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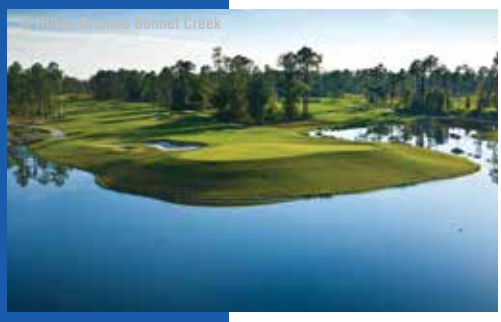

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225th ECS Meeting

ORLANDO, FL

May 11-15, 2014

Hilton Orlando Bonnet Creek

Special Meeting Section

225th ECS Meeting

ORLANDO, FL
May 11-15, 2014
Hilton Orlando Bonnet Creek

Welcome to Orlando! What a great place to convene the 225th ECS Meeting – tropical weather, fun attractions, premier golfing and much more make this the perfect setting to complement your technical meeting experience. This major international conference will be located in the Hilton Orlando Bonnet Creek Hotel and will include more than 1,700 technical presentations, guest and award-winning lecturers, full-day short courses, professional development workshops, panels, and career opportunities, a dynamic technical exhibit, and the first-ever 5K Energy-Run-for-Fun, with proceeds benefitting the ECS Publications Endowment. Whether you're running to symposia or receptions, or a part of the early morning race, enjoy the best that Orlando and the 225th ECS Meeting has to offer!

Featured Speakers and Lecturers

The ECS Lecture

Nanowires: From Nanocomputing to Nano-Bioelectronics
by Charles M. Lieber

Monday, May 12, 2014, 1700h
Bonnet Creek Ballrooms VII & VIII
Lobby Level

Charles M. Lieber received his undergraduate degree from Franklin and Marshall College and carried out his doctoral studies at Stanford University, followed by postdoctoral research at the California Institute of Technology. He was an Assistant Professor at Columbia University, and now holds appointments in the Department of Chemistry and Chemical Biology as the Mark Hyman Professor of Chemistry, and the School of Engineering and Applied Sciences at Harvard University. Professor Lieber has pioneered the synthesis of a broad range of nanowire materials, the characterization of the fundamental properties of these materials, the development of methods of hierarchical assembly of nanowires, and applications of these materials in nanoelectronics, nanophotonics, and nanocomputing. He has pioneered the field of nano-bioelectronics with seminal contributions to sensing, the development of novel nanoelectronic cell probes, and cyborg tissues.

Professor Lieber's work has been recognized by many awards, including the IEEE Nanotechnology Pioneer Award (2013), Willard Gibbs Medal (2013), and Wolf Prize in Chemistry (2012). Lieber is an elected member of the National Academy of Sciences and the American Academy of Arts and Sciences. He is Co-Editor of *Nano Letters*, and has published over 350 papers (71,737 citations; H-index 121) and is the principal inventor on more than 35 patents.

Nanoscience offers the promise of revolutionary advances in many areas of science and technology, ranging from electronics and computing to biology and medicine, yet the realization of this promise depends critically on the rational synthesis of unique functional nanoscale structures and their organization into well-defined devices, circuits and systems. Here we highlight the power of semiconductor nanowires as a platform material for exploring new science and technology. First, a brief review of the 'chemical'

(continued on next page)

Society Award Lecture – Vittorio de Nora Award Address

On-Wire Lithography: An Electrochemical Approach to Controlling Nanoscale Architecture
by Chad Mirkin

Tuesday, May 13, 2014, 0805h
B1 Sensors, Actuators, and Microsystems General Session
Sarasota, Ground Level

Chad Mirkin is the Director of the International Institute for Nanotechnology, and the George B. Rathmann Professor of Chemistry, Chemical and Biological Engineering, Biomedical Engineering, Materials Science and Engineering, and Medicine at Northwestern University. He is a chemist and nanoscience expert, who has authored over 550 manuscripts; he is an inventor on over 900 patent applications worldwide (243 issued). Professor Mirkin has won over 80 national and international awards, and he is a Member of the President's Council of Advisors on Science & Technology (Obama Administration). He is one of only 15 scientists, engineers, and medical doctors to be elected to all three US National Academies (the Institute of Medicine, the Natl. Academy of Sciences, and the Natl. Academy of Engineering). He is the Founding Editor of *Small*, an Associate Editor of *JACS*, and the founder of multiple companies, including Nanosphere, AuraSense, and AuraSense Therapeutics. Professor Mirkin holds a BS from Dickinson College and a PhD from Penn State. He was an NSF Postdoc at MIT prior to becoming a Professor at Northwestern in 1991.

On-wire lithography (OWL) is a template-based, electrochemical process for forming one-dimensional solution dispersible arrays of nanorods with programmably synthesized nano- and micro-scale gaps. OWL provides excellent control over the nanowire diameter (from 30 to 360 nm depending on the membrane pore size), segment length (from 6 nm to a few microns), gap size (from 1 nm to a few microns), composition (e.g., Au, Ni, Ag, Pt, Pd, PEDOT, PTh, P3HT, PPY, PPV) of the different nanowire components. The versatility of this novel technique has allowed for the fabrication of a wide variety of structures with emergent and highly

(continued on next page)

Society Award Lecture – Henry B. Linford Award for Distinguished Teaching

Low Temperature Plasma Etching of Copper, Silver, and Gold Films

by Dennis Hess

Monday, May 12, 2014, 1540h
P2 Silicon Compatible Materials, Processes and Technologies for Advanced Integrated Circuits and Emerging Applications 4
Flagler, Ground Level

Dennis W. Hess is the Thomas C. DeLoach, Jr., Professor of Chemical & Biomolecular Engineering and Director of the NSF Materials Research Science and Engineering Center at the Georgia Institute of Technology. He received a B.S. in Chemistry from Albright College and M.S. and Ph.D. degrees in Physical Chemistry from Lehigh University. He was a Member of the Research Staff and Supervisor of Process Development at Fairchild Semiconductor from 1973 to 1977 where he worked for Bruce Deal. In 1977, he joined the Department of Chemical Engineering (ChE) at the University of California, Berkeley as an Assistant Professor. During his time at Berkeley, he served as Assistant Dean of the College of Chemistry (1982-1987) and Vice Chair of the ChE Department (1988-1991). From 1991-1996 Dr. Hess served as Chair of the ChE Department at Lehigh University. He joined the School of Chemical & Biomolecular Engineering at Georgia Tech in 1996.

