

## Chicago

The Section held a meeting on March 11 in Lisle, Illinois. The technical talk was presented by Prof. Peter S. Fedkiw from the Chemical Engineering Department at North Carolina State University. The title of the talk was "Electrolytes Based on Fumed Oxides for Rechargeable Lithium Batteries." The technical talk was preceded by an introduction describing recent activities and the status of The Electrochemical Society.

The Section met on March 18 at Northern Illinois University, Department of Chemistry and Biochemistry, DeKalb, IL. The meeting was organized by Petr Vanyšek and consisted of two presentations and a hands-on demonstration. The first lecture was entitled "SPM Imaging under Controlled Conditions" and was given by Dr. Song Xu of Molecular Imaging. The presentation focused on STM/AFM imaging under controlled conditions, in the electrochemistry, material sci-

ence and in biological fields. The methods and hardware for environmental control were discussed, together with presented experimental results. The second lecture was entitled "Recent Developments in Environmental SPM and Real Time Molecular Recognition," which was also given by Dr. Song Xu of Molecular Imaging. This presentation was specifically directed toward the electrochemists in the audience. By combining electrochemical control with scanning probe microscopy it is possible to manipulate an electrode surface and study the changes at real time with resolutions ranging from atomic to micron scales. Results were presented in EC-STM and EC-AFM studies in corrosion, battery, SAM, and bioelectrochemistry. The investigations were carried out at controlled conditions, in particular temperature and dissolved oxygen.

## Cleveland

In May 2003, the Section organized a Symposium entitled, "Electrochemistry: The New Generation," to serve as a venue for assistant professors across the country with major interest in electrochemistry, to present and discuss their current and future work.

The symposium was chaired by Dr. Barry Miller and involved participation of Professor Keith Stevenson of the Department of Chemistry, University of Texas, Austin, who presented a talk entitled, "Electrochemical Synthesis of Molybdenum Oxide: Deposition Mechanism and Template-Directed Assembly of Macroporous Electrodes." Professor Jim Burgess, Department of Chemistry, Case Western Reserve University (CASE), discussed "Probing Cholesterol Dynamics in Single Cells." Professor Mekki Bayachou, Department of Chemistry, Cleveland State University, gave a presentation entitled, "NO" news is "NOS" news: "What Can We Learn from Direct Electrochemistry?" Professor Frank Zamborini, Department of Chemistry, University of Louisville, discussed, "The Assembly and Nanoscale Patterning of Gold Nanoparticles."

The late afternoon session featured Professor Heidi Martin, Department of Chemical Engineering, CASE, who gave a talk entitled, "Boron Doped Diamond Electrodes for Electroanalysis and

Neuroscience Applications." Jason Ritchie, an assistant professor at the Department of Chemistry, University of Mississippi talked about, "A Sol-Gel Synthesis of Polyether-Based Proton Conducting Electrolytes." Xiangqun Zeng, an assistant professor at Oakland University presented her work on "Ionic Liquid-Based PVC Membrane Potentiometric Sensor." This was followed by Professor David Cliffl's (Vanderbilt University) talk on "A Modified Cytosensor for Multianalyte Microphysiometry and Metabolic Responses to Sub-lethal Toxins."

During the evening session Professor Yuriy Tolmachev, Kent State University, talked about "Molecular Structure of Ruthenium Dioxide/Water Interface." The final talk of the day was presented by Professor Shigeru Amemiya, Department of Chemistry, University of Pittsburgh, about "Ion-Transfer Voltammetry of Biological Polyions at Liquid/Liquid Interfaces." Oral presentations were followed by the student poster session and dinner hosted by the Section.

This past winter the Section launched their "Women in Electrochemistry" lecture series. The first guest speaker was Dr. Debra Rolison, who joined the Naval Research Laboratory (NRL) as a research chemist in 1980 and currently heads the Advanced Electrochemical Materials section. She is also an adjunct full professor of chemistry at the University of Utah. Dr. Rolison's research at NRL focuses on multifunctional nanoarchitectures, with special emphasis on new nanostructured materials for catalytic chemistries, energy storage and conversion, biomolecular composites, porous magnets, and sensors. She is the principal inventor of composite aerogels, electrified micro-heterogeneous catalysis, a process to electrodesulfurize carbons and coals under mild conditions, and 3D nanowired mesoporous architectures.

