L. Rafael Reif Named New MIT Provost

L. Rafael Reif was named as the new provost of the Massachusetts Institute of Technology (MIT) this summer. He succeeds Robert A. Brown, who left MIT to become president of Boston University. In making the announcement, MIT President Susan Hockfield said, "Professor Reif has held leadership positions at MIT for much of his 25 years on the faculty, and is widely regarded as a deeply thoughtful, collaborative leader. His early championing of MIT's engagement in micro- and nanotechnologies; his concern for the broader impact of those technologies on society; his engagement with industry and government on both technical and policy matters in this country and abroad; his guidance on a wide range of policy matters at the school and institute level; and his outstanding teaching and student mentorship all promise to serve MIT very well. I am delighted that he has agreed to take on this new responsibility and look forward to working with him to increase MIT's great strengths."

The provost is the senior academic officer of the Institute, with overall responsibility for MIT's educational and research programs, as well as for faculty development, including the recruitment, promotion and tenure processes. As provost, Professor Reif will work closely with the academic deans to establish academic priorities on an ongoing basis. Working with the Executive Vice-President and other senior officers, he will have responsibility for financial planning to meet those priorities. The provost also has responsibility for the libraries, and for a number of major interdisciplinary laboratories, centers, and programs on campus, as well as Lincoln Laboratory in Lexington, Massachusetts.

Professor Reif, an internationally recognized researcher and educator in microelectronics, has been a member of ECS since 1975. At MIT, he has been head of the Department of Electrical Engineering and Computer Science since September 2004, following more than five years as Associate Head for Electrical Engineering. Prior to that, from 1990 to 1999, he was Director of MIT's Microsystems Technology Laboratories, an interdepartmental enterprise involving faculty, students, and senior staff from throughout the Institute.

Dr. Reif received his undergraduate degree in electrical engineering from the Universidad de Carabobo, Valencia, Venezuela in 1973; and his doctorate in electrical engineering from Stanford University in 1979. The following year, he joined the MIT faculty, and currently holds the Maseeh Professorship in Emerging Technology. His current research is on three-dimensional integrated circuit technologies and on environmentally benign microelectronics fabrication.

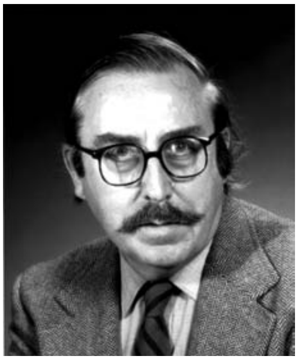
Dr. Reif is a Fellow of the Institute for Electrical and Electronic Engineers and is a member of Tau Beta Pi. In 2000, he was a recipient of the Semiconductor Research Corporation's Aristotle Award for outstanding teaching and student mentorship. ■

David J. Lockwood Receives Tory Medal from Royal Society of Canada

David J. Lockwood, FRSC, received the Tory Medal from the Royal Society of Canada this past November. This medal is the top physical science award in Canada. It has been won previously by three of Canada's Nobel Prize winners, G. Herzberg, B. N. Brockhouse, and J. C. Polanyi. The medal is awarded bi-annually for outstanding research in a branch of astronomy, chemistry, mathematics, physics, or an allied science carried out mainly in the eight years preceding the date of the award; but all the research of the candidate is taken into account.

Dr. Lockwood, a member of ECS since 1994, was named an ECS Fellow in 2001. He has served on numerous Society committees; and was chair of the Luminescence and Display Materials Division (2002-2004). Lockwood is Principal Research Officer at the Institute for Microstructural Sciences of the National Research Council of Canada. Recently (see *Interface*, summer 2005), he was awarded the Brockhouse Medal of the Canadian Association of Physicists for Outstanding Achievement in Condensed Matter and Materials Physics.

