

Materials Research Outreach Arranged for the 2004 MRS Fall Meeting

A set of activities designed to promote materials science outreach has been arranged by the 2004 Materials Research Society Fall Meeting Chairs Shefford P. Baker (Cornell University), Bethanie J.H. Stadler (University of Minnesota), Julia Hsu (Sandia National Laboratories), and Richard Vaia (Air Force Research Laboratory).

"Science outreach to the public is a national priority right now," said Baker. "MRS as a society as well as many individual MRS members have made significant commitments in this area, and we wanted both to highlight these contributions at our Meeting as well as to generate new opportunities for outreach."

Free Passes to *Strange Matter* Exhibition Available to Meeting Attendees

Attendees of the 2004 MRS Fall Meeting will have the opportunity to visit the MRS science exhibition *Strange Matter*, which will be hosted at Boston's Museum of Science October 2, 2004 through January 3, 2005. A voucher for free admission will be provided to each meeting attendee, and a daily shuttle to the museum will be in operation, free, throughout the week of technical talks.

Stadler said, "*Strange Matter* is an important new effort on the part of the Society to promote science education, and materials research in particular, to the public. The results are terrific, both in terms of attendance and in MRS volunteer contributions at the hosting museums. We hope MRS members will see the exhibition while they're in Boston."

By providing admissions to the exhibition, the Meeting Chairs hope to engage more MRS members in outreach. An integral part of *Strange Matter* is its educational outreach component. Materials scientists volunteering at the hosting science centers have an opportunity to lead tutorials and demonstrations or to guide museum visitors through the exhibition's hands-on activities. Fall Meeting attendees can learn more about volunteer opportunities by visiting the *Strange Matter* display in the Hynes Convention Center, Exhibit Hall C. See also the article "MRS Volunteers Explain 'Strange Matter'" in *MRS Bulletin* 29 (8) (August 2004, p. 590) (www.mrs.org/publications/bulletin).

The *Strange Matter* exhibition and its tour are made possible by the generous support of the National Science Foundation, Alcan Inc., Dow, Ford Motor Com-



pany Fund, Intel Innovation in Education, and the 3M Foundation. The admission passes and transportation during the Fall Meeting are being provided by Raytheon Company.

High School Teachers to Attend the Fall Meeting


High school science and math teachers selected from across the United States will participate in the MRS Meeting through a specially designed educational program.

"High school teachers can strongly influence career decisions, but generally do not have opportunities to experience science and engineering first hand, and may not be aware of career opportunities in materials research," said Baker.

Teachers selected for this program will work together with an MRS member in both research and classroom activities. A set of related activities for the teachers and meeting attendees has been arranged by the Meeting Chairs and the organizers of Symposium PP (Communicating Materials Science—Secondary Education for the 21st Century), Shenda Baker (Harvey Mudd College), Fiona Goodchild (University of California, Santa Barbara), Wendy Crone (University of Wisconsin—Madison), and Susan Rosevear (Massachusetts Institute of Technology).

Teachers can attend special workshops at the Museum of Science as well as

Symposium PP. Shenda Baker, who also chairs the *Strange Matter* project committee, said that her symposium focuses on secondary education and communicating materials science. "It is intended to bring together educators and researchers to discuss the future of science education," she said.

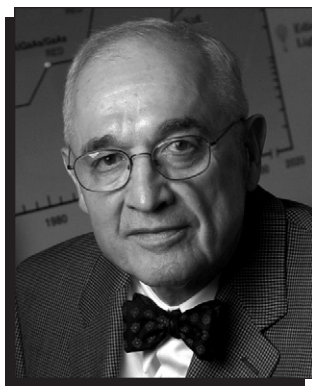
The teachers will be introduced to the *Strange Matter* exhibition along with its associated, award-winning Web site (<http://www.strangematterexhibit.com>) that includes a teacher's guide. For MRS members interested in outreach, Symposium PP offers a tutorial, "Demoworks—The Fine Art of Materials Science Demonstrations," designed with guidelines on how to conduct successful outreach programs, as well as a "recipe book" of effective materials science demonstrations for use in secondary schools. The high school teacher program is sponsored by the National Science Foundation. 

Nick Holonyak Jr. to Receive 2004 MRS Von Hippel Award for Contributions to the Field of Semiconductors

The 2004 Von Hippel Award, the Materials Research Society's highest honor, will be presented to Nick Holonyak Jr., who holds the John Bardeen Endowed Chair in Electrical and Computer Engineering and Physics at the University of Illinois, Urbana-Champaign. Holonyak is being recognized for "his many contributions to research and development in the field of semiconductors, not least for the first development of semiconducting lasers in the useful visible portion of the optical spectrum." Holonyak will accept the honor during the awards ceremony at the 2004 MRS Fall Meeting in Boston on December 1 at 6:30 p.m. in the Sheraton Boston Grand Ballroom, where he will also present his award lecture, "From Transistor to Laser and Light-Emitting Diode."

Holonyak has worked at the forefront of semiconductor science and technology for more than 50 years. He is best known for his work on light-emitting diodes (LEDs) and for the development of the first visible-spectrum (red) LED. His work laid the foundation for fundamental and practical developments in the field of compound semiconductors. These include the first epitaxial growth of alloy semiconductors and heterojunctions, such as those now used in essentially all state-of-the-art compound semiconductor devices. Holonyak demonstrated the first growth of quaternary alloy semiconductors. He invented impurity-induced disordering in alloy semiconductor heterostructures and the formation of stable oxide layers from Al-containing alloys. He and his students are the source of the term "quantum-well laser." More recently, Holonyak, along with other collaborators, demonstrated tunneling-coupled quantum-well-assisted quantum-dot lasers. He has always encouraged collaborations across disciplines addressed by materials and device engineering, chemistry, and physics.

