

## Meeting Highlights

Québec City's Old World setting provided an interesting contrast to the very present-day science and technology papers presented at the 207<sup>th</sup> ECS meeting. Representatives from the ECS Canadian Section welcomed the attendees, and Christina Bock, the Section's Councilor, provided a short history lesson and guide to the local culture at the plenary session on Monday morning of meeting week. The attendance was 2,039, an excellent figure for a meeting that followed on the heels of a joint international meeting in Hawaii (fall 2004). Technical papers totaled 1,801, and the large list of 47 symposia included the long-running Solid Oxide Fuel Cells Symposium. The Québec City Convention Centre was an outstanding venue for the meeting, with excellent session rooms and convention staff. The Centre was located close to the Old City, providing a wide selection of restaurant choices and wonderful views of the river for those enjoying walks around town.

### Successes and Future Challenges for Canadian Research and Development

**ARTHUR CARTY**, National Science Advisor to the Prime Minister of Canada, delivered the Society's plenary address. Prior to being appointed to his present post, Dr. Carty was President of the National Research Council of Canada (NRC), following a distinguished academic career at Memorial University and at the University of Waterloo. Dr. Carty maintains an active research group at NRC in the field of synthetic chemistry and metal clusters. In his introduction, ECS 3<sup>rd</sup> Vice-President Barry MacDougall spoke about the days when he and Dr. Carty were colleagues at the NRC, and shared a love for good science and good wine. Dr. Carty began his plenary talk by noting that the government advisory position in science and technology was created only recently, in April 2004. He listed the priorities of the advisory position in terms of mapping a long term vision for

Canadian science and technology: fostering international collaborations and identifying challenges for the developing world; establishing horizontal collaborations between research institutions, universities, and industry; and balancing excellence in science and technology with societal benefits and economical growth.

Dr. Carty noted the need to invigorate R&D in government laboratories in Canada and to push research outcomes from the laboratories to the commercial realm. Government outlays in R&D, as a percentage of GDP, have increased in Canada and have lagged behind only very few countries such as Finland, Australia, and Japan. He pointed out that Canada had lost less ground than many countries during the dot-com bubble burst in the 1990s. In 2004-05, Canadian R&D outlay was about 25 billion dollars and had increased by about 13 billion dollars from 1997-98 to 2003-04. Interestingly ca. 70% of this increase occurred over the last four-year time span. He then went on to point out the positive impact of these recent investments by the government.

As many as 21 National Centres of Excellence and 52 community research alliances have been established, particularly in the areas of genomics and proteomics. The Canada Research Chairs Program has been a resounding success and has been instrumental in retaining talented academic researchers and in aiding the recruitment of "stars" from other universities worldwide. In a 2004 report in *Nature* by D. A. King on the scientific impact of nations, Canada ranked a creditable 6<sup>th</sup> in the world from among 31 countries including G-8 and EU nations. In spite of these impressive advances, Carty noted that industrial innovation was still lacking in the country.

The lecture then focused on the development of national strategies in emerging areas including



**ARTHUR CARTY** (third from left), the National Science Advisor to the Prime Minister of Canada, delivered the plenary lecture at the 207<sup>th</sup> ECS meeting in Québec City. ECS President **ROBIN SUSKO** (second from right) thanked him for his talk. ECS Vice-President **BARRY MACDOUGALL** (far left) introduced Dr. Carty and **CHRISTINA BOCK** (far right) welcomed attendees on behalf of the ECS Canadian Section.



Photo courtesy of J.-F. Bergeron, Environ Foto



**KEITH E. JOHNSON** (right) was acknowledged by ECS President **ROBIN SUSKO** for Dr. Johnson's generous contribution to the ECS Centennial Campaign, which will go toward funding educational programs at ECS, including a new Summer Fellowship.

nanotechnology, quantum information technology, biotech, and sustainable energy. He pointed out the many joint initiatives recently established in these disciplines, including NSERC, NINT, Nano Quebec, CERION, and the Canadian Light Source (synchrotron beam facility). He also briefly described the activities in many NRC institutes including the Steacie Institute for Molecular Sciences and the Institute for Chemical Process and Environmental Technology.

