ECS Seeds Four Projects Aimed at Solving the World's Sanitation Challenges

by Dan Fatton

ECS awarded $210,000 of seed funding to four innovative research projects addressing critical technology gaps in water, sanitation, and hygiene being faced around the world.

In its first "Science for Solving Society's Problems Challenge," ECS partnered with the Bill & Melinda Gates Foundation to leverage the brainpower of the many scientists in electrochemistry and solid state science and technology that regularly attend ECS meetings. The four grantees were identified during a multi-day workshop at the Electrochemical Energy Summit in Cancun, Mexico held October 5-9, 2014.

Over 100 researchers were guided through a brainstorming and working group session with the theme of improving access to clean water and sanitation in developing countries. Brandy Salmon, PhD, Senior Innovation Advisor from RTI International, facilitated the brainstorming. "The idea was to inspire researchers to consider the many ways electrochemistry can be applied to solve issues of global significance," explained Salmon. "ECS provided a lab for collaboration that generated new ideas and partnerships."

Ideas suggested ran the gamut from turning urine to hydrogen power and using microorganisms that harvest energy from marine sediments to looking at "molecular slip" as part of making waste pipes more efficient. A summary of the brainstorming session is available for download on the ECS website. The format provided a unique opportunity for researchers to generate possible solutions and then almost immediately start testing them.

After the brainstorming session, researchers had two days to develop a one-page proposal. Thirty finalists were selected from the 47 proposals submitted. Those 30 were given five minutes each in the "Shark Tank" to present their ideas to a panel of judges followed by five minutes of questions. The funding review panel scored proposals for innovation, collaboration, mission, and capacity. The final deliberations and selection concluded the next day.

"This really is science for solving society's problems," noted Paul Kohl, ECS President. "An expert, in this case the Bill & Melinda Gates Foundation, presents the problem, ECS gathers ideas from the brightest minds in the field, and their peers review the proposals and grant the money in a very short period of time. No red tape. More time will be spent on addressing the problem and less time on raising money to perform the research."

Noé Arjona, *of Centro de Investigación y Desarrollo Tecnológico en Electroquímica, participates in the workshop at the Electrochemical Energy Summit.*

"This is true reality programing, a model for moving the needle on real-world problems," said Roque Calvo, ECS Executive Director. "We would like to replicate this at our future biannual meetings, which regularly attract more than 2,000 of the brightest minds in science. We have invaluable assets in our membership; we just need corporations and foundations to identify the challenges they'd like to address, and provide the capital so our membership can start tackling these additional challenges."

Winners of the First "Science for Solving Society's Problems Challenge"

- ***Artificial Biofilms for Sanitary/Hygienic Interface Technologies (A-Bio SHIT)***
  Plamen Atanassov, *University of New Mexico, $70,000*
  Interfaces: Produce biocatalytic septic cleaning materials that incorporate microorganisms removing organic and inorganic contaminants, while simultaneously creating electricity (or hydrocarbon fuel) for energy generation in support of a sustainable and portable system.

- ***In situ Electrochemical Generation of the Fenton Reagent for Wastewater Treatment***
  Luis Godínez, *Centro de Investigación y Desarrollo Tecnológico en Electroquímica SC, Mexico, $50,000*
  Disinfection: Study the electro-Fenton approach using activated carbon to efficiently oxidize most of the organic and biological materials present in sanitary wastewater so that recycling of the wastewater might be possible.

- ***powerPAD***
  Neus Sabaté, *Institut de Microelectrónica de Barcelona (CSIC);* **Juan Pablo Esquivel**, *University of Washington; and* **Erik Kjeang**, *Simon Fraser University, $50,000*
  Monitoring and Measurement: Develop a non-toxic portable source of power for water measuring and monitoring systems, which will not require recycling facilities. Using inexpensive materials such as paper, nanoporous carbon electrodes, and organic redox species, the team will strive to create a biodegradable and even compostable power source.

