



Seattle, WA

May 6-10, 2012



221st ECS Meeting

Meeting Highlights

Defying its often rainy climate, Seattle smiled on the ECS meeting May 6-10, with the sun shining often on attendees as they traversed the routes from hotel to Convention Center and to various interesting places around town.

Many of the Society's symposia have to do with the very important energy research; but another issue is emerging as an important ECS topic as well: clean water. ECS has a unique opportunity to provide a forum for the presentation of original research and innovation that can have an impact on the future direction of clean water technologies, and provide viable solutions for current and future needs. The **Clean Water Technologies** symposium in Seattle did just that. The symposium also was fortunate to have as a speaker **Doulaye Kone**, Senior Program Officer with the Bill & Melinda Gates Foundation, who provided an update on, and continuing challenges to the Water, Sanitation & Hygiene program of the Foundation.

The first-ever Career Fair was a highlight of Seattle, with **ESL ElectroScience Laboratories** and **Princeton Applied Research/Solartron Analytical** participating in the program. The event, held in the exhibit hall of the Washington State Convention Center, was a great way for employers and potential employees to meet and exchange information. All meeting attendees had the opportunity to speak to participating company recruiters, provide their resumes for available employment opportunities, and be interviewed for a position. A job board was also available for job and résumé postings. A second Career Fair is planned for the fall meeting in Honolulu, Hawaii, with an expanded program of career developments events.

Will It Be a Tank of Lithium to Drive Our Next Car?

The ECS Lecture, with the above intriguing title, was given by **Bruno Scrosati** of the University of Rome La Sapienza to a packed Monday evening audience. The speaker is recognized as a leading contributor to the lithium-ion battery technology that is now used worldwide in laptop computers and cell-phones. Renewed interest in this technology stems from its targeted application in electric vehicles (EVs).

Professor Scrosati, aside from his position as Senior Professor of Electrochemistry in the University of Rome "La Sapienza," also is a visiting professor in the Department of Energy Engineering

at Hanyang University in Seoul, Korea. (He has an on-going international collaboration on Li-ion batteries with this institution.) Professor Scrosati's research accomplishments have been recognized worldwide by many awards and honorary degrees. Among them are the Italgas Prize (2004), the Volta Medal of the ECS European Section (2006), "Sigillo d'oro" Medal from the Italian Chemical Society (2007), and honorary degrees from the University of St. Andrews, Scotland (1996) and the Chalmers University of Technology, Sweden (2008). He was elected a Fellow of The Electrochemical Society (2005) and a Fellow of the International Society of Electrochemistry

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(2007). He has served on leadership positions in several organizations including the International Society of Solid-State Ionics (President in 1990-1992), Italian Chemical Society (President, 1996-1998), and The Electrochemical Society (Vice-President, 2000-2002, and President, 2003-2004).

After being introduced to the audience by the ECS President, Esther Takeuchi, Prof. Scrosati began his plenary lecture with an historical note. He noted that the invention of the battery in 1800 (then termed the “electric pile”) was the fruit of a dispute between Alessandro Volta of the University of Pavia and Luigi Galvani at the University of Bologna. It ultimately led to the realization that what was initially believed to be animal or muscle electricity really stemmed from bioelectrochemical processes. The invention of the lead acid battery in 1860 was then followed by discovery of the zinc-carbon cell in 1866. There was a hiatus in battery design and electrochemistry developments until 1973 when the first-generation

cardiac pacemaker batteries (based on the Zn-Hg cell) were developed. These were heavy and relatively bulky devices that soon gave way to the modern light and long-life battery counterparts based on the Li-iodine cell.

The period 1980-1986 was a fertile one in rechargeable Li batteries based on Li/TiS_2 and Li/MoS_2 intercalation chemistry. The so-called rocking-chair design led to Sony commercializing the technology in 1990. Lithium batteries are produced globally at the rate of billions of units per year. The spectacular successes of this battery technology have also been punctuated by reports of spontaneous ignition and fires leading to safety concerns from the consumer sector.

Professor Scrosati then turned the focus of his talk to environmental concerns with anthropogenic CO_2 emissions and the consequent shift in the transportation sector from low emission vehicles to all-electric vehicles. He noted that Li batteries are poised to play a key role in this transition. He described on-going research efforts in this area on



BRUNO SCROSATI delivered *The ECS Lecture* at the Society's 221st Meeting—on the topic of “Will It Be a Tank of Lithium to Drive Our Next Car?”—to a packed audience in Seattle.



ESTHER TAKEUCHI (left), ECS President, presented **MARK ORAZEM** (right) with the 2012 ECS Henry B. Linford Award for Distinguished Teaching, which is given for excellence in teaching in subject areas of interest to the Society.



