



## Preview: 2010 Materials Research Society Fall Meeting & Exhibit

Hynes Convention Center and Sheraton Boston Hotel, Boston, Massachusetts

**Meeting:** November 29–December 3

**Exhibit:** November 30–December 2

[www.mrs.org/F10](http://www.mrs.org/F10)

length scales, including nanowires, hierarchical and composite materials, group-IV semiconductor nanostructures, aerogels and aerogel-inspired materials, boron and boron compounds, artificially aligned crystalline thin films and nanostructures, and group-VIII inorganic materials, with applications in electronic, optoelectronic, nanophotonics, energy, and sensing devices.

**Materials for Energy** covers research related to magnetocalorics and magnetic cooling and novel fuel cell materials and concepts as well as advanced Li batteries; polymer-based materials as nanocomposites, nanostructures, and smart materials; transparent conducting oxides; and thermoelectric materials for power generation and cooling.

**Biological and Environmental Applications of Materials** centers on synthesis, assembly, and applications of biological and bioinspired materials with a focus on the forefront of bio-mineralization and biomimetics; multiscale mechanics; materials synthesis and assembly for imaging, sensing, and therapeutics; and applications to nanobiotechnology and their health and environmental safety.

**Materials Exploration** focuses on *in situ* characterization approaches using advanced imaging and scattering techniques, synchrotron radiation, and methods to study the structure–property relation of evolving thin films, novel developments in scanning probe microscopy, materials issues in art and archaeology, and materials education and outreach from kindergarten to graduate school.

In addition to the technical symposia, Symposium X will feature lunchtime lectures aimed at a broad audience to provide meeting attendees with an overview of leading-edge topics. Speakers include John Rogers of the University of Illinois at Urbana/Champaign presenting a talk on materials and mechanics for bio-integrated electronics and Eberhard Umbach of Karlsruhe Institute of Technology, on new concepts for energy research in Germany and Europe. Symposium X will open on Monday with a special panel presentation about the NOVA series, *Making Stuff*—a four-part PBS prime-time television series devel-

### 2010 MRS FALL MEETING • Meeting Chairs



**Ana Claudia Arias**  
Palo Alto Research Center



**Robert F. Cook**  
National Institute of Standards and Technology



**Clemens Heske**  
University of Nevada, Las Vegas



**Shu Yang**  
University of Pennsylvania

The Materials Research Society will hold its 2010 Fall Meeting at the Hynes Convention Center and the Sheraton Boston Hotel in Boston, Mass., November 29–December 3, 2010. The meeting will include a technical program, tutorials, a plenary session, an awards ceremony, an equipment exhibit, poster sessions, a career center, funding seminars, and other special activities. Symposium proceedings will be published on the MRS Web site, where they will be available free online to MRS members.

The increasingly cross-disciplinary worldwide activity on materials research culminates every year in the MRS Fall Meetings. Symposium organizers from around the world have created a program of 49 symposia that addresses leading-edge research and captures the extraordinary progress in materials science and technology, featuring an exciting mix of well-established and popular topics. The symposia are organized into the following six clusters.

**Materials for Information Processing** covers fundamentals on materials

research applied to photonics, electronics, displays, photovoltaics, and bioelectronics. Materials such as organic semiconductors, diamond, rare-earths, transition metals, doped nitrides, oxides, liquid crystals, and organic–inorganic composites are included in the program. Challenges in large-scale processing of emerging materials or printable devices, as well as low-temperature processing and reliability, will be addressed.

**Materials for Infrastructure and Mechanical Applications** addresses research on materials for mechanical applications at all length scales, including advanced intermetallic alloys, new steel designs, bulk metallic glasses, ceramic, metal and composite materials for nuclear power applications, behavior at micro- and nanoscales and in harsh environments, microelectromechanical systems, and harnessing instabilities in soft materials.

**Materials Processing and Device Fabrication** focuses on synthesis, fabrication, assembly, and integration of a broad range of materials at different



oped in cooperation with MRS. The panel will include David Pogue, the series host and an Emmy award-winning tech correspondent for CBS News.

Poster sessions, an integral feature of MRS meetings, will be held during the evenings. The meeting chairs will award the best posters during each session with prizes of up to \$500. Winning posters will be displayed prominently throughout the week.

### Special sessions and events

The **Plenary Session** will be held in the Grand Ballroom of the Sheraton Boston Hotel on Nov. 29, 6:30 p.m., at which **Christopher P.J. Barty** of Lawrence Livermore National Laboratory will present a talk on “Creating Star Power on Earth—The Path to Fusion at the National Ignition Facility.”

The **Awards Ceremony** will convene on Wednesday, Dec. 1, in the Grand Ballroom of the Sheraton Boston Hotel, at which the Von Hippel Award, Turnbull Lectureship, MRS Medal, and Graduate Student Awards will be presented. The ceremony will be followed by the Von Hippel Award address by **L. Eric Cross** of The Pennsylvania State University on “Flexoelectric Composites—The Cutting Edge for New Lead-Free Piezoceramics.”