Dr. Rolison presented three technical talks: "Opportunities with Nanoarchitectures: The Importance of Nothing and the Unimportance of Periodicity," "Silica Nanoarchitectures Incorporating Self-Organized Protein Superstructures with Gas Phase Biofunctionality," and "Nanomaterials and Architectures for Energy Storage."

On May 4, 2004 the Section held its annual spring symposium. This year's

symposium was organized in honor of Dr. Barry Miller, the Frank Hovorka Professor of Chemistry Emeritus at Case Western Reserve University.

Guest speakers included Prof. Miller's long-time friend Professor Stanley Bruckenstein from the Department of Chemistry, State University of New York at Buffalo, who presented a talk entitled, "The Effect of Potential on Fibrinogen Adsorption at Gold and Polypyrrole Surfaces, an EQCM Study." Professor Richard McCreery from the Department of Chemistry, Ohio State University, discussed "Carbon-Based Molecular Electronics—Electron Transport and Conductance Switching in Carbon/Molecule/Metal Molecular Junctions." Professor Stephen Webber of the Department of Chemistry, University of Pittsburgh, gave a talk about "Investigation of Cu-Peptide Complexes by Rotating Ring-Disk Voltammetry." Professor Uziel Landau, Department of Chemical Engineering, CASE, talked about "Copper Metallization of Semiconductor Interconnects—Elucidation of a Controversial Mechanism Enabling a Key Technology." Professor Dan Scherson from the Department of Chemistry, CASE, presented a talk on "Electrochemical Supercapacitors: From High Power Sources to Neural Stimulation." Lastly, Dr. George Blomgren, of Blomgren Consulting Services Ltd., discussed, "Alloy Anodes for Lithium-Ion Batteries."

Following the oral presentations, the Section hosted a poster session and dinner. Twenty-two posters were presented by CASE students from the Departments of Chemistry, Chemical Engineering and Biomedical Engineering, and by scientists from Energizer. The Cleveland State University Department of Chemistry was also represented by three student posters.

More information about the Section, including past and upcoming events, may be found at [home.cwru.edu/~hbm/ecs/ecslocal.htm](http://home.cwru.edu/~hbm/ecs/ecslocal.htm).

### New England

On February 10, the Section held a dinner meeting and presentation at the Egan Research Center, Northeastern University, Boston, Massachusetts. The featured speaker was Dr. John Kosek, Director of Energy Conversion Programs of Giner, Inc., Newton, Massachusetts, and the topic was entitled

"Portable Direct Methanol Fuel Cells (DMFC)." These fuel cells are being developed for application to cellular phones, laptop computers, electric scooters, and backup power supplies. Methanol is the fuel of choice because of its wide availability, consumer familiarity, and ease of use. (Aqueous methanol is windshield washer fluid.) Further the operating temperature of a DMFC, at or below 80°C, is regarded as moderate and enhances the portability of the fuel cell. Several fuel cell prototypes have been built and successfully tested but more development work needs to be done to lower costs of components, decrease unit size and weight, and improve reliability. Giner sees development success in two or three years and is sufficiently optimistic to have begun factory development now.

The sixth dinner meeting of the Section was held at the Egan Research Center, Northeastern University, Boston, Massachusetts on March 9. The featured speaker was Dr. Theodore D. Moustakas of the Departments of Physics and Electrical Engineering of Boston University. Professor Moustakas research interests have covered a broad spectrum of topics in opto-electronics materials and devices including Nitride semiconductors. The presentation focused on nitrides of aluminum, gallium, and indium as well as the alloys, AlGa<sub>N</sub> and InGa<sub>N</sub>. Methods of preparation such as halide vapor phase epitaxy, molecular beam epitaxy, and metal organic chemical vapor deposition techniques were discussed and their advantages and hazards explored. The second half of the talk addressed the requirements for the replacement of fluorescent light bulbs by LEDs and various options for solid state lighting.

