

## ECS Members Receive National Medal of Technology and Innovation

Two ECS members—**ADAM HELLER** and **CARLTON GRANT WILLSON**, both of the University of Texas, Austin (Texas)—were named National Medal of Technology and Innovation recipients for 2007. Adam Heller was awarded the medal for his contributions to electrochemistry and bioelectrochemistry, which led to the development of products that have improved the quality of life of millions particularly in the area of human health and well-being. C. Grant Willson received the medal in recognition of his work to create novel lithographic imaging materials and techniques, which have enabled the manufacturing of smaller, faster, and more efficient microelectronic components.

Established by an act of the U.S. Congress in 1980, the medal honors America's leading innovators. The award is given to individuals, teams, and/or companies/divisions for their outstanding contributions to the nation's economic, environmental and social well-being through the development and commercialization of technology products, processes and concepts; technological innovation; and development of the nation's technological manpower.

**Ed. Note:** See the upcoming spring 2009 issue of *Interface* for a story on these exciting innovators.



### Subhash Singhal Receives 2008 Grove Medal

Fuel cell pioneer **SUBHASH SINGHAL**, fuel cell director at the Department of Energy's Pacific Northwest National Laboratory (PNNL), has received the 2008 Grove Medal for sustained advances in fuel cell technology. Singhal accepted the honor at the Fuel Cells Science & Technology 2008 conference

in Copenhagen, where he gave the opening address. The medal commemorates Welsh judge, inventor, and physicist Sir William Robert Grove, who created the first fuel cell in 1839. It is the fifth international award to recognize Singhal's contributions to fuel cell research.

As a Battelle Fellow at PNNL, Singhal provides senior technical, managerial, and commercialization leadership to the laboratory's fuel cell program. He joined PNNL in 2000 after nearly 30 years leading fuel cell development at Westinghouse Electric Corp.

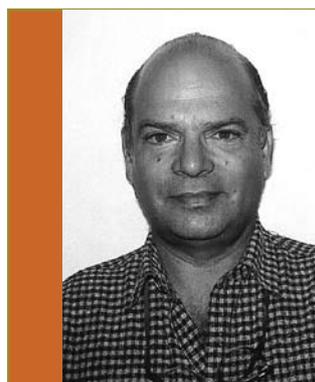
Singhal received his doctorate in materials science and engineering from the University of Pennsylvania. A member of the National Academy of Engineering, Singhal is a fellow of four professional societies: ECS, the American Ceramics Society, ASM International, and the American Association for the Advancement of Science. He also is a senior member of TMS, the Mineral, Metals & Materials Society, and has served on numerous national and international advisory panels.

Dr. Singhal has authored more than 85 scientific publications, edited 13 books, received 13 patents, and delivered more than 260 plenary, keynote, and other invited presentations worldwide. He is an adjunct professor in the Department of Materials Science and Engineering at the University of Utah, and serves on advisory boards of the Florida Institute of Sustainable Energy and the Department of Materials Science and Engineering at the University of Florida.

PNNL is a Department of Energy Office of Science national laboratory where interdisciplinary teams advance science and technology and deliver solutions to America's most intractable problems in energy, national security, and the environment.

## 2008 Fuel Cell Seminar Award Winners

The Fuel Cell Seminar & Exposition recently announced the winners of the 2008 Fuel Cell Seminar & Exposition Award: Shimshon Gottesfeld and Karl Kordesch, both long-time ECS members. This award is given annually to those who have achieved outstanding leadership and innovation in the promotion of the overall advancement of fuel cell technology. ECS is a sponsor of this event, with the most recent edition being held in Phoenix, Arizona in October.



**SHIMSHON GOTTESFELD** obtained his DSc in chemistry in 1970 from Technion, the Israel Institute of Technology, and joined the staff of the Department of Chemistry, University of Tel Aviv, in 1972. His research activities at Tel Aviv included studies of electrochemical interfaces with spectroscopic techniques, focusing on fundamental and applied aspects of electro-catalysis and on photo-electrochemical energy conversion processes.

Dr. Gottesfeld spent an extended sabbatical leave between 1977 and 1979 at Bell Labs in Murray Hill, NJ, working primarily on electrochromic materials. In 1984 he went to Los Alamos National Laboratory (LANL) on sabbatical leave, and in 1987 became the Technical Project Leader for the Fuel Cell Research program at LANL. The work of his team at LANL in the 1980s and 1990s was recognized world-wide for technology-enabling contributions in the areas of polymer electrolyte fuel cells and direct methanol fuel cells (DMFC).