**David D. Awschalom** of the University of California, Santa Barbara, is the recipient of the **David Turnbull Lectureship**. He will present his lecture, “Semiconductor Spintronics and Quantum Information Processing,” on Tuesday, Nov. 30 at 5:15 p.m. in the Grand Ballroom of the Sheraton Boston Hotel.

**MRS Medalist Walter A. de Heer** of Georgia Institute of Technology will present the award talk on Thursday, Dec. 2 in Symposium X, on epitaxial graphene for 21st-century electronics.

A number of exciting events will take place on **SUPER SUNDAY**, Nov. 28. Events include **tutorials** (plus one tutorial on Monday afternoon), professional development including the **Women’s Professional Development Workshop**, and **Making Stuff** Education and Outreach activities at the Boston Museum of Science. **Charles Lieber** of Harvard University, recipient of the **Fred Kavli Dis-**

# SUPER SUNDAY

**tinguished Lectureship in Nanoscience**, will present the award talk at 7:00 p.m.

The **Women in Materials Science and Engineering Breakfast** will feature **Jennifer Stancil**, executive director of Educational Partnerships at WQED, Pittsburgh, on the topic of girls in science, technology, engineering, and mathematics: inspiring the next generation of scientists. **Government agency seminars** will be held, including representatives from the National Science Foundation (NSF), the Department of Energy, and the National Institutes of Health, which will offer attendees information on funding opportunities in materials research.

Additional instructional seminars in-

## Don’t Miss these SUPER SUNDAY events at the 2010 MRS Fall Meeting • Sunday, November 28

### 7 TUTORIAL SESSIONS—FREE to meeting attendees

Running throughout the day, the tutorials offer a variety of topics to complement the scientific sessions. Subjects range from polymer-based nanocomposites, to microfluidics and optical biosensing, to magnetic cooling machines and their potential for energy efficiency, and so much more!

### WOMEN’S PROFESSIONAL DEVELOPMENT WORKSHOP—COACHing Strong Women in the Art of Strategic Persuasion

This Workshop will focus on the fundamentals of responsible negotiations and conflict resolution. Attendees will use self-examination to discover personal negotiating styles and develop alternatives to agreement that build self-confidence and enhance preparation.

### MASTERING SCIENCE PRESENTATIONS WORKSHOP—FREE to meeting attendees

Learn how to choose the very best communication tools to take your scientific presentations to the next level—and to successfully communicate the results both to peers and to the general public.

### MAKING STUFF DAY AT THE MUSEUM OF SCIENCE: Explorations in Materials Science and Engineering

A day of professional development in education outreach is being planned at the Museum of Science, Boston. Enjoy materials science demonstrations, hands-on activities, and special stage performances ... and at the same time learn about some of the challenges, strategies and resources behind creating effective and creative education outreach programs for the general public. A public presentation by David Pogue, host of *Making Stuff*, the new NOVA series on materials, is also on tap for the afternoon.

### FRED KAVLI DISTINGUISHED LECTURESHIP IN NANOSCIENCE—FREE to meeting attendees

World-renowned nanoscience expert Charles Lieber, Harvard University, will present his Kavli lecture at 7PM in the Sheraton Hotel, Grand Ballroom.

For more information on SUPER SUNDAY events, visit [www.mrs.org/f10\\_supersunday](http://www.mrs.org/f10_supersunday)

clude **Mastering Science Presentations**, by Greta Zenner Peterson, who is education director of the MRSEC at the University of Wisconsin, Madison and chair of the MRS NISE Subcommittee; and the **NSF Broader Impacts**, by Sue Whitsett, the Einstein Distinguished Educator Fellow with the NSF Division of Molecular and Cellular Biosciences.

Jennifer Larese, the outreach coordinator for NOVA, will present a talk on how to host **Science Cafes**.

In addition, a **Science as Art competition** will be held. The competition is open to all registered meeting attendees. Prizes of up to \$400 will be awarded. The deadline for entries is Oct. 18.

## Hotels in Boston

The 2010 MRS Fall Meeting will be held at the Hynes Convention Center and Sheraton Boston Hotel in Boston, Massachusetts. For your convenience, special room rates have been arranged at the hotels listed below. Rooms are limited at these rates, so make your reservation early. Your patronage of the official hotels enables MRS to secure the meeting space at a greatly reduced cost. Check the MRS Web site for more information: [www.mrs.org/F10](http://www.mrs.org/F10).