The Section held a dinner meeting on April 13, at Northeastern University in Boston, Massachusetts. The featured speaker was Dr. Iqbal K. Bansal of M/A-Com in Burlington, Massachusetts. Dr. Bansal spoke on "Hydrophobic Silicon-Direct Wafer Bonding for Fabrication of RF Microwave Diodes." The presentation focused on the treatment necessary to carry out ultrafine alignment, joining, and thermal bonding of two silicon wafers. Chemical cleaning of wafers is followed by an oxide etching process to produce hydrophobicity of wafer surface. The joining operation is an automatic operation and is performed in a Class

100 or better environment by employing a commercial joiner. Thermal bonding or annealing is carried out by employing an extended steam oxidation cycle at elevated temperatures. Ninety five percent of the bonded wafer pairs are produced without voids at the interface. The whole process has been carried out to produce over 5,000 acceptable, annealed paired wafers of diameter 100 mm for the fabrication of RF Microwave diodes.

On May 18 the Section held its last dinner meeting of the 2003-04 season at Northeastern University in Boston, Massachusetts. The featured presenter was Dr. Stuart Licht, Chair of the Department of Chemistry at the University of Massachusetts in Boston and founder and former Chair of the Israel Section of The Electrochemical Society. The topic was "Fe (VI) Chemistry, The Super-Iron Battery." Dr. Licht reported on a new class of batteries, referred to as super-iron batteries, which contain a cathode that uses a common material (Fe) but in an unusual (greater than 3) valence state. Although they contain the same Zn anode and electrolyte as conventional alkaline batteries, the super-iron batteries provide >50% more energy capacity. Additionally the Fe (VI) chemistry is rechargeable, is based on abundant starting materials, has a relatively benign discharge product, Fe<sub>2</sub>O<sub>3</sub>, and appears to be compatible with the anode of either the primary alkaline or secondary MH batteries. Although Fe (VI) has been known for more than a century it was erroneously believed to be inherently unstable and its chemistry was unexplored.

### San Francisco

The Section had a meeting on March 10 in Dublin, California. The section chairman, Tom Dinan, presented past section chairman pins to Gina Whitney (1989-1990), Marca Doeff (1994-1996), and Robert Kostecki (2001-2003). The speaker was a vice-president of ECS, Prof. William Smyrl of the University of Minnesota. Prof. Smyrl first talked about the present and future of ECS. He then presented "Surface Texture and Structure of Reactive Surfaces," which focused on near field scanning optical microscopy (NSOM). By scanning a tip over a surface, both topographical and chemical characteristics can be obtained. Optical contrast

mechanisms such as fluorescence, reflection and absorption can be used. With the development of a tuning fork control system, the technique can now be used in solution. This allows the study of electrochemically active surface for defects, inclusions and grain boundaries. Two examples were described, aluminum 2024 and titanium. The study elucidated the mechanism of corrosion, and raised some questions for future studies.

The Section had a meeting on April 13 in San Jose, California. The speaker was Dr. Meyya Meyyappan, Director of Center of Nanotechnology in the NASA Ames Lab. The topic was "Nanotechnology, a Review of Recent Developments." Dr. Meyyapan directs many projects, some examples are carbon nanotubes, inorganic nanowires, proteins nanotubes, genomics and computational nanotechnology. Because of time limitation, Dr. Meyyapan spoke in detail about carbon nanotubes and inor-

ganic nanowires. Carbon nanotubes can be made by several methods. CVD from a surface coated with a catalyst is the preferred method because it allows patterning. A carbon nanotube has unusually high modulus and electrical conductivity. Some current applications are composite structural materials, tips for AFM and STM, and tips of field emission electron sources. Some potential application in the future are logic devices, interconnect in microcircuits, and bio-sensors, especially in genomics. Inorganic nanowires of interest are mostly of semiconductor materials. Previously they were made by ion beam etching. But recent development in CVD produces better quality at lower cost. Potential applications are in microelectronics, such as a surround-gate MOSFET. For most nano-material applications, future research will have to address issues in the control of material properties, and in the economics of manufacturing. ■

## New England Section Honors John Reardon

The New England Section recently recognized the outstanding efforts of one of its members, JOHN REARDON. The Section thanked Prof. Reardon (of the University of Massachusetts), who has just completed his tenth year as Secretary of the Section, and noted that his efforts have been instrumental in helping the Section provide a high level of service to its members. He has served not only as a liaison to the Society, but has also arranged dinner meetings, invited speakers, and attended virtually every meeting of the Section over the past ten years. The Section's Councilors said that the Section has been "fortunate to have been the beneficiaries of his commitment for these past years and hope they will continue to be able to do so for the foreseeable future." ■

## Council of Section Officers



**DAVE SHIFLER**, chair of the Council, has over 30 years experience in materials research, materials testing, and failure analyses. He is a materials engineer of the Marine Corrosion Branch at the Naval Surface Warfare Center, Carderock Division (NSWCCD), where he is involved in high temperature materials

testing and research for waste incinerators and marine gas turbine engines, corrosion engineering assessments of design for various ship systems, testing of materials and processes for corrosion control in marine aqueous environments, and where he serves in an advisory role with the U.S. Office of Naval Research.

