



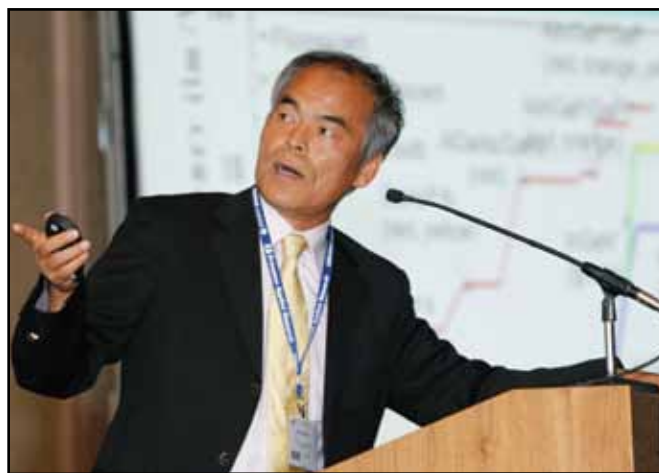
The 218th ECS Meeting was the third time ECS met in the city of Las Vegas; the last time being 25 years ago (in 1985) at Caesar's Palace. Third time's a charm, apparently, for the 2010 meeting set a record for the largest attendance for an ECS meeting in the continental U.S.: 3,239! The Monday Evening Mixer and Student Poster Session drew an exceptionally large crowd, which had the chance to view some excellent student posters (see page 65); and 44 exhibitors offered a look at their products and services. Visitors to the ECS exhibit had the opportunity to win a copy of the Society's newest monograph, the latest edition of *Modern Electroplating*, edited by Mordechai Schlesinger and Milan Paunovic. A number of Leadership Circle Awards were presented to loyal ECS Corporate Members, for membership terms ranging from five years to 25 years. Outstanding feature lectures rounded out a program that included 2,374 presentations in 43 different technical symposia.

Energy Storage: Edward Goodrich Acheson Award Lecture

John S. Newman gave his award lecture on Monday afternoon to a packed audience. The Edward Goodrich Acheson Award was established in 1928 for distinguished contributions to the advancement of any of the objects, purposes, or activities of ECS. The award is named for Edward Acheson, a U.S. inventor best known for the invention of the highly effective abrasive materials, carborundum (silicon carbide). He also helped develop the incandescent lamp.

In addition to the Acheson Award, Prof. Newman has received many other awards from the Society, among them the Young Author's Prize in 1966, the Olin Palladium Medal in 1991, and the Vittorio de Nora Award Medal in 2008. He is an ECS Fellow and was elected to the National Academy of Engineering in 1999. In recognition of his outstanding contributions to the Society, Dr. Newman became an Honorary Member in 2007. Dr. Newman's book, *Electrochemical Systems*, has inspired generations of students to undertake careers in electrochemical engineering, and many of them are making key contributions to the Society. More details on Dr. Newman's illustrious career may be found in the last issue of *Interface* (fall 2010, p. 21).

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SHUJI NAKAMURA delivered The ECS Lecture, entitled "Current and Future Status of Nitride-Based Solid State Lighting" at the 218th ECS Meeting in Las Vegas.



JOHN S. NEWMAN (left) received the 2010 Edward Goodrich Acheson Award from President **WILLIAM D. BROWN** (right). The award was established in 1928 for distinguished contributions to the advancement of any of the objects, purposes, or activities of ECS.

Professor Newman was introduced to the audience by James (Jim) A. Trainham, Vice President, Strategic Energy Initiatives at RTI International, and a graduate student under Newman in Berkeley. Dr. Newman began his lecture by thanking all his students and associates over the years. He talk focused on the essentials of continuum and molecular modeling as they applied to energy and power as well as life and failure of electrochemical systems. He reminded the audience that modeling enhanced understanding as long as they were based on sound chemical and physical principles. The physical laws consisted of Ohm's law, transport equations for diffusion (Fick's laws), migration, and convection, and material balances. The electrode processes involved charge transfer kinetics and processes at the interface (double layer).

The lecture turned to specific examples including discharge curves and the construction of optimized Ragone plots. Modeling battery size and capacity use for applications in hybrid or plug-in hybrid electric vehicles (EVs) were discussed.