Dr. Hess served as Divisional Editor for *Journal of The Electrochemical Society* from 1978-1990 and Associate Editor for *Chemistry of Materials* from 1988-1996. From 2004-2012, he served as Editor for *Electrochemical and Solid State Letters*; currently, he is Editor of *ECS Journal of Solid State Science and Technology* and *ECS Solid State Letters*. He served as ECS President for the 1996-1997 term. He received the Thomas D. Callinan Award from the ECS Dielectric Science and Technology Division (1993), the Distinguished Alumnus Award from Albright College (1998), the Charles M. A. Stine Award from the Materials Engineering and Sciences Division of AIChE (1999), the ECS Solid State Science and Technology Award (2005), and The ECS Edward Goodrich Acheson Award (2012). Dr. Hess is an ECS Fellow, a Fellow of the American Association for the Advancement of Science, the American Chemical Society and the American Institute of Chemical Engineers.

Copper, silver and gold films have garnered considerable interest due to the numerous applications possible because of their unique electrical and optical properties. Low resistivity and good electromigration resistance make these films attractive as interconnect layers in integrated circuits and microelectronic devices, while nano structures of these metals can be used to form plasmonic devices.

Fabrication of structures, devices and circuits with these metals requires etching or patterning methods. However, Group 11 metals are inherently difficult to reactively plasma etch at reasonable (<100 °C) temperatures because of the limited volatility of compounds that can be formed with these metals.

As a result, additive processes (e.g., lift-off or electroplating followed by polishing) have been the preferred approach to generating patterns/structures. In contrast, pattern formation by subtractive etching offers simplicity, consistency with the patterning processes used for other films in device manufacture, and in some cases may alleviate limitations in the fabrication of future generation devices.

Etching of Cu, Ag, and Au in hydrogen-based plasmas at temperatures at or below room temperature has been demonstrated. Group 11 metal hydrides form readily in an H_2 plasma, suggesting that these compounds are the likely etch products, despite their limited thermodynamic stability. Due to the low ion flux and momentum of hydrogen ions under the conditions used in the inductively-coupled plasma reactor system, sputtering alone cannot account for the etch rates observed (13, 33, and 26 nm/min respectively for Cu, Ag, and Au at 20 mTorr and 10°C in H_2). In these cases, desorption of metal hydrides is promoted by ion, and likely photon, bombardment.

Plasma etching with methane (CH_4) plasmas is possible under the same plasma conditions as those for H_2 plasmas. This etch gas displays Cu etch rates of 17 nm/min relative to that of H_2 (13 nm/min) with no change in wall slope. These enhancements relative to H_2 plasma etching appear to be due to the formation of etch products that have improved thermodynamic stability compared to copper hydrides (e.g., CH_3Cu and CH_3CuH^-). Preliminary etch studies of Ag and Au films using CH_4 plasmas demonstrate that chemical aspects of the etch process are important, since etch rates are not reduced although hydrocarbon deposition occurs during the etch process.

Charles M. Lieber *(continued from previous page)*

synthesis of complex modulated nanowires will be highlighted as a central material in nanoscience for enabling the bottom-up paradigm. Second, we describe novel deterministic assembly methods that involve one initial patterning step with all subsequent steps registered to this initial pattern, including the assembly and interconnection of individual nanowire elements into complex circuits. Third, we will exploit these advances together with a novel architecture, to address the concept of assembling a nanocomputer, first introduced by Feynman in 1959, with the realization of a programmable nanoprocessor of unprecedented complexity. Last, we will describe exciting complementary advances at the frontier between nanoelectronics and biology – "nano-bioelectronics" – including nanowire probes capable of intracellular recording and stimulation at scales heretofore not possible with existing passive electrical measurements, and an 'out-of-the-box' look at what the future might hold in terms of merging nanoelectronic circuits with cell networks in three dimensions to 'synthesize' cyborg tissues and cyborg organisms. The prospects for blurring the distinction between nanoelectronic circuitry, computation and living systems in the future will be highlighted.

Chad Mirkin *(continued from previous page)*

functional properties that are advancing studies of SERS, plasmonics, and plexcitonics and forming the basis for novel molecular electronic, optoelectronic, encoding, and chemical and biological detection devices. synthesis of complex modulated nanowires will be highlighted as a central material in nanoscience for enabling the bottom-up paradigm. Second, we describe novel deterministic assembly methods that involve one initial patterning step with all subsequent steps registered to this initial pattern, including the assembly and interconnection of individual nanowire elements into complex circuits. Third, we will exploit these advances together with a novel architecture, to address the concept of assembling a nanocomputer, first introduced by Feynman in 1959, with the realization of a programmable nanoprocessor of unprecedented complexity. Last, we will describe exciting complementary advances at the frontier between nanoelectronics and biology – "nano-bioelectronics" – including nanowire probes capable of intracellular recording and stimulation at scales heretofore not possible with existing passive electrical measurements, and an 'out-of-the-box' look at what the future might hold in terms of merging nanoelectronic circuits with cell networks in three dimensions to 'synthesize' cyborg tissues and cyborg organisms. The prospects for blurring the distinction between nanoelectronic circuitry, computation and living systems in the future will be highlighted.