The announcement of the award noted that Lockwood is "an internationally renowned authority whose research on the optical properties of solids is characterized by its extreme breadth and outstanding innovation and originality. His seminal work in recent years on quantum confinement effects in semiconductor nanostructures culminated in the definitive observation of quantum-confined light emission in silicon, where previous worldwide efforts over two decades had proved inconclusive. This highly cited work has already led to numerous new world-wide endeavors in silicon nanocrystal research and technology. His application of inelastic light scattering to elucidate the dynamic properties of quantum dots, superlattices, magnets, and phase transitions has produced remarkable new insights into the physics of solids and has placed him amongst the international elite in each of these quite disparate subjects. Lockwood's work has had a broad impact on the development of solid-state physics; and his research underpins future applications of nanotechnology in areas as diverse as telecommunications and biosensors." ■



Brian E. Conway
1927-2005

On July 9, 2005, Canada lost its most prominent electrochemist, **Brian E. Conway**, to cancer at age 78. Brian was born in London, England on January 26, 1927, and attended Imperial College, University of London, where he received his PhD in 1949 under the supervision of Dr. John O'M. Bockris. The field of electrode kinetics was coming into its own at that time, and Brian and John were two of the earliest trail-blazers in this field in the western world. During that period, Brian was in a group that included Roger Parsons, Martin Fleishman, Edmund Potter, and J. W. Tomlinson. Brian worked at the Chester Beatty Cancer Research Institute of University of London as a permanent staff member from 1949 to 1954, in close contact with his other mentor, J. A. V. Butler, of Butler-Volmer equation fame. In later years, Brian spoke fondly of Butler, whom he found to be a person of great scientific and personal stature. In 1954 Brian took up a senior research position at the University of Pennsylvania, convinced by Bockris to come to North America and try his hand at electrochemistry in the "new world." He came to the University of Ottawa as an associate professor in late 1956 with the encouragement of the late Keith J. Laidler, a renowned physical chemist. He remained at U. of O. for the rest of his research life, and became a professor emeritus in 1993 (continuing full-time research until the end of his life). During that time, he supervised and influenced scores of PhD students and postdoctoral fellows from all corners of the world, many of whom are now leading scientists in industry, government and academia. He had a prodigious research output during his 60 years in the field, publishing over 400 scientific papers, several textbooks, and editing some of the most important serial volumes in electrochemistry of his day, such as "Modern Aspects of Electrochemistry." He is survived by his wife, Nina; and one son, Adrian, a PhD electrical engineer in the high-tech field, living in Boston.

Brian conducted original research in both main areas of electrochemistry, i.e., ionics and electrodics. Indeed, his strong knowledge of the solution side of the electrochemical system is doubtless responsible for his definitive and original contributions on the electrode side. His research encompassed electrode kinetics, oxide film formation and electrocatalysis, properties of solvated ions and their adsorption, applied electrochemistry, batteries, fuel cells, and supercapacitors. He was in many ways a "complete" electrochemist and covered pretty much the entire subject. As a teacher and mentor, Brian was exemplary. His more than 100 graduate and postdoctoral students realized that Brian had a unique and all-consuming passion for scientific research, as well as the ability to understand and explain phenomena in the physical sciences. He was certainly the top electrochemist in Canada for almost half a century, and most say one of the top physical electrochemists in the world during that time. His knowledge, memory, and powers of reasoning were legendary in the scientific community, and his students and co-workers greatly benefited from those talents and abilities. At the same time, Brian was totally loyal to his colleagues, who could always count on him for support and "words-of-wisdom." Many of these positive traits rubbed off on his students, who learned much, much more than just electrochemistry from Brian Conway. He was indeed the "master" electrochemist and scientific mentor.

Brian received scores of awards and honors, both national and international, during his long, distinguished scientific career. Two in particular stand out. The first is the Henry B. Linford Teaching Award of ECS in 1984, which recognizes contributions to teaching at the university level and the mentoring of young scientists and researchers. The second is the Olin Palladium Award in 1989 from ECS, this being the highest research award of the Society; previous recipients include Carl Wagner, U. R. Evans, A. N. Frumkin, and A. J. Bard. Only one other Canadian, the late Morris Cohen of NRC, has received this award during the past 55 years. These, and the many other awards and honors he received, never inflated Brian's ego or changed his openness and willingness to discuss science with anyone. He was always a down-to-earth researcher who was driven by an insatiable curiosity and desire to understand and explain phenomena.

