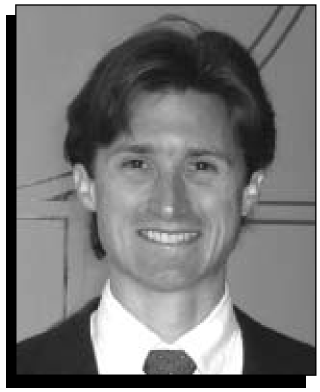
Colin McCormick Named 2003-2004 MRS/OSA Congressional Fellow, Accepts Assignment with Rep. Markey



Colin McCormick

Colin McCormick has been named the MRS/OSA Congressional Science and Engineering Fellow for 2003–2004. His term began in September. As a recipient of this one-year appointment, sponsored jointly by the Materials Research Society and the Optical Society of America, McCormick has taken a position in the office of Rep. Edward J. Markey (D-Mass.).

"During my research career in atomic physics and nonlinear optics, I have become aware of the important links between public policy and science," McCormick said. "Policymakers often guide what scientific areas will be explored, pressing researchers to answer questions of immediate importance—at least in the view of the policymaker in question. Yet at other times, science leads policy, by developing faster than debate and decision can follow. Legislators then must determine after the fact how these advances will impact society as a whole. I am interested in both of these modes of science policy."

McCormick chose the Markey office because of the opportunity to work on nonproliferation and nuclear safety issues, calling Markey "one of the most recognized and outspoken members of Congress in those areas." McCormick will coordinate the work of the Bipartisan Task Force on Nonproliferation, co-chaired by Markey and Rep. Chris Shays (R-Conn.). His portfolio will also include defense, science research and development, and human rights. Markey has had numerous science fellows in his office over the past decade, including 1996–1997 MRS/OSA Congressional Fellow Michal Freedhoff, who is now a permanent member of Markey's staff.

"MRS and OSA are fortunate to have found another outstanding candidate for their congressional fellowship—and all of us who work for Congressman Markey are thrilled that he's on board," said Freedhoff, who also chairs the MRS Subcommittee on Congressional Fellows. "He'll be a terrific addition to our office."

While obtaining his MA and PhD degrees in physics at the University of California, Berkeley, McCormick taught physics to undergraduate students who typically have not already been exposed to the field. This experience, along with his tenure as editor in chief of the student-run *Berkeley Science Review*, a journal promoting public understanding of graduate research, has prepared McCormick to explain scientific topics to a nontechnical audience. He is eager to apply this skill to the legislative process.

At OSA, Howard Schlossberg, who is liaison to the Congressional Fellows Program, said, "Colin McCormick greatly impressed the selection committee with his congenial and outgoing manner, his technical accomplishments, and his editorship of the *Berkeley Science Review*, which we could tell was very high quality from the copies he brought for us. We also believed his international background would be valuable as a fellow."

McCormick was a Herschel Smith Fellow in Emmanuel College at Cambridge University from 1995 to 1997, and he was named Outstanding Graduate Student Instructor by UC—Berkeley in 1998. He has published in conference proceedings and peer-reviewed journals, including *Applied Physics Letters, Physical Review Letters*, and *Optics Express*. He received his PhD degree in 2003. MRS

Plenary Speaker Darryl L. Smith to Address Electronic Properties of Inorganic and Organic Semiconductors at MRS Fall Meeting

Darryl L. Smith

Darryl L. Smith, a laboratory fellow at Los Alamos National Laboratory (LANL), will present the plenary talk at the 2003 Materials Research Society Fall Meeting in Boston on December 3 at 6:00 p.m. in the Sheraton Boston Grand Ballroom. The title of his talk is "Electronic Properties of Inorganic and Organic Semiconductors: Application to National Security Needs."

In his talk, Smith will contrast the basic electronic structure of inorganic semiconductors, such as Si and GaAs, with π-conjugated organic semiconductors, such as pentacene and poly(phenylene vinylene) (PPV) polymers. The differences in the basic electronic structures result in distinct but complementary physical properties, he said. Smith will discuss how these complementary properties are being applied to national security needs such as gamma radiation and neutron detection and chemical-biological sensors.

At LANL, Smith's research interests are in condensed-matter physics and electronic/optical materials, including III–V semiconductor heterostructures and nanostructures, as well as the electronic and optical properties of conjugated organic materials and electrical and electro-optic devices fabricated from these materials. He received his PhD degree in physics from the University of Illinois in 1974. Smith is a member of the Defense Sciences Research Council, a fellow of the American Physical Society, and the author of more than 200 technical papers.