The final part of the lecture dealt with specific examples drawn from recent advances in Canada in the area of nanocoatings designed for erosion damage control. Modification of the standard titanium nitride coating with a proprietary TiXN composition brought about a diminution in the erosion rate to one-seventh of the benchmark level. Nanocatalysis for fuel cell applications and computational materials design were identified as other active areas of technological import. Dr. Carty concluded his very informative talk with a clear message that a strong R&D base was crucial to the economic well-being of any nation (with Canada being no exception) and the key to this was collaboration at all stages of the



**DENNIS W. HESS** (center) received the 2004 Solid State Science and Technology Award from ECS President **ROBIN SUSKO** (left). The award recognizes outstanding contributions to the fundamental understanding and technological applications of solid-state materials, phenomena, and processes. **TIMOTHY ANDERSON** (right) introduced the new awardee.

science, technology, and the innovation spectrum.

### Solid State Science and Technology Award Address: Thin Films in Microelectronics

ECS President **ROBIN SUSKO** had some special duties at the Honors and Awards Session on Wednesday morning. The

president had the pleasure of presenting a certificate of appreciation to **KEITH E. JOHNSON**, who is generously funding educational programs at ECS, including a new Society Summer Fellowship. Dr. Johnson said, "Electrochemistry has been part of my life since 1956. I wanted to see its promotion among future scientists and engineers and believe ECS offers the best route to accomplish this goal."

President Susko also presented a number of Leadership Circle Awards to ECS Corporate Members, and announced the results of the Student Poster Session competition.

The main feature of the Session was the presentation of the Solid State

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## Name Changes For Two ECS Divisions

At the Québec City meeting this past May, the ECS Board of Directors approved name changes for two ECS Divisions.

The Electronics Division is now the **ELECTRONICS AND PHOTONICS DIVISION**. The new name more accurately reflects the present mission and activities of the Division. Adding "Photonics" to the title serves to communicate to the uninitiated the Division's interests and activities. For new members (particularly students) who are active in lightwave/ photonics technology, and are unfamiliar with the ECS Divisional structure, it will be more obvious which Division to join.

The Physical Electrochemistry Division is now the **PHYSICAL AND ANALYTICAL ELECTROCHEMISTRY DIVISION**. Adding "Analytical" to the title more clearly communicates the Division's interests and activities to those unfamiliar with ECS's technical structure. The name change also serves to align the Division with the groupings of papers in the Society's journals, which currently includes the category of "Physical and Analytical Electrochemistry." The new name will be helpful to prospective members who are active in electroanalytical chemistry.

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The ECS LEADERSHIP CIRCLE AWARDS recognize long-term supporters of ECS. At the Québec City meeting, a number of Corporate Members were acknowledged for their contributions. In the photo at left, from left to right, are FERNANDA VIEIRA, Nacional de Grafite, LTDA, Silver Award (10 years); WEIDONG AN, FMC Corporation, Silver Award (10 years); ECS President ROBIN SUSKO; BILL EGGERS, Princeton Applied Research, Gold Award (25 years); and KAZIMIERZ (KAZ) WIKIEL, Technic Inc., Silver Award (10 years); (photos below, at left) JAMES C. MASSINGILL received a Bronze Award (5 years) on behalf of the Battery Technology Center of BAE Systems; (below, center) J. DAVID GENDERS received a Silver Award (10 years) on behalf of the Electrosynthesis Company; and (below, right) LOUIE SCRIBNER received a Silver Award (10 years) on behalf of Scribner Associates, Inc.