- ***More than MERe microbes: Microbial Electrochemical Reactors for water reuse in Africa***
  Gemma Reguera, *Michigan State University, $40,000*
  Chemical Conversion: Develop microbial electrochemical reactors that harvest energy from human waste substrates using bioanodes engineered to process the waste into biofuels while simultaneously cleaning water for reuse. The microbial catalysts will be selected for their efficiency at processing the wastes, but also for their versatility to process other residential and agricultural waste substrates. This will provide an affordable, easy to operate system for the decentralized processing of a wide range of wastes for improved sanitation, water reuse, and energy independence.

electrochem.org/meetings/biannual/226/energy_summit/summary

Eric Wachsman, *a member of the Steering Committee for the 2014 Electrochemical Energy Summit.*

Senior Technology Integration and Innovation Manager from RTI International, Brandy Salmon, supported the development of workshop resources, and provided structure and guidance for the workshop. Dr. Salmon is among a team of Innovation Advisors at RTI who provide innovation management and strategy, technology commercialization, assessment, and partnership support for federal agencies, universities, foundations, and companies. Dr. Salmon is an experienced facilitator and expert in innovation management and technology assessment.

Dan Fatton *is the Director of Development and Membership Services for ECS and adds the following comments:*

I've been working with ECS for less than 2 years, and implementing programs like this has been one of the best, most rewarding parts of my job. We are very excited about the four grantees that ECS selected in Cancun, but I'm also energized by the innovative experiment we've just undertaken. ECS is already considering future opportunities for the "Science Solving Society's Problems" program, but if you have an idea for a similar problem solving collaboration, or want to share some other new approach that ECS should consider for our meetings, members or something else, let's talk. Please email me at dan.fatton@electrochem.org.

Clement Cid, *of the California Institute of Technology, gives a morning talk at the workshop.*

ECS Appoints New Technical Editor

The Electrochemical Society is pleased to announce the appointment of **Doron Aurbach** as the next Technical Editor of the Batteries and Energy Storage technical interest area for the *Journal of The Electrochemical Society* (JES) and *ECS Electrochemistry Letters* (EEL).

Doron Aurbach is a full professor in the Department of Chemistry, leads an electrochemistry group of 40 people, and is a Senate member at Bar-Ilan University (BIU). He chaired the Department of Chemistry during 2001-2005. Prof. Aurbach founded the electrochemistry group at BIU 28 years ago. Since then over 40 PhD and 60 MSc students have worked with Prof. Aurbach to earn their degrees. His team studies the electrochemistry of active metals, non-aqueous electrochemical systems, electrochemical intercalation processes, electrochemical water desalination, and electronically conducting redox polymers. He also develops spectroscopic methods (*in situ* and *ex situ*) for sensitive electrochemical systems, and develops rechargeable high energy density batteries and EDL capacitors. Prof. Aurbach collaborates with several academic groups throughout the world and with a number of leading industries in Israel and elsewhere (*e.g.*, BASF Germany and GM USA).

Prof. Aurbach has published more than 470 peer reviewed papers (nearly 19,000 citations with an H index of 69), 21 patents, 19 chapters in books, and presented his scientific work in hundreds of invited talks in international conferences. Prof. Aurbach served as an associate editor in 4 electrochemistry journals: the aforementioned JES and EEL, and *Electrochemical and Solid-State Letters* (journals of The Electrochemical Society); and *Journal of Solid State Electrochemistry* (Springer). He is a fellow of the ECS (2008), ISE (2010) and MRS (2012). He is the head of the Israel National Research Center for Electrochemical Propulsion (founded in 2012) and the chairman of the Israeli National Authority for Laboratory Accreditation (since 2010). He has received numerous awards including: the ECS Battery Division Technology Award (2005); the Israel Vacuum Society (IVS) and Israel Chemical Society (ICS) Excellence Prizes (2007, 2012); the Landau Prize for Research towards Green Energy (2011); the ECS Battery Division Research Award; the Kolthoff Prize (2013); and the E. B. Yeager prize of the International Battery Association (2014). With his nomination as the Technical Editor for the Batteries and Energy Storage area of the ECS journals, Aurbach conveys the following massage: "The Electrochemical Society attracts prominent scientists, young researchers, students, industrial partners, and academic institutions from all over the world having interests in electrochemistry, materials science, and surface science. The ECS journals serves this community by fulfilling a central role in the publication of highly valuable and solid scientific information in all the fields that the ECS represents. The ECS publications over the years have been supported by a very dedicated and professional editorial board that provides the best routes for publishing promptly high quality papers, and it intends to continue this tradition. The editorial board of ECS is committed to provide authors the best service in terms of highly effective, qualified, fair and prompt reviewing processes and then, a very quick publication procedure."