Brian's ability to discuss scientific issues at length, in a detailed and thoughtful manner, was legendary. A quote from his previous research supervisor, John Bockris, sums it up perfectly: "Conway was a superb discussion partner; and if the subject was scientific theories of anything, and one had three to four hours of isolation and silence available, one could have scientific discussions as good as any John O'M Bockris has had with any of his co-workers. Discussions of a single topic usually lasted several hours. The first time the value of silence (3-4 minutes) during a discussion became clear was with Conway. Then came the murmured new suggestion, accompanied sometimes by a roughly made drawing on the board." All who worked with Brian would concur with this statement. Even when he

(continued next page)

In Memoriam

Arvid Arvidson (*d.*2005) — member since 1999, Electronics and Photonics Division

Edumund C. Potter (*d.*2005) — member since 1951, Corrosion Division

Myron A. Coler (1913-2004) — member since 1935, Electronics and Photonics Division

Conway

(continued from previous page)

was on vacation, Brian was coming up with new ideas and theories as he sat on a sandy beach half-way around the world. His graduate students and postdocs would receive post-cards (this was long before e-mail) with some new theory, and a suggested experiment to try, all in his famous handwriting. Most of the time, these ideas were on-the-mark, and would result in a publication down-the-road. He had one of the most active, clever minds of anyone I knew or will ever know, as well as a vast storehouse of information that was always at his fingertips. These gifts and strengths benefited all who worked and associated with Brian Conway.

Besides his ability as a scientist, Brian was also an excellent glassblower, indeed he could have been a professional one if he had had the time. Glassblowing seemed to be therapeutic for him, and allowed him to show another side of his creativity. In the late '60s and early '70s, all of his researchers came to the lab on Saturday and generally put in a full day. Brian would arrive first and leave last. Since he had free time on the week-ends, he would help with setting up experiments and do some routine glassblowing. But occasionally he would take the time to actually make a 3-compartment electrochemical cell from scratch, a not insignificant task that could take as much as a few hours, with more time afterwards for annealing in an oven to relieve the built-up stresses. He was like an artist at work, and truly enjoyed the challenge, and did not mind if others watched him worked. We could even carry on scientific discussions, at least when he wasn't "blowing." We usually went together for lunch at local Chinese and pizza restaurants, and the discussions continued with Brian, the students and postdocs. This was the atmosphere that created some awfully good electrochemistry; and I was fortunate to have been there. We will never forget Brian Conway, physical electrochemist, teacher and professor, mentor, amateur glassblower, and true friend who was always there for us all. ■

This notice was prepared by Barry MacDougall, National Research Council of Canada and ECS Vice-President; and by John O'M Bockris, professor at the University of Pennsylvania (1953-1972) and distinguished professor at Texas A&M University (1978-1997).

In Memoriam

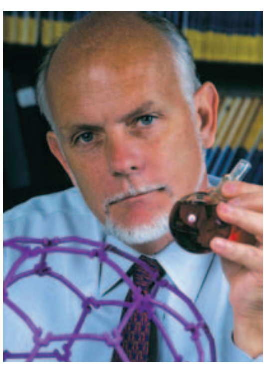


Photo courtesy of Rice University

Richard E. Smalley

1943-2005

The scientific community has suffered a great loss with the death of **Richard Errett Smalley** at age 62 following a six-year battle against cancer. Smalley was particularly renowned to members of ECS for his famous discovery of Buckminsterfullerene and his pioneering research on carbon nanotubes.

Richard Smalley (known as Rick) was born in 1943, the youngest of four children in a middle-class Ohio family that moved to Kansas City when he was three years old. Growing up there, Smalley developed a love of science through his mother's fascination with the topic. He was also inspired by an aunt who was one of the few women in American universities then holding the rank of full professor of chemistry. In high school, Smalley became a serious student as he encountered extraordinary science teachers and saw how the Soviet launch of Sputnik focused national attention on the importance of science and technology.

His college studies began at Hope College and continued at the University of Michigan in Ann Arbor, where he was awarded a bachelor's degree in chemistry. After graduation, Smalley spent four years working at a Shell Chemical Company plant in New Jersey. In 1969, he enrolled in the chemistry graduate program of Princeton University. His PhD thesis research under Professor Elliot Bernstein concerned the spectroscopy of molecular crystals at cryogenic temperatures. In 1973, he accepted a postdoctoral appointment at the University of Chicago to work with Donald Levy. There, a famous collaboration between Smalley, Levy, and Lennard Wharton led to the invention of supersonic jet spectroscopy. This powerful experimental method measures the optical spectra of gas phase molecules that are cooled nearly to absolute zero without condensing. The enormous spectral simplification that results from this ultracold gas phase environment allowed the spectra of many molecules to be studied and understood in unprecedented detail. The impact of supersonic jet molecular spectroscopy in chemical physics is even greater today than it was at its introduction thirty years ago.