Short Courses

Four Short Courses will be offered in Orlando on Sunday, May 11, 2014, from 0830h to 1630h. The registration fee for the Short Courses is $425 for ECS Members and $520 for Nonmembers. Students may register for a Short Course at a 50% discount—ECS Student Members: $212.50, and Nonmember Students: $260.

The registration fee for the course includes participation in the course, text materials, continental breakfast, luncheon, and refreshment breaks; the **Short Course Registration fee does not include or apply to the general Meeting Registration**, and it is not applicable to any other activities of the meeting. **Pre-registration for Short Courses is required—the deadline is April 11, 2014**

Short Course #1

Basic Impedance Spectroscopy
Mark E. Orazem, Instructor

This course is intended for chemists, physicists, materials scientists, and engineers with an interest in applying electrochemical impedance techniques to study a broad variety of electrochemical processes. The attendee will develop a basic understanding of the technique, the sources of errors in impedance measurements, the manner in which experiments can be optimized to reduce these errors, and the use of graphical methods to interpret measurements in terms of meaningful physical properties.

Short Course #2

Fundamentals of Electrochemistry: Basic Theory and Thermodynamic Methods
Jamie Noël, Instructor

This course covers the basic theory and application of electrochemical science. It is targeted toward people with a physical sciences or engineering background who have not been trained as electrochemists, but who want to add electrochemical methods to their repertoire of research approaches. There are many fields in which researchers originally approach their work from another discipline but then discover that it would be advantageous to understand and use some electrochemical methods to complement the work that they are doing.

The course has just been fully revised to include more practical examples and a more manageable volume of material. It complements a revised sister course, "Fundamentals of Electrochemistry: Basic Theory and Kinetic Methods", to be offered by the same instructor at the ECS fall meeting. The two courses have different emphasis, and each is designed to be a stand-alone introduction to electrochemical fundamentals. If both courses are desired, they can be taken in either order.

Short Course #3

Grid-Scale Energy Storage
Jeremy P. Meyers, Instructor

This course is intended for chemists, physicists, materials scientists, and engineers to better understand the specific requirements for energy storage on the electric grid. The course will introduce students to the concepts associated with the "smart grid" and the demands that intermittent renewable power sources place on the grid from the perspective of distribution. We will then examine some of the key technologies under consideration for energy storage and the technical targets and challenges that must be addressed. Students will be brought up to date with the current state of the art, and review data from demonstration systems, experimental data from prototype designs, and some modeling and analysis.

Short Course #4

More-than-Moore Technologies: Device, Circuit and System Perspectives
Yiyu Shi, Instructor

This course is designed to be interdisciplinary, providing cross-domain knowledge in computer engineering, physics and chemistry. It is intended for chemists, physicists, materials scientists, and electrical/computer engineers with an interest in developing or utilizing More-than-Moore technologies. The course is best suited for an attendee who has little or no background in these technologies and wants to appreciate the overall picture. The attendee will develop basic understanding of fundamental mechanisms behind various More-than-Moore technologies, their pros and cons, their critical issues/open questions that need to be addressed, and their possible applications in computer circuit and system designs.

Short Course Refund Policy: Written requests for Short Course refunds will be honored only if received at ECS headquarters by May 5, 2014. All refunds are subject to a 10% processing fee and requests for refunds must be made in writing and e-mailed to customerservice@electrochem.org.

Refunds will not be processed until AFTER the meeting. All courses are subject to cancellation pending an appropriate number of advance registrants.

Before making any flight or hotel reservations, please check to make sure the Short Course that you have selected is being offered.

Please visit the ECS website for full course descriptions and instructor biographies.

Panel of Professionals

As part of the professional development series, ECS is pleased to present the inaugural Panel of Professionals at the 225th ECS Meeting in Orlando in May. Please join us on Monday, May 12th, 1800-1900h in Floridian Ballroom H, on the Lobby Level.

Attendees will hear from three guest speakers, representing industry, academia, and government, each discussing the unique challenges and opportunities of pursuing a career in their chosen field.

Confirmed panelists:

Hariklia (Lili) Deligianni, PhD, Thomas J. Watson Research Center, IBM Corporation
Amy Marschilok, PhD, Research Associate Professor in Materials Science and Engineering Chemistry at Stony Brook University, SUNY
Gabriel Veith, PhD, Senior Staff Scientist, Oak Ridge National Laboratory

The session will be moderated by **Kevin Rhodes** of Ford Motor Company. There will be ample time for questions and answers. Students and early-career professionals are strongly encouraged to attend.

Electronics and Photonics Division Award

Albert G. Baca is a Distinguished Member of the Technical Staff at Sandia National Laboratories. From 1985-1990 he worked at AT&T Bell Laboratories in GaAs-based microelectronics. Since 1990 he has been at Sandia National Laboratories where he has been responsible for the development of a number of compound semiconductor device technologies. Dr. Baca has led research efforts in the realization of compound semiconductor devices such as GaAs/AlGaAs heterostructure field effect transistors for high speed fiber optic communications, high voltage GaAs heterojunction bipolar transistors (HBTs), co-integration of sensors and GaAs electronics, low-power InP HBTs, novel InGaAsN HBTs, high power GaN/AlGaN high electron mobility transistors, and high voltage, high current photoconductive semiconductor switches. He has most recently engaged in reliability research in HBTs. This research has led both to research "firsts" as well as production worthy technology. He has co-authored more than 160 publications, holds eight US patents, and has also co-authored the book, *Fabrication of GaAs Devices*. He served on the honorary editorial board for *Solid-State Electronics* from 1998-2012.