Between 1996 and 2000, Dr. Gottesfeld served as representative of the U.S. National Laboratories on the Fuel Cell Technology Steering Committee of the "Partnership for the New Generation Vehicle." In 1999, Dr. Gottesfeld was appointed a Laboratory Fellow at LANL.

Dr. Gottesfeld has published over 150 articles and several book chapters and holds 25 patents with 5 more pending. He served for several years as an officer and Chair of the ECS Physical and Analytical Electrochemistry Division. In 1999 Dr. Gottesfeld was named an ECS Fellow.

In 1999, Dr. Gottesfeld co-initiated the series of Gordon Research Conferences on Fuel Cells, remaining to date the highest level annual meeting devoted to fuel cell science and technology.

In December 2000, Dr. Gottesfeld took an entrepreneurial leave from LANL, to become CTO of MTI Microfuel Cells in Albany, NY. At MTI he led the development of direct methanol fuel cells for use in advanced power sources for portable electronic applications. A central development of DMFC technology at MTI was a novel platform (Mobion®) that enables significant DMFC power system simplification. Dr. Gottesfeld moved to status of senior advisor in 2006, and later concluded his activities at MTI.

In 2006, Dr. Gottesfeld was the recipient of the Grove Medal for Fuel Cell Science and Technology. He was the first to receive this award. In 2007, Dr. Gottesfeld made another new start in the area of fuel cell technology, aiming this time at resolution of the significant barrier to market entry due to the high cost of the technology. He co-initiated a new start-

up company, Cellera Technologies, where he is now CTO and member of the board. Cellera is devoted to the development of a new polymer electrolyte fuel cell technology based on non-PGM catalysts and inexpensive stack hardware. The company was incorporated in the U.S. in 2007 and established early in 2008 a first R&D center in Caesaria, Israel.

**KARL KORDESCH** studied chemistry and physics at the University of Vienna where he received his PhD in 1948. As a university assistant at the Physical Chemistry Institute in Vienna he developed a zinc-air battery, and was granted several patents. In 1953 he was invited to continue his work with the U.S. Signal Corps as a scientific staff member and moved with his family to the U.S. There he worked on several electrochemical systems and electronic circuits, resulting in several patents.

In 1955 Dr. Kordesch joined Union Carbide Corp. to work at the Research Laboratory in Parma, Ohio. As Battery Group Leader he continued the development of different batteries. The alkaline manganese dioxide-zinc primary cell was one of his major projects. Union Carbide at that time was the manufacturer of Eveready Batteries in the U.S. The new alkaline system rapidly replaced the zinc-carbon (LeClanche) manganese dioxide battery in the following years (1960-70). Dr. Kordesch obtained many of the basic patents on composition and design matters.

During his time at Union Carbide as a contract manager, Dr. Kordesch contributed to the development of hydrogen fuel cells for the U.S. space program, for the U.S. Navy, and for the General Motors Electrovan. In the early '70s he built a Fuel Cell City Car (an Austin A 40, designed as a hybrid vehicle with rechargeable batteries) for his personal use and operated it for several years. Many patents and scientific publications were the result. A motorcycle was built as a hydrazine-fuel cell-nickel cadmium battery hybrid. It was used by Union Carbide Corp. in New York to demonstrate the usefulness of that system for the U.S. Army.

Later, a gasoline-lead battery hybrid car variation of the Austin was demonstrated at the NASA test-track facilities in Cleveland and judged as a very promising future vehicle. He published two volumes of the book *Batteries*; in 1974, Vol. 1: Manganese Dioxide, and in 1977, Vol. 2: Electric Vehicles. Both were published by Marcel Dekker, NY.

In recognition of his work, ECS awarded Dr. Kordesch the Vittorio de Nora Award for outstanding achievements. Several other awards of technical societies followed, including the Wilhelm Exner Medal from his home country of Austria. Many patents were granted to Kordesch and then assigned to the contracting companies.

