

Preview: 1999 MRS Fall Meeting

Hynes Convention Center and Boston Marriott Copley Place, Boston, Massachusetts

NOVEMBER 29–DECEMBER 3, 1999

Meeting Chairs: Paul D. Bristowe (Cambridge University), David G. Grier (University of Chicago)
Fernando A. Ponce (Arizona State University), Ellen D. Williams (University of Maryland)

The 1999 MRS Fall Meeting expands into the Hynes Convention Center while retaining use of the Boston Marriott, thus occupying two sites instead of the three used in recent years. This move allows the meeting, with its 43 technical symposia and nearly 3,900 oral and poster presentations to be more consolidated, with both the exhibit and poster sessions held in the Hynes, and technical sessions split between the two locations. The meeting has several focus areas including soft materials, modeling, thin film materials, and devices. Topics in well-established areas will continue to be represented including nitride semiconductors, ferroelectrics, nanophase materials, and nuclear waste management.

This meeting provides food for thought, both figuratively and literally. In the area of soft materials, food (Symposium AA) is a component for study of processing-structure-property relationships. Gels and powders are not just scientific curiosities, but important materials systems for the edible world. Proteins, starch, and even potatoes and chocolate come into play in this symposium. Another important component of soft materials is self-assembled systems. This theme runs the gamut from biomineralization (Symposium DD) and phospholipid assemblies (Symposium EE) to nanocomposite and nanostructured materials (Symposia F and G), including sol-gel processing, nanowires, and ceramic and self-assembled semiconducting structures. Nonlithographic approaches include printing and molding. Self-assembly even plays a role in the newest nanolithographic processes (Symposium J). Naturally, self-assembly is a recurring theme in the biological and complex fluid systems emphasized in Symposium CC. The materials research community is finding many ways of convincing systems to organize themselves into complex materials and is actively learning from nature how to do this. In a joint session between Symposia CC and G, a talk covers nanoscale assembly of rechargeable battery components. Engineering of bone tissue and drug and gene delivery represent some of the biological areas represented.

Soft materials and small materials join forces with electronics in new areas such



as Molecular Electronics (Symposium H), plus Electroactive Polymers (Symposium FF), Self-Organized Processes in Semiconductor Alloys—Spontaneous Ordering, Composition Modulation, and 3-D Islanding (Symposium I), and Electrical, Optical, and Magnetic Properties of Organic Solid-State Materials V (Symposium BB). Symposium BB has an all-invited joint session with Symposium PP (Materials for Optical Limiting III) on Two-Photon Absorption and Applications and another joint session with Symposium PP on organic photorefractives. Also, an extra session of Symposium BB will be held on Tuesday evening.

The contribution of theory and modeling to materials research is a strong component of this meeting. Out of five symposia on this subject, two address predicting materials properties from first principles and the others emphasize approaches based on different length scales and the coupling of models with experimental observation. Symposium A examines Multiscale Phenomena in Materials—Experiments and Modeling and it includes dislocation theory and fracture and crack propagation. Computation of optical properties is covered in Symposium B. With more of an industrial slant, Symposium C addresses Microstructural Modeling for Industrial Metals Processing, including casting, solidification, powder processes, and deformation. Symposium D then looks at prediction of mechanical and electronic properties, and examines progress into large

length and time scales. Symposium E covers nucleation and growth processes, including phase transformations.

The growing importance of thin film technology is reflected in the number of planned symposia in this area. The synthesis, processing, characterization, and integration of thin films in various classes of materials including ferroelectrics, dielectrics, semiconductors, polymers, and amorphous materials will be included. Symposium K on Materials Synthesis by Thermal Spraying includes a session Monday afternoon honoring Herbert Herman, who brought thermal spray processing to the forefront. Combining low-energy beams, substrate engineering, and high-temperature superconductors, a three-way joint session (Symposia L, O, and II) will be held Tuesday morning on biaxially textured substrates for high- T_c coated conductors. Symposium M journeys into the boundaries between grains to understand how best to engineer properties here so that nanocomposites can be configured and mechanical properties improved. An all-invited joint session of Symposia I and N Thursday morning covers real-time *in situ* studies of three-dimensional islanding, leading up to the Turnbull award lecture by J.E. Greene.

