Phone: (734) 936-3352 Fax: (734) 763-2282 e-mail: jfmjfm@umich.edu

s Editor Center e-mail: jay.jerome@vanderbilt.edu

### **Book Review Editor**

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

### **Calendar Editor**

Nan Yao Princeton University Princeton, NJ 08540 e-mail: nyao@Princeton.edu

### *Expo* Editor

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

### **Proceedings** Editor

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



© MICROSCOPY SOCIETY OF AMERICA 2009

### **Editorial Board**

Ralph Albrecht	University of Wisconsin, Madison, Wisconsin
Barry Carter	University of Connecticut, Storrs, Connecticut
Wah Chiu	Baylor College of Medicine, Houston, Texas
Alwyn Eades	Lehigh University, Bethlehem, Pennsylvania
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	Northeastern Ohio Universities College of Medicine, Rootstown, 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
Conly Rieder	Wadsworth Center, Albany, New York
Phillip Russell	Appalachian State University, Boone, North Carolina
John Silcox	Cornell University, Ithaca, New York
Nestor Zaluzec	Argonne National Laboratory, Argonne, Illinois

### Editorial Board Representatives from Affiliated Societies

Ian Anderson	NIST, Gaithersburg, Maryland (MAS)
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)
Clive Walker	Institute for Transuranium Elements, Karlsruhe (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.

### 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. 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, 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 \$920.00 in the USA, Canada, and Mexico; UK  $\pounds$ 555.00 + VAT elsewhere. Institutions online only: US \$760.00 in the USA, Canada, and Mexico; UK  $\pounds$ 460.00 + VAT elsewhere. Institutions print only: US \$830.00 in the USA, Canada, and Mexico; UK  $\pounds$ 500.00 + VAT elsewhere. Individuals print and online: US \$345.00 in the USA, Canada, and Mexico; UK  $\pounds$ 210.00 + 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.

**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) 733-3392; 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**

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

© 2009 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.

### Microscopy and Microanalysis

### An International Journal for the Biological and Physical Sciences

Volume 15, Number 5 October 2009

### **TOMOGRAPHY APPLICATIONS**

A Method for Observing Silver-Stained Osteocytes In Situ in 3-μm Sections Using Ultra-High Voltage Electron Microscopy Tomography Hiroshi Kamioka, Sakhr A. Murshid, Yoshihito Ishihara, Naoko Kajimura, Toshiaki Hasegawa, Ryoko Ando, Yasuyo Sugawara, Takashi Yamashiro, Akio Takaoka, and Teruko Takano-Yamamoto	377
X-Ray Microtomography Studies of Tannin-Derived Organic and Carbon Foams G. Tondi, S. Blacher, A. Léonard, A. Pizzi, V. Fierro, J.M. Leban, and A. Celzard	384
Three-Dimensional X-Ray Imaging and Analysis of Fungi on and in Wood Jan Van den Bulcke, Matthieu Boone, Joris Van Acker, and Luc Van Hoorebeke	395
<b>B</b> IOLOGICAL <b>A</b> PPLICATIONS	
An Innovative Triple Immunogold Labeling Method to Investigate the Hemopoietic Stem Cell Niche In Situ Sarah L. Ellis, Brenda Williams, Stephen Asquith, Ivan Bertoncello, and Susan K. Nilsson	403
The Role of Interleukin-6 in the Formation of the Coronary Vasculature Indroneal Banerjee, John W. Fuseler, Colby A. Souders, Stephanie L.K. Bowers, and Troy A. Baudino	415
The Preimaginal Phases and Development of <i>Pachycrepoideus vindemmiae</i> (Hymenoptera, Pteromalidae) on Mediterranean Fruit Fly, <i>Ceratitis</i> <i>capitata</i> (Diptera, Tephritidae) <i>José Tormos, Francisco Beitia, Elias A. Böckmann, Josep D. Asís, and</i> <i>Severiano Fernández</i>	422
MATERIALS APPLICATIONS	
Compositional and Structural Study of a (K <sub>0.5</sub> Na <sub>0.5</sub> )NbO <sub>3</sub> Single Crystal Prepared by Solid State Crystal Growth Andreja Benčan, Elena Tchernychova, Matjaž Godec, John Fisher, and Marija Kosec	435
INSTRUMENTATION AND SOFTWARE	

### Development

 Characterizing the Two- and Three-Dimensional Resolution of an Improved
 Aberration-Corrected STEM
 441

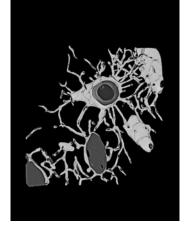
 A.R. Lupini, A.Y. Borisevich, J.C. Idrobo, H.M. Christen, M. Biegalski, and
 S.J. Pennycook

454

Spectrum Simulation in DTSA-II

Nicholas W.M. Ritchie

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



**On the Cover:** High-resolution tomography of osteocytes embedded in bone visualized by the Osaka ultra-high voltage electron microscopy. For further information please see the article by Kamioka et al. on p. 377.

### BOOK REVIEW

Handbook of Cryo-Preparation Methods for Electron Microscopy. Edited by	
Annie Cavalier, Danielle Spehner, and Bruno M. Humbel	469
Kent McDonald	

### CALENDAR OF MEETINGS AND COURSES 471