Holonyak earned his BS, MS, and PhD degrees from the University of Illinois in electrical engineering. In 1951, he took his first course from John Bardeen and first laid eyes on a transistor. Subsequently, in 1952, Holonyak transferred out of vacuum tube research and into Bardeen's semiconductor laboratory, where he became Bardeen's first graduate student. Upon



Nick Holonyak Jr.

graduation, Holonyak joined Bell Labs for a year, then served in the U.S. Army Signal Corps., and next joined General Electric, where he carried out his seminal work on LEDs. In 1963, he joined the University of Illinois. His sustained high level of contribution makes Holonyak's career one of the most remarkable in the history of semiconductors.

One of Holonyak's early major developments was the demonstration of closed-tube vapor transport of GaAsP alloys in 1960, yielding in 1962 the first practical visible LED, the red GaAs_{1-x}P_x LED. This marks the beginning of the use of III-V alloys in semiconductor devices, including in heterojunctions and quantum-well heterostructures. Much of the technology utilized in the multibillion dollar LED industry can be traced back to his early work and the later work on quaternary alloy semiconductors. Another of Holonyak's early achievements was the invention of the shorted emitter *p-n-p-n* switch, currently used in all thyristor applications. He was the first to make Si tunnel diodes and observe photon-assisted tunneling, marking the beginning of tunneling spectroscopy.

Holonyak and his students demonstrated the visible-spectrum laser operation of various alloys including InGaP (1970), AlGaAsP (1970), and InGaPAs (1972). His research group made the initial *p-n* quantum-well (QW) laser diode and the first continuous 300 K operation of a QW laser (using metalorganic chemical-vapor-deposited AlGaAs-GaAs). His group introduced impurity-induced inter-

mixing of QW heterostructure and superlattice layers. In 1990, his group introduced Al-bearing III-V native oxides into optoelectronics, including its use as a buried oxide aperture to define current and cavity in lasers, now used in vertical-cavity surface-emitting lasers (VCSELs). More recently, in association with other collaborators, he demonstrated tunneling-coupled QW-assisted quantum-dot lasers (quantum one-dimensional to three-dimensional coupled systems).

Holonyak has co-authored more than 500 papers and received 33 patents over the course of his career. He is a member of both the National Academy of Science and the National Academy of Engineering. He has received numerous awards during his distinguished career, including the IEEE Edison Medal and the National Medal of Science. He received the prestigious Japan Prize in 1995. Most recently, in 2003, he received the National Medal of Technology; the IEEE Medal of Honor, which is the highest award of the Institute of Electrical and Electronics Engineers; and he shared the first Russian Global Energy International Prize; and in 2004, the Lemelson-MIT Prize.

Holonyak has attracted outstanding students and supervised the doctoral studies of more than 60 students, many of whom have continued into distinguished careers of their own. Many of his former students are members of the National Academy of Engineering (8), fellows of IEEE, and senior faculty members at universities or hold key positions in major U.S. electronics companies. For his excellence in education, Holonyak received the Monie A. Ferst Award from Sigma Xi, the Scientific Research Society.

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 scientific disciplines, as exemplified by the life of Arthur von Hippel (<http://vonhippel.mrs.org>). MRS

Arthur
Von Hippel
(1898-2003)

New Web site from MRS celebrates the life and times of Arthur von Hippel
<http://vonhippel.mrs.org/>

NEW!

Frank S. Bates Selected for 2004 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, Frank S. Bates, Distinguished McKnight University Professor and head of the Chemical Engineering and Materials Science Department at the University of Minnesota, has been selected to deliver the 2004 David Turnbull Lecture. Bates is cited for his "pioneering contributions to the fundamental understanding of structure and properties of complex polymeric materials, particularly block copolymers and polymeric vesicles, coupled with outstanding lecturing, writing, teaching, and educational leadership." He will deliver his lecture, "Network Phases in Block Copolymer Melts," at the 2004 MRS Fall Meeting in Boston on November 30 at 5:00 p.m. in the Hynes Convention Center, Room 309.

For the past 20 years, Bates has been a major intellectual and experimental force in driving important directions in polymer science. He is best known for his studies of phase behavior in block copolymers, challenging some universally held assumptions. For example, he was the first to show that isotopic substitution alone (i.e., deuterium for hydrogen) could induce phase separation in polymer mixtures. Bates has made strides in the area of surfactants, demonstrating that polymeric nonionic surfactants can readily be induced to form giant wormlike micelles and vesicles—a new class of complex materials—called "polymersomes." The membranes of these artificial vesicles are more than 10 times stronger than those in living cells; they are used to encapsulate a variety of different materials suitable for drug delivery and gene therapy applications.

Among his seminal contributions to the field of complex polymeric materials, in the mid-to-late 1980s, were his discoveries of unique morphologies, new phases, and extraordinary rheological and mechanical properties of block copolymers. One of the first scientists to use neutron reflectometry for the study of polymer thin films, Bates opened the field of shear flow effects on copolymer phase separation, and



Frank S. Bates


he saw unique ways to connect his studies of block copolymer phase separation with the development of useful new properties in bulk block copolymers. Among his most cited results were the characterization and explanation of the bicontinuous cubic gyroid phase in block copolymers. While most studies concentrated on diblock copolymers, Bates pursued the creation and understanding of copolymers whose molecules contain 3–5 blocks, having controlled chemistries and unprecedented morphologies and properties.

Polymer blends represent a major area of research in which Bates demonstrated the presence of isotropic Lifshitz behavior in a three-dimensional system. His group used carefully tailored polymer/polymer/copolymer ternary blends. Bates recognized early on that his research depended on ready access to model materials, so he systematically developed expertise in controlled polymerization and modification. Another important impact Bates has made in his field is his discovery of how to weld together two incompatible polymers, such as polyethylene and polypropylene, the most common commercial plastics, accounting for over \$100 billion in sales annually. This work has led to polymeric laminates and blends of extraordinary strengths.

With more than 215 publications, including six in *Science* and over 20 in *Physical Review Letters*, and a number of definitive and highly quoted review articles and chapters, Bates has made a substantial contribution to the literature of his

field. He is also known to deliver captivating lectures. Students have described Bates as an inspiring teacher, mentor, and role model. A number of his former students and postdocs are successful professors and highly regarded corporate leaders.