Materials characterization is always an important part of materials research, with complementary techniques giving new insight. This meeting has a group of four symposia (P–S) specifically covering optical and electron microscopy, synchrotron radiation techniques, and nondestructive methods. In the optical arena, near-field optics continue to take microscopy to finer resolution. Also luminescence and Raman spectroscopy show how light is not just for imaging. LEEM, SEM, STEM, SPELEEM, and TEM represent some of the acronym soup reflecting the diversity of electron microscopy techniques. Symposium R on applications of synchrotron radiation techniques starts with x-ray scattering, spectromicroscopy, and topography. Then the techniques described move to the micro-level with micro-diffraction, for instance, to examine metal interconnects and stresses and micro-tomography/phase contrast with applications to osteoporosis, carbon/carbon composites, and wave-

guides. Nondestructive evaluation (Symposium S) is shown to be useful across a wide spectrum for analyzing fracture fatigue and corrosion, evaluation of concrete and steel, as well as for silicon wafers and related materials.

Symposium T addresses the need for thinner and thinner insulating layers in microelectronics. As silicon dioxide approaches the apparent end of its road, a deeper understanding of physical, chemical, and electronic properties of silicon dioxide and other materials such as oxynitrides are being sought to extend the road.

Nanotubes are highlighted in Symposium U in an attempt to understand properties of single- and multiwalled tubes and ropes, and to find ways to control their arrangement. In a joint session with Symposium V, the wear, adhesion, and stress of amorphous and diamondlike carbon films are examined. Also Symposium V looks at the influence of mechanical behavior of thin film and multilayers materials in semiconductor devices and packaging, information storage media, hard coatings, and microelectromechanical systems (MEMS). The Symposium ends with a session on nanoindentation and advanced testing techniques.

The largest symposium of the meeting is Symposium W, GaN and Related Alloys, with nearly three quarters of the papers presented as posters Monday and Thursday evenings. A panel discussion on Wednesday afternoon reports on a study of wide bandgap semiconductor research in Europe.

Tunable dielectric films are of increasing interest for applications in cellular communication systems. This subject will be covered in Symposium Y, including a joint session with Symposium KK. Symposium Y also covers DRAM products, which have shown recent progress toward devices, and embedded FERAM. Embedded memory products are gaining interest among memory and chip manufacturers due to potential savings in production costs. This symposium also reports on a ferroelectric film product prepared by a solution deposition process.

Symposium Z, held Wednesday and Thursday, covers exciting rare-earth doped materials, planar wave guides, and photonic crystals. Materials ranging from ferroelectrics to polymers are addressed.

In the area of superconductors, Symposium II focuses on new materials, how to process them, and resulting properties. Also in the oxide category, Symposium JJ explores magnetic oxides and properties such as spin polarization, optical behavior, and transport. Perovskite magnanites, in addition to their potential use as mag-

netic sensors, have emerged as candidate materials for pressure sensors, bolometers, and field-effect transistors.

Actuators and sensors incorporating smart materials such as piezoelectric, magnetostrictive, electrostrictive, and shape memory alloys have now been intensively developed. Symposium LL reports on how ceramics, polymers, gels, and other materials form the backbone for these smart, or even intelligent, materials systems. In a related area, Symposium MM on MEMS devices looks at integration of sensors, actuators, and electronics. These tiny devices, now moving beyond silicon, require understanding of deposition and characterization methods, materials processing, and wear and friction properties. Symposium NN addresses chemical vapor deposition and characterization of precursors for thin film deposition as well as new technologies for non-oxide sol-gel and spray fabrication of bulk electronic ceramics.

Quantum dots, cascade lasers, light-emitting diodes, and solar cells are some of the structures examined in Symposium OO on Infrared Applications of Semiconductors. Lead salts, rare-earth materials, III-V, II-VI, and group IV semiconductors are all represented. Symposium PP feeds off of the proliferation of lasers and electro-optic systems and the potential dangers to human vision. This symposium focuses on development of optical limiters and tunable filters which can suppress undesirable radiation. Liquid crystals, nanotubes, and photorefractives are covered, plus theory and modeling to understand how to engineer the best materials.

