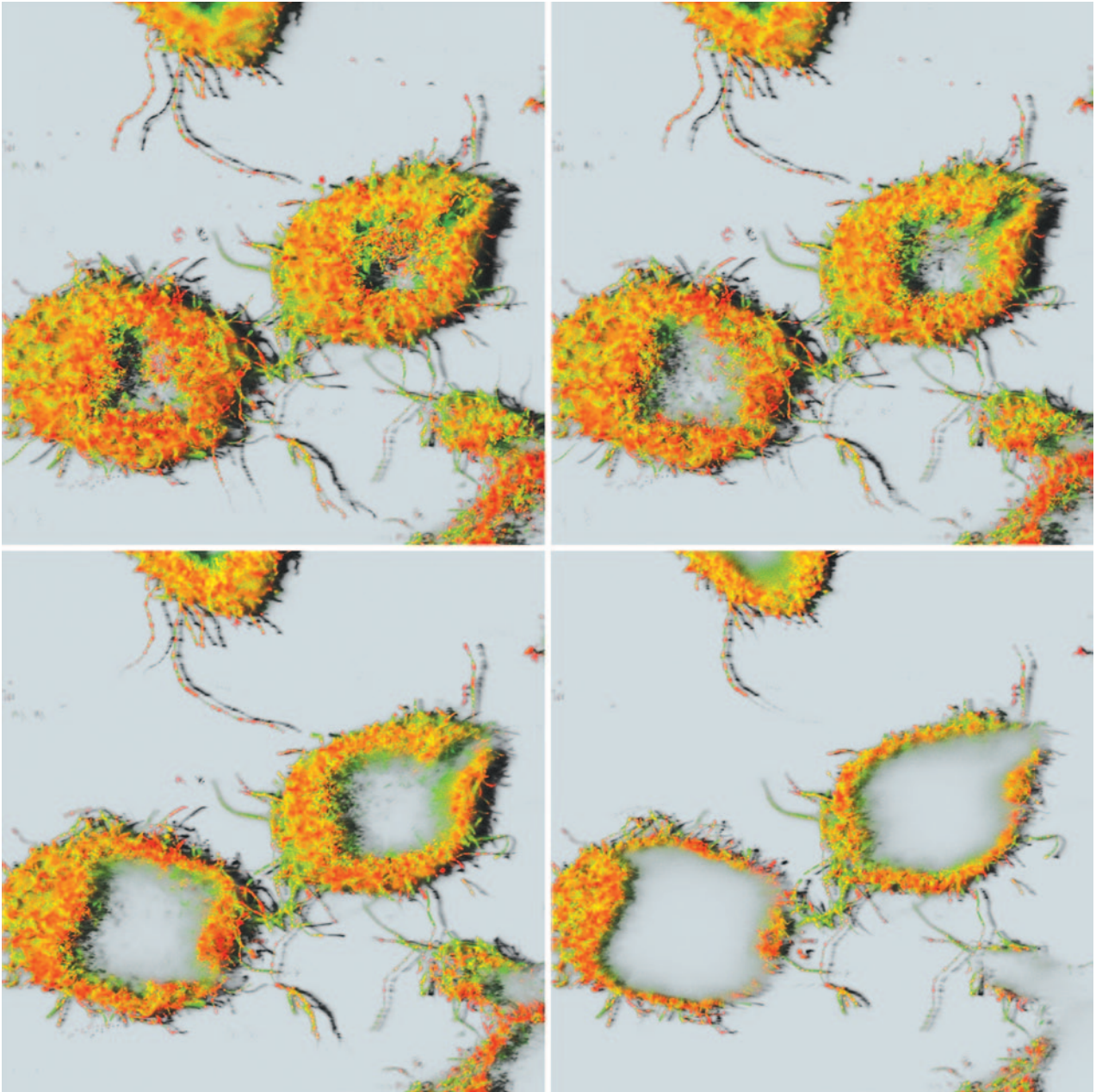


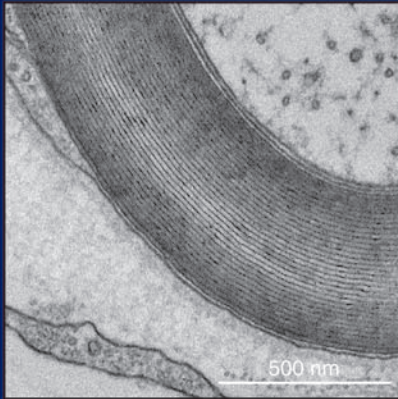
Microscopy TODAY

Volume 19 Number 5 2011 September



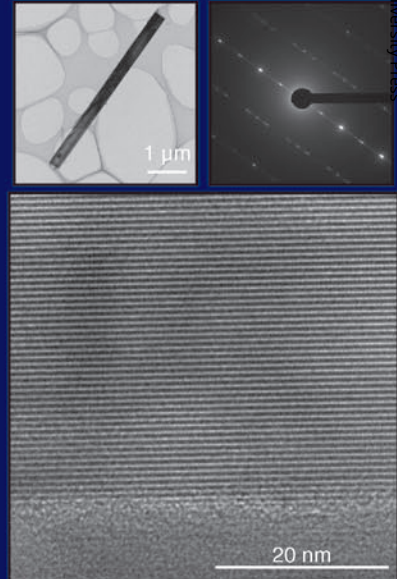
Don't Compromise!

See high contrast and high resolution
in the Hitachi HT7700 120kV TEM.



Unstained rat sciatic nerve, 80kV

**All new Hitachi SEMs,
TEMs, and FIBs are
now offered with a
3-year parts warranty!***



Anthophyllite, 120kV

You examine everything from genetically-modified Arabidopsis to zirconium/niobium alloys. You need a 120kV TEM that provides high contrast at low magnification for biological specimens and lattice resolution at high magnification for materials analysis. The Hitachi-patented compound objective lens does it all at the touch of a button.

When it counts, think Hitachi

* Consumables and non-Hitachi accessories excluded. Offer valid in the United States only. Requires acceptance of additional Terms & Conditions. Hitachi High Technologies America reserves the right to terminate the 3-year parts warranty program at any time. Contact us for details.

Hitachi High Technologies America, Inc.
toll free: 800-548-9001 (US & Canada)
email: sales-LS@hitachi-hta.com

www.hitachi-hta.com

HITACHI
Inspire the Next

Microscopy Society of America Awards

Nominations are now open for the Microscopy Society of America Annual Awards. The awards process is one way in which the Microscopy Society of America recognizes the significant and diverse contributions that individuals make to our field. Deserving nominations for consideration should be submitted online no later than December 15th, 2011, to:

AssociationManagement@microscopy.org

The Main Society Awards Are

Distinguished Scientist Awards

These Awards recognize preeminent senior scientists from both the Biological and Physical disciplines who have a long-standing record of achievement during their career in the field of microscopy or microanalysis.

Burton Medal

The Burton Medal was initiated to honor the distinguished contributions to the field of microscopy and microanalysis of a scientist who is less than 40 years of age on January 1st of the award year. (Please note the change in the selection criterion regarding age.)

Outstanding Technologist Awards

These Awards honor technologists from both the Biological (Hildegard H. Crowley Award) and Physical Sciences (Chuck Fiori Award) who have made significant contributions such as the development of new techniques which have contributed to the advancement of microscopy and microanalysis.

Morton D. Maser Distinguished Service Award

This Award was initiated to recognize outstanding volunteer service to the Society as exemplified by Mort Maser, who served the Society for many years with great dedication. This award is made to honor an MSA member who has provided significant volunteer service to the Society over a period of years.