Dr. Baca received a BS degree in chemistry and mathematics from the University of New Mexico in 1979 and a PhD in chemistry from the University of California at Berkeley in 1985. He was selected fellow of the ECS in 2006. Among other Society activities, he served as chair of the Electronics and Photonics Division from 2007-2009, has co-organized multiple symposia for ECS meetings, and chaired the Solid-State Subcommittee for selection of the Young Authors Award from 2002-2005. In 2003, he chaired the Subcommittee on Processing for the InP and Related Materials Conference. He also served on the IEEE GaAs IC Symposium Technical Program Committee from 1997-1999.

Supramanian Srinivasan Young Investigator Award of the Energy Technology Division

Minhua Shao earned BS and MS degrees in chemistry from Xiamen University in China, and a PhD degree in materials science and engineering from Stony Brook University in 2006. Under the guidance of Radoslav Adzic, his doctoral research focused on understanding the reaction mechanisms of fuel cell reactions by surface enhanced infrared absorption spectroscopy (SEIRAS) and developing low cost electrocatalysts for oxygen reduction reaction (ORR) and small organic molecule oxidation. Dr. Shao joined UTC Power (now ClearEdge Power) in 2007 to lead the development of advanced catalysts and supports for proton exchange membrane fuel cell and phosphoric acid fuel cell. He was promoted to Technical Fellow for his outstanding technical contributions, strategic leadership and mentoring skills. In 2013, he joined Ford Motor Company to conduct research on lithium-ion batteries for the next generation electrified vehicles. He looks forward to starting his academic career at the Hong Kong University of Science and Technology this spring. He has published 50 peer-reviewed articles, 1 edited book and filed over 30 patent applications. He has also received a number of awards, including the ECS Student Achievement Award of the Industrial Electrochemistry and Electrochemical Engineering Division (2007), President's Award to Distinguished Doctoral Students from Stony Brook University (2006), Chinese Government Award for Outstanding Self-Financed Students Abroad from China Scholarship Council (2006), and Dr. Mow Shiah Lin Award from Brookhaven National Laboratory (2006).

Please see pages 24 and 25 for biographies of the Vittorio de Nora Award winner and the Henry B. Linford Award for Distinguished Teaching winner. For additional information and schedule for award presentations, please see the General Meeting Program on the Orlando page of the ECS web site: http://www.electrochem.org/meetings/biannual/225/.

Research Award of the Energy Technology Division

James M. Fenton is the Director of the University of Central Florida's Florida Solar Energy Center (FSEC), where he leads a staff of 140 in the research and development of energy technologies that enhance Florida's and the nation's economy and environment and educate the public, students and practitioners on the results of the research. The US DOE is currently funding programs at FSEC in: "Building America" energy efficient homes, Photovoltaic Manufacturing, Hot-Humid PV testing of large-scale PV to show bankability, train-the-trainers education for solar installations, and programs to decrease the soft-costs of PV installation. Recently, DOE provided funding to UCF to manage a smart-grid education consortium for university power electrical engineering students (FEEDER), and the US DOT awarded to UCF the nation's only University Electrical Vehicle Transportation Center (EVTC). Prior to joining FSEC, Dr. Fenton spent 20 years as a Chemical Engineering Professor at the University of Connecticut. He received his Ph.D. in Chemical Engineering from the University of Illinois in 1984 and his B.S. from UCLA in 1979.

He has over 30 years' experience in electrochemical energy devices and education topics which include: zinc/bromine, zinc/chlorine flow batteries, membrane durability, CO tolerance electrocatalysts, hydrogen purification processes, low-methanol crossover membranes, high temperature membranes, membranes needing no external humidification, selective oxidation catalysts, gas diffusion layer design, reversible PEM fuel cells, and biomass and landfill gas fuel processing. He is an Electrochemical Society Fellow and has strongly encouraged younger scientists and engineers in participating in The Electrochemical Society's, Energy Technology, and IEEE Division's technical symposia and in taking on service roles for the Society. He is the author of more than 120 scientific publications, a number of book chapters, and co-authored *Experimental Methods and Data Analyses for Polymer Electrolyte Fuel Cells*, and holds four patents. He led a 12-member university and industry research team on a $19 million U.S. Department of Energy research program to develop the next generation proton exchange membrane (PEM) fuel cell automobile engine that would operate at 120 ºC. He will be presenting "Membrane Electrode Assembly Fabrication from Membranes of the DOE High Temperature High Temperature Membrane Working Group," as the award address for the Research Award of the Energy Technology Division.

Organic and Biological Electrochemistry Division Manuel M. Baizer Award

Jun-Ichi Yoshida is a professor in the Department of Synthetic Chemistry and Biological Chemistry at Kyoto University, where he has been since 1994. He graduated from Kyoto University in 1975, where he received his doctor's degree under the supervision of Prof. Makoto Kumada in 1981. In 1979, Dr. Yoshida joined the faculty at Kyoto Institute of Technology as an assistant professor. He was a visiting professor at the University of Wisconsin in 1982-1983, where he joined the research group of Prof. B. M. Trost. In 1985 he moved to Osaka City University, where he was promoted to an associate professor in 1992.

Professor Yoshida has earned numerous awards, including the Progress Award of Synthetic Organic Chemistry, Japan (1987); the Chemical Society of Japan Award for Creative Work (2001); the Nagoya Medal Prize (Silver Medal) (2006); the Humboldt Research Award (2007); the Green Sustainable Chemistry Award (2010); the Ta-shue Chou Lectureship Award (2013); and the Chemical Society of Japan Award (2013).

His research interests include integrated organic synthesis on the basis of reactive intermediates, organic electron transfer reactions, organometallic reactions, and microreactors.