Robert F. Savinell, editor of the *Journal of The Electrochemical Society* and *ECS Electrochemistry Letters* said, "We are pleased to welcome Prof. Aurbach to this leadership role with the ECS journals. He brings extensive experience, depth of understanding of the field, and great energy to the editorial board. We look forward to his help in making the ECS journals 'the journals of choice' for authors in the electrochemical and related fields." ■

ECS Welcomes New Staff Member

Tim Gamberzky joined ECS in November of 2013 and in his capacity as Chief Operating Officer has contributed to the advancement of the Society through his efforts to improve our efficiency and effectiveness in the areas of finance, information technology, and human resources. Tim graduated Rutgers University with a bachelor's degree in Accounting and received his master's degree in Business Management from Fairleigh Dickinson University. He brings an extensive background in financial and operational management as well as strong leadership skills honed through many years of senior executive positions in the private and public sectors working with for-profit and not-for-profit organizations.

Tim's professional career includes senior leadership positions with AT&T, Lucent Technologies, Avaya, Arc eConsultancy, AdvantEdge Healthcare, and Grand Street Settlement, where he held positions such as Chief Operating Officer, Chief Financial Officer, Senior Vice President, Controller, and Board Reporting Director. Tim has also served as a member of the Board of Directors for Arc eConsultancy, Inc.

After a 30-year career with for-profit corporations, Tim decided to pursue his interest in the not-for-profit realm. He helped Grand Street Settlement, a social services non-profit organization that provides educational, health, and wellness assistance to families and individuals in need on the lower east side of Manhattan and the Williamsburg section of Brooklyn, New York to improve their financial and operational performance as they worked toward their 100th anniversary of service to their community. He was recognized for his strong technical and leadership skills as well as his ability to communicate financial and operational results to non-financial staff, the Board of Directors, and other constituents of the Grand Street Settlement.

Executive Director Roque Calvo commented that, "Tim joined ECS at a time when we needed greater operational support to manage the changing landscape of the scholarly publishing industry. His financial, IT, and leadership experience have already paid dividends for ECS by building a strong operations foundation to advance our ability to disseminate technical content." ■

Institutional Member Spotlight: ZSW

by Dan Fatton

On Thursday, October 23, I accompanied ECS President Paul Kohl on a visit to ZSW, the Center for Solar Energy and Hydrogen Research in Ulm, Germany. Werner Tillmetz, Director of the Electrochemical Energy Technologies Division, and Mario Wachtler, Head of the Electrochemistry Team, graciously hosted our visit and provided an overview of the amazing work being done at their research facilities including the new eLaB.

The ZSW site in Ulm has been focused specifically on batteries and fuel cells. Nearly 300 researchers (including the University of Ulm and the Helmholtz Institute Ulm for fundamentals) are working in electrochemistry, with a focus on advanced materials, electrode design, and pilot manufacturing for lithium ion batteries. Much of the work at ZSW is conducted in partnership with industry. For example, ZSW handles functional, lifetime, and safety testing for the automotive industry.

ZSW also has a department dedicated to materials research, which has 20+ years of experience in materials for lithium ion batteries, as well as options beyond lithium. A young researchers group has been working on a hybrid supercapacitor.

On the fuel cell side, there is a focus on characterization of fuel cell components, and fundamentals, including work on new membranes and catalysts, as well as stack design for automotive and other applications. The fuel cell test center at ZSW has 20 fully automated benches. ZSW has built more than 800 fuel cell stacks, and has achieved a continuous operation high lifetime of 20,000 hours.

Another ZSW facility in Stuttgart works on photovoltaics and energy policy, and ZSW also has solar test fields, both in Germany and Spain.

During our visit, the finishing touches were being made on the new eLaB facility in Ulm. It was certainly an impressive space, and the commitment to partnering with industry for practical application of research was noteworthy.

"It was a great pleasure to visit ZSW and tour the new building and battery facilities in Ulm. It is exciting to see these state-of-the-art facilities come to life in Germany," said Paul Kohl.

Dr. Tillmetz added, "The activities of ECS as the world leading network of electrochemists are of tremendous importance in a world where electrochemical energy technologies are now in the focus of many industry sectors."