Dr. Shifler directed a metallurgical laboratory and performed numerous failure analyses of structural components in high temperature, marine, freshwater, soil, microbiological, and atmospheric environments. He designed and conducted electrochemical and analytical tests to assess factors related to passivity and breakdown of passivity of alloys in aprotic nonaqueous solvents during which he co-discovered electropolymerization as a passivating mechanism.

Dr. Shifler has a BA in chemistry from Western Maryland College and MSE and PhD degrees in materials science and engineering from the Johns Hopkins University. He is a certified National Association of Corrosion Engineers (NACE) International Materials Selection/Design Specialist and Corrosion Specialist, a registered professional engineer (Metallurgical Engineering), and a Fellow of both the Institute of Corrosion (UK) and of NACE International.

Dr. Shifler has served in various administrative and technical capacities with NACE International and The Electrochemical Society. He is currently working on an update of Frank LaQue's book on Marine Corrosion. He also serves on the Minerals, Metals, and Materials Society (TMS) (chair of the Professional Registration Committee); and ASTM International (voting member of corrosion-related committees and subcommittees of new and revised standards).

Dr. Shifler is a technical reviewer for ECS (*Journal of The Electrochemical Society*), NACE International (*Corrosion and Materials Performance*), other technical journals (*Electrochimica Acta*, *Oxidation of Metals*, *Journal of Materials Research*), and various symposia sponsored by NACE International, The Electrochemical Society, and The American Society of Mechanical Engineers (ASME, International Gas Turbine Institute). He is also a member of ASM International, American Society of Naval Engineers (ASNE), International society of Electrochemistry (ISE), International Metallographic Society (IMS), Materials Research Society (MRS), Microscopy Society of America (MSA), The Institute of Corrosion (UK), American Chemical Society (ACS), ASME International, National Society of Professional Engineers (NSPE), and Sigma Xi.



**DON GERVASIO**, vice-chair of the Council, is presently an Associate Research Professor at the Center for Applied Nano-BioScience at Arizona State University. Dr. Gervasio studied chemistry at Pennsylvania State University (BS) and at Case Western Reserve University (MS and PhD) with main emphasis on the syntheses of organometallic and coordination compounds which are redox and often catalytically active. Dr. Gervasio has

interest in synthesis, spectroscopy, physical electrochemistry, catalysis, and power sources. Prior academic appointments include Senior Research Associate at the Case Center for Electrochemical Sciences (CCES, now the Yeager Center, YCES) from 1984 to 1993 where he was the lead participant in the study of ion conduction, adsorption, gas solubility, and stability of liquid and solid acid electrolytes for making improved fuel cells. Other involvements included research on the mechanisms and catalyses of electrochemical reactions; hydrogen absorption and permeation in metals; electrochemical sensors and biosensors; and the corrosion of materials, particularly the disbonding of protective coatings under cathodic protection.

Dr. Gervasio was an instructor at Case Western Reserve (1984) and lecturer at Cleveland State University (1987). In July of 1993, he joined the Red Bank Research Company, a joint venture of Motorola and Bellcore (now Telcordia), to develop new membrane and catalyst materials for a mixed-fuel-oxidant-fed, thin film fuel cell (TFFC). During this time, the TFFC was developed from a laboratory curiosity to a device showing potential for commercialization. From December of 1997 to March of 2003, Dr. Gervasio worked at Motorola Labs located in Tempe, AZ to work on fuel cells as long lived electrical power supplies for personal portable applications. In March 2003, he joined Arizona State University and continues to work on fuel cells for portable power and catalysts used in fuel cells, sensors, and microchemical reactors.

Dr. Gervasio is the author of over 30