Technical Exhibit

The ECS Technical Exhibit is always the talk-of-the-meeting—technical exhibits offer a popular networking opportunity as attendees gather together with colleagues and meet new contacts. The exhibitors in Orlando will showcase instruments, materials, systems, publications, and software, and other products and services, and many will provide demonstrations. Complimentary coffee breaks are scheduled on Tuesday and Wednesday at 0930h in the Exhibit Hall. In addition, the Poster Sessions and receptions will be held in the Exhibit Hall on Tuesday and Wednesday evenings, beginning at 1800h.

Exhibit Hours

Grand Foyer, Lobby Level

Monday, May 12
1900h–2300h ..... Exhibitor Move-In

Tuesday, May 13
0900h–1400h..... Technical Exhibit
0930h–1000h.....Coffee Break in Exhibit Area
1800h–2000h..... Technical Exhibit, General & Student Poster Session*

Wednesday, May 14
0900h–1400h..... Technical Exhibit
0930h–1000h.....Coffee Break in Exhibit Area
1800h–2000h..... Technical Exhibit & General Poster Session*
2030h–2330h..... Technical Exhibit Tear Down
** This event will host beer, soft drinks, and dry snacks*

ECS welcomes our Exhibitors

ALS CO., LTD.
Booth 123
Katsunobu Yamamoto
yamamoto@bas.co.jp
www.als-japan.com

Arbin Instruments
Booth 138
Antony Parulian
antony@arbinmail.com
www.arbin.com

Beijing Mikrouna / Vacuum Technology Inc.
Booth 131
Sam Cai
caiyuling@mikrouna.cn
www.mikrouna.cn

Biologic
Booths 142, 143, 144
David Carey
david.carey@bio-logic.us
www.bio-logic.us

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ESL Electro Science
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www.horiba.com

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Ivium Technologies
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www.ivium.us

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www.mtixtl.com

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www.nanoflex.com

PEC North America Inc.
Booth 106
Peter Ulrix
Peter.ulrix@peccorp.com
www.peccorp.com

Pine Research Instrumentation
Booths 140, 141
Jenny Garry
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www.pineinst.com/echem

Princeton Applied Research/Solartron Analytical
Booths 117, 118, 119
Ari Tampasis
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www.princetonappliedresearch.com

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Symposium Topics and Organizers

A — Batteries, Fuel Cells, and Energy Conversion

A1 — Batteries and Energy Technology Joint General Session (M-Th) – Y. Xing, V. Di Noto, J. Muldoon, A. Manivannan, S. Narayanan
Battery Division, Energy Technology Division

A2 — Material and Electrode Designs for Energy Storage and Conversion (M –Th) – J. Xiao, J. Wu, K. Zaghib, V. Kalra
Battery Division, Energy Technology Division, Industrial Electrochemistry and Electrochemical Engineering Division

A3 — Mechanical-Electrochemical Coupling in Energy Related Materials and Devices (M-W) – J. D. Nicholas, Y. Qi, P. Mukerjee, S. Bishop
High Temperature Materials Division, Battery Division, Energy Technology Division

A4 — Stationary and Large Scale Electrical Energy Storage Systems 4 (M-T) – S. Narayan, A. Weber, J. Meyers, B. Y. Liaw, G. Botte
Energy Technology Division, Battery Division, Industrial Electrochemistry and Electrochemical Engineering Division

B — Chemical and Biological Sensors

B1 — Sensors, Actuators, and Microsystems General Session (Chemical and Biological Sensors) (T-W) – N. Wu, G. Hunter, L. Nagahara, A. Khosla, A. Simoniam, S. Mitra, Z. Aguilar
Sensor Division, Battery Division, Energy Technology Division, High Temperature Materials Division

B5 — Future Prospects for Sensors: Commercialization, Practical Issues, and Ubiquitous Sensing (M) – M. Carter, G. Hunter, V. Lvovich, J. Stetter, P. Hesketh, J. Li, S. Minteer, A. Khosla, S. C. Barton
Sensor Division, Energy Technology Division, Physical and Analytical Electrochemistry Division, Interdisciplinary Science and Technology Subcommittee

C — Corrosion Science and Technology

C1 — Corrosion General Session (W-Th) – R. G. Buchheit
Corrosion Division

D — Electrochemical/Electroless Deposition

D1 — Electrodeposition for Micro- and Nano-Battery Materials (T) – J. Rohan, J. Owen, S. Mukerjee, K. M. Abraham
Electrodeposition Division, Battery Division, Energy Technology Division

D2 — Electroless Plating: Principles and Applications 3 (M-T) – S. Djokic, N. Dimitrov, J. Stickney, L. Magagnin
Electrodeposition Division

E — Electrochemical Engineering

E1 — Industrial Electrochemistry and Electrochemical Engineering General Session (T) – G. Botte, J. Weidner, H. Xu, E. J. Taylor
Industrial Electrochemistry and Electrochemical Engineering Division, Battery Division, Electrodeposition Division, Energy Technology Division

E2 — Characterization of Porous Materials 6 (T) – J. Staser, V. Birss, J. Gostick, J. Xiao
Industrial Electrochemistry and Electrochemical Engineering Division, Battery Division, Energy Technology Division, Physical and Analytical Electrochemistry Division

E4 — Electrolysis and Electrochemical Processes (W) – G. Botte, J. Weidner, K. Ayers
Industrial Electrochemistry and Electrochemical Engineering Division, Energy Technology Division

E5 — Materials for Low Temperature Electrochemical Systems (T-Th) – P. Pintauro, M. Shao, R. Wycisk, P. Atanassov, K. Karan, B. Lucht
Industrial Electrochemistry and Electrochemical Engineering Division, Battery Division, Energy Technology Division, Physical and Analytical Electrochemistry Division