Prior to becoming head of his department, Bates co-founded and co-directed the Materials Research Science and Engineering Center (MRSEC) at the University of Minnesota, which focuses on polymer materials. A hallmark of this MRSEC is its emphasis on education and training Native Americans. In partnership with 13 tribal colleges, the center offers a large number of undergraduate and graduate fellowships for Native Americans, a highly underrepresented group in science and engineering.

Upon receiving his ScD degree from the Massachusetts Institute of Technology in 1982, Bates joined AT&T Bell Laboratories as a member of the technical staff, becoming a Distinguished Member of the Technical Staff in 1988. He began his tenure at the University of Minnesota in 1989. Bates currently serves on the Department of Energy Council on Materials Sciences. He has served as chair of the National Steering Committee for an Advanced Neutron Source, president of the Neutron Scattering Society of America, and member of the editorial boards of several journals. He holds more than 10 patents. Among Bates's honors and awards are the American Physical Society's High Polymer Physics Prize (1997) and Dillon Medal (1989) and election to the National Academy of Engineering (2002). His honorary lectureships include the Robert Vaughn Lectureship, California Institute of Technology (1995); G. Stafford Whitby Lectures, University of Akron (1998); Aggarwal Lectures, Cornell University (1999); Amundson Lectures, University of Guadalajara (2000); Robert Madden Lecture, University of Pennsylvania (2000); S.C. Lind Lectures, University of Tennessee (2001); Rohm and Haas Lectures, University of North Carolina (2003); Laughlin Lectures, Cornell University (2003); Herbert Morawetz Lecture, Polytechnic University (2003); Joe Smith Lecture, University of California, Davis (2004); and the Warren K. Lewis Lecture, Massachusetts Institute of Technology (2004). 

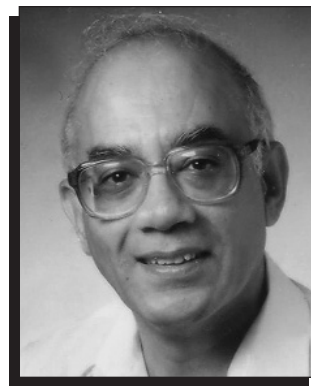
Israelachvili, Lu, and Sinha Named 2004 MRS Medalists



Jacob Israelachvili



Toh-Ming Lu



Sunil Sinha

The Materials Research Society has selected three scientists to receive the MRS Medals for 2004, which recognize a specific outstanding recent discovery or advancement that has a major impact on the progress of a materials-related field. **Jacob Israelachvili** (University of California, Santa Barbara), **Toh-Ming Lu** (Rensselaer Polytechnic Institute), and **Sunil Sinha** (University of California, San Diego/Los Alamos National Laboratory) will receive their medals at the 2004 MRS Fall Meeting in Boston during the awards ceremony on December 1 at 6:30 p.m. in the Sheraton Boston Grand Ballroom. Lu and Sinha, of separate research groups, are both being recognized for "seminal contributions to understanding mechanisms of thin-film surface and interface morphology evolution and establishing the foundations of diffraction and scattering methods for its quantitative analysis." Israelachvili is being honored for "work on adhesion and friction, which has revolutionized the understanding of molecular mechanisms responsible for these technologically vital phenomena." Each medalist will deliver an award presentation earlier in the day at the Hynes Convention Center. Details will be available in the *Meeting & Exhibit Guide* on-site.

Throughout their careers, Lu and Sinha, with their respective research groups, have each contributed to theoretical and experimental quantitative analyses of surface and interface morphology evolution. Sinha applied his expertise in neutron and x-ray scattering to the analysis of surface roughness measurements, while Lu, using diffraction and atomic force microscopy techniques, studied roughening evolution during chemical vapor deposition (CVD), sputter deposition, plasma-enhanced CVD, and plasma etching of surfaces.

Author of the seminal books *Diffraction*

from Rough Surfaces and Dynamic Growth Fronts (World Scientific, 1993 and *Characterization of Amorphous and Crystalline Rough Surface: Principles and Applications* (Academic Press, 2001), **Toh-Ming Lu**, R.P. Baker Distinguished Professor of Physics at RPI, opened the way for studies of surface morphology during growth by bridging the gap between a theoretical understanding of kinetic roughening and experimental observations. While it is known that surface diffusion and shadowing influence the evolution of surface morphology, Lu has demonstrated that the re-emission mechanism, which results due to non-unity sticking coefficients during deposition, also profoundly affects surface morphology. Thin-film deposition techniques such as CVD and sputtering are a major part of modern materials research efforts and high-tech manufacturing processes. Lu's finding on the dramatic effect of re-emission during growth is a major advancement in the basic understanding of the morphological evolution of films. Opposite to the growth, the re-emission mechanism during etching, as Lu discovered, plays an equally important role in the morphological evolution of etch front during many plasma processes.

Lu has also made outstanding contributions to the science and technology of microstructure control during thin-film deposition. He invented an innovative class of partially ionized beam (self-ion) sources to grow metal and insulator thin films and interfaces with unusual properties at low temperatures. These deposition techniques enable control of the film's orientation, texture, morphology, and resistivity during growth without the use of inert gas ions. His group introduced the use of self-ions for deep via and trench filling and laid the foundation for the development of a class of semi-

conductor thin-film deposition tools called ionized metal beam deposition by industry for the advanced metallization of ultralarge-scale integrated circuits.

Lu received a PhD degree in physics from the University of Wisconsin, Madison in 1976. He is currently the director of the SRC (Semiconductor Research Corporation) Center for Advanced Interconnect Systems and Technologies and associate director of the Center for Integrated Electronic and Electronics Manufacturing. His awards and honors include the Williams Wiley Distinguished Faculty Award (2002), and fellow of the American Vacuum Society and the American Physical Society. He is author or co-author of six books and more than 320 articles.