BRUNO SCROSATI (right) was the recipient of the 2012 ECS Vittorio de Nora Award. At left is ECS President **ESTHER TAKEUCHI** presenting Prof. Bruno Scrosati with the de Nora Award. The de Nora Award is one of the Society's highest honors, given to recognize major achievements in the field of electrochemical engineering and technology.



PETER BRUCE (right) received the 2011 ECS Carl Wagner Memorial Award from ECS President **ESTHER TAKEUCHI** (left). The Carl Wagner Award is given for mid-career achievement and excellence in research areas of interest of the Society, and significant contributions in the teaching or guidance of students or colleagues in education, industry, or government.

organic electrolytes and polymer (gel) electrolytes. Ionic liquids hold much promise in terms of their high conductivity and low flammability (unlike their organic liquid counterparts) but their cost implications were noted as murky. Optimization of charge transfer kinetics at the two battery terminals continue to attract R&D attraction and the pros and cons associated in the shift from bulk to nano electrode morphology were discussed. Several fold enhancements in the energy density of these batteries from the ~150 Wh/kg current levels would be needed to boost the EV range to practically relevant distances of several hundred kilometers.

Professor Scrosati ended his entertaining and highly informative lecture with a discussion on Li metal reserves worldwide as they occur in nature. That Li was permeating into everyday life and stream of consciousness was corroborated by a student poem and mentions of it in popular comics by Walt Disney and such.

The Vittorio de Nora Award Lecture

The award lecture, entitled: “Lithium-Sulfur and Lithium-Air: Superbatteries of the Future” was also given by **Bruno Scrosati** on Monday afternoon. This earlier talk was a more specialized discussion of the technical aspects of two advanced Li battery technologies. The award lecture was organized into discussions on the anode, electrolyte, and cathode, noting at the outset that the transition from consumer electronics to electric vehicles requires quantum improvements in specific capacity, safety, and cost. The theme of this talk was that practical exploitation of the two “superbatteries” was hindered by a series of issues mostly centered on the incompatibility of the electrolyte phase with the electrode materials.

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The Leadership Circle Awards are one way that ECS acknowledges and thanks its organizational members for their loyal support of ECS. In Seattle, ECS President **ESTHER TAKEUCHI** (far left) presented five-year awards to the following (starting with the second from left): **BILL EGGERS** of Bio-Logic USA/ Bio-Logic SAS; **DAVID LOVEDAY** of Gamry Instruments, and **VERA NICKEL** a of Rockwood Lithium (formerly Chemetall GmbH).