Werner Tillmetz *(left), ZSW Head of the Electrochemical Energy Technologies Division, and* **Mario Wachtler** *(right), ZSW Head of Team Electrochemistry, with ECS President* **Paul Kohl** *(center) at the ZSW facility in Ulm.*

It was a great pleasure to visit ZSW in Germany, and I'm looking forward to hearing about many more projects from the new site in the near future. ■

Dan Fatton *is the Director of Development and Membership Services for ECS. He may be reached at dan.fatton@electrochem.org.*

ECS Sponsored Meetings for 2015

In addition to the regular ECS biannual meetings and ECS Satellite Conferences, ECS, its Divisions, and Sections sponsor meetings and symposia of interest to the technical audience ECS serves. The following is a list of sponsored meetings for 2015. Please visit the ECS website for a list of all sponsored meetings.

- **2015 China Semiconductor Technology International Conference**, March 17-19, 2015 — Shanghai, China
- **16th Topical Meeting of the International Society of Electrochemistry**, March 22-26, 2015 — Angra do Reis, Brazil
- **17th Topical Meeting of the International Society of Electrochemistry**, May 31-June 3, 2015 — Saint-Malo, France
- **66th Annual Meeting of the International Society of Electrochemistry**, October 4-9, 2015 — Taipei, Taiwan

To learn more about what ECS sponsorship could do for your meeting, including information on publishing proceeding volumes for sponsored meetings, or to request an ECS sponsorship of your technical event, please contact ecs@electrochem.org.

DIVISION NEWS

Battery Division

The **Battery Division** *held its Division luncheon in Cancun on Tuesday, October 6, 2014.* **Martin Ebner** *(pictured on the left) received the Battery Division Student Research Award.* **Ram Manthiram** *(right) received the Battery Division Research Award. Pictured in the center is* **Bor Yann Liaw**, *Chair of the Battery Division. (Photograph by Shirley Meng, Battery Division Treasurer.)*

Electrodeposition Division

The Electrodeposition Division Research Award winner **Allan West** *(left) is receiving his award from Division Chair* **Giovanni Zangari**.

The **Electrodeposition Division Research Award** was established in 1979 to recognize outstanding research contributions for the field of electrodeposition. The 2014 award recipient was **Alan West** from Columbia University and he received the award for his contributions in modeling of the electrochemical systems. Dr. West was acknowledged at the Division luncheon on Wednesday, October 13, 2014, at the fall ECS meeting in Cancun. **Giovanni Zangari**, chair of the Division, presented him with the award plaque and check for $2000. The same day, Dr. West presented his award lecture, "Mathematical Modeling in Electrodeposition Studies."

Dielectric Science and Technology Division and Electronic and Photonic Division: A Symposium Award

The Symposium on Semiconductors, Dielectrics, and Metals for Nanoelectronics 12, sponsored by the **Dielectric Science and Technology Division** and the **Electronic and Photonic Division**, gave the ***Best Paper Award*** at the 2014 joint ECS and SMEQ meeting in Cancun, Mexico for the papers presented at the 2013 symposium held in San Francisco, California during the 224th ECS meeting. The best paper award winners were Michel Houssa, Valery Afanasiev, Katsumasa Kamiya, and Daniele Ielmini for their respective papers:

- "Interaction of Germanene with (0001)ZnSe Surfaces: A Theoretical Study," by M. Houssa, E. Scalise, B. van den Broek, G. Pourtois, V. V. Afanas'ev, and A. Stesmans
- "Electron Band Alignment At Ge/Oxide and AIII-BV/Oxide Interfaces From Internal Photoemission Experiments," by V. V. Afanas'ev, H. Y. Chou, M. Houssa, and A. Stesmans
- "Theoretical Design of Desirable Stack Structure for Resistive Random Access Memories," by K. Kamiya, M. Y. Yang, B. Magyari-Kope, M. Niwa, Y. Nishi, and K. Shiraishi
- "Resistive Switching in Metal Oxides: From Physical Modeling to Device Scaling," by D. Ielmini, S. Balatti, and S. Ambrogio

This symposium introduced the Best Paper Award at its third run (Los Angeles, 2005) in the series on high dielectric constant gate stacks. The first of these best paper awards was won by Maureen MacKenzie of the University of Glasgow, UK, on the basis of her presentation and her manuscript entitled, "Advanced Nano-Analysis of High-K Dielectric Stacks." The award was made possible by a donation from Anelva Corporation (now part of Canon Inc.) of Japan, and consisted of a citation and a check for $1000.