**Further details of the nomination process
can be found on the society webpage at:**

www.microscopy.org



complete characterization

Science continues to challenge the limits of material properties and capabilities. Whether improving conventional materials, such as tungsten alloys, or probing the potential of carbon fiber nanotechnology, our instruments and expertise help scientists characterize and confirm complex chemistries and unique structures. Our comprehensive offering includes innovative imaging and spectroscopy, industry-leading data management and proven method development. All designed to help provide deeper insights and more confident decisions as you drive bold progress in the materials of tomorrow.

speeds discovery in materials science

• www.thermoscientific.com/materialsscience

Nanotechnology

Polymers

Metallurgy

Microelectronics

Bio-Materials

Cement

Energy

Ceramics and Glass

Polymers

Carbon

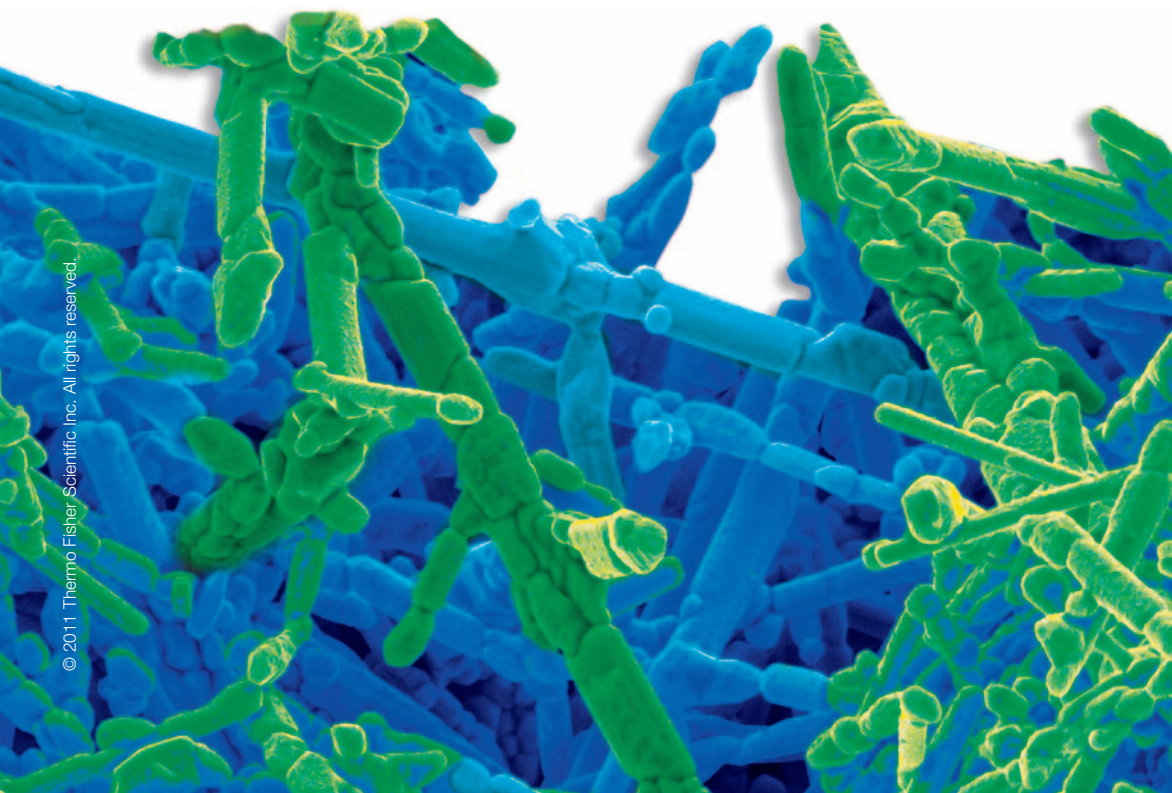
Paints and Coatings

Chemicals

Paper and Printing

Medical Implants

Art Restoration



Contents

Feature Article

12 Imaging Biologically Induced Mineralization in Fully Hydrated Flow Systems

Logan Schultz, Betsey Pitts, Andrew C. Mitchell, Alfred B. Cunningham, and Robin Gerlach