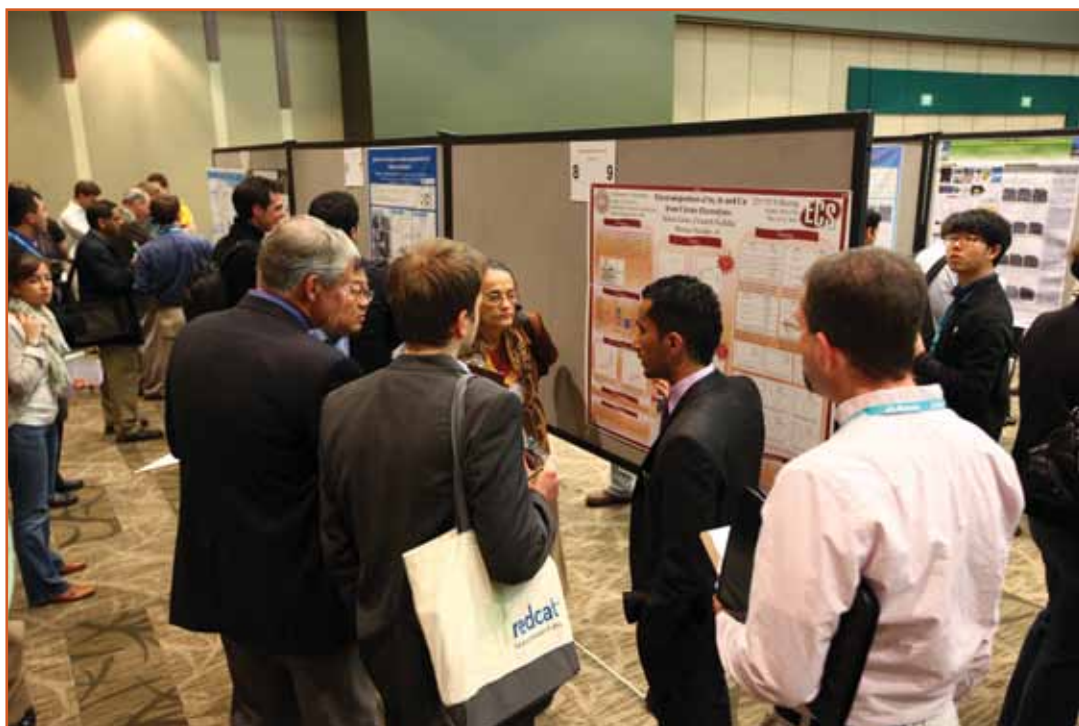
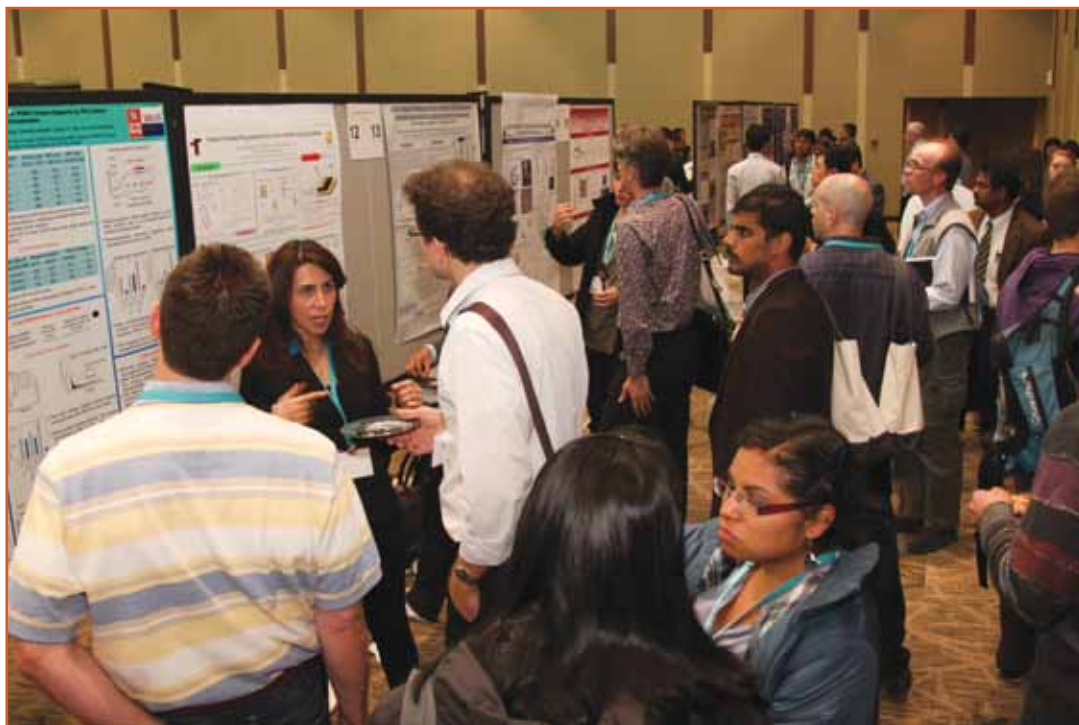
The ECS Exhibit Booth

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The first superbattery discussed was the Li-S system with the charge–discharge cycle involving a progression from elemental sulfur at one end to lithium sulfide at the other. A whole range of polysulfides comprised of the intermediate products during battery cycling. The major issues were centered on loss of active material (and capacity) during cycling, the low electrical conductivity of elemental sulfur, Li_2S , and the intermediate products, and reactivity of the Li metal anode. Solutions included the development of a solid electrolyte barrier to solubility losses, alteration of the cathode morphology, and the use of a Sn-C matrix for Li nanosized particles for the anode side. The carbon matrix serves to ameliorate anode safety by providing a buffer to the drastic volume change that occurs here.

The discussion then turned to the Li-air superbattery reviewed recently elsewhere (Girishkumar, *J. Phys. Chem. Lett.*, **1**, 2193 2010). The major challenges here revolve around kinetics of the oxygen electrode in non-aqueous electrolytes, electrolyte instability, and reactivity of the Li metal on the anode side (leading to electric shorts etc). On the other hand, the 5-10 times potential enhancement in energy density offered by this battery technology provides the driver to continued R&D on solutions to the above issues.

The award talk concluded with the assessment that the Li-S superbattery was closer to commercialization than the Li-air counterpart.



At the Monday Evening Get-Together, the **Student Poster Session** was in full swing. Students explain their posters to attendees and to judges of the award competition (see story on page 73).





ECS President **ESTHER TAKEUCHI** (right) welcomed **DIANA CRISTINA MARTINEZ-CASILLAS**, the 2011 first place winner of the poster session at the XXVI National Congress of the Sociedad Mexicana de Electroquímica (SMEQ) and meeting of the ECS Mexico Section.



The 2012 ECS F. M. Beckett Summer Fellowship winner, **CELESTE MORRIS** (at left), of Indiana University, received congratulations from ECS President **ESTHER TAKEUCHI** (right) at the ECS meeting in Seattle.