- **Sheraton Boston Hotel**  
 Deadline: November 8, 2010  
 Tel: 617-236-2000  
 Single.....\$181 + tax  
 Double .....\$191 + tax
- **Boston Marriott Copley Place**  
 Deadline: October 22, 2010  
 Tel: 617-236-5800  
 Single.....\$175 + tax  
 Double .....\$192 + tax
- **Boston Park Plaza**  
 Deadline: November 19, 2010  
 Tel: (617) 426-2000  
 Single.....\$164 + tax  
 Double .....\$164 + tax
- **Westin Copley Place**  
 Deadline: October 29, 2010  
 Tel: (617) 262-9600  
 Single.....\$178 + tax  
 Double .....\$198 + tax
- **Hilton Boston Back Bay**  
 Deadline: October 22, 2010  
 Tel: (617) 236-1100  
 Single/Double.....\$178 + tax  
 Triple/Quad.....\$198 + tax
- **Embassy Suites Boston at Logan Airport**  
 Tel: (617) 567-5000  
 Single.....\$129 + tax  
 Each additional person \$10

State and local taxes are currently at 14.45%



## Career services, student events, and networking opportunities

MRS will host a **Career Center** for meeting attendees, to be held Nov. 30–Dec. 2 at the Hynes Convention Center. Services include access to current job postings, a resume file for prospective employers, and onsite interview opportunities.

**Gold and Silver Graduate Student Awards** will be presented during the Awards Ceremony to graduate students whose academic achievements and current materials research display a high level of excellence and distinction.

Graduate students and members of MRS University Chapters are invited to attend the **student mixer**, and chapter officers and faculty advisors are invited to attend a **meeting of MRS University Chapter representatives** to compare notes on recent activities and brainstorm new projects and issues of common concern. Those interested in starting new chapters are also welcome. Details will be available on the MRS Web site.

## Other events coinciding with the meeting

MRS is holding the **X-Ray Scattering Methods for Characterization of Nanomaterials Workshop** in Boston on Dec. 3. The aim of this workshop is to give the attendees insight into valuable characterization tools to help unravel nanostructural parameters of samples and/or devices by using x-ray diffraction and scattering techniques. The workshop will start with a brief history of nanomaterials and their main applications given by **Z.L. Wang** of Georgia Institute of Technology, and continue with a short history of the x-ray scattering methods given by **Robert L. Snyder** of Georgia Institute of Technology. Then leading experts on each scattering method will give a practical tutorial on how to apply

different scattering methods to nanomaterials characterization, what parameters can be extracted from each method, and also what are the limitations of each method discussed for nanomaterials characterization. Each session will include practical examples and also tips and tricks on how to collect and interpret the data. Invited instructors include **Thomas Proffen** of Los Alamos National Laboratory and **Andrew Payzant** of the Center for Nanophase Materials Sciences at Oak Ridge National Laboratory. The workshop will conclude with a field trip to tour PANalytical's Applications Laboratory where attendees can see the latest developments in x-ray diffraction laboratory systems. Roundtrip transportation and refreshments will be provided.

On Nov. 30, 7:00 p.m.–9:00 p.m., a re-training session will be held for evaluators for the Accreditation Board for Engineering and Technology, Inc. (ABET).

## For more information

See the following pages for additional information on the MRS award recipients and the plenary speaker.

The deadline to pre-register for the meeting is **November 12, 2010, 5:00 p.m. (EST)**. International travelers are reminded to allow ample time to obtain a visa, if necessary. For additional details about the meeting, contact MRS Member Services, Materials Research Society, 506 Keystone Drive, Warrendale, PA 15086-7573, USA; e-mail [info@mrs.org](mailto:info@mrs.org), tel. 724-779-3003, and fax 724-779-8313. Details of various events and activities will be published in the Program and Exhibit Guide available on site. The MRS Web site can be accessed for updated information on confirmed talks and details of special events, for more information on obtaining a visa, and for pre-registration: [www.mrs.org/F10](http://www.mrs.org/F10).

### 2010 MRS FALL MEETING REGISTRATION RATES

	Pre-Registration Before 5:00 p.m. (EST), November 12, 2010	On-Site Registration
Member	\$455	\$555
Student Member	\$110	\$140
Nonmember	\$555	\$655
Student Nonmember	\$135	\$165
Unemployed/Retired	\$135	\$165



## L. Eric Cross to receive 2010 Von Hippel Award

The 2010 Von Hippel Award, the Material Research Society's highest honor, will be presented to L. Eric Cross, Evan Pugh Professor Emeritus of Electrical Engineering, Materials Research Institute, The Pennsylvania State University. Cross is being recognized "for his imposing leadership in the science and applications of ferroelectric materials." Cross will accept the honor during the awards ceremony at the 2010 MRS Fall Meeting, in Boston, on Wednesday, December 1, in the Grand Ballroom of the Sheraton Boston Hotel, where he will present his award lecture, "Flexoelectric Composites—The Cutting Edge for New Lead-Free Piezoceramics."