The second Best Paper Award, given in the 2006 Cancun symposium (again facilitated by a donation from the Canon Anelva Corporation, Japan), was won by Daniel Lichtenwalner of North Carolina State University, on the basis of the quality of both the manuscript and the presentation, entitled "Reliability and Stability Issues for Lanthanum Silicate as a High-K Dielectric."

For the Washington, D.C. symposium in 2007, two Best Paper Awards were given, one for the best presentation, and another for the best *ECS Transactions* manuscript. Both awards consisted of a citation and a check for $1000, and were made possible by donations from the Canon Anelva Corporation, Japan, Semiconductor Diagnostics Incorporated, Tampa, Florida, and Aixtron AG, Aachen, Germany. While the best manuscript award was won by Koji Kita of the University of Tokyo, on the basis of the quality of the manuscript entitled "Dramatic Improvement of GeO_2/Ge MIS Characteristics by Suppression of GeO Volatilization," the best presentation award was won by Carlos Driemeier of the Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil on the basis of his presentation entitled "Oxygen Species in HfO_2 Films: An in situ X-Ray Photoelectron Spectroscopy Study."

In 2008 at the Honolulu, Hawaii symposium, the best manuscript award was won by Kouichi Muraoka of the Toshiba Corporation, Japan on the basis of the quality of the manuscript entitled "Interface Engineering of a Metal/High-k/Ge Layered Structure by Water Vapor Discharge," and the best presentation award was won by Robert Wallace of the University of Texas, USA on the basis of his presentation entitled "In-Situ Studies of Interfacial Bonding of High-k Dielectrics for CMOS Beyond 22 nm."

At the Vienna, Austria symposium (2009), the award winners were Paul Hurley for the best presentation and Geoffrey Pourtois for the best manuscript for their papers: "Structural and Electrical Properties of $HfO_2/In_xGa_{1-x}As$ Structures (x = 0, 0.15, 0.3, and 0.53)," by Paul Hurley; and "Modeling of Alternative High-k Dielectrics for Memory Based Applications," by G. Pourtois, S. Clima, K. Sankaran, P. Delugas, V. Fiorentini, W. Magnus, B. Soree, S. Van Elshocht, C. Adelman, J. Van Houdt, D. Wouters, S. DeGendt, M. M. Heyns, and J. Kittl.

In 2010 at the Las Vegas, Nevada symposium, the award winners were Eduard Cartier for the best presentation and Masaharu Oshima for the best manuscript. Their respective papers were: "The Role of Oxygen in the Development of Hf-Based High-k/Metal Gate Stacks for CMOS Technologies," by E. A. Cartier, and "Synchrotron Radiation Photoelectron Spectroscopy of Metal Gate/HfSiO(N)/SiO(N)/Si Stack Structures," by M. Oshima, S. Toyoda, H. Kamada, T. Tanimura, Y. Nakamura, K. Horiba, and H. Kumigashira.

At the Boston, Massachusetts symposium in 2011, we reverted to the best paper for both the manuscript and the presentation and the award winner was Shinichi Takagi for his paper "MOS Interface Control Technologies for III-V/Ge Channel MOSFETs," by S. Takagi, R. Zhang, T. Hoshii, and M. Takenaka.

At the Honolulu, Hawaii symposium (2012), the best paper award winner was Takahide Umeda for his paper "SiC MOS Interface States: Similarity and Dissimilarity from Silicon," by T. Umeda, R. Kosugi, Y. Sakuma, Y. Satoh, M. Okamoto, S. Harada, and T. Ohshima.

This item was contributed by Durga Misra (New Jersey Institute of Technology).

Samares Kar, *lead organizer of the symposium on Semiconductors, Dielectrics, and Metals for Nanoelectronics 12, (at left in all three photos), presents the Best Paper Award to* **Michel Houssa** *(left photo),* **Valery Afanasiev** *(center photo), and* **Kenji Shiriashi** *(right photo), who is accepting the award for Katsumasa Kamiya. The fourth award winner, Daniel Ielmini, was unable to attend the meeting.*

New Division Officers

New officers for the 2014-2016 terms have been elected for the following Divisions.