THOMAS J. SCHMIDT (right) was the 2010 recipient of the Charles W. Tobias Young Investigator Award. The award, presented by ECS President **WILLIAM D. BROWN** (left), was established in 2003 to recognize outstanding scientific and/or engineering work in fundamental or applied electrochemistry or solid-state science and technology by a young scientist or engineer.

An example of molecular modeling centered on dynamic Monte Carlo simulations of site hopping in the $\text{Li}_y\text{Mn}_2\text{O}_4$ spinel system. The physics of Zn shape change and Li dendrite growth were finally addressed in examples of problems limiting the life of battery systems for energy storage.

Current and Future Status of Nitride-Based Solid State Lighting

The highly successful recent innovation of picking a late day slot for the plenary session was continued in Las Vegas with the ECS Lecture being given by **Shuji Nakamura** from the University of California at Santa Barbara, CA. Dr. Nakamura's many awards and recognitions include the Nishina Memorial Award (1996), the Materials Research Society Award (1997), the IEEE Jack A. Morton Award, and most notably, the prestigious Millennium Technology Prize in 2006. He was elected to the National Academy of Engineering in 2003. Prof. Nakamura developed the first Group III nitride-based high-brightness blue/green light emitting diodes (LEDs) and the first violet laser diode (LD) based on the same active semiconductor material. The commercial success of white LEDs and Blue-Ray digital video disk (DVD) players can be traced to his inventions. More details on Prof. Nakamura's background and contributions may be found in the last issue of *Interface* (fall 2010, p. 20).

The speaker was introduced by the ECS President, Bill Brown. Dr. Nakamura began his lecture by introducing the members of his research team at UC Santa Barbara that included other faculty in Materials Science along with post-doctoral researchers and students. He organized his informative talk around three topics involving Group III nitrides: LEDs derived from polar c-plane semiconductors, LD counterparts based on non-polar/semi-polar material, and finally, bulk GaN growth. He pointed out the dramatic improvements in luminous efficiencies of white LEDs so much so that they have largely displaced incandescent lamps and their performance approach the popular compact fluorescent lamp (CFL) technology. He outlined the three major strategies for designing LEDs. The use of these highly efficient lighting systems translate to cost and energy savings of \$100 billion a year and ca. 273 TWh/y respectively. Lighting currently accounts for 20% of electricity consumption and Dr. Nakamura also pointed out the enormous impact on the quality of life and education in the developing countries brought about by solid-state lighting. He highlighted the contributions made in this area by one such organization with which he is involved: Light Up the World Foundation (www.lutw.org).

Dr. Nakamura's lecture then turned toward many of the R&D advances currently on-going to make solid-state lighting more cost effective and efficient. He pointed out that there was much room yet for improvement in the area of light extraction in these devices. He discussed approaches to circumvent "efficiency droop" that currently hampers long-term use of LEDs. The lecture turned to the challenges posed by the growth of non-polar/semi-polar GaN substrates and the need to enlarge substrate area. Dr. Nakamura and co-workers reported the first lasing of GaN-based LDs derived from such substrates in 2007. The final topic centered on the bulk GaN growth by ammonothermal method based on the use of supercritical ammonia as a carrier fluid. The first bulk crystal was grown in UCSB in 2006. Growth rates are as yet very slow by this method.

Photovoltaic Solar Cells for the Rest of Us

The ECS "XYZ for the Rest of Us" series continued in Las Vegas with a tutorial entitled "Status and Outlook on the Photovoltaic Solar Industry Based on Solar Cell R&D" by **Bolko von Roedern** of the National Renewable Energy Laboratory (NREL) in Golden, CO. The speaker surveyed the photovoltaic (PV) market through 2009 also examining how PV fared in the overall renewable energy portfolio. The focus of this talk was on the assessment and comparison of current PV technologies. The speaker noted that 10,660 MW of PV power was produced



The 2010 CLASS OF ECS FELLOWS was presented by ECS President **WILLIAM D. BROWN** (front row, center). Seated, from left to right, are: **TOSHIO FUCHIGAMI**, **PETER N. PINTAURO**, (President Brown), **FRANCIS D'SOUZA**, and **DAVID YOUNG**. Standing, from left to right, are: **ROBERT G. KELLY**, **BERNARD TRIBOLLET**, **MICHEL HOUSSA**, **JOHN WEIDNER**, **DAVID SHOESMITH**, and **ROGER C. NEWMAN**. Missing from the photo are **RUDOLPH G. BUCHHEIT** and **PETER C. SEARSON**.