Cross is a leading expert in the field of ferroelectric materials. This covers a diverse set of materials and phenomena including ferroelectrics, piezoelectrics, ferroelastics, and more recently the novel class of materials termed "relaxor ferroelectrics" (for which he was awarded the MRS Medal in 1992). These materials exhibit a rich, hierarchical spectrum of phase transitions, the underpinning physics of which was elegantly elucidated by Cross and his co-workers, and a unique signature of their polar state, including a frequency dependence of the dielectric response, large usable electrostrictive coefficients, and the gradual development of a macroscopic spontaneous polarization. His fundamental measurements on these systems led to the development of numerous practical devices such as electrostrictive actuators which show little hysteresis in the strain response, and are therefore ideal for a number of applications requiring a return to a fiducial position. One of the most visible applications of these devices, based on Cross's early

research, is the corrective mirror used in the Hubble space telescope. Positioning of the mirror using six electrostrictive actuators enabled the Hubble to achieve its original design specifications.

In addition to the practical results evolving from his work on relaxors, Cross has provided the field with a sound scientific basis. He recognized that at certain temperatures, these materials, unlike classical ferroelectrics, are comprised of "nanopolar" regions whose nature and extent change with electric field. This enabled him to define one of the earliest "nano" materials, as well as to lay the foundation for a school of thought that is generically applicable to many types of complex materials. For example, recent findings in the field of colossal magnetoresistive (CMR) manganites and related "highly correlated" electron systems have revealed the nanoscale coexistence of highly conducting regions with insulating regions, through an electronic phase separation scenario. It is also believed that the extent and connectivity of these two phases can be changed through the application of electric and/or magnetic fields, analogous to the behavior of "relaxor" ferroelectrics. Many physicists now refer to these materials as "relaxor-like" correlated systems.

Cross has also made major contributions to the development and application of phenomenological descriptions of ferroelectrics. He was the first to correctly report the spontaneous polarization of  $\text{BaTiO}_3$  (the materials used for billions of capacitors produced annually). Similar careful measurements in the lead zirconate titanate family resulted in a series of highly cited articles

describing the phenomenology of that family across the phase diagram. These articles are still widely used in calculations on the system, which remains one of the most important piezoelectric ceramic systems. These phenomenological calculations also allowed Cross to unambiguously separate intrinsic and extrinsic (domain wall and phase boundary) contributions to the dielectric and piezoelectric response of ferroelectrics. His careful electric measurements at low temperatures confirmed the importance of extrinsic contributions to the elasto-dielectric properties, and were pivotal in molding the physical understanding of the properties of ferroelectric materials. His long-term, extraordinarily fruitful collaboration with Robert Newnham of Penn State resulted in numerous other breakthroughs, including the development of piezoelectric-polymer composites and their application to sonar and biomedical ultrasound.

Cross has guided several generations of graduate students through his laboratory; he has graduated at least 59 PhD students and many of his students are themselves leaders in the field as well as in industry, national laboratories, and in key government positions throughout the world. His educational impact is not limited to the mentoring of his graduate students: Innumerable scientists and professionals have been taught the basics of ferroelectricity and relaxor behavior through his classic tutorial lectures.

The strong leadership provided by Cross during his career has made a defining contribution to the scientific standing of the field of ferroelectricity. In the early stages of his career, he was responsible for introducing the field of electroceramics into conferences such as the International Meeting on Ferroelectricity; the International Symposium on Applications of Ferroelectrics; and the International Symposium on Integrated Ferroelectrics; he was deeply involved in the inaugural MRS meeting, held at the Pennsylvania State University in 1973, where he chaired the National Conference on Phase Transitions and Their Applications in Materials Science. Together with Kiyoshi Okazaki of Shonan



Institute of Technology, he founded the U.S.-Japan Meetings on Dielectric and Piezoelectric Ceramics which were the first of their kind to provide meaningful interactions and visits between “ferro-electricians” of both countries.

Cross completed his education at the University of Leeds, receiving a BSc degree in 1948 and a PhD degree in 1952. On completion of two research fellowships at the University of Leeds in 1961, he accepted a position as senior research associate at the Pennsylvania State University, where he was appointed associate professor in 1964, Professor of Solid State Science in 1964, and Professor of Electrical Engineering in 1968. Cross assumed his present position in 1985,

and served as director of the Materials Research Laboratory from 1985 to 1989. He is the author of more than 600 articles in scientific journals.

Cross is a fellow of MRS, the American Physical Society, the American Ceramic Society, the Institute of Electrical & Electronics Engineers (IEEE), and the American Optical Society. He has received numerous Honorary Doctorates from universities around the world, and his many awards include the MRS Medal in 1992, membership into the National Academy of Engineering in 1983, and key awards and prizes from the IEEE and American Ceramics Society. He serves on many key national and international advisory boards, including the

Defense Science Research Board, and became a permanent U.S. representative for ferroelectricity in the International Union of Pure and Applied Physics (IUPAP) Engineering in 1983.