By developing the theory of surface scattering from rough surfaces, **Sunil Sinha**, LANSCE Professor of Physics at UCSD/LANL, and his collaborators have had a profound influence on x-ray scattering studies of thin films, in particular, in interpreting diffuse or off-specular scattering from surfaces. The treatment was subsequently generalized to the case of magnetic scattering from thin films. In a seminal paper published in 1988, Sinha and his co-authors laid the foundation for a method to use diffuse or off-specular scattering from surfaces at grazing incidence to analyze the morphology of surface roughness, using both the Born approximation and the distorted wave Born approximation. The concept of self-affine roughness, generalized and applied by Sinha to the scattering theory using parameters such as mean square roughness, roughness correlation length, and roughness exponent, has proven to be a useful method of characterizing rough surfaces, becoming standard in the literature. Most recently, Sinha and his group have carried out the first grazing-incidence neutron diffraction

study of the domain structure of micro-patterned magnetic arrays.

At Exxon, where he worked from 1983 to 1995, Sinha applied small-angle neutron scattering (SANS) to a variety of problems in liquids and soft condensed matter. He led his group in pioneering studies, including the phase separation of binary fluids in nanoporous media using contrast-matching techniques to remove the scattering from the porous medium; the first definitive study of Vycor glass (the most frequently used porous medium for studying fluids under confinement) and the first study of the conformation of polymers confined inside porous Vycor glass; and the development of strings of tubular micelles in liquid surfactants under shear. Sinha and his collaborators carried out the first SANS measurements on fractal aggregates and showed how the fractal dimension and the fractal correlation length can be determined. This has been used widely to analyze the structure of aggregates in materials ranging from gels and micro-porous media to metal clusters.

Sinha has been a major user at neutron and synchrotron facilities worldwide, and has been instrumental in popularizing the industrial usefulness of scattering techniques as a probe of materials. One consequence is the construction of the NG-7 SANS beamline at the National Institute of Standards and Technology, partly funded by Exxon.


Sinha has served on numerous science advisory committees for the government and for synchrotron user facilities. He received his PhD degree (1964) from the University of Cambridge, has over 240 publications, and is the editor of three books. Before accepting his professorship at UCSD, Sinha served as associate division director for the Experimental Facilities Division of the Advanced Photon Source at Argonne National Laboratory (1995–2001). In addition to Exxon, he has held appointments at Brookhaven National

Laboratory, Iowa State University/Ames Laboratory, and the Bhabha Atomic Research Centre in Bombay. His honors include the Arthur H. Compton Award of the Advanced Photon Source (2000), the Ernest O. Lawrence Award (1996), Guggenheim Foundation Fellow (1983), and fellowships in the American Physical Society and the American Association for the Advancement of Science.

Jacob Israelachvili, professor in the Departments of Chemical Engineering, Materials Science, and Biomolecular Science and Engineering at the University of California, Santa Barbara (UCSB), is being honored with the MRS Medal for his pioneering studies of friction and adhesion of confined polymers. His development of a molecular-scale understanding of friction, lubrication, and adhesion has had a significant impact on both nanoscale science and on technology, with industrial implications in the area of disk drives, biomedical applications, and food. Employing the surface force apparatus (SFA), which he helped develop, Israelachvili has dominated his field for over two decades. In addressing the origins of Amontons' Law—the linear relationship between the friction force and the applied load—Israelachvili demonstrated that friction and adhesion are generated thermodynamically at the molecular level (and not through a mechanical energy dissipation process over a real area of contact) through the irreversible compression–decompression cycles of trapped molecules.

Israelachvili illustrated the behavior of simple liquids and of polymers when confined between two solid surfaces. The surfaces of polymers contain both molecular ends and chains (“loops” and “coils”), whose density and mobility can be varied by changing their molecular weight (molecular length) and degree of cross-linking. By varying all of these parameters at polymer surfaces, Israelachvili and his group

found that fully cross-linked chains at surfaces produce the smallest adhesion and friction forces; uncross-linked chains whose coils can penetrate but only slowly and to a limited extent exhibit intermediate forces; while short, semi-mobile ends that can readily penetrate into an opposite surface produce the largest adhesion and friction forces. The results suggest new ways for manipulating the adhesion and friction of polymer surfaces over many orders of magnitude by adjusting the state of the surface chains. More generally, the sub-nanometer state of surface atomic and sub-molecular groups appears to be critically important in determining adhesion and friction in other materials as well, both between surfaces and in terms of the “internal friction” of composite materials, which determines their strength. Israelachvili will address this latter issue in his award presentation, “The Importance of Sub-Angstrom (Pico-Scale) Structural Details of Surfaces on Adhesion and Friction.”

In addition to his position on the faculty of UCSB, Israelachvili served as associate director of the university's Materials Research Laboratory from 1993 to 2004. He has published more than 250 papers and is author of a major textbook, *Intermolecular and Surface Forces* (2nd edition, Academic Press, 1992). Israelachvili's awards and honors include fellow of the American Physical Society, the Royal Society of London, and the Australian Academy of Science; and elected member of the U.S. National Academy of Science and elected foreign associate of the U.S. National Academy of Engineering. Upon receiving his PhD degree from the University of Cambridge (1971), Israelachvili held a postdoctoral research position at Cambridge, followed by research and professorial fellowships at the Australian National University, where he later became head of the Department of Applied Mathematics. Israelachvili began his tenure at UCSB in 1986. 

2004
MRS
FALL
MEETING

Back by Popular Demand!
The Meeting Scene...
bringing you the very best of MRS.

Attention MRS Members

Can't attend the 2004 MRS Fall Meeting in Boston?
No problem... we've got it covered.

The MRS “Meeting Scene” is coming to you!

Check your e-mail daily from November 29 through December 3. We'll be sending you news and highlights from the preceding day with links back to the meeting Web site. The Plenary and awards sessions. Symposium X talks. Poster award winners. The most exciting technical talks.

And so much more.