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Julia R. Weertman to Receive 2003 MRS Von Hippel Award for Contributions to Understanding Mechanical Behavior in Materials

The Materials Research Society's highest honor, the Von Hippel Award, this year will be given to Julia R. Weertman, the Walter P. Murphy Professor Emerita of Materials Science and Engineering at Northwestern University, for "her lifelong exceptional contributions to understanding the basic deformation processes and failure mechanisms in a wide class of materials, from nanocrystalline metals to high-temperature structural alloys, and for her inspiring role as an educator in materials science." Weertman will accept the Von Hippel Award during the awards ceremony at the 2003 MRS Fall Meeting in Boston on December 3 at 6:00 p.m. in the Sheraton Boston Grand Ballroom, where she will then present the Von Hippel lecture, "Pursuit of the Small."

Weertman has made seminal contributions to the field of mechanical behavior of metals and alloys, for example, pioneering experimental techniques in order to achieve a fundamental understanding of nanostructure from the atomic to macroscopic scales. At a time when most nanocrystalline research on mechanical properties consisted of simple hardness testing, Weertman's group at Northwestern University evaluated samples for a range of properties, including their internal strains, grain size distributions, porosity, stored energy, purity, and thermal history. She used small-angle neutron scattering (SANS) to provide quantitative information on void populations and the effect of various synthesis parameters on improving sample density. Perhaps best known in more recent years for her work on the synthesis, structural characterization, and study of the mechanical behavior of nanocrystalline metals, Weertman is recognized as an international authority on the subject.

Upon her graduation in 1951 with a DSc degree in physics from the Carnegie Institute of Technology (now Carnegie Mellon University), Weertman served as a postdoctoral fellow at Ecole Normale Supérieure in Paris (1951–1952) and began her career as a solid-state physicist at the U.S. Naval Research Laboratory (1952–1958), where she worked in the area of ferromagnetic spin wave resonance. A classic experiment, with G. Rado, demonstrated the influence of exchange effects in the resonance spectrum, as predicted by

Julia R. Weertman

Rado. Weertman then interrupted her research for 13 years as she focused her attention on her family. During this time, she and husband Hans Weertman coauthored the classic and widely used textbook, *Elementary Dislocation Theory* (Macmillan, New York, 1964; Oxford University Press 1992), which was translated into three languages. She also contributed chapters on mechanical properties to the first through third editions of R.W. Cahn's seminal book *Physical Metallurgy* (North Holland, Amsterdam, [1965] 1970).

Weertman returned to research in 1972 when she joined the faculty at Northwestern and rapidly became one of the leaders in the young field of materials research. In recognizing her inspiring role as an educator in this interdisciplinary field, Weertman's colleagues also point specifically to the impact she has made on a generation of women materials researchers. The area of mechanical behavior of nanostructured materials holds an especially high concentration of women researchers, as compared with materials science and engineering generally.

Using SANS experiments in her early work at Northwestern, Weertman obtained quantitative global information about microstructural changes and damage in materials. While studying high-temperature deformation in superalloys, Weertman's group showed the influence of stress concentrations at grain-boundary carbides on the nucleation and growth of grain-boundary voids. In cavitation experiments in pure materials, the SANS measurements made it possible to follow quantitatively the evolution of void nucleation and growth during deformation. Weertman's other research involved

- the study of dislocation structures that develop during high-temperature fatigue in single-crystal and polycrystalline copper,
- the demonstration of softening and microstructural instability during cyclic loading at elevated temperatures in an advanced high-temperature steel previously shown to have long-term stability under steady loads,
- the interactions between hold times in cyclic deformation and oxidation to hasten failure in steel commonly used in high-temperature applications, and
- high-temperature behavior of several cryomilled Al alloys.

During her continuing tenure at Northwestern, Weertman served as chair of the Materials Science and Engineering Department from 1987 to 1992. She was also a guest professor at the Swiss Federal Institute of Technology in Zurich in 1986. Weertman is a member of the National Academy of Engineering and the American Academy of Arts and Sciences. She is a past member of the Committee on Women in Science and Engineering and the Committee on Human Rights of the National Academies, and she is currently a member of the National Academies National Materials Advisory Board. She has served on advisory panels for the Department of Energy and the National Science Foundation (NSF), continues on advisory committees for several national laboratories and university groups, and is a member of the MRS Board of Directors. Weertman also serves on the board of review editors for *Science* and as a 2003 volume organizer for *MRS Bulletin*. Weertman has three U.S. patents and over 150 technical publications. She is a fellow of The Minerals, Metals & Materials Society (TMS) and ASM International and has received Special Creativity Awards for Research from NSF, a Guggenheim fellowship, the Achievement Award from the Society of Women Engineers, and the Leadership Award from TMS.