The MRS Von Hippel Award includes a \$10,000 cash prize, honorary membership in MRS, and a unique trophy—a mounted ruby laser crystal, symbolizing the many faceted nature of materials research. The award recognizes those qualities most prized by materials scientists and engineers—brilliance and originality of intellect, combined with vision that transcends the boundaries of conventional disciplines, as exemplified by the life of Arthur von Hippel (<http://vonhippel.mrs.org>).



## David D. Awschalom selected for 2010 David Turnbull Lectureship

The Materials Research Society’s David Turnbull Lectureship recognizes the career of a scientist who has made outstanding contributions to understanding materials phenomena and properties through research, writing, and lecturing, as exemplified by David Turnbull of Harvard University. This year David D. Awschalom of the University of California, Santa Barbara, has been selected to give the 2010 Turnbull Lecture. Awschalom is cited “for pioneering achievements and leadership in establishing the field of semiconductor spintronics, including fundamental discoveries of spin transport and coherence in the solid state, developing new experimental techniques and materials engineering for spin-based quantum information science, and for excellence in communication through lecturing and writing.” He will be presented with the

award at the 2010 MRS Fall Meeting in Boston, where he will deliver his award lecture, “Semiconductor Spintronics and Quantum Information Processing,” on Tuesday, November 30 at 5:15 p.m. in the Grand Ballroom of the Sheraton Boston Hotel.

Awschalom has been one of the key contributors to the understanding of coherent spin phenomena in a wide range of semiconductor materials, including semiconductor heterostructures and quantum dots. He pioneered the field of semiconductor spintronics, and continues to play a leading role in the discipline by inventing new femtosecond spatially resolved semiconductor spectroscopies, and developing submicron-scale spin-based systems. His engineering of electrically and magnetically doped semiconductors to explore electron spin transport have had a dramatic impact in

the materials science and engineering communities. These activities have led to several seminal discoveries in science and engineering, including long-lived electron spin coherence in semiconductors, macroscopic transport of coherent spin states, electrical spin injection into semiconductors, ultrafast manipulation of electron and nuclear spins, engineered magnetic heterostructures, and the discovery of the spin-Hall effect. His temporally and spatially resolved experiments explore the spin degrees of freedom in a wide variety of semiconductor heterostructures and nanometer-scale systems. This work has generated new probes of fundamental spin interactions for the scientific community and opened the possibility of future technologies based on the spin degree of freedom. In addition to semiconductor spintronics, these discoveries have made this technology attractive for the implementation of quantum computing in the solid state. Awschalom’s success is based on his persistent efforts toward the integration of the materials science, physics, and electrical engineering communities that have created new opportunities for research and technology in the emerging fields of solid-state spintronics and quantum computation.

In a series of publications, starting in 1996, Awschalom has demonstrated



ways to detect and control the spin-coherence of carriers, magnetic impurities, and nuclear spins in a variety of semiconductors and nanostructures by the development and use of femtosecond time-resolved Faraday/Kerr rotation spectroscopies. In 1996, Awschalom showed coherent transfer of angular momenta from optically generated carriers to magnetic spins and their terahertz spin precession, which paved the way to a series of discoveries regarding the generation, transport, detection, and manipulation of spin-coherence of various spins in semiconductors. He then showed that appropriate doping can enhance the lifetime of carrier spin-coherence by orders of magnitude and the carrier spin-coherence can be spatially dragged by applying external electric fields, which was an important finding for the future device usage of spin-coherence. This observation was made possible by Awschalom's invention of a technique called "resonant spin amplification," in which carrier spins are excited synchronously in phase by successive polarized optical pulses. He then demonstrated that continuous coherent spin sourcing is possible using semiconductor heterostructures. The same optical technique was shown to be applicable to perform all optical nuclear magnetic resonance in semiconductor quantum wells. Demonstration of the use of the optical Stark effect to manipulate carrier spins in semiconductors provided

a way to manipulate spin-coherence optically, in a few hundred femtosecond time frame. Together with Hideo Ohno of Tohoku University, he reported on the first electrical spin injection from a ferromagnet into a semiconductor in 1999. And recently, he and his students observed the spin Hall effect in the solid state.

Awschalom's major contributions to the area of spintronics include his considerable devotion to educating students and young researchers in this emerging area of research. He has organized and participated in several international "Spintech" schools on spintronics and quantum information technology, intended to give students a broad overview of the field, as presented by its leading researchers. He has also received the UCSB Chancellors award for undergraduate research, and the UCSB Faculty Lecturer Award "for a combination of outstanding research contributions, scholarship, scientific leadership, broad contributions to enriching the intellectual stature of UCSB, and for his outstanding role as a teacher and mentor."