Plenary Speaker Mildred S. Dresselhaus to Address Advanced Materials for Energy at MRS Fall Meeting

Mildred S. Dresselhaus, Institute Professor of Physics and Electrical Engineering at the Massachusetts Institute of Technology (MIT), will present the plenary talk at the 2004 Materials Research Society Fall Meeting in Boston on November 29 at 6:00 p.m. in the Sheraton Boston Grand Ballroom. The title of her talk is "Beyond Nanotechnology—Advanced Materials for Energy and Other Key Applications."

Co-author of four books on carbon science, Dresselhaus's research interests are in experimental solid-state physics, particularly in carbon-related materials; novel forms of carbon, including fullerenes, carbon nanotubes, porous carbons, activated carbons, and carbon aerogels; other nanostructures, such as bismuth nanowires; and the use of nanostructures in low-dimensional thermoelectricity. She served as director of the Office of Science at the U.S. Department of Energy in 2000–2001. In her plenary presentation, Dresselhaus will describe research accomplishments and opportunities at the nanoscale, with special attention to the potential impact of advanced materials and nanoscience



Mildred S. Dresselhaus

on societal challenges related to a sustainable energy supply for the 21st century and beyond.

After obtaining her PhD degree at the University of Chicago (1958), Dresselhaus spent two years at Cornell University as a National Science Foundation postdoctoral fellow and then seven years as a staff member of the MIT Lincoln Laboratory in the

Solid State Physics Division. She joined the MIT faculty in the Department of Electrical Engineering and Computer Science in 1967 and the Department of Physics in 1983, and she was named an Institute Professor in 1985. She is currently the chair of the governing board of the American Institute of Physics. She has also served as president of both the American Association for the Advancement of Science (AAAS) and the American Physical Society, as treasurer of the National Academy of Sciences, and on numerous advisory committees and councils.

Dresselhaus is a member of the National Academy of Sciences, the National Academy of Engineering, and the American Philosophical Society, and she is a fellow of the American Academy of Arts and Sciences, the American Physical Society, and the Institute of Electrical and Electronics Engineers. She is a member of AAAS, the Materials Research Society, the Society of Women Engineers, and the American Carbon Society. Among her awards and honors are the National Medal of Science and 19 honorary doctorates. MRS

MRS 2004 MRS Fall Meeting

research tools seminars

As a complement to the 2004 MRS Fall Meeting, the Materials Research Society is pleased to continue Research Tools Seminars, an exciting educational program that focuses on the scientific basis and practical application of commercially available, state-of-the-art tools for materials research.

Held in the Exhibit Hall and free-of-charge to meeting attendees, these one-hour seminars describe a technical approach to meet a particular challenge, as embodied in commercially available products or tools.

TUESDAY, NOVEMBER 30

3:30 pm–4:30 pm **3-D Compositional Imaging at the Atomic Scale: Innovations in Atom Probe Technology**
IMAGO SCIENTIFIC INSTRUMENTS CORPORATION • BOOTH 1028

WEDNESDAY, DECEMBER 1

10:30 am–11:30 am **Measurement of IV Curves of Nanoscale Electronic Materials at Cryogenic Temperatures**
LAKE SHORE CRYOTRONICS, INC. • BOOTH 717

2:30 pm–3:30 pm **Simplifying Electrical Characterization to Make Accurate Electrical Measurements in the Nanoscale Realm**
KEITHLEY INSTRUMENTS, INC. • BOOTH 716

3:30 pm–4:30 pm **Nanoindentation and Beyond—New Industrially Relevant Techniques for Characterizing Mechanical Properties at the Nano-scale**
MICRO MATERIALS LIMITED • BOOTH 718

THURSDAY, DECEMBER 2

10:30 am–11:30 am **The EnviroScope: A Turnkey SPM with Environmental Controls for Temperature, Vacuum, Liquids, Purged Gases and Electrochemistry**
VEECO INSTRUMENTS INC. • BOOTH 301 ISLE

MRS Elects Officers, Board of Directors for 2005

Members of the Materials Research Society have elected two officers and six directors to join the 2005 Board of Directors. The Board of Directors is composed of the officers and up to 18 directors. The officers of the Society are the president, the vice president (who is also the president-elect), the secretary, the treasurer (appointed by the Board of Directors), and the immediate past president. The annual election ended October 13, 2004.

The Board of Directors is organized into the following governing committees: Planning, Operational Oversight, External Relations/Volunteer Involvement, and Governance. The president, who serves as chair of the board, will appoint each of the directors and officers to one of the first three governing committees, and will designate the chairs of these committees. Terms of office expire at the end of the year indicated in parentheses. The asterisk (*) designates those who are newly elected.

2005 MRS Officers

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David J. Eaglesham
Lawrence Livermore National Laboratory

Immediate Past President

Howard E. Katz
Johns Hopkins University

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*Peter F. Green
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*Cynthia A. Volkert
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Zhenan Bao (2005)
Stanford University

Marie-Isabelle Baraton (2006)
University of Limoges

Eugene A. Fitzgerald (2006)
Massachusetts Institute of Technology

***William A. Frezza (2005)**

Adams Capital Management, Inc.

Ulrich Goesele (2005)

Max Planck Institute of
Microstructure Physics

***Horst W. Hahn (2007)**

Forschungszentrum Karlsruhe/
University of Technology Darmstadt

***Julia W.P. Hsu (2007)**

Sandia National Laboratories

Albert Polman (2006)

FOM Institute AMOLF

***Darrell G. Schlom (2007)**

Pennsylvania State University

***David J. Srolovitz (2007)**

Princeton University

***Bethanie J.H. Stadler**

University of Minnesota

Yuri Suzuki (2005)

University of California—Berkeley

Jerry Tersoff (2005)

IBM T.J. Watson Research Center

www.mrs.org

SPECIAL THANKS *The following events have been funded, in part, by the generous contributions of these organizations.*

2004
MRS
FALL
MEETING

BADGE LANYARDS



Booth 311

STUDENT MIXER



ELSEVIER

Booth 100



Solutions for a nanoscale world.