Battery Division

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Robert Kostecki, Lawrence Berkeley National Laboratory

Vice-Chair

Christopher Johnson, Argonne National Laboratory

Secretary

Marca Doeff, Lawrence Berkeley National Laboratory

Treasurer

(Ying) Shirley Meng, University of California at San Diego

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Kristina Edstrom, Uppsala University
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Brett Lucht, University of Rhode Island
John Muldoon, Toyota Research Institute of North America
Martin Winter, Westfalische Wilhelms-Universitat
Marina Yakovleva, FMC Corp

Corrosion Division

Chair

Rudolph Buchheit, Ohio State University

Vice-Chair

Sannakaisa Virtanen , University of Erlangen-Nuremberg

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Members-at-Large

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Devicharan Chidambaram, University of Nevada, Reno
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Tatsumi Ishihara, Kyushu University
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Mira Josowicz, Georgia Tech
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Chung-Chiun Liu, Case Western Reserve University
Vadim Lvovich, NASA Glenn Research Center
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Rangachary Mukundan, Los Alamos National Laboratory
Larry Nagahara, National Cancer Institute
Antonio Ricco, Stanford University
Michael Sailor, University of California at San Diego
Christopher Salthouse, University of Massachusetts
Praveen Kumar Sekhar, Washington State University
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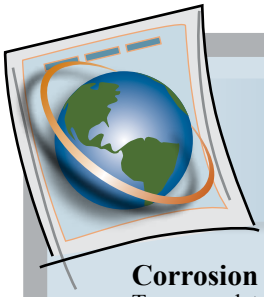
Nianquiang Wu, Vice-Chair
Ajit Khosla, Secretary
Jessica Koehne, Treasurer



websites of note

by Zoltan Nagy

Corrosion Electrochemistry and Kinetics

Two very detailed introductory websites of corrosion and its connection and measurements by electrochemistry.

- P. R. Roberge, McGraw-Hill Professional
- http://www.mhprofessional.com/downloads/products/0071482431/RobergeCh3.pdf
- http://www.mhprofessional.com/downloads/products/0071482431/RobergeCh5.pdf

Cathodic Protection

A series of a large number of papers dealing with all aspects of cathodic protection, theory, and applications.

- Deepwater Corrosion Services
- http://www.stoprust.com/technical-library.htm

Kinetics of Aqueous Corrosion

A very good series of teaching material about corrosion and its connection to electrochemistry, with practical applications.

- Dept of Materials Science and Metallurgy, (U. of Cambridge)
- http://www.doitpoms.ac.uk/tlplib/aqueous_corrosion/index.php

Anodic Protection: Its Operation and Applications

Detailed theory and applications of anodic protection, which somehow nowadays does not seem very practical, though it made big news about fifty years ago.

- J. I. Munro and W. W. Shim, Corrosion Service Co. Ltd
- http://www.westcoastcorrosion.com/Papers/13104%20AP%20Operation%20&%20Apps.pdf

About the Author

Zoltan Nagy is a semi-retired electrochemist. After 15 years in a variety of electrochemical industrial research, he spent 30 years at Argonne National Laboratory carrying out research on electrode kinetics and surface electrochemistry. Presently he is at the Chemistry Department of the University of North Carolina at Chapel Hill. He welcomes suggestions for entries; send them to nagyz@email.unc.edu.

In the NEXT *issue of* INTERFACE

- The spring 2015 issue of *Interface* will be a special issue on photovoltaics and electric vehicles, entitled, "**PV, EV, and Your Home**," that will be guest edited by **James M. Fenton**, Director of the Florida Solar Energy Center (FSEC), University of Central Florida. The issue will feature the following articles (tentative list): "PV, EV, and Your Home," by James M. Fenton; "PV and Battery Storage for Your Home and Business," by **Dave Click**, FSEC; "V2G," by **Rich Raustaud**, FSEC; "Fuel Cells, H2 Generation at Home – Backup Power Options," by **Paul Brooker,** FSEC; and "Fast and Wireless Charging," by **Charles Botsford** and **Andrea Edwards**, AeroVironment and Qualcomm.
- **ECS Spring 2015 Meeting in Chicago** ... The spring issue will feature a special section on the upcoming ECS meeting, with information on special lectures and symposia.
- **Tech Highlights** continues to provide readers with synopses of some of the most interesting papers published in the ECS journals. As an added bonus, the full text of all of the articles mentioned in this column are freely accessible in the ECS Digital Library.
- Don't miss the next edition of **Websites of Note**, which gives readers a look at some little-known, but very useful sites.