and shipped in 2009. China and Taiwan accounted for 49% of the world market. The challenge would be to secure and sustain a 1000 fold growth worldwide. He outlined progress in ribbon Si, CdTe, and CIGS, next generation organic PV and dye-sensitized cells, and concentrator PV technology. The speaker outlined a scheme he has developed to critically compare the

newer-term potential of different PV module technologies. He summarized the current "Dollar a Peak Watt Fully Installed" initiative currently pursued by Advanced Research Projects Agency-Energy (ARPA-E) of the U.S. Department of Energy. The speaker concluded by posing an open question: Who will win the PV race?

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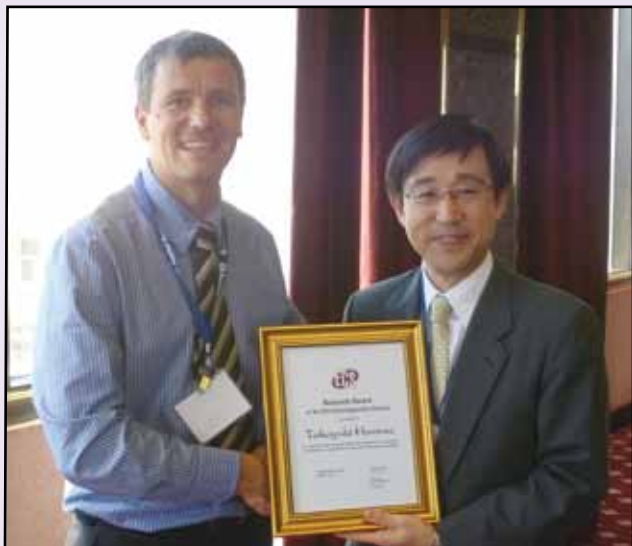
PAUL ALBERTUS (left) received the Norman Hackerman Young Author Award from ECS President **WILLIAM D. BROWN** (right). One of two awards, this one was given in the category of Electrochemical Science & Technology, for his paper "Experiments on and Modeling of Positive Electrodes with Multiple Active Materials for Lithium-Ion Batteries" (J. Electrochem. Soc., **156**, A606, 2009).



LOUIS HUTIN (right) received the Norman Hackerman Young Author Award from ECS President **WILLIAM D. BROWN** (left). One of two awards, this one was given in the category of Solid State Science & Technology, for his paper, for "Schottky Barrier Height Extraction in Ohmic Regime: Contacts on Fully Processed GeOI Substrates" (J. Electrochem. Soc., **156**, H522, 2009).

Las Vegas

Meeting Highlights



TAKAYUKI HOMMA (right) accepted the 2010 Electrodeposition Division Research Award from **CHRISTIAN BONHÔTE** (left), Chair of the Division. After receiving the award, Prof. Homma delivered his lecture on "Electrochemical Fabrication of Functional Micro/Nanostructures: Process Development and Mechanistic Understanding." He discussed his work on theoretical studies of electroless deposition processes, selective deposition at defect sites on silicon surfaces, and the electrodeposition of magnetic arrays for future recording media designs. Takayuki Homma is Professor of Applied Chemistry and Associate Dean of the Faculty of Science and Engineering at Waseda University, Tokyo (Japan), and is an Associate Editor of the Journal of The Electrochemical Society.



HARRY L. TULLER (right), of the Department of Materials Science and Engineering at MIT, was the recipient of the High Temperature Materials Division Outstanding Achievement Award for 2010. The award was established in 1984 to recognize excellence in high temperature materials research and outstanding technical contributions to the field of high temperature materials science. The 2010 award was presented by **ENRICO TRAVERSA** (left), MANA, NIMS, Japan, Chair of the HTM Division.



The Exhibit Hall at the **MONDAY EVENING MIXER AND STUDENT POSTER SESSION** was a lively affair.



Giner, Inc. received a Gold Level Leadership Circle Award for 25 years of Corporate Membership with ECS. ECS President **WILLIAM D. BROWN** (left) presented the award to **JOHN STASER** of Giner.