The Society is publishing three new journals in 2012. ECS President **ESTHER TAKEUCHI** made the official announcement in Seattle, standing next to the re-designed cover for the Journal of The Electrochemical Society (**JES**), and the covers of the three new journals: ECS Journal of Solid State Science and Technology (**JSS**), ECS Solid State Letters (**SSL**), and ECS Electrochemistry Letters (**EEL**). (See the story about the new journals in the spring 2012 issue of *Interface*.)

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DAN SCHERSON (left), outgoing Editor of the EST Editorial Board, received a scroll from ECS President **ESTHER TAKEUCHI** (right) thanking him for his years of service as Editor and as an Associate Editor of the Journal of The Electrochemical Society.



A night-time view of the city from the top of the Sheraton Seattle.



ECS President **ESTHER TAKEUCHI** thanked members of the Editorial Boards for their dedication to making the Society journals leaders in electrochemistry and solid state science and technology. From left to right are: **DORON AURBACH**, **JOHN WEIDNER**, **DENNIS PETERS**, **CHUCK HUSSEY**, **DENNIS HESS**, **STEFAN DEGENDT**, **ANDY GEWIRTH**, and **PETR VANÝSEK**. Not able to attend were **JENNIFER BARDWELL**, **GEORGE CELLER**, **FRANCIS D'SOUZA**, **JERRY FRANKEL**, **TOM FULLER**, **RAY GORTE**, **TAKAYUKI HOMMA**, **YUE KUO**, **KAILASH MISHRA**, **RANGACHARY MUKUNDAN**, and **MARTIN WINTER**.



*ECS President **ESTHER TAKEUCHI** welcomed **FRANK AND MAUREEN McLARNON** to the special reception marking the launch of the new ECS journals. Dr. McLarnon was for many years an Associate Editor for the Journal of The Electrochemical Society.*



*Executive Director **ROQUE CALVO** greeted ECS Past President **TED BECK** and his wife, **RUTH BECK** at the special reception in Seattle marking the launch of the new ECS journals.*



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*ECS President **ESTHER TAKEUCHI** (right) and ECS Secretary **JOHNA LEDDY** (left) conferring over last-minute announcements to the script for the Society's Annual Business Meeting and Luncheon.*



*ECS Treasurer **CHRISTINA BOCK** reporting on the Society's 2011 financial statements at the Society's Annual Business Meeting and Luncheon.*



*ECS President-elect **FERNANDO GARZON** and Vice-President **PAUL KOHL** before the start of the Society's Annual Business Meeting and Luncheon. At the back is **ROBIN SUSKO**, Past Society Secretary and Past President.*



***VENKAT SUBRAMANIAN**, Chair of the General Society Student Poster Session, at the Society's Annual Business Meeting and Luncheon.*



See the Society's 2011 Annual Report

starting on page 77 in this issue

FNCN Highlights

The ECS Divisions are an important part of what makes ECS such an interesting and vibrant organization. The ECS **Fullerenes, Nanotubes, and Carbon Nanostructures (FNCN) Division** sponsored a large and stimulating technical program with more than 220 oral research papers in nine topical symposia. The Division's 2012 SES Research Young Investigator Award was presented to **Aurelio Mateo-Alonso** of the Freiburg Institute for Advanced Studies, who gave a research lecture on "Fullerene-Driven Molecular Shuttles" as part of the symposium on Chemistry of Fullerenes and Carbon Nanotubes.

Awards for the best poster presentations in the Division's symposia were given to **Stuart Corr** of the M. D. Anderson Cancer Center, **Yifan Tang** of the University of Pittsburgh, **Yuki Sado** of Nagoya University, and **Alexandra Krawicz** of Rensselaer Polytechnic Institute. ■

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

All photos are by Steve Schneider Photography, Shoreline, WA.



STUART CORR (left) received a poster session award from FNCN Division Chair **DIRK GULDI** (right), for Corr's paper, "Nanoparticles and Gd (III)-loaded Ultrashort Carbon Nanotubes for Applications in Non-invasive RF Hyperthermia Cancer Treatment."



FNCN Division Chair **DIRK GULDI** (left) presented **ALEXANDRA KRAWICZ** (right) with a poster session award for Krawicz's paper, "Porphyrin-based CuAAC Coupled Layer-by-Layer Molecular Multilayers on Gold (III) Electrodes for Electro-optical Applications."



At the Wednesday business luncheon, Division members elected a new slate of officers for two-year terms. **R. BRUCE WEISMAN** takes over the Chair duties from **DIRK GULDI**, who is the new Treasurer. **LUIS ECHEGOYEN** is the new Vice-Chair, and **SLAVA ROTKIN** is the new Secretary.

