





www.microscopy-today.com



# The Ultimate Solution for Efficiency

The All-New SU7000 Ultra-High Resolution Variable-Pressure Analytical Schottky FE-SEM



#### **High-Resolution Imaging**

- 0.9 nm resolution at 1 keV
- 0.8 nm resolution at 15 keV

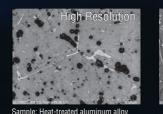
#### **Enhanced Versatility**

- Large chamber handles samples 200 mm  $\Phi$  or 80 mm tall
- 18 accessory ports for analytical options

#### **Fast Data Collection**

- 200 nA beam current
- Synchronized working distance for imaging and analysis
- Fully integrated sample navigation camera
- Simultaneous 6-signal acquisition

### All data collected simultaneously at 6 mm WD!





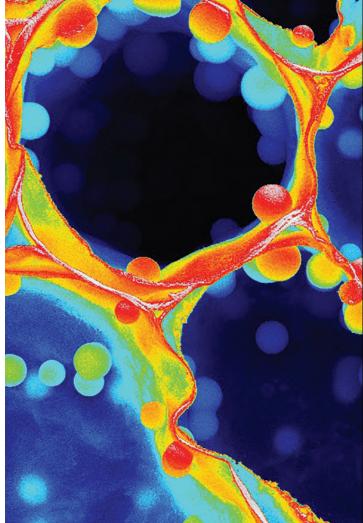




## Innovation • Synergy • Solutions



Hitachi High Technologies America, Inc. www.hitachi-hightech.com/us Tel. 800-253-3053 E-mail: microscopy@hitachi-hta.com





## **Register Now**

Early Bird Savings Deadline: June 24

Image: Timothy Pegg | Miami University of Ohio | Motley Spheres SLASH Prismatic Spheres







www.microscopy.org/MandM/2019 for up-to-date meeting information

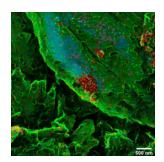


# Machining sub-10 nm structures with high fidelity.

ZEISS ORION NanoFab



// INNOVATION MADE BY ZEISS



## Your ion beam microscope for sub-10nm applications

Profit from the only system in the world that covers the complete range of micromachining to nanomachining applications using gallium, neon and helium ion beams in a single instrument.

www.zeiss.com/orion-nanofab







#### High-Resolution STEM

- 12 Introduction to the Ronchigram and its Calculation with Ronchigram.com Noah Schnitzer, Suk Hyun Sung, and Robert Hovden
- 16 In situ Scanning Transmission Electron Microscopy with Atomic Resolution under Atmospheric Pressure Sheng Dai, Shuyi Zhang, George W. Graham, and Xiaoqing Pan

#### Microanalysis

#### 22 NanoFab SIMS: High Spatial Resolution Imaging and Analysis Using Inert-Gas Ion Beams

Sybren Sijbrandij, Alexander Lombardi, Alain Sireuil, Fouzia Khanom, Brett Lewis, Christelle Guillermier, Doug Runt, and John Notte

#### **Microscopy Education**

28 Factors to Consider When Selecting Student Microscopes for Schools and Universities Vince Vaccarelli

#### Microscopy 101

**32** Correcting Astigmatism in SEM Images Charles E. Lyman

#### Platform Tutorial Summary

**36** How to Get Funding for Instrumentation When Budgets Are Tight Christine A. Brantner

#### Highlights from Microscopy and Microanalysis

- 44 Morphological Properties of the Two Types of Caudate Interneurons: Kohonen Self-Organizing Maps and Correlation-Comparison Analysis
- 44 Compressed Sensing of Scanning Transmission Electron Microscopy (STEM) with Nonrectangular Scans
- **45** Multi-Angle Plasma FIB Curtaining Artefact Correction Using a Fourier-Based Linear Optimization Model

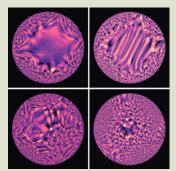
#### Departments

- 7 Editorial
- 8 Carmichael's Concise Review
- **39** Pioneers of Microscopy
- 40 Industry News
- 42 Product News

#### 46 NetNotes

- 48 Calendar of Meetings
- 53 Dear Abbe
- 54 Index of Advertisers

#### About the Cover



Contents

Simulated electron Ronchigrams for an aberration-corrected STEM. Clockwise from upper left: well-aligned STEM, two-fold astigmatism, three-fold astigmatism, and axial coma.

See article by Schnitzer et al.

## **TESCAN S9000X**

Ultimate resolution and maximum throughput in physical failure analysis of semiconductor devices and material microanalysis



#### Extremely large cross-section:

New iFIB+<sup>™</sup> Xe plasma FIB with high currents up to 2 µA and unmatched FoV of 1 mm redefines conventional large-area cross-sectioning and dramatically decreases sample preparation time.

#### Extended imaging capabilities:

Next generation Triglav SEM column with improved and optimized in-beam detection system, and extending imaging capabilities, that now include energy-filtering BSE signal collection for ultimate surface sensitivity in sample characterization.

#### Applications easier than ever:

New TESCAN Essence<sup>™</sup> software platform offers a simplified, user-friendly and customizable interface for effortless and maximum control in all applications, regardless the user skill level.

## For more information visit **www.tescan.com**



