

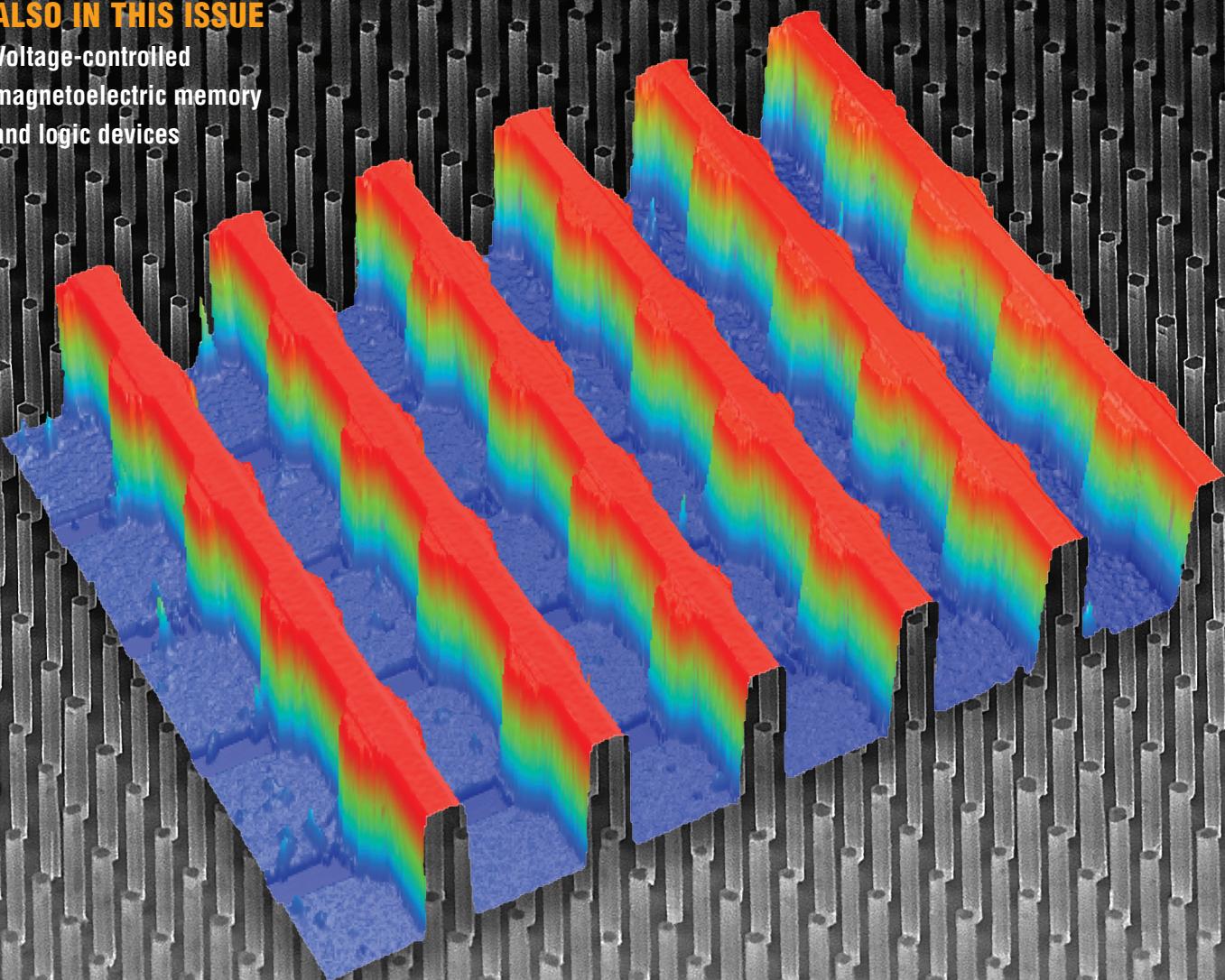
# MRS Bulletin

**MRS** MATERIALS RESEARCH SOCIETY®  
Advancing materials. Improving the quality of life.

## Piezotronics and piezo-photronics

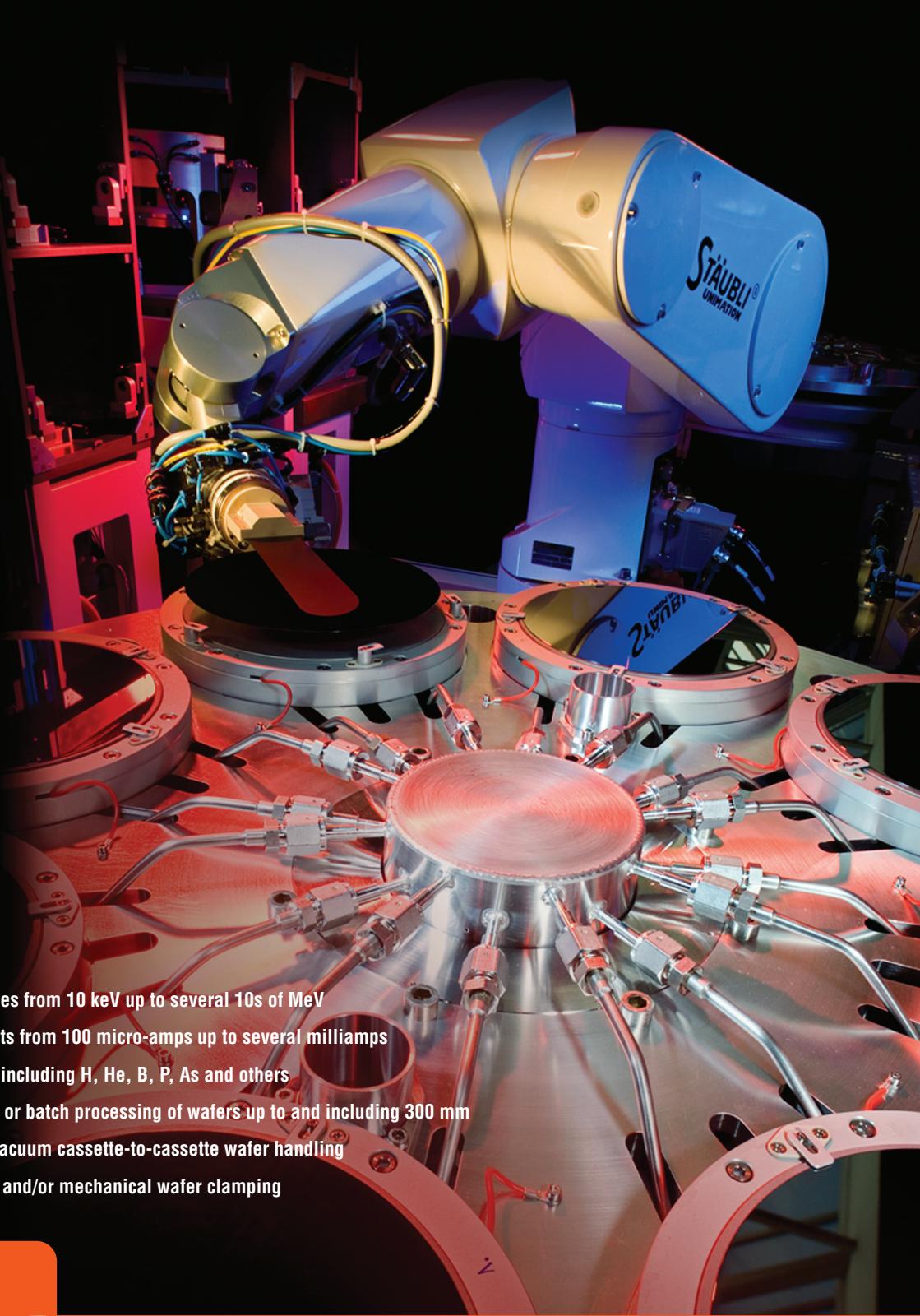
### ALSO IN THIS ISSUE

Voltage-controlled  
magnetoelectric memory  
and logic devices



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# CUSTOMIZED PRODUCTION ION IMPLANTERS



- Beam energies from 10 keV up to several 10s of MeV
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2019 MRS® SPRING MEETING & EXHIBIT

April 22–26, 2019 | Phoenix, Arizona

Preregistration Opens  
Mid-January

# LATE NEWS—HOT TOPIC ABSTRACTS

ACCEPTED DECEMBER 14, 2018 – JANUARY 11, 2019

Spring Meeting registrations include MRS Membership July 1, 2019 – June 30, 2020

## BROADER IMPACT

- BI01 High Impact Practice—Increasing Ethnic and Gender Diversification in Engineering Education

## CHARACTERIZATION, PROCESSING AND THEORY

- CP01 Advances in *In Situ* Experimentation Techniques Enabling Novel and Extreme Materials/Nanocomposite Design  
CP02 Design and *In Situ* TEM Characterization of Self-Assembling Colloidal Nanosystems  
CP03 Advances in *In Situ* Techniques for Diagnostics and Synthetic Design of Energy Materials  
CP04 Interfacial Science and Engineering—Mechanics, Thermodynamics, Kinetics and Chemistry  
CP05 Materials Evolution in Dry Friction—Microstructural, Chemical and Environmental Effects  
CP06 Smart Materials for Multifunctional Devices and Interfaces  
CP07 From Mechanical Metamaterials to Programmable Materials  
CP08 Additive Manufacturing of Metals  
CP09 Mathematical Aspects of Materials Science—Modeling, Analysis and Computations

## ELECTRONICS AND PHOTONICS

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EP02 Photonic Materials and Devices for Biointerfaces  
EP03 Materials Strategies and Device Fabrication for Biofriendly Electronics  
EP04 Soft and Stretchable Electronics—from Fundamentals to Applications  
EP05 Engineered Functional Multicellular Circuits, Devices and Systems  
EP06 Organic Electronics—Materials and Devices