In 1976, Rick Smalley came to Rice University in Houston to accept his first and only faculty appointment. Despite very modest start-up funding and experimental space consisting only of the corner of another professor's lab, Smalley began his own research program with the focus, creativity, and dedication that characterized his entire career. Soon he had attracted a crew of talented and inspired graduate students, built a state-of-the-art apparatus for supersonic jet spectroscopy, and made important contributions to molecular physics. A few years later, Smalley enhanced his apparatus by installing a pulsed laser in the source chamber that could vaporize a wide variety of high-melting target materials into small molecular clusters. These novel species were then cooled in the supersonic gas expansion and studied using spectroscopy lasers combined with a mass spectrometer. This powerful new technique allowed him to invent and pioneer another new field: the study of small metal and semiconductor clusters.

Smalley's remarkable cluster spectroscopy attracted the attention of Harry Kroto, a British molecular spectroscopist who was interested in the spectral signatures of linear chains of carbon atoms that might be detected in interstellar space. Kroto contacted Robert Curl, his friend on the Rice faculty, and arranged to visit Houston in the summer of 1985 for three-way collaborative experiments on carbon using Smalley's apparatus. As Smalley's graduate students Jim Heath and Sean O'Brien worked on this project, they found a totally unexpected mass spectrum from species formed by laser vaporizing a graphite target. The mass spectrum showed a series of peaks arising from clusters with even numbers of carbon atoms, and a dominant signal at mass 720, corresponding to

60 carbon atoms. This result instantly galvanized the researchers. In a burst of insight and creativity they quickly deduced the correct explanation: the new species must be a closed-cage molecule with the structure of a soccer ball. This was the discovery of Buckminsterfullerene, C_{60}.

The assertion of this structure based only on a mass spectral peak was quite controversial, but Smalley and his co-workers performed increasingly elegant and persuasive experiments to support their claim. Following the 1990 discovery by Huffman and Kratschmer of a method to produce fullerenes in bulk, the soccer ball structure was immediately confirmed and the field of fullerene science exploded. To date, tens of thousands of papers have been published in this area, and an entire ECS Division is focused on studies of fullerenes and related carbon nanostructures. In recognition of their landmark discovery, Smalley, Curl, and Kroto were awarded the 1996 Nobel Prize in chemistry.

Not content to continue working in the expanding and vital field that he had pioneered, Smalley turned his attention in the early 1990s to an even newer area: carbon nanotubes. These are materials that are related to the spheroidal fullerenes, but instead have enormous aspect ratios and properties intermediate between crystalline solids and molecules. The Smalley group made a long series of important discoveries about carbon nanotubes, including novel growth methods that have provided the main source of samples for researchers around the world. In 2000, Smalley founded Carbon Nanotechnologies, Inc., a company that is now a leading commercial producer of single-walled carbon nanotubes. Most recently, he expanded his horizons beyond the scope of conventional chemistry or physics research to seek solutions to the immense problem of future global energy needs. Smalley would often travel to Washington and use his great powers of explanation and persuasion on high elected officials in order to shape national priorities in scientific research, including the National Nanotechnology Initiative. Rick Smalley was a passionate believer in the power of science and technology to solve great problems. One of his favorite bits of advice to students was "Become a scientist and save the world."

This account of Rick Smalley's scientific career does not convey the remarkable personal qualities of the man. He had great personal charm, communication skills, and charisma. He loved to teach and mentor his students, inspiring them with the excitement and importance of scientific research. He was incredibly intelligent and focused. His intellectual curiosity let him soak up information from diverse fields like a sponge and then synthesize it into grand new ideas and plans. He was truly a scientific visionary, referred to as "Moses-like" by some. Rick Smalley was absolutely fearless in abandoning the comforts of a well-established research program to leap into promising but uncertain new fields. And he was fearless in battling his fatal disease, working intensely until the very end of his life. He was devoted to and is survived by his wife, the former Deborah Lynn Sheffield, and his two sons, Chad and Preston.

Rick Smalley's untimely death is a loss not only to his family, friends, students, colleagues, and collaborators, but to the worldwide communities that he led and served. He will be deeply missed and long remembered.■

This notice was prepared by R. Bruce Weisman of Rice University.