In the area of structural materials, a new symposium, HH, covers superplasticity of metals and ceramics, plus examines industrial applications of superplasticity for materials forming as well as fundamentals. Scientific Basis for Nuclear Waste Management, Symposium QQ, continues for the 23rd time, including joint sessions with Symposium GG, Transport Properties and Microstructure of Cement-Based Systems.

Special Events

The Plenary Speaker will be Nobel laureate **Horst L. Stormer** (Columbia University and Bell Labs, Lucent Technologies), presenting a talk on fractional quantum numbers on Monday, November 29, 6:00 p.m., Salon E, Boston Marriott Hotel.

The Awards Ceremony will convene on Wednesday, December 1, 6:00 p.m., Salon E, Boston Marriott Hotel. **Richard S. Stein** (University of Massachusetts) will receive the **Von Hippel Award**, **Joseph E. Greene** (University of Illinois) will receive the **David Turnbull Lectureship**, and **M.**

George Craford (Hewlett Packard) and **Stephen R. Forrest** (Princeton University) will each receive the **MRS Medal**. See articles in the following pages.

Panels

A seminar on **Materials Research Support in the Department of Energy (DOE)** will be held on Tuesday, November 30, 5:30 p.m., Room 207 in the Hynes Convention Center. Iran Thomas, Director of the Division of Materials Science (DMS) and Deputy Associate Director of Basic Energy Sciences for DOE, will discuss current and future opportunities for funding of fundamental materials research in this department. He will give an overview of research activities supported in the Office of Science and will discuss specific programs of potential interest to MRS members. Sources for more detailed information on research areas and proposal submission and evaluation will be given.

A seminar on **Materials Research Support at the National Science Foundation (NSF)** will be held on Tuesday, November 30, 6:30 p.m., Room 208 in the Hynes Convention Center. An Informal Drop-In Session will be open on Wednesday, December 1, noon-2:00 p.m.; the location will be listed in the *Meeting Guide* on site. Following outline presentations by NSF staff on support for materials research and education, focusing primarily on the activities of the Division of Materials Research (DMR), there will be a question-and-answer period. Attendees will have the opportunity to learn about NSF programs, proposal submission, and proposal evaluation. In the follow-up drop-in session, attendees may discuss ideas informally with DMR program directors.

Attendees will have the opportunity to discuss some alternatives to the traditional materials research career path with a panel of professionals in nontraditional fields at the **Alternative Careers in Science Panel**, to be held Wednesday, December 1, 8:00 p.m., Salon H/I in the Boston Marriott Hotel. Representatives from the fields of intellectual property law, political support staff (executive and legislative branches), technical journalism, financial analysis, and technical museum curation are scheduled to participate in a free-flowing discussion with the audience on their experiences as scientists in nontraditional fields.

Additional Events

Symposium X, Frontiers of Materials Research, presents a series of authoritative reviews for the nonspecialist between noon and 1:30 p.m., Monday through Thursday. In addition to the Medal

Award presentations on Monday and Wednesday, Symposium X talks will include prospects for molecular scale electronics, controlling the interactions of cells with materials, the materials science of food, two-photon absorbing materials and applications in three-dimensional technologies, superplasticity, and materials insights from biomineralization.

Poster Sessions will be held Monday through Thursday, 8:00 p.m.–11:00 p.m. in Exhibition Hall D of the Hynes Convention Center. The Meeting Chairs will sponsor a Best Poster Award competition at which a prize of \$500 will be awarded to the presenting author(s) of the winning paper(s). Award recipients will be selected on the basis of the poster's technical content, appearance, graphic excellence, and presentation quality.

Seven **Symposium Tutorial** sessions by leading experts will be given on Sunday and Monday. See page 78 for more information.

For the first time, the Hynes Convention Center will house the **MRS Equipment Exhibit** featuring more than 200 international exhibitors from all sectors of the global materials science and engineering communities. The exhibit will contain a full spectrum of equipment, instrumentation, products, software, publications, and services. Set for Tuesday, November 30,

through Thursday, December 2, on the Second Level of the Hynes Convention Center, the exhibit is convenient to the technical session rooms and scheduled to coincide with the program. Complimentary coffee will be available during morning and afternoon breaks in the exhibit hall.