After receiving his PhD degree in physics at Cornell University in 1982, Awschalom joined the IBM T.J. Watson Research Center as a postdoctoral fellow. He was appointed to the permanent staff at IBM in 1984, and as manager of the Nonequilibrium Physics Group in 1989. In 1992, he assumed his po-

sition at UCSB where he is currently a Professor of Physics, Electrical and Computer Engineering, and the Peter J. Clarke Director of the California Nano-systems Institute. He has published more than 300 articles, made over 700 invited presentations, and he has been awarded four patents. Awschalom is the founding editor of the AIP *Virtual Journal of Nanoscience and Technology*, the editor of the *Handbook of Spintronics* (Springer), and he has served as a member of the editorial board of *Nanotechnology* (Institute of Physics) and *Nano Letters* (American Chemical Society) and is currently a member of the editorial board of *Physics Reports*. He has also been awarded numerous lectureships in universities throughout the world.

Among his many professional honors, Awschalom was named MRS Outstanding Young Investigator (1992) and received the International Union of Pure and Applied Physics (IUPAP) Magnetism Prize (2003); the Oliver E. Buckley Prize, American Physical Society (2005); the Agilent Technical Europhysics Prize, European Physical Society (2005); and the Newcomb-Cleveland Prize, American Association for the Advancement of Science (2006). He is a fellow of the American Physical Society, the American Association for the Advancement of Science, and a member of the American Academy of Arts and Sciences and the National Academy of Sciences.



## Walter A. de Heer named 2010 MRS Medalist

The Materials Research Society has named Walter de Heer, Regents Professor of Physics at the Georgia Institute of Technology, as an MRS Medalist "for

his pioneering contributions to the science and technology of epitaxial graphene." De Heer will be recognized during the awards ceremony at the 2010 MRS Fall

Meeting in Boston, where he will also give an award talk on "Epitaxial Graphene for 21st-Century Electronics." De Heer will give his presentation on Thursday, December 2 at 12:15 p.m. in the Grand Ballroom of the Sheraton Boston Hotel.

Since 2000, de Heer has been a pioneer in research on graphene, which is now a major field in materials research. He has extensively researched the physical properties of epitaxial graphene, with important results on its electronic and spectroscopic properties, the manipulation of the electric structure by influence of the substrate, and the interpretation of



different properties of single and multi-layer graphene. It was known for some time that research on graphene could be performed on exfoliated graphene films, but de Heer was able to demonstrate the fabrication and patterning of epitaxial graphene on wafer surfaces (e.g., SiC), thus opening the way for the use of graphene for applications in electronics.

During his early career, de Heer discovered the electronic shell structure in alkali clusters (1983) and intra-molecular spin relaxation in clusters (1990). He later turned his attention to the study of carbon nanotubes, where he discovered their field-emitting properties and applied this effect to flat-panel displays (1996). In 1998 he discovered that carbon nanotubes are ballistic conductors, which is their single most important electronic property and indicates the feasibility of carbon-based electronics.

By 2001, de Heer had recognized the fundamental flaws in carbon nanotube electronics related to contacts and pat-

ternerng. In his first graphene proposal in 2001 to a government agency, he reasoned that graphene-based electronics could overcome the problems of carbon nanotubes, while retaining their essential advantageous features. By 2003, de Heer and his team had the required experimental evidence to support the concept of epitaxial graphene as a new electronic material. This data was also the basis for the first graphene electronics patent that was filed in 2003 and issued in 2006. After proposing graphene-based electronics, de Heer has since relentlessly pursued the science and technology of epitaxial graphene.

Industry has recognized the importance of epitaxial graphene on silicon carbide. Major programs in Europe, Asia, and the United States are now uniquely focused on this new material. The Carbon Electronics for RF Applications (CERA) of the Defense Advanced Research Projects Agency is based on de Heer's pioneering work, and specifically

on the demonstrations of the large-scale patterning of epitaxial graphene transistor arrays on a single epitaxial graphene chip. The concepts and methods developed by de Heer have also been adopted by IBM to produce 100 GHz transistors.

De Heer received a PhD degree in physics from the University of California, Berkley in 1985, where he continued as a postdoctoral fellow. In 1987, he accepted a position at the Ecole Polytechnique Fédérale de Lausanne, Switzerland. Since 1996, he has been Professor of Physics (since 2008, Regents Professor of Physics) at Georgia Institute of Technology. He has published more than 100 articles, with a total of 17,000 citations. De Heer is a fellow of the American Physical Society and received the IBM Faculty Fellowship Award in 2007 and 2008, and the Sigma Xi Sustained Research Award in 2008.