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. MRS

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Ellen D. Williams Selected for 2003 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, Ellen D. Williams, Distinguished University Professor of Physics and the Institute for Physical Science and Technology and director of the Materials Research Science and Engineering Center (MRSEC) at the University of Maryland, has been selected to deliver the 2003 David Turnbull Lecture. Williams is cited "for groundbreaking research on the atomic-scale science of surfaces and for leadership, writing, teaching, and outreach that conveys her deep understanding of and enthusiasm for materials research." She will deliver her lecture, "Fluctuations and Instabilities in Nanoscale Materials," at the 2003 MRS Fall Meeting in Boston on December 2 at 5:05 p.m. in the Grand Ballroom of the Sheraton Boston Hotel.

Ellen D. Williams

Williams has vastly extended the fundamental understanding of the thermodynamics and kinetics of Si surfaces and the chemical interactions on these and other surfaces, beginning with her contributions on the behavior of vicinal surfaces—plane terraces separated by steps of monoatomic height. The topic of vicinal semiconductor surfaces has critical technological implications; small crystalline devices with far fewer defects than previously made can be grown by using stepped surfaces as substrates. Using a homebuilt scanning tunneling microscope (STM) and low-energy electron diffraction (LEED), Williams launched a thorough study of stepped silicon surfaces. The quantitative studies of these surfaces resulted in what is now a textbook demonstration of the thermodynamics of orientational phase separation.

Working closely with theorists, Williams exploited the power of direct-imaging tools to quantify the statistical properties of steps on surfaces. The results have proven the ability to extract thermodynamic quantities and time constants by formulating appropriate correlation functions from quantified experimental images. Williams's group is recognized internationally in this area, often described as "continuum step mechanics," and she has co-authored two definitive review articles on the subject, published in Volume 1 of *Handbook of Surface Science* (Elsevier, Amsterdam, 1996) and Volume 34 of *Surface Science Reports* (1999), as well as over 150 research publications.

Williams has also worked on the application of continuum step mechanics to problems of structural evolution under electromigration and in nanostructures. She has demonstrated that quantitative predictions of the form and rate of structural evolution can be made based on a simple parametrization. In addition, the thermal fluctuations that underlie mass transport begin to play an increasingly important role in materials properties as structures approach the nanoscale. Her publications on this work are destined to become required reading among those who attempt to build small devices approaching the nanometer scale.

In parallel, Williams has identified and developed practical applications of some of the experimental probes used in her basic research, specifically the use of photoemission electron microscopy for analytical semiconductor device applications and magnetic force microscopy for the detection of current crowding in conducting lines.

Williams has presented ~150 invited talks and is well known for lucidly presenting difficult materials concepts both at conferences and in teaching. Furthermore, Williams is active in communicating the excitement of science to nonscientists, and has given more than 50 talks in the last 15 years to pre-college, undergraduate, and nonacademic audiences. She developed the educational outreach program for the University of Maryland MRSEC, funded by the National Science Foundation (NSF). The MRSEC provides service training to graduate students and postdoctorates and has delivered over 6000 hours of community service, predominantly to middle schools in the local public school system.

Upon receiving her PhD degree in chemistry in 1981 from the California Institute of Technology, Williams began her tenure at the University of Maryland as a research associate, becoming a full professor in 1991 and being appointed to her current position as Distinguished University Professor in 2000. She served as the principal investigator for an NSF Materials Research Group (1991–1996) at the University of Maryland prior to establishing the NSF-MRSEC at the university in 1996. She chaired the 1999 MRS Fall Meeting and the 2001 Gordon Conference on Thin Films and Crystal Growth. She has served on the executive committee of the Surface Science Division of the American Vacuum Society (1989–1990), the editorial advisory board of *Surface Science* (1995–1998), and the editorial board for *Review of Scientific Instruments* (1991–1993) and *Nano Letters* (2001–present), as well as on many panels and committees of professional societies. Her honors include, most recently, being named a fellow of the American Academy of Arts and Sciences (2003) and receiving the American Physical Society's David Adler Lectureship (2001). MRS

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Brinker and Schuller Named 2003 MRS Medalists


C. Jeffrey Brinker


Ivan K. Schuller

The Materials Research Society has selected two scientists to receive the MRS Medals for 2003, which recognize a specific outstanding recent discovery or advancement in materials research that is expected to have a major impact on the progress of any materials-related field. **C. Jeffrey Brinker** (Sandia National Laboratories and the University of New Mexico) and **Ivan K. Schuller** (University of California, San Diego) will receive their medals at the 2003 MRS Fall Meeting during the awards ceremony on December 3 at 6:00 p.m. in the Grand Ballroom of the Sheraton Boston Hotel. Schuller will give his Medalist presentation, "Exchange-Biased Nanostructures," on December 3 at 10:15 a.m. in the Commonwealth Room of the Sheraton. Brinker will deliver his Medalist presentation, "Self-Assembly of Biologically Inspired Complex Functional Materials," on December 3 at 1:30 p.m. in the Hynes Convention Center, Room 304.