Science and Technology Award to **DENNIS W. HESS**. The awardee was introduced by Timothy Anderson, who pointed out that there are many attributes to an individual that are not readily apparent from simply perusing his or her CV. As an example, he noted that Hess had been inducted into the "Drift Society" in 1975. Membership in the Drift Society was awarded to Fairchild employees and others who discovered one of the many mechanisms for "drift" at the silicon-oxide interface, who left Fairchild under favorable circumstances, or were otherwise notable in the semiconductor field. Following this industrial stint, Hess has enjoyed a long and distinguished academic career first at UC Berkeley, then at Lehigh, and now at the Georgia Institute of Technology, where he is currently William W. LaRoche, Jr. Professor in Chemical and Biomolecular Engineering. Dr. Hess joined the Society in 1974, became President for the 1996-97 term and hasn't "drifted" far since: he is now the Editor of *Electrochemical and Solid-State Letters*.

Dr. Hess began his address by thanking the Society for the honor and noting that ECS has been an important part of his career since 1973. He divided his talk into three sections: the use of plasmas for etching, for dielectric film formation, and for photoresist removal. He scrolled through a long list of students and post-doctoral associates and acknowledged their contributions over a period spanning three decades from 1977 to 2005. He pointed out that the driver for much of his research was the shrinking feature size trend in IC memory devices leading to the current issues related to the need for clean and effective removal of processing residues. He noted that the term "plasma" was coined by the 1932 Nobel Prize winner in chemistry, Irving Langmuir.

The first part of the award lecture noted the dearth of knowledge underpinning the use of reactive gases (such as CF<sub>4</sub>) for plasma-assisted etching of silicon surfaces. A graph, purportedly of the etch rate versus process variables, evoked peels of laughter from the audience. On the independent variable

axis, the graph showed variability using the days of the week, underlining the irreproducibility problems besetting the community. Dr. Hess briefly alluded to careful studies of Al etch in chlorinated gases and the design of a discharge flow reactor for chemiluminescent monitoring of atom etch kinetics. This was followed by a brief survey of his group's work on tungsten, tantalum, and plutonium surface etch mechanisms, including temperature effects and the manifestation of exothermic processes. The second part of the lecture focused on Si oxidation in electron cyclotron resonance oxygen and in nitrous oxide plasmas.

The final part of this fast-moving and entertaining award lecture focused on issues related to photoresist removal—a topic that the Hess group turned to in 1995. He discussed the use and advantages with the use of supercritical fluids, but pointed out the challenges in the acceptance of this new technology by the industry. Much of his recent efforts have focused on how these fluids clean the residues using TMAHCO<sub>3</sub>-methanol

as the active agent. Hess wrapped up his talk by acknowledging the many mentors who have had a profound influence on him starting at the undergraduate level (Bob Rapp and Tony Izbicki), then in graduate school (Fred Fowkes), and culminating in his professional career in industry and academia (Bruce Deal, Jud King, Klavs Jensen, and others). Finally, he acknowledged his "life mentor," namely his wife, Pat Weidner-Hess.

### AFM and STM for the Rest of Us

The Sunday evening talk in the "XYZ for the Rest of Us" series has turned out to be an enormously popular feature of the ECS meeting program in recent years. This particular talk, on scanning probe microscopies, was given by **ANDREW GEWIRTH** of the University of Illinois, Urbana-Champaign. Gewirth began his lecture by pointing out that, after a very quick recognition of the importance of the discovery of scanning tunneling microscopy (STM) with Nobel Prizes to Binnig and Rohrer, this group of techniques has undergone infusion from the physics to the chemistry communities in the 1980s and 90s. Since the 90s, it has been embraced by the polymer and biological communities, thanks to the advent of atomic force microscopy, or AFM. (Unlike STM, AFM facilitates the examination of non-conductive sample surfaces.) The speaker noted that the hallmark of a truly revolutionary group of techniques is that they do not simply peak and die but they continue to grow. Certainly this group of techniques has enjoyed rapid growth and has progressed beyond use only by specialists thanks to user-friendly and commercially available instrumentation. After a nice review of the underlying principles, Gewirth mentioned examples of the use of STM,

not only in ultra-high vacuum, but also for examination of surfaces immersed in solution and under electrochemical control.