For 10 years of Corporate Membership, **Teledyne Energy Systems, Inc.** received a Silver Level Leadership Circle Award from ECS President **WILLIAM D. BROWN** (left). **PINAKIN M. SHAH** (right) received the award on behalf of Teledyne.



E. JENNINGS TAYLOR (right), received a Bronze Level Leadership Circle Award for **Faraday Technology, Inc.'s** five years of Corporate Membership. The award was presented by ECS President **WILLIAM D. BROWN** (left).



A Bronze Level Leadership Circle Award, for five years of Corporate Membership, was presented to **Johnson Matthey Technology Centre** by ECS President **WILLIAM D. BROWN** (left). On hand to receive the award were **RACHEL O'MALLEY** (center), and **SARAH BALL** (right).



Metrohm USA, with five years of Corporate Membership, received a Bronze Level Leadership Circle Award. ECS President **WILLIAM D. BROWN** (far left) presented the award to **MIKE KUBICKO** (second from left), **MARTIJN VAN DIJK** (second from right), and **JEFFREY TOMPKINS** (far right).

IE&EE Division Outreach Program in Las Vegas

The IE&EE Division continued its outreach program at the 218th ECS meeting in Las Vegas. This program demonstrated the tenets of a renewable and sustainable energy economy and the role of electrochemistry and electrochemical engineering in achieving such a sustainable economy. This event marked the 9th consecutive time that volunteers from the IE&EE Division visited a local high school in the ECS meeting city to conduct this outreach program. The first eight programs were conducted in Cancun, Chicago, Washington DC, Phoenix, Honolulu, Oakland, Vienna, and Vancouver, and over 430 middle and high school students have benefitted from this program to date.

Thirty students in the 11th grade at the Advanced Technologies Academy, led by their teacher Scott Underwood, participated in this program. The program commenced with brief lectures from the facilitators (listed below) on batteries, fuel cells, electrolyzers, solar cells, and hydrogen as an energy carrier. The class was then sub-divided into four teams of students, each of which participated in the traditional electrolyzer/fuel cell car activity. In this activity, teams had to produce sufficient hydrogen and oxygen (through electrolysis, based on data from prior calibration experiments) to propel their fuel cell car a pre-determined distance. The winning team came within 4 inches of the target distance (42 feet) set by the organizers. The winning team members were Francis Pioquinto, Shao Chen, Dalston Terry, Christian Mauyao, Freddie Ohene, Karim Payton, Casey Tay, and Alejandro Flores. ECS and the IE&EE Division congratulate them on their accomplishment. Congratulations and thanks go to all the students for their enthusiastic participation in the program.

The following people contributed to the organization of the outreach program. From the IE&EE Division: Vijay Ramani (Illinois Institute of Technology, Chicago), Venkat Subramanian (Washington University in St. Louis); Cynthia Rice-York (Tennessee Tech University), Vaidyanathan (Ravi) Subramanian (University of Nevada, Reno), Javit Drake (Duracell), Gerardine Botte (Ohio University), and Dennie T. Mah (DuPont).

Students affiliated with the IE&EE Division included: Venkateshkumar Prabhakaran (Illinois Institute of Technology), Venkatsailanathan Ramadesikan, Sumitava De, and Paul Northrop (Washington University in St. Louis), and Ramasamy Palaniappan and Vedasri Vedharathinam (Ohio University).

Locally in Las Vegas Ms. Liberty Leavitt and Mr. Scott Underwood (Advanced Tech Academy) contributed.

The IE&EE Division and ECS thank these facilitators for their time and effort. A special note of thanks to Ravi Subramanian for his efforts in identifying the venue for this program.

The outreach program was financially supported by Vijay Ramani's NSF CAREER award, which funded the purchase of the miniature fuel cell cars used to conduct the program, and will continue to do so for the next four years. As is customary, the cars used were donated to the Advanced Technologies Academy to ensure that they can conduct similar activities in the future. The Division is pleased to announce that the program has been steadily growing (at this meeting, we welcomed two new faculty coordinators—Cindy Rice-York and Ravi Subramanian—as well as several new graduate student facilitators). The IE&EE Division looks forward with anticipation to continuing this high-impact program at future meetings, starting with the 219th Meeting in Montréal in spring 2011.



The winning team from Advanced Technologies Academy in Las Vegas.



Assembling and calibrating the cars at the IE&EE Outreach program in October.



The entire IE&EE Outreach program team.