## Christopher P.J. Barty to give MRS plenary address on the U.S. National Ignition Facility

Christopher P.J. Barty, chief technology officer for the National Ignition Facility and Photon Science Directorate at the Lawrence Livermore National Laboratory, will deliver the plenary address at the 2010 Materials Research Society Fall Meeting in the Grand Ballroom of the Sheraton Boston Hotel. His presentation is titled, "Creating Star Power on Earth—The Path to Fusion at the National Ignition Facility."

His academic background includes PhD and MS degrees in applied physics from Stanford University and BS de-

grees, each with honors, in chemistry, physics, and chemical engineering from North Carolina State University. He has published more than 200 articles and presented over 200 invited talks, spanning topics in lasers, optics, materials science, medicine, chemistry, engineering, and physics. He was elected a fellow of the Optical Society of America for his pioneering work on intense short-pulse lasers and x-ray applications. Barty has founded both the biennial international meeting on Ultrafast Optics and the International Conference on Ultrahigh

Intensity Lasers. Currently, he is the co-chair of the International Committee on Ultrahigh Intensity Lasers.

Before his arrival at LLNL in 2000, Barty had been Director of Laser Science for a privately funded research organization at the University of California at San Diego, Director of Advanced Technology for a Silicon Valley laser company, and had served as a member of the Applied Physics and Electrical Engineering Faculty at Stanford University. At LLNL, Barty has served as the chief scientist for the Laser Science and Technology Program and was the architect and the first program director of the mission-based, Photon Science and Applications Program.

His technical interests include development of new optical capabilities for fusion energy drivers, directed energy systems, nuclear photo-science, high-energy-density science, fast ignition, and laser-based x-ray applications of relevance to national security-related missions.



# 2010 **MRS** FALL MEETING SYMPOSIUM PROCEEDINGS

Place your order today for proceedings of the 2010 MRS Fall Meeting in Boston and SAVE!  
Special pre-meeting prices (prices in red) effective until December 17, 2010.  
After December 17, 2010, pay the higher prices on the right.

These books are scheduled for publication by spring or early summer 2011.

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11:00 am – 5:30 pm

Wednesday, December 1  
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Join us for a  
**Wine & Cheese  
Happy Hour Reception**  
on Wednesday  
from 5:00 to 6:00 pm



## JMR announces enhancements for 2011

Expands Benefits for Authors, Readers and Libraries

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

The Materials Research Society (MRS) has undertaken a number of improvements to the *Journal of Materials Research (JMR)* over the past year and more are planned for 2011.

Readers may have already noticed an updated logo and new cover design featuring select author art. In addition, 2010 saw *JMR* expand its focus on Materials Communications and Review Articles, institute an RSS Feed, and produce two well-received special issues on energy.

As the publication launches its 26th year, a wide range of additional enhancements will continue to expand benefits and services to *JMR* authors, readers, and libraries. Many of these improvements are the result of a recent publishing partnership between MRS and Cambridge University Press. Effective January 1, 2011, all MRS publications, including *JMR*, will be hosted on Cambridge's cutting-edge electronic platform, Cambridge Journals Online (CJO).

According to Gary L. Messing, *JMR* Editor-in-Chief, "Cambridge is a hallmark of quality. This transition will allow *JMR* to build on its solid foundation and move forward with greatly expanded functionality. We will continue to focus on our strength—delivering innovative, high-quality content and editorial integrity. The collaboration with Cambridge will provide unparalleled international reach in education and science and a powerful electronic platform serving the science community."

In the coming months, *JMR* authors and readers should look for these expanded benefits and services.

- **No author page charges.** *JMR* has eliminated the financial barrier to publication.
- **24 issues per year.** Increasing from 12 to 24 issues per year means an expedited review process and fast-track publication, which is essential because important research needs to be published quickly.

- **Free online color.** Incorporating color enhances the presentation of data and improves the overall impact of the technical content.
- **Transition to the CJO electronic platform.** The powerful CJO platform will provide member and institutional subscribers with enhanced access, search, discovery, and dissemination functionality such as social bookmarking, citation exports, and quick links to Top 10 Most Read Articles and Top 10 Most Cited Articles.
- **First View.** Accepted *JMR* articles will now be published online—weeks before they are available in print—via CJO's First View.
- **Electronic-only subscription options.** Both MRS members and institutions may now opt for an electronic-only subscription to *JMR*. The traditional print-plus-online package will also be available.
- **Three special focus issues.** A special issue on Self-Assembly and Directed Assembly of Advanced Materials will be featured in January 2011. "Thermoelectric Materials" and "Nanowires: Fundamentals and Applications" will be featured, respectively, in August and September.

For the most up-to-date information on *JMR*, visit [www.mrs.org/jmr](http://www.mrs.org/jmr).