Booth 301 Isle

COFFEE BREAKS



Booth 911

EXHIBIT REFRESHMENT BREAKS

Honeywell

ELECTRONIC MATERIALS

Booth 724

INTERNET ACCESS



Booth 517



Booth 911



Springer

the language of science

Booth 101

WOMEN IN MATERIALS SCIENCE BREAKFAST



ALDRICH

Booth 200



Solutions for a nanoscale world.

Booth 301 Isle



YOUR GUIDE TO MRS MEMBER BENEFITS & SOCIETY ACTIVITIES

2005

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Lawrence Livermore National Laboratory



Peter F. Green, Vice President*
University of Texas—Austin



Howard E. Katz, Immediate Past President
Johns Hopkins University



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Princeton University

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University of California—Berkeley

Jerry Tersoff
IBM T.J. Watson Research Center

Executive Director
John B. Ballance
Materials Research Society

*Newly elected

EXPAND YOUR KNOWLEDGE

MRS members for 2005 will enjoy increased access to the very latest materials information available.

MRS BULLETIN

www.mrs.org/publications/bulletin/

As an MRS member, you can count on your FREE monthly subscription to *MRS Bulletin* (both in print and electronic format) for the best news and research overviews available today. The technical articles in the *Bulletin* are among the most highly cited in the field of materials research, consistently ranking in the top 10 among 170 materials science journals.

Theme topics for 2005 will include:

- Organic Photovoltaics
- Advances in Materials Patterning for Cellular and Biomolecular Biodiagnostics
- Synthesis and Surface Plasmonic Properties of Metallic Nanostructures
- Carbide Power—Silicon Carbide-Based Electronics
- Complex Adaptive Matter—The Science of Emergent Phenomena in Materials
- Materials Science of Fuel Cells
- Designer Materials for Nucleic Acid Delivery
- Self-Assembly in Materials Synthesis
- Arthur von Hippel, In Memoriam (1898-2003)—A Tribute to the Modern Interdisciplinary Research He Spawned

MRS SYMPOSIUM PROCEEDINGS

www.mrs.org/publications/books/

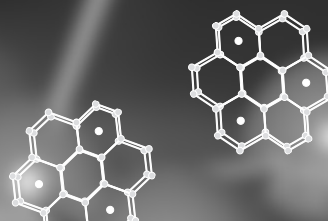
The MRS Symposium Proceedings Series, a long-standing standard reference in many areas of materials science, now includes over 12,000 proceedings papers available FREE online to members, with more added daily. This massive database provides a critical resource for researchers entering new fields, or following new developments in established fields. It is an ideal reference for graduate students, corporate scientists and engineers, and overseas researchers needing access to current information without the lag time of printing and mail delivery.

For our more archivally-minded members, print volumes of the MRS proceedings are available at 15-30% off list price. Check the 2005 Publications Catalog or the MRS Web site for the most current listings.

MIJ-NSR

nsr.mij.mrs.org/

MRS Internet Journal of Nitride Semiconductor Research (MIJ-NSR) is a fully electronic, peer-reviewed archival journal, featuring technical papers on the leading edge of nitride semiconductor research.



JOURNAL OF MATERIALS RESEARCH

www.mrs.org/publications/jmr/

As an MRS member, you may subscribe to *JMR*, one of the foremost archival materials research journals in the world, at a very low member rate. And all print subscriptions to *JMR* include exclusive FREE online Web access—full text of all *JMR* articles from January 1996 to the current issue. New articles are posted electronically and are available for viewing approximately 4-6 weeks before the print issue arrives in the mail. For authors wishing to submit to *JMR*, we're pleased to announce that a new expedited review process has decreased the time to decision on a newly-submitted paper to below two months.

Your 2005 subscription also includes:

- **Rapid Communications**—brief reports of unusual urgency and significance to the materials research community. Upon their acceptance, preprints are immediately available through the Web to *JMR* subscribers.
- **Special focus issue**—*In Situ TEM* will be featured in the July 2005 issue of *JMR*.

E-MAIL ALERTS

www.mrs.org/alerts/

MRS Members are invited to sign up for FREE member e-mail alerts aimed at providing new materials information quickly.

- **eMatters** delivers a monthly "snapshot" of what's new in the materials research community—research news, important links, professional opportunities, and more.
- **MRS Table of Contents Alert** delivers advance table-of-contents listings for *JMR* and *MRS Bulletin*.
- **Just Published! Book Alert** provides announcements of newly published proceedings and books from MRS.
- **MRS Meetings Alert** offers regular updates on upcoming meetings and workshops from MRS—call for papers announcements, abstract submission deadlines, registration dates and discounts, program and speaker updates, etc.
- **MRS Meeting Scene**. Can't attend an MRS Meeting? This e-mail will keep you abreast of each day's exciting activities and developments.
- **MRS Public Affairs Alert** provides occasional calls-to-action and/or summaries of current public-policy issues affecting the materials science and engineering community.

CONNECT WITH GREAT MINDS

2005

MRS offers its members a broad and exciting array of networking opportunities.

MRS MEETINGS & WORKSHOPS

www.mrs.org/meetings/

The Materials Research Society has always been the "great meetings Society." In 2005, more than 7,000 members from around the world will attend MRS Meetings and Workshops, expanding their professional network of contacts through the exchange of new ideas and information. As an MRS member, you'll enjoy reduced registration fees for these events.

2005 MRS Spring Meeting & Exhibit

March 28-April 1, 2005 • San Francisco, CA

Symposium Clusters:

- Electronics and Photonics
- Biological and Molecular Materials
- Nanoscale and Interfacial Phenomena and Related Materials
- New Approaches to Materials Synthesis and Fabrication
- Modeling and Computation

Other symposium topics include materials and technology for hydrogen storage and generation and advanced devices and materials for laser remote sensing.

Note: The preregistration deadline is March 11, 2005.

For additional information, contact the 2005 MRS Spring Meeting Chairs: Joanna Aizenberg (Bell Laboratories, Lucent Technologies); Oliver Kraft (IMF II, Forschungszentrum Karlsruhe and IZBS, University of Karlsruhe); Neville R. Moody (Sandia National Laboratories); and Ramamoorthy Ramesh (University of California, Berkeley).