F — Fuel Cells, Electrolyzers, and Energy Conversion

F1 — Characterization of Interfaces and Interphases (T-W) – T. Nguyen, P. Atanassov, R. Kostecki, F.-Y. Zhang
Energy Technology Division, Battery Division, Industrial Electrochemistry and Electrochemical Engineering Division, Physical and Analytical Electrochemistry Division

F2 — Computational Studies on Battery and Fuel Cell Materials (in Honor of Professor Ishikawa Symposium) (M-W) – D. Chu, S. R. Narayan, E. M. Ryan, S. Meng
Energy Technology Division, Battery Division, High Temperature Materials Division, Physical and Analytical Electrochemistry Division

F4 — Ionic and Mixed Conducting Ceramics 9 (M-Th) – M. Mogensen, T. Kawada, T. Armstrong, T. Gur, X.-D. Zhou, A. Manivannan, S. Gopalan, S. R. Narayan
High Temperature Materials Division, Energy Technology Division

F5 — Solar Fuels and Photocatalysts 3 (M-T) – N. Wu, V. Subramanian, A. Manivannan, P. Kulesza, D. Chu, H. Dinh, J. Fenton, H. Wang
Energy Technology Division, Industrial Electrochemistry and Electrochemical Engineering Division, Physical and Analytical Electrochemistry Division

F6 — State-of-the-Art Tutorial on Durability in Low Temperature Fuel Cells (T-W) – A. Weber, T. Zawodzinski, T. Schmidt, J. Fenton, R. Borup
Energy Technology Division, Industrial Electrochemistry and Electrochemical Engineering Division, Physical and Analytical Electrochemistry Division
(NOTE: Please refer to A3 for a related symposium)

G — Organic and Bioelectrochemistry

G2 — Manuel Baizer Memorial Award Symposium in Organic Electrochemistry 11 (M-T) – K. Chiba, D. Peters, S. Nishiyama
Organic and Biological Electrochemistry Division

H — Physical and Analytical Electrochemistry, Electrocatalysis, and Photoelectrochemistry

H1 — Physical and Analytical Electrochemistry General Session (M-T) – P. Kulesza
Physical and Analytical Electrochemistry Division

H2 — Symposium in Honor of Andrzej Wieckowski (M-Th) – P. Zelenay, R. R. Adzic, S. Gottesfeld, J. Inukai, N. M. Markovic, S. Mukerjee, M. Neurock, A. Lewenstam, P. J. Kulesza, P. Atanassov, D. J. Myers
Physical and Analytical Electrochemistry Division

H3 — Biofuel Cells 6 (M-W) – P. Atanassov, S. C. Barton, N. Mano, S. Minteer
Physical and Analytical Electrochemistry Division, Energy Technology Division, Organic and Biological Electrochemistry Division, Sensor Division

H4 — Charge Transfer: Electrons, Protons, and Other Ions 2 (T-W) – S. Paddison, V. Di Noto
Physical and Analytical Electrochemistry Division, High Temperature Materials Division

H5 — Physical Chemistry of Electrolytes (M-W) – P. Trulove, P. J. Kulesza, P. Vanýsek, K. Gering
Physical and Analytical Electrochemistry Division, Battery Division

H8 — Spectroelectrochemistry 2 (T) – S. Mukerjee, V. Di Noto
Physical and Analytical Electrochemistry Division

H9 — Symposium in Honor of Richard Buck (M-T) – P. Vanýsek, A. Lewenstam
Physical and Analytical Electrochemistry Division

M — Carbon Nanostructures and Devices

M1 — Carbon Electronics: Interfaces to Metals, Dielectrics, and Electrolytes (T-W) – M. Madou, A. Hoff, M. Carter, D. Landheer, R. Martel, R. Kostecki, C. Wang
Dielectric Science and Technology Division, Battery Division, Electronics and Photonics Division, Nanocarbons Division, Sensor Division

M2 — Carbon Nanostructures for Energy Conversion (M-T) – J. Blackburn, M. Arnold, K. Rajeshwar, R. Kostecki, R. Martel
Nanocarbons Division, Energy Technology Division

M3 — Carbon Nanostructures in Medicine and Biology (M) – T. DaRos, L. Wilson, R. Van Staden, D. Heller
Nanocarbons Division, Sensor Division

M4 — Carbon Nanotubes - From Fundamentals to Devices (T-W) – S. V. Rotkin, M. Zheng, S. Doorn, Y. Gogotsi, R. B. Weisman
Nanocarbons Division

M5 — Endofullerenes and Carbon Nanocapsules (W) – T. Akasaka, L. Echegoyen, S. Yang
Nanocarbons Division

M6 — Fullerenes - Chemical Functionalization, Electron Transfer, and Theory (T) – F. D'Souza, D. Guldi, S. Fukuzumi
Nanocarbons Division, Physical and Analytical Electrochemistry Division

M7 — Graphene and Related Structures (M-T) – H. Grebel, S. V. Rotkin, L. Huang, Y. Obeng
Nanocarbons Division

M8 — Nanostructures for Energy Conversion (T-W) – H. Imahori, P. Kamat, K. Murakoshi, V. Subramanian, J. Xiao
Nanocarbons Division, Battery Division, Energy Technology Division

Symposium Topics and Organizers *(continued)*

M9 — Porphyrins, Phthalocyanines, and Supramolecular Assemblies (M-W)– K. Kadish, R. Paolesse, N. Solladie, T. Torres
Nanocarbons Division, Physical and Analytical Electrochemistry Division

N — Dielectric Science and Materials

N2 — Dielectrics for Nanosystems 6: Materials Science, Processing, Reliability, and Manufacturing (M-W) – D. Misra, Y. Obeng, T. Chikyow, H. Iwai, Z. Chen, D. Bauza
Dielectric Science and Technology Division, Electronics and Photonics Division HC e