The speaker then turned to a discussion of AFM, mentioning the pioneering contributions by Binnig, Quate, and Gerber in 1986. The various modes of application of AFM were then enumerated with examples drawn from DNA on mica, phase transitions in phospholipid bilayers, benzotriazole films on copper, and purple (light-driven proton pump) membrane surfaces. A discussion of magnetic force microscopy (where magnetic regions on a sample are made to "light up") and lithography (including a very recent innovation, dip pen lithography) was followed by a discussion of force-distance curves. It was noted that AFM data do suffer from a lack of chemistry-specific information content—a handicap that can be addressed by chemical force microscopy. Finally, examples showing sensitivity of images to surface charge were shown using a silica tip rastered on a copper surface and using solution pH as a variable. All in all, this was a particularly lucid lecture dealing very effectively with the challenge of covering a large territory to a diverse audience comprised of both specialists eager to flesh out the latest advances, and neophytes curious to learn about how the techniques worked and what was possible in terms of morphological characterization. ■

*Meeting Highlights was prepared by Krishnan Rajeshwar and Mary Yess, Interface's Editor and Managing Editor respectively.*

## Results of 2005 ECS Election of Officers and Slate for 2006

The ECS Tellers of Election have announced the results of the 2005 election of Society officers, with the following persons elected: for President—William H. ("Bill") Smyrl, University of Minnesota; and for Vice-President—D. Noel Buckley, University of Limerick, Ireland. The terms of Mark Allendorf (Vice-President), Barry MacDougall (Vice-President), Peter Fedkiw (Treasurer), and Petr Vanýšek (Secretary) were unaffected by this election.

At the Board of Directors meeting in Québec City, Canada on May 19, 2005,

members of the Board voted to approve the slate of candidates recommended by the ECS Nominating Committee. The slate of candidates for the next ECS election of officers, to be held in January 2006, include: for President—Mark Allendorf; for Vice-President (one to be elected)—Curtis Holmes and Paul Natishan; and for Treasurer (one to be elected)—Subhash Singhal and John Susko. Full biographies and candidate statements will appear in the winter 2005 issue of *Interface*. ■

## New Division Officers

New officers for the 2005-2007 term have been elected for the following divisions.

### Electronics and Photonics

#### Chair

Jerzy Ruzyllo

#### Vice-Chair

Albert Baca,

Junich Murota

#### Secretary

David Harame

#### Treasurer

Rodney Ridley

#### Members-at-Large

Helmut Baumgart, Noel Buckley, George Celler, Pablo Chang, Cor Claeys, Sorin Cristoloveanu, Jamal Deen, Manfred Engelhardt, Laszlo Fabry, Petra Feichtinger, Robert Fitch, Ulrich Gösele, Fernando Gonzalez, Takeishi Hattori, Dennis Hess, Andrew Hoff, Howard Huff, Hiroshi Iwai, Chennupati Jagadish, Bernd Kolbesen, Yue Kuo, Durga Misra, Gald Oleszek, Carl Osburn, Fan Ren, Fred Roozeboom, George Rozgonyi, Kenji Shiojima, Ed Stokes, and Masaharu Watanabe



### Energy Technology

#### Chair

Jai Prakash

#### Vice-Chair

Karim Zaghbi

#### Secretary

S. Narayanan

#### Treasurer

Jean St-Pierré



### Organic and Biological Electrochemistry

#### Chair

James Rusling

#### Vice-Chair

Isao Taniguchi

#### Secretary-Treasurer

Albert Fry

#### Members-at-Large

Alain Bergel, James Burgess, Flavio Maran, Duane Mazur, Ikuzo Nishiguchi, Mark Workentin, and Andrei Yudin



### Physical and Analytical Electrochemistry

#### Chair

Gessie Brisard

#### Vice-Chair

Hugh DeLong

#### Secretary-Treasurer

Paul Trulove

#### Members-at-Large

Daniel Belanger, Ingrid Fritsch, Hubert Gasteiger, Shelley Minter, Greg Swain, and Tom Zawodzinski