2005 MRS Fall Meeting & Exhibit

November 28-December 2, 2005 • Boston, MA

Tentative symposium topics include: the hydrogen cycle—generation, storage and fuel cells; engineering biointerfaces via cell-interactive materials; flexible and printed electronics, photonics and biomaterials; and assembly at the nanoscale—towards functional nanostructured materials, among many others.

Note: The abstract deadline is June 21, 2005.

For additional information, contact the 2005 MRS Fall Meeting Chairs: Yang-Tse Cheng (General Motors R&D Center); David S. Ginley (National Renewable Energy Laboratory); Kathryn E. Uhrich (Rutgers University); and Ralf B. Wehrspohn (Paderborn University).

2005 Workshops

Plans are also underway for 2005 Workshops, smaller, highly focused meetings organized and/or coordinated by the Materials Research Society. Already scheduled:

- Organic Microelectronics
July 10-13 • Newport, RI

Looking Ahead at 2006 MRS Meetings

- 2006 MRS Spring Meeting: April 17 – 21, San Francisco, CA
- 2006 MRS Fall Meeting: November 27 – December 1, Boston, MA

MEMBERSHIP DIRECTORY

www.mrs.org/membership/

The MRS Online Membership Directory is a professional networking service available exclusively to our members. Updated regularly, it is a quick and easy way for you to search for colleagues by name, institution or geographical location.

CAREER OPPORTUNITIES

www.mrs.org/career_services/

Opportunities for you to expand your career or your company include the MRS Spring and Fall Meeting Career Centers, the most efficient forums available for pursuing employment or filling materials research positions. In addition, *MRS Bulletin* advertises a wide range of materials-related professional openings in industry, academia, government and research worldwide. Listings are also posted on the MRS Web site each month for convenient online access.

UNIVERSITY CHAPTERS & SECTIONS

www.mrs.org/university/

www.mrs.org/sections/

University Chapters facilitate discussion between students and faculty and promote student interest in materials science. As a student member in 2005, you may network among 34 active Chapters in the U.S., compare notes on recent activities and brainstorm with other students on new projects and issues of common concern. MRS Sections provide convenient regional forums for the interaction of scientists and engineers in various materials disciplines of particular interest to that community.

INTERNATIONAL COLLABORATIONS

www.mrs.org/gateway/iumrs.html

MRS works closely with other materials organizations around the world and is an Adhering Body of IUMRS (International Union of Materials Research Societies). This collaboration facilitates international cooperation among materials research organizations and helps to advance the multidisciplinary nature of the materials research community. Link directly to IUMRS at www.iumrs.org for general information, a list of officers, publications, and upcoming meeting information.

GAIN RECOGNITION

**You may recognize your colleagues,
or be recognized yourself, for
outstanding research contributions.**

MRS AWARDS www.mrs.org/awards/

The MRS Awards Program acknowledges outstanding contributions to the progress of materials research, honoring those whose work has already impacted the field, as well as those whose work shows great promise for future leadership.

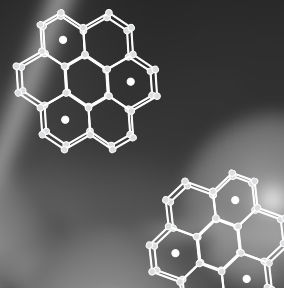
The **Von Hippel Award**, the Materials Research Society's highest honor, recognizes those qualities most prized by materials scientists and engineers—brilliance and originality of intellect, combined with vision that transcends the boundaries of conventional scientific disciplines. The deadline for receipt of new nominations is June 1 of each year.

The **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 the life work of David Turnbull. The recipient will present a technical lecture of broad appeal at the MRS Fall Meeting, and may be asked to speak at MRS Section and University Chapter meetings. Nominations are due June 1 of each year.

The **MRS Medal** recognizes an exceptional recent achievement in materials research which is expected to have a major impact on the progress of any materials-related field. Nominations are due June 1 of each year.

The **MRS Outstanding Young Investigator Award** recognizes outstanding, interdisciplinary scientific work in materials research by a young scientist or engineer. The award recipient must also show exceptional promise as a developing leader in the materials area. The deadline for receipt of new nominations is October 1 of each year.

MRS Graduate Student Awards honor and encourage graduate students whose academic achievements and current materials research display a high order of excellence and distinction. Finalists compete for Gold and Silver Medals at the MRS Spring and Fall Meetings. Applications are due approximately 5 months preceding each MRS meeting.



PUBLISHING OPPORTUNITIES www.mrs.org/publications/

Publishing venues for MRS members include the *MRS Bulletin* and *Journal of Materials Research*. To propose a theme topic for *MRS Bulletin*, or for information on guest-editor opportunities, contact the *Bulletin* editor. For authors wishing to submit to *JMR*, we are pleased to announce that the *Journal's* new expedited review process has decreased the time to decision on a newly-submitted paper to below two months.

In addition, the MRS Symposium and Conference Proceedings Series offer opportunities to publish papers presented at MRS meetings and other scientific and technical meetings.

THE MRS/OSA CONGRESSIONAL FELLOWSHIP www.mrs.org/pa/fellowship/

MRS, in conjunction with the Optical Society of America (OSA), is the proud sponsor of the MRS/OSA Congressional Science and Engineering Fellowship Program. This provides MRS/OSA members with an invaluable public-policy learning experience, while educating policy makers about the value of materials science.

The Fellow spends one year (beginning each September) working as a special legislative assistant on the staff of a member of Congress or Congressional Committee. Activities may involve conducting legislative work, assisting in Congressional hearings and debates, preparing briefs and writing speeches. The Fellow also attends an orientation program on Congressional and Executive Branch operations in addition to a year-long seminar series on science and public-policy issues.

Applications are currently being sought for the 2005-2006 Congressional Fellowship. The deadline for 2005 is January 14.