Biological Applications

16 Imaging Specific Protein Labels on Eukaryotic Cells in Liquid with Scanning Transmission Electron Microscopy

Diana B. Peckys, Madeline J. Dukes, Elisabeth A. Ring, David W. Piston, and Niels de Jonge

22 High-Resolution Imaging of Dried and Living Single Bacterial Cell Surfaces: Artifact or Not?

Dominik Greif, Daniel Wesner, Dario Anselmetti, and Jan Regtmeier

Instrumentation, Software, and Analysis

26 A 200-kV STEM/SEM Produces 1 Å SEM Resolution

Xiao Feng Zhang

30 Standards-Based Quantification in DTSA-II—Part I

Nicholas W.M. Ritchie

38 Simplifying Electron Diffraction Pattern Identification of Mixed-Material Nanoparticles

Jacopo Samson, Patrick C. Nahirney, Charles Michael Drain, and Irene Piscopo

Microscopy Innovations

42 2011 *Microscopy Today* Innovation Awards

Microscopy Facilities

48 Quietly Building Capabilities: New Instruments, Expertise, “Quiet Wing” Available at DOE User Facility

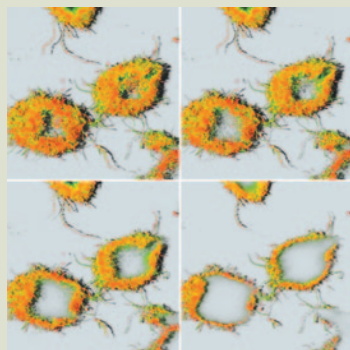
Scott Lea, Bernd Kabius, Bruce Arey, Libor Kovarik, Chongmin Wang, Galya Orr, Igor Lyubinetsky, and Ross Carper

Microscopy Pioneers

54 Pioneers in Optics: Joseph von Fraunhofer and Gustav Robert Kirchhoff

Michael W. Davidson

About the Cover



Reconstructed image slices through clusters of bacteria growing around calcium carbonate precipitates inside a glass capillary. Image width = 230 μm .

See article by Shultz et al.

Departments

7 Editorial

8 Carmichael's Concise Review

58 Industry News

60 Product News

62 NetNotes

76 Calendar of Meetings

80 Dear Abbe

82 Index of Advertisers

Exacting Research Demands Only the Highest Quality Products.

Introducing the 2011–2012 EMS Catalog, your comprehensive source for chemicals, supplies, accessories, and equipment for Microscopy, Histology and all fields of biological and materials research.

The new
**2011-2012
EMS CATALOG**
is now
available!

Featuring new and revolutionary products, including:

- C-flat™ Holey Carbon Grids for cryo-TEM
- Tools for Microsample Manipulation & Measurements
- WETSEM™ Capsules for Hydrated SEM Samples
- DuraSIN™ Substrates for TEM & X-ray
- Diatome Oscillating Diamond Knife
- Digital High Resolution Microscopes
- Ultra-Thin Carbon Tabs
- Plunge Freezer
- EMS 9000 Precision Pulsed Laboratory Microwave Oven
- State-of-the-Art Oscillating Tissue Slicers
- NioProbe and TipCheck for AFM
- Aurion ImmunoGold Reagents and Accessories
- EMS LYNX Tissue Processor
- MAG*1*CAL®
- EMS Carbon Coaters and Sputter Coaters

Your one-stop shop for the latest products and solutions for Microscopy and Histology!

APPLICATION NOTES • MORE TECHNICAL SUPPORT • ENHANCED PRODUCT LINES • REVOLUTIONARY PRODUCTS

- To request our new catalog, please call or write us today, or visit us online at www.emsdiasum.com



**Electron
Microscopy
Sciences**

P.O. Box 550 • 1560 Industry Rd. • Hatfield, Pa 19440 • Tel: (215) 412-8400 • Toll Free: 1-(800) 523-5874
Fax: (215) 412-8450 or 8452 • email: sgkcck@aol.com • stacie@ems-secure.com • www.emsdiasum.com