N3 — More-than-Moore (M-W) – Y. Obeng, G. Banerjee, S. Datta, P. Hesketh, T. Hiramoto, P. Srinivasan, A. Hoff
Dielectric Science and Technology Division, Electronics and Photonics Division, Sensor Division, Interdisciplinary Science and Technology Subcommittee e

P — Electronic Materials and Processing

P1 — Chemical Mechanical Polishing 13 (T) – R. Rhoades, I. Ali, G. Banerjee, L. Economikos, D. Huang, Y. Obeng, B. Basim
Dielectric Science and Technology Division

P2 — Silicon Compatible Materials, Processes, and Technologies for Advanced Integrated Circuits and Emerging Applications 4 (M-W) – F. Roozeboom, E. P. Gusev, H. Iwai, K. Kakushima, V. Narayanan, P. J. Timans, Paul Kohl, O. M. Leonte
Electronics and Photonics Division, Dielectric Science and Technology Division HC e

Q — Electronic and Photonic Devices and Systems

Q1 — Integrated Optoelectronics 7 (M-W) – M. J. Deen, Q. Fang, C. Jagadish, L. F. Marsal, K. Ohashi
Electronics and Photonics Division, Dielectric Science and Technology Division

Q2 — Wide Bandgap Semiconductor Materials and Devices 15 (M-Th) – F. Ren, D. Senesky, Y.-L. Wang, S. J. Pearton, E. B. Stokes, G. Hunter
Electronics and Photonics Division, Sensor Division HC e

R — Luminescence and Display Materials, Devices, and Processing

R1 — Nanoscale Luminescent Materials 3 (M-W) – P. Mascher, D. Lockwood
Dielectric Science and Technology Division, Luminescence and Display Materials Division HC e

Z — General

Z1 — General Student Poster Session (T) – V. Subramanian, V. Chaitanya, J. St-Pierre, C. Johnson, M. P. Foley, K. B. Sundaram
All Divisions

Z2 — Nanotechnology General Session (T-W) – W. Mustain, O. M. Leonte
All Divisions, Interdisciplinary Science and Technology Subcommittee

Z3 — Solid State Topics General Session (T-W) – K. Sundaram, O. M. Leonte, K. Shimamura, H. Iwai
Dielectric Science and Technology Division, Electronics and Photonics Division, Energy Technology Division, Luminescence and Display Materials Division, Nanocarbons Division, Organic and Biological Electrochemistry Division, Sensor Division

ECS Transactions – Forthcoming Issues

In addition to those symposia that have committed to publishing an issue of *ECS Transactions* (ECST), all other symposia potentially will be publishing an issue of ECST approximately 16 weeks after the Orlando meeting. If you would like to receive information on any of these issues when they become available, please e-mail. Please include your name, e-mail address, and all issues in which you are interested.

HC ***ECS Transactions*** **(ECST) – Symposia with issues available "at" the meeting are labeled with HC this special icon. Hard-cover (HC)** editions will be available for purchase and pick-up at the meeting; or you may pre-order on the meeting registration form or when registering online.

e **Electronic (PDF)** editions will be available ONLY via the ECS Digital Library (www.ecsdl.org). Electronic editions of the Orlando "at" meeting issues will be available for purchase beginning May 2, 2014. Please visit the ECS website for all issue pricing and ordering information for the electronic editions.

Reserve Hotel Accommodations Early

Hotel discounts are available through April 11, 2014 or until the block sells out, whichever comes first!

The 225th ECS Meeting will be held at the meeting headquarters hotel, the Hilton Orlando Bonnet Creek (14100 Bonnet Creek Resort Lane, Orlando, Florida 32821). We strongly encourage you to stay at this hotel to ensure an enjoyable and convenient meeting experience.

Hotel reservations may be made online for the special discounted meeting rate of **$205** which includes the mandatory $22 resort fee, Internet access and free shuttle service to Disney attractions. **The deadline for reservations is April 11, 2014, or until the block sells out, whichever comes first.** Reservations placed after April 11 will be accepted on a space and rate availability basis only.

Travel Companions—Nontechnical Registrants

Travel companions of attendees are invited to register for the 225th ECS Meeting as a "Nontechnical Registrant." The nontechnical registrant registration Early-Bird fee of $25 (increases to $35 after April 11) includes admission to non-ticketed social events; use of an exclusive Get-together Lounge with beverage service and light refreshments, Monday through Thursday, 0800-1000h; and a special "Welcome to Orlando" orientation presented by Visit Orlando on Monday, May 12 at 0900h in the lounge. Please note that online registration is not available for Nontechnical Registrants.

Registration Information

Registration Hours

Saturday, May 10	1600–1900h
Sunday, May 11	0700–1900h
Monday, May 12	0700–1900h
Tuesday, May 13	0700–1730h
Wednesday, May 14	0800–1600h
Thursday, May 15	0800–1200h

***Registration Fees*—ALL PARTICIPANTS AND ATTENDEES ARE REQUIRED TO PAY THE APPROPRIATE REGISTRATION FEE LISTED BELOW**. Payment can be made by cash, check, or travelers' checks in U.S. funds drawn on a U.S. bank. Visa, MasterCard, American Express, or Discover are also accepted.

The deadline for Early-Bird Registration is April 11. 2014. Regular registration rates are in effect online after April 11, 2014 and at the meeting.

	Early-Bird (through April 11)	Regular Rate (April 12 and after)
ECS Member	$475	$575
Nonmember	$635	$735
ECS Student Member	$170	$270
Student Nonmember	$205	$305
One Day ECS Member	$290	$390
One Day Nonmember	$380	$480
Nontechnical Registrant	$25	$35
ECS Emeritus or Honorary Member	Gratis	Gratis

Information for Students –All students must present a current, dated student ID card, or for postdocs, a letter from a professor stating that you are a full or part-time student, when you pick up your registration materials at the meeting.