BECOME A VITAL PART

2005

MRS encourages you to become active within the Society as well as the larger community.

SOCIETY MEMBER VOLUNTEERS www.mrs.org/geninfo/

The tremendous growth and success of our Society is the result of member input and the energetic efforts of many MRS member volunteers. The MRS committee structure and task forces offer members an invaluable opportunity to participate in, and influence profoundly, the operation of the Society.

A recent radical restructuring of our governance has now made such volunteer activities even more effective than they have been in the past. If you have an interest in working on any aspect of MRS activity, contact David Eaglesham, 2005 MRS President at eaglesham@lnl.gov.

SPECIAL INTEREST DISCUSSION GROUP—WOMEN IN MS&E www.mrs.org/women/

Women in Materials Science and Engineering is the subject of a special breakfast at both the MRS Spring and Fall Meetings and features a timely discussion about issues facing women in the materials research and engineering professions. Additionally, MRS members are encouraged to join the "Women in MS&E" mailing list for a continuing discussion and exchange of ideas. Both women and men are welcome to participate. Subscribe at mrs-women-subscribe@mrs.org.

CORPORATE AFFILIATION www.mrs.org/mo/corporate/

MRS Corporate Affiliates provide a vital link in the Society's promotion of close interaction among scientists and engineering professionals in the materials research community. Through networking and information exchange, your organization will be better able to develop products and services that are tailored to the needs of the research community—which in turn will generate additional partnership opportunities.

If your organization is interested in influencing the growth and direction of interdisciplinary, basic research on advanced materials, contact Mary E. Kaufold (Materials Research Society) at kaufold@mrs.org.

STRANGE MATTER www.mrs.org/strangematter/

Strange Matter is a traveling interactive exhibition where users enter the fascinating, practical, occasionally bizarre and often beautiful world of materials science through over a dozen hands-on experiences. Targeting 5th-8th grade students and families, the Strange Matter exhibition opened in North America in June 2003 with a public preview at the Ontario Science Centre. For 2005, two versions of the exhibition will continue their tours to major science centers throughout the United States including:

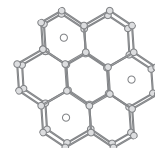
- **Cranbrook Institute of Science**, Bloomfield Hills, MI
- **Discovery Center of Idaho**, Boise, ID
- **Museum of Life and Science**, Durham, NC

MRS members will have opportunities to contribute and/or volunteer their services in each of the museum's local communities. For more information, contact Richard Souza at souza@mrs.org.

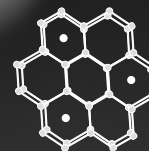
A dynamic and interactive Web site (www.strangematterexhibit.com) accompanies the exhibit, and provides a number of elements that supplement the exhibit experience. Since its launch, the Strange Matter Web site has garnered significant acclaim. The Washington Times, for example, called it "an awesome immersion in the science of materials."

In addition to the Strange Matter exhibition and Web site, the Strange Matter team has developed a teacher curriculum/activity guide designed to assist teachers with integrating materials science into their 5th-8th grade science curriculums. The hands-on activities, aligned with the National Science Education Standards, are designed to encourage exploration and inquiry.

The exhibition and its tour are made possible by the National Science Foundation, Alcan Inc, Dow, Ford Motor Company Fund, Intel Innovation in Education, and the 3M Foundation.



INVITE YOUR COLLEAGUES



To join, mail or fax this application to:

Materials Research Society
506 Keystone Drive
Warrendale, PA 15086 USA
Tel: 724-779-3003
Fax: 724-779-8313

or join online at
www.mrs.org/membership/

2005 MRS MEMBER BENEFITS

MRS Publications & Online Resources

- FREE print subscription to *MRS Bulletin* with FREE electronic access as well
- Discounted rate to *Journal of Materials Research* which includes FREE Web access
- Opportunities to purchase MRS symposium proceedings at member discounts and enjoy FREE Web access to over 12,000 proceedings papers online
- FREE registration to *MRS Internet Journal of Nitride Semiconductor Research*
- Access to FREE MRS E-Mail Alerts

MRS Networking Opportunities

- Discounted registration fees for MRS meetings and workshops
- The online MRS Membership Directory
- Career development opportunities at MRS meetings and through the *MRS Bulletin*
- Student involvement in MRS University Chapters
- Regional forums for interaction through MRS Sections
- Access to information on international collaborations such as IUMRS

Opportunities for Recognition

- The MRS Awards Program
- Publishing venues including the monthly *MRS Bulletin*, *Journal of Materials Research* and MRS symposium proceedings
- The MRS/OSA Congressional Science and Engineering Fellowship Program

Opportunities to Contribute

- MRS volunteer opportunities
- Public outreach and education opportunities including Materials MicroWorld, "Women in Materials Science and Engineering," and high school student workshop involvement.
- Corporate Affiliation

MEMBERSHIP APPLICATION

B

I am a new member Please renew my membership

MRS MEMBERSHIP RATES

Rates are for 12 months and include complimentary subscription to *MRS Bulletin* and FREE access to online MRS proceedings.

A. Start membership (check one): January 1, 2005 July 1, 2005

Regular Membership	\$105.00	\$ _____
Student Membership	\$ 30.00	\$ _____
Retired/Unemployed	\$ 30.00	\$ _____

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U.S. Member Rate.....	\$130.00	\$ _____
Non-U.S. Member Rate (surface)	\$170.00	\$ _____
Non-U.S. Member Rate (air freight)	\$230.00	\$ _____

C. Voluntary Contribution to support MRS student programs

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D. Total (A+B+C)

Allow 6-8 weeks for delivery of any back issues of subscriptions.
Dues allocated to MRS Bulletin Subscription: \$29 Regular, \$17 Student

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E-mail address _____ WWW address _____

NOTE: The address above will also be used in future MRS Membership Directories unless you provide an alternate.

STUDENT APPLICANTS

I am currently enrolled as a full-time student, or I am working full-time on a thesis or dissertation.

Signature _____ Date _____ NOV BUL 04

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