In Canada, in 1986, together with Mr. Wayne D. Hartford, Battery Technologies Inc. (BTI) was founded. A pilot plant production was established and negotiations about licensing this product were initiated. Rayovac, in Madison, WI (U.S.) became the first licensee of BTI and started to manufacture all four cylindrical types of the rechargeable alkaline manganese dioxide-zinc (RAMTM) battery under the trade name, Renewal. Soon over 50% of the small consumer Ni-Cd batteries in the U.S. were replaced.

After his retirement in 1992, Dr. Kordesch continued to head a Research Group in Austria. In Canada, Dr. Kordesch founded the company Kordesch & Associates, Inc. and serves as a consultant in electrochemistry.

His book, *Brennstoffbatterien*, was published in 1984 by Springer Verlag. More recently, his book, *Fuel Cells and their Applications* (co-authored by his previous student, G. Simader) was published by VCH/Wiley, NY. A new up-to-date edition is now in the works. He has contributed several chapters in the new *Handbook of Fuel Cells* (W. Vielstich, et al., ed.), published by Wiley 2002/03.



## Jamal Deen Receives Thomas W. Eadie Medal

**M. JAMAL DEEN**, professor of electrical and computer engineering at McMaster University, and Canada Research Chair in Information Technology, has been awarded the prestigious Thomas W. Eadie Medal by the Royal Society of Canada.

The medal is awarded in recognition of major contributions to engineering

or applied science, with preference given to those having an impact on communications, in particular the development of the Internet. It was established in 1975 by Bell Canada in appreciation of its past Board Chair, Thomas Wardrope Eadie, and in recognition of the increasingly important role of applied science to the quality of life in Canada.

Professor Deen's citation from the Royal Society of Canada reads, "Dr. Deen is a major contributor and world leader in microelectronics/nanoelectronics and optoelectronics and has made significant contributions to communication systems hardware. He is the world's foremost authority in the modeling and noise of electronic and optoelectronic devices, particularly silicon transistors and high-speed photodetectors for application in wireless communication circuits and optical communication receivers."

Professor Deen is an ECS Fellow (2004), a Fellow of the Royal Society of Canada - The Academies of Arts, Humanities, and Sciences of Canada, a Fellow of the Canadian Academy of Engineering, and a Foreign Fellow of the Indian National Academy of Engineering. He holds numerous additional awards and distinctions. Most recently, he returned from Germany where he conducted research on the modeling of nanoscale semiconductor devices and their applications to millimeter and microwave applications as a recipient of a Humboldt Research Award from the Alexander von Humboldt Foundation. ■

*In Memoriam***Vittorio de Nora**  
1912-2008

The global electrochemical community lost a unique and remarkable leader on June 29, 2008 with the passing of **VITTORIO DE NORA** at the age of 95. It is difficult to describe the Professor's true impact, as he started as a brilliant academic, but became an astute business man who led the globalization of the electrochemical chlor-alkali industry in the era following World War II, developing, promoting and selling the de Nora cell technology world wide.

Vittorio de Nora left a pioneering legacy in the field of industrial electrochemistry, along with his older brother Oronzio de Nora, because he was the first scientist to recognize the value of Henry Beer's non-carbon anode material and to complete its development so that it could be used industrially. The result was the de Nora coated titanium dimensionally stable anode (DSA®) used in the chlor-alkali industry. This led not only to the elimination of the polluting mercury cell technology, or alternatively the need for the use of asbestos separators, but also to the improvement of the environment by eliminating the greenhouse gas emissions evolved from the carbon anodes DSA replaced.

Vittorio de Nora was born in Altamura, Italy, on November 11, 1912. He was admitted to the Royal Politecnico Institute of Milan in 1929, from which he gained a doctorate in electrochemical engineering with full honors in 1935. Rather than accepting an invitation in 1936 to become a professor of physical chemistry and electrochemistry at the Royal Politecnico Institute, he decided to carry out research abroad. He spent time doing research at King's College, University of London, and then at the Hochschule of Dresden.

Leaving Dresden in 1937, Vittorio de Nora went to the United States, in order to work with Professor Butts at Lehigh University, where the results of his research permitted him to receive a PhD in physical chemistry in just nine months, a feat never since repeated.