### Semiconductor Devices, Interconnects, Plasmonic and Thermoelectric Materials

- EP07 Next-Generation Interconnects—Materials, Processes and Integration  
EP08 Phase-Change Materials for Memories, Photonics, Neuromorphic and Emerging Application  
EP09 Devices and Materials to Extend the CMOS Roadmap for Logic and Memory Applications  
EP10 Heterovalent Integration of Semiconductors and Applications to Optical Devices  
EP11 Hybrid Materials and Devices for Enhanced Light-Matter Interactions  
EP12 Emerging Materials for Plasmonics, Metamaterials and Metasurfaces  
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ES02 Next-Generation Intercalation Batteries  
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- ES05 Cooperative Catalysis for Energy and Environmental Applications  
ES06 Atomic-Level Understanding of Materials in Fuel Cells and Electrolyzers  
ES07 New Carbon for Energy—Materials, Chemistry and Applications  
ES08 Materials Challenges in Surfaces and Coatings for Solar Thermal Technologies  
ES10 Rational Designed Hierarchical Nanostructures for Photocatalytic System  
ES11 Advanced Low Temperature Water-Splitting for Renewable Hydrogen Production via Electrochemical and Photoelectrochemical Processes  
ES12 Redox-Active Oxides for Creating Renewable and Sustainable Energy Carriers

### Water-Energy Materials and Sustainability

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ES13 Materials Selection and Design—A Tool to Enable Sustainable Materials Development and a Reduced Materials Footprint  
ES14 Materials Circular Economy for Urban Sustainability

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ES16 Perovskite Photovoltaics and Optoelectronics  
ES17 Perovskite-Based Light-Emission and Frontier Phenomena—Single Crystals, Thin Films and Nanocrystals  
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QN03 2D Materials—Tunable Physical Properties, Heterostructures and Device Applications  
QN04 Nanoscale Heat Transport—Fundamentals  
QN05 Emerging Thermal Materials—From Nanoscale to Multiscale Thermal Transport, Energy Conversion, Storage and Thermal Management  
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SM06 Nano- and Microgels  
SM07 Bioinspired Materials—From Basic Discovery to Biomimicry

[www.mrs.org/spring2019](http://www.mrs.org/spring2019)

### Meeting Chairs

- Yuping Bao** The University of Alabama  
**Bruce Dunn** University of California, Los Angeles  
**Subodh Mhaisalkar** Nanyang Technological University  
**Ruth Schwaiger** Karlsruhe Institute of Technology—Institute for Applied Materials  
**Subhash L. Shinde** University of Notre Dame

### Don't Miss These Future MRS Meetings!

#### 2019 MRS Fall Meeting & Exhibit

December 1–6, 2019, Boston, Massachusetts

#### 2020 MRS Spring Meeting & Exhibit

April 13–17, 2020, Phoenix, Arizona

### FOLLOW THE MEETING!

#S19MRS

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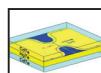
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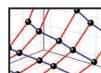
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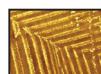
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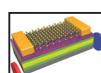
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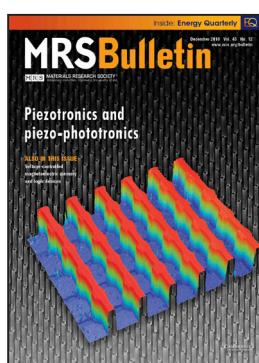
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Eva Karatairi

FEATURE EDITOR: Andrea Ambrosini



### ON THE COVER

**Piezotronics and piezo-photronics.** Piezotronics and piezo-photronics are characterized by the active coupling of strain-induced polarization potential, mobile charge-carrier transport behavior, and photoexcitation in third-generation semiconductors. They have the potential to affect the design and fabrication of many current and future electronic and photonic devices. This issue of *MRS Bulletin* highlights the rapid progress in these two fields. The cover background shows a vertical ZnO nanowire array for use in 3D piezotronic transistor devices. The image in the foreground shows a 3D strain-gated vertical piezotronic transistor. Credit: Zhong Lin Wang, Georgia Institute of Technology. See the technical theme that begins on page 922.

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**Erratum:** In Xu et al., *MRS Bull.* **42** (12), 943, in Figure 1 c–d, the scale bar numbers should be 500 nm and 100 nm (inset). Also in Reference 9, the author's name should be spelled Gür.



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Look Again



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The Materials Research Society (MRS), a not-for-profit scientific association founded in 1973 and headquartered in Warrendale, Pennsylvania, USA, promotes interdisciplinary materials research. Today, MRS is a growing, vibrant, member-driven organization of over 16,000 materials researchers spanning over 80 countries, from academia, industry, and government, and a recognized leader in the advancement of interdisciplinary materials research.

The Society's interdisciplinary approach differs from that of single-discipline professional societies because it promotes information exchange across many scientific and technical fields touching materials development. MRS conducts three major international annual meetings and also sponsors numerous single-topic scientific meetings. The Society recognizes professional and technical excellence and fosters technical interaction through University Chapters. In the international arena, MRS implements bilateral projects with partner organizations to benefit the worldwide materials community. The Materials Research Society Foundation helps the Society advance its mission by supporting various projects and initiatives.

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