### 17th International Conference on Microscopy of Semiconducting Materials to be held in April 2011 <http://msm2011.org>

The 17th international conference on Microscopy of Semiconducting Materials will be held at Churchill College, University of Cambridge, UK on April 4–7, 2011. This meeting, chaired by Thomas Walther and Tony Cullis of the University of Sheffield and Paul Midgley of the University of Cambridge, will focus on the latest developments in the study of the structural, electronic, and optical properties of semiconductors by the application of transmission and scanning electron microscopy and scanning probe microscopy as well as ion- and x-ray-based methods.

Conference sessions will concentrate on key topics including state-of-the-art studies in high-resolution imaging and analytical electron microscopy; advanced scanning electron, scanning ion, and scanning probe application; novel epitaxial layer phenomena; the properties of quantum nanostructures (i.e., quantum wells, wires, and dots), III-nitride developments; GeSi/Si for advanced devices; metal-semiconductor and oxide-semiconductor contacts; and silicides and the important effects of device processing treatments.

Confirmed invited speakers include

M. Albrecht (Institute for Crystal Growth, Germany) on cathodoluminescence, H. Amano (Meijo University, Japan) on aluminium gallium nitride, G.A. Botton (McMaster University, Canada) on electron microscopy of buried clusters and epitaxial nanowires, A. Delobbe (Orsay Physics, France) on improved focused ion beam instrumentation, and V. Grillo (University of Modena, Italy) on annular dark-field imaging.

The **abstract deadline is December 10, 2010**. For further details and information on abstract submission and registration, access the conference Web site <http://msm2011.org> or send an e-mail to [claire.garland@iop.org](mailto:claire.garland@iop.org). □



CALL FOR PAPERS

**FOCUS ISSUE**

Journal of Materials Research  
August 2011

**Advances in Thermoelectric  
Materials**

Thermoelectric materials exhibit the novel attribute that they can convert thermal energy (heat) directly into electricity as a solid-state conversion process with no moving parts. The thermoelectric conversion efficiency is directly proportional to the Carnot efficiency of a heat engine operating between the two temperatures. Thermoelectric materials can also behave as solid-state refrigerators via the Peltier effect in these materials. Recently, there have been significant advances in direct thermal-to-electrical energy conversion materials and this has generated increased interest in the field. *JMR* will publish a focused issue on Thermoelectric Materials in August 2011. This issue will capture some of the most important recent advances in fundamental materials design and resulting thermoelectric properties. The issue will also include several review articles that will highlight the important developments and various directions of the field over the last few years.

This focused issue will include a combination of new theoretical ideas, new materials and new device concepts in the field. It will focus on novel materials, various methods of materials processing and synthesis along with technologies and applications related to direct thermal-to-electric energy conversion and cooling.

**Topics to be addressed include, but are not limited to, the following:**

- ◆ Oxides and other materials with strong electron correlation
- ◆ Theoretical guidance to high efficiency thermoelectric energy conversion
- ◆ New and emerging technologies for TE power conversion
- ◆ High efficiency bulk TE materials
- ◆ Composite and nano-composite thermoelectrics
- ◆ Thermoelectrics related to harvesting solar energy
- ◆ Low dimensional aspects of TE materials
- ◆ Synthetic strategies for preparing novel materials and compounds
- ◆ Role of spark plasma sintering techniques for TE materials
- ◆ Processing of bulk and thin film nanostructured materials
- ◆ Materials property measurement and new measurement techniques
- ◆ Design, performance testing, fabrication and processing of energy conversion devices
- ◆ Applications and new directions in thermal energy conversion
- ◆ Advances in materials property measurements and characterization

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**SUBMISSION DEADLINE: DECEMBER 15, 2010.**

Please select "Focus Issue: *Advances in Thermoelectric Materials*" as the manuscript type when submitting.

**FOCUS ISSUE**

Journal of Materials Research  
September 2011

**Nanowires: Fundamentals  
and Applications**

Research on nanowires encompasses fundamental issues in crystal growth and the scaling of materials properties to molecular dimensions, and work on possible applications of nano-scale single crystal assemblies in advanced devices. The goal of this *JMR* focus issue is to summarize leading research performed by the broad, multidisciplinary community of nanowire researchers to provide a review of 1) the current state of the field and 2) the opportunities for future high-impact science and technology related to semiconductor nanowires.

**Contributed papers are solicited on the following topics:**

- ◆ Top-down and bottom-up assembly of nanowire arrays
- ◆ Catalyzed versus non-catalyzed nanowire growth
- ◆ Catalyst materials selection
- ◆ Vapor, solution, and template mediated nanowire growth
- ◆ Thermodynamics and kinetics of nanowire nucleation and growth
- ◆ Crystallographic and topological orientation control
- ◆ Axial and core-shell heterostructures – synthesis and properties
- ◆ Limits to nanowire area and length scaling
- ◆ Size-dependent electronic, optical and mechanical properties
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Please contact [jmr@mrs.org](mailto:jmr@mrs.org) with questions.

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