ECS Meeting Abstracts—are always right at hand—and as always, are **FREE** with registration. Registrants may easily access them through wireless Internet, which will be available at the meeting; view them on the ECS Meeting App; or download them directly from the 225th ECS Meeting website. Paper editions of meeting abstracts are no longer distributed; attendees who require paper should download the abstracts and print them in advance of the meeting.

Financial Assistance—Financial assistance is limited and generally governed by the symposium organizers. Individuals may inquire directly to the symposium organizers of the symposium in which they are presenting their paper to see if funding is available. Individuals requiring an official letter of invitation should write to the ECS headquarters office; such letters will not imply any financial responsibilities of ECS.

General Meeting Information

Key Locations in the Hilton Orlando Bonnet Creek Hotel

Meeting Registration	Grand Foyer, Lobby Level
Information/Message Board	Grand Foyer, Lobby level
ECS Headquarters Office	Bradford, Ground Level
ECS and Redcat	Grand Foyer, Lobby Level
AV Tech Table	Located outside select symposium rooms
Technical Exhibit	Grand Foyer, Lobby Level

Refund Policy

Refund requests for Meeting Registration or Short Course Registration (separate fees) must be requested in writing and will be accepted only if received by May 5, 2014. All refunds are subject to a 10% processing fee. Requests for refunds should be e-mailed to customerservice@electrochem.org. Refunds will not be processed until AFTER the meeting.

Photography & Recording

By attending the ECS meeting, you agree that you will not record any meeting-related activity, without the express, written consent from ECS. Recording means any audiovisual or photographic methods. Meeting-related activity means any presentation (oral or poster) or social event directly related to the meeting. You may photograph your own personal, non-meeting related activity, but you must obtain permission from all involved parties before photographs can be taken of other people or displays at the meeting or exhibit. Press representatives must receive media credentials and recording permission from the ECS Headquarters Office. If you violate this policy, you will be removed from the meeting. Your registration will be revoked and you will lose all access to the meeting. In this case, you will not receive a refund of the registration fees. ECS also reserves the right to deny your attendance at future ECS or ECS sponsored meetings. Thank you for your consideration.

ADA Accessibility

Special accommodations for disabled attendees will be handled on an individual basis provided that adequate notice is given to the ECS Headquarters Office.

Author Choice Open Access

ECS is very pleased to announce the launch of **Author Choice Open Access** across its four peer-reviewed journals: *Journal of The Electrochemical Society*, *ECS Journal of Solid State Science and Technology*, *ECS Electrochemistry Letters*, and *ECS Solid State Letters*. If you are attending the 225th ECS Meeting in Orlando, Florida you will also receive one Article Credit, which may be used for up to 12 months after the meeting. (See story on page 9.)

If you have questions, please visit our Open Access page on the ECS website or contact oa@electrochem.org for personal assistance.

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The 225th ECS Meeting 5K ENERGY-RUN-FOR-FUN

Claim your space at the starting line of the inaugural ***5K Energy-Run-For-Fun*** and enjoy the scenery of the Hilton Orlando Bonnet Creek during a fresh morning run! *Plus, the top three finishers will receive award medals.*

The 5K Energy-Run-For-Fun is a ticketed event within the 225th ECS Meeting, with proceeds benefitting the ECS Publications Endowment. Bring your shoes and join us for a memorable activity to jog your mind, as well as your body.

When: Monday, May 12, starting time of 0730h
Where: Signature Island

Cost:
- Early-Bird rate until April 11, 2014.....$15
- Between April 12 and May 11, 2014 .....$20
- Event day sign-up $25

To register for this exciting event, please add it to your meeting registration.

Meeting Events-at-a-Glance

Note: *For a list of Committee Meetings, please visit the Orlando meeting page: http://www.electrochem.org/orlando.*

SUNDAY, MAY 11

0830h.....Short Courses
1400h.....Professional Development Series: Essential Elements for Employment Success

MONDAY, MAY 12

0730h.....5K Energy-Run-For-Fun
0800h.....Technical Sessions*
0800h.....Professional Development Series: Essential Elements for Employment Success
0930h.....Technical Session Coffee Break
1200h.....Professional Development Series: Resume Review
1540h.....*Henry B. Linford Award for Distinguished Teaching Address:* Low Temperature Plasma Etching of Copper, Silver, and Gold Films by Dennis Hess
1700h.....The *ECS Lecture*— Nanowires: From Nanocomputing to Nano-Bioelectronics by Charles M. Lieber
1800h.....Professional Development Series: Panel of Professionals
1900h.....Student Mixer (By invitation only; contact sponsorship@electrochem.org for details)

TUESDAY, MAY 13

0800h.....Technical Sessions*
0800h.....Professional Development Series: Resume Review
0810h.....*Vittorio de Nora Award Address:* On-Wire Lithography: An Electrochemical Approach to Controlling Nanoscale Architecture by Chad Mirkin
0900h.....Technical Exhibit
0930h.....Technical Session Coffee Break in Exhibit Hall
1215h.....Annual Society Business Meeting & Luncheon; *non-refundable ticketed event*
1700h.....ECS Publications–Author Information Session
1800h.....Technical Exhibit and General and Student Poster Session

WEDNESDAY, MAY 14

0800h.....Technical Sessions*
0800h.....Professional Development Series: Resume Review
0900h.....Technical Exhibit
0930h.....Technical Session Coffee Break in Exhibit Hall
1800h.....Student Poster Award Presentation in Exhibit Hall
1800h.....Technical Exhibit and General Poster Session

THURSDAY, MAY 15

0800h.....Technical Sessions*
0930h.....Technical Session Coffee Break

** Check Technical Program for exact time*