Returning to the Royal Politecnico in 1939, Vittorio was named Professor of Physics and Chemistry. But, the Second World War had already begun in Europe and his colleagues and family finally advised him to escape Italy and the Fascists so that his talents would not be commandeered by the Axis

powers during the occupation of Italy. It was the Swiss Ambassador to Italy who helped him to get to Zurich, in order to prevent his having to work for the Axis. The Ambassador had a daughter, Chantal, and one evening while dining with the Ambassador and his family before leaving Italy, Vittorio met her and said to himself, "this is the woman I am going to marry," although at the time she was only sixteen years old. Chantal would become Vittorio's wife in 1944.

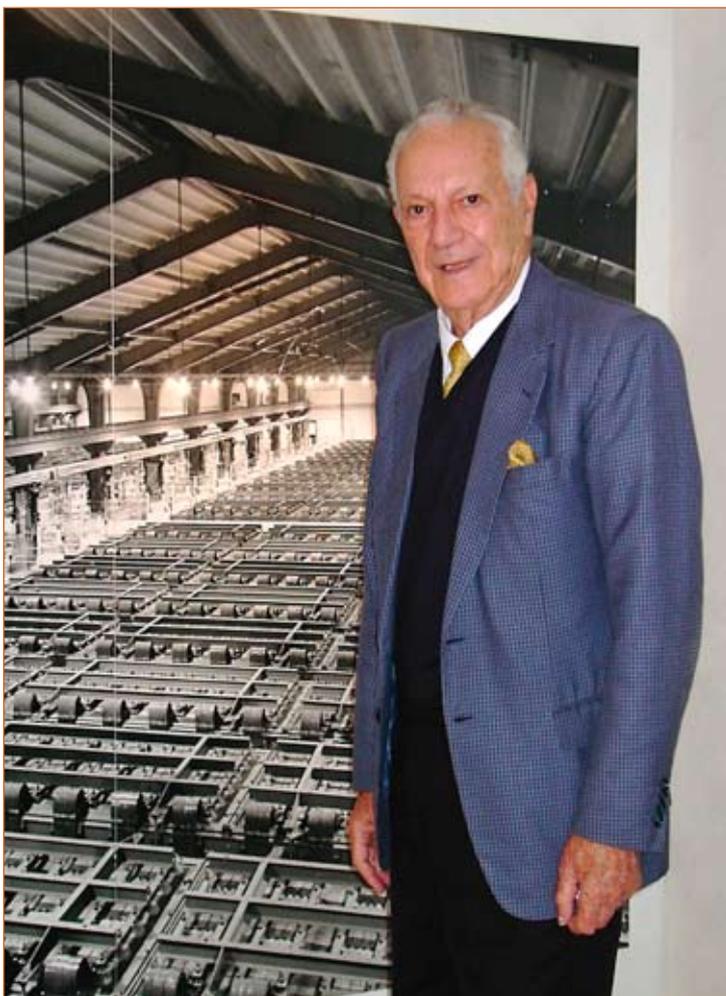
He left for Switzerland, to begin his non-academic research career in the field of electrometallurgy. His research field of interest was, of course, electrochemistry, the flourishing baby of the chemistry discipline. In a somewhat symbiotic fashion, Vittorio de Nora and electrochemistry grew up together.

The de Nora companies, founded by the two brothers, had a flourishing business and Vittorio would probably have been content to continue his private research and work with the brother he revered, had it not been for a letter received by Oronzio in 1962, when Vittorio was already fifty years old. The rest of Vittorio's life would be changed drastically by that letter, written by Henry Beer to the major chlorine producers asking them to consider the use of his patents for a novel chlorine cell anode made of a metal alloy instead of carbon. Oronzio showed the letter to Vittorio, who immediately saw the value of Beer's idea. Oronzio wasn't as enthusiastic, but,

characteristically, Vittorio decided to contact Henry Beer anyway.

When Vittorio de Nora and Henry Beer met, they instantly liked each other. Beer gave him the details of his invention, which would replace the unpleasant carbon anodes in chlor-alkali cells with metallic anodes, which would save energy and eliminate the emissions related to burning carbon anodes to make chlorine. Vittorio improved the invention and added a coating that made it feasible industrially. The de Nora brothers set out to find the money they needed and to build their strategy for manufacturing the anodes and convincing chlorine producers to use them.

The de Nora companies not only developed the bi-polar chlorine cell, but also built plants accounting for one-third of the world's chlorine production. This included the largest



chlorine cell (450,000 amp), which until recently was the largest electrochemical cell ever built. They also constructed the world's largest water electrolysis plant having heavy water as a by-product.