Materials MicroWorld, a program of Interactive Traveling Displays and Educational Programs, is now in development. Prototype exhibits along with the concept drawings for the future exhibit will be displayed Sunday through Wednesday on the second floor of the Hynes Convention Center. Activities associated with these displays will consist of collecting and developing ideas for educational programs and demonstrations that would accompany a full-scale traveling science exhibit.


Student Opportunities and Employment

The Society will present **Gold and Silver Graduate Student Awards** to graduate students who authored or co-authored symposium papers which exemplified significant and timely research. On Wednesday evening, all finalists will be honored at the Awards Ceremony.

Graduate students who are interested in assisting in the symposium rooms are

encouraged to apply for a **Symposium Assistant** position. Symposium assistants deliver essential meeting materials to and from the technical sessions, operate audiovisual equipment and room lighting, and perform other tasks requested by their session chairs. Symposium Assistants will receive a complimentary student registration, a one-year MRS student membership commencing January 1, 2000, and a stipend to help defray expenses.

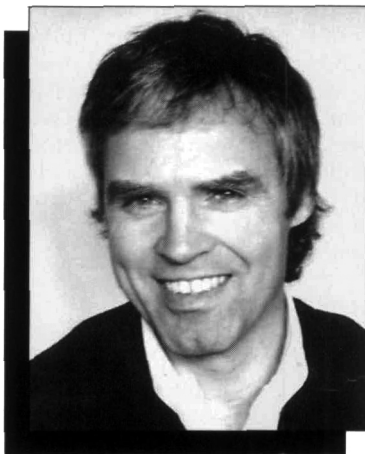
Graduate students and members of MRS University Chapters are invited to attend the **Student Mixer** reception. Also, Chapter officers and faculty advisors are invited to attend a meeting of **MRS University Chapter** representatives to compare notes on recent activities and brainstorm on new projects and issues of common concern. Those interested in starting a new chapter are also welcome. The date, time, and location of both events will be announced in the *Meeting Guide* on site.

MRS, in conjunction with the American Institute of Physics (AIP), will host an **Employment Center** for meeting attendees. The Center will operate Tuesday through Thursday, in the Exhibit Area on the second level of the Hynes Convention Center. Services include access to current job postings, resume file for prospective employers, and on-site interview opportunities. 

Nobel Laureate Stormer to Give Plenary Talk on Fractional Quantum Numbers

Nobel laureate Horst L. Stormer of Columbia University and Bell Labs/Lucent Technologies will present the plenary talk at the 1999 Materials Research Society Fall Meeting in Boston. In his talk, "Fractional Quantum Numbers and Other Tales from Flatland," Stormer will address how "electrons moving at low temperatures in a plane and exposed to a strong magnetic field show a rich spectrum of counterintuitive behaviors." The Plenary Session is scheduled for Monday, November 29, at 6:00 p.m. in Salon E of the Boston Marriott Hotel.

Stormer has devoted his research career to the study of condensed matter physics with an emphasis on semiconductors. In particular, he is interested in the physics of lower dimensional systems at which electrons are quantum-mechanically bound to a plane, a line, or to a small dot. At very low temperatures of about 1 K and below, these quantum structures exhibit unusual new properties. He has over 200 publications in this area and has received several



Horst L. Stormer

awards including in 1998 both the Nobel Prize in physics and the Franklin Medal, each shared with Dan Tsui and Bob Laughlin. In 1984, he shared the Oliver E. Buckley Prize of the American Physical

Society with Dan Tsui and Art Gossard for the discovery of the fractional quantum Hall effect, and in 1985 Stormer received the Otto Klung Award of the Freie University of Berlin.

In 1992, Stormer was appointed director of the Physical Research Laboratory at AT&T Bell Laboratories, and became adjunct physics director in the Physical Sciences Division of Bell Labs/Lucent Technologies in 1997 and professor in the Physics and the Applied Physics Departments of Columbia University the following year. He received his BS degree from Goethe University in Frankfurt/Main, Germany in 1970. He received his PhD degree in physics from the University of Stuttgart in 1977 and worked in the high field magnet laboratory of the Max Planck Institute in Grenoble, France.

Stormer is a Bell Labs Fellow, a Fellow of the American Physical Society and of the Academy of Arts and Sciences, and a member of the National Academy of Sciences. 