C. Jeffrey Brinker is cited for "his pioneering application of principles of sol-gel chemistry to the self-assembly of functional nanoscale materials." Beginning with seminal contributions to sol-gel chemistry, including the classic textbook *Sol-Gel Science*, co-authored with G.W. Scherer, Brinker has extended his original research into the area of self-assembled materials. In the late 1990s, Brinker's group combined controlled sol-gel chemistry with self-assembly processes, creating opportunities for rapid, continuous processing and precise structural control of self-assembled nanoscale materials. This process led to the development of organic–inorganic nanocomposites that mimic the microstructure and properties of biominerals, and nanoporous particles for catalytic applications. He and his group demonstrated the direct writing of functional self-assembled nanostructures using computer-driven pens and inkjet printers. This advance provided a simple, robust approach to form functional hierarchically organized structures in seconds and established a link between computer-aided design and self-assembled nanostructures. Brinker's group also demonstrated the self-assembly of photosensitive films that incorporated molecular photoacid generators compartmentalized within their periodic nanostructures. This combination of photosensitivity and self-assembly is enabling standard lithographic procedures to be used to pattern and define the structure and function of nanomaterials. His group further developed polymerizable surfactants to direct the self-assembly of periodic nanostructures and to serve as monomeric precursors to a conjugated polymer, illustrating a highly controlled method of incorporating conjugated polymers in nanostructured hosts. His group recently prepared a novel thermally sensitive polymer/ceramic nanocomposite in which the lattice structure expands or shrinks in response to a temperature change.

Several of Brinker's 250-plus publications are among the highest cited in materials research. Brinker received his PhD degree in 1978 from Rutgers University. He holds 25 patents. Among Brinker's most recent honors are Sandia National Laboratories Fellow (2003), election to the National Academy of Engineering (2002), and the Department of Energy Ernest O. Lawrence Memorial Award in Materials Science (2002).

Ivan K. Schuller is cited for his "innovative studies of exchange bias in magnetic heterostructures and nanostructures." Exchange bias, a key ingredient in read heads and for a variety of applications, is the shift of the magnetic hysteresis curve when a ferromagnetic film in close contact with an antiferromagnetic substrate is cooled below the Néel temperature of the antiferromagnet. Schuller revived basic research in this field with a series of detailed quantitative studies. His group initiated the use of transition-metal difluoride antiferromagnets (e.g., FeF_2 and MnF_2) as model antiferromagnetic materials for exploring exchange biasing. Schuller and his group demonstrated exchange bias in a fully compensated antiferromagnetic surface; a positive exchange bias that depends on both the surface roughness and cooling field strength; spin-flop coupling of the ferromagnetic and antiferromagnetic spins, verifying theoretical predictions of this phenomena; a dramatic asymmetry in the reversal modes of the ferromagnetic layer; and a coercivity enhancement above the Néel temperature of the antiferromagnetic layer. Furthermore, Schuller measured the order parameter of the antiferromagnetic surface spins and correlated mesoscopic disorder in the antiferromagnetic layer with coercivity enhancement of the ferromagnetic layer. Currently, he is extending these studies to nanostructured magnetic materials. These phenomena override previously held beliefs regarding exchange bias and elucidate the origin of many unusual experimental observations. The insight Schuller has provided into exchange bias has impact on the development of high-technology devices, such as read heads, magnetic random access memories, and magnetic sensors.

Schuller received his PhD degree in 1976 from Northwestern University. He has close to 400 technical publications and many patents. He is one of the top Highly Cited Researchers as found by the Institute for Scientific Information. His most recent honors include the American Physical Society (APS) David Adler Award (2003) and the Alexander von Humboldt Prize (2000). Schuller is a fellow of APS and a member of the Belgian and Chilean Academies of Science.

The MRS Medal is intended to offer public and professional recognition of the recipient's achievements in materials research. The award includes a $3,000 cash prize, an engraved and mounted Medal, and a citation certificate. MRS

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