Despite the financial reward that came with his technical success, Vittorio de Nora continued to actively devote his career to advancing electrochemistry, and with his innovative mind became the author or co-author of several hundred industrial patents linked to the electrochemical industry. These were not confined to the chlor-alkali industries but expanded to include aluminum production, where he gained more than 70 patents related to an inert anode for aluminum production, as well as a similar number of patents for cell design innovations to facilitate inert anode use and for improvements existing electrode technology.

Eltech Systems Corporation, the American affiliate of the de Nora Group, became the world leader in the marketing of the DSA for chlorine production and other electrochemical applications, later including membrane cells technology for the chlorine industry. Under Vittorio de Nora's leadership, Eltech Systems also initiated research and development on one of his own dreams, to develop advanced electrode technology for primary aluminum cells.

During the last quarter century of Vittorio de Nora's life, the development of an inert anode for aluminum smelting became his mission and passion. His goal was to eliminate serious pollution problems related to the use of carbon anodes and to improve energy efficiency with the more flexible cell designs that inert anodes make possible in electrochemical cells, thus opening the potential to significantly reduce capital and operating costs.

While Eltech provided the initial R&D facilities for Prof. de Nora to pursue his goal, he later formed a private company, Moltech, specifically for R&D in aluminium cell technology, and more specifically for new materials development. As it progressed, Vittorio established a scientific team in purpose-built laboratories in the Swiss Valais, where they not only worked on perfecting the materials science, but also developed prototype anodes and since 1999 have operated pilot test cells utilizing the de Nora inert anodes.

Always an academic at heart, Vittorio's research leadership skills continued to inspire others to pursue their goals. He generously facilitated and encouraged other noteworthy technical achievements by sponsoring research through various endowments and awards. Included among these has been being an important sponsor of the Ernest B Yeager Center for Electrochemical Science at Case Western University, and the endowment of the ECS Vittorio de Nora Award for distinguished contributions to electrochemical engineering and technology. The de Nora Award, consisting of a gold medal, wall plaque, and prize of \$7,500 is presented to a recipient biennially at the spring meeting of ECS. It is one of the Society's premier awards.

Prof. de Nora's personal devotion to the betterment of global society was also demonstrated by Dr. de Nora in his support and helping to found the International Physicians for the Prevention of Nuclear War, to whose activities he contributed. The group was awarded the Nobel Peace Prize in 1985.

Vittorio joined ECS in 1938 while a postgraduate at Lehigh and continued as a member until his recent death. He had the distinction of being the Society member with the second-longest membership record. Vittorio de Nora was elected an Honorary Member of ECS in 1982 and became a Fellow of the Society in 1992, in recognition of his contributions to science and electrochemical engineering. He was further honoured by ECS in 2006, when he was awarded the Edward Goodrich Acheson Award, established in 1928 for distinguished contributions to the advancement of any of the objects, purposes, or activities of ECS.

Case Western University, Lehigh University, and the University of Cincinnati have all conferred on him the honorary degree of Doctor of Science. Vittorio was also a Volta Fellow, a Weston Fellow, and a Case Centennial Scholar.

Everyone who met Vittorio de Nora remembers him as a gentleman—courteous to a fault, always polite and soft-spoken no matter the situation, and ever ready to listen to new ideas and to engage in dialogue to test their validity. He loved to tell stories, usually making fun of himself. His favorite perhaps was to recount the winter evening long ago when he and several friends were in the Italian Alps for skiing. They were having dinner when Vittorio heard the conversation at the next table turn to a mathematical puzzle. He solved it in his usual lightning fashion and approached the other table, giving the answer, only to find that one of them already had the solution. As everyone introduced themselves, one man said his name was Fermi. Startled, Vittorio asked if he knew the famous scientist and the man replied, "I know him very well because I am he." That story amused Vittorio for the rest of his life, along with fast cars, motorcycles, chocolate, and of course, science.

Vittorio de Nora is survived by his widow, the Baroness Chantal de Nora-de Bavier, and three children, Emanuela, Tiziana, and Matteo. ■

*This notice was contributed by Emeritus Professor Barry Welch (member since 1961) and by K. J. Holz, legal advisor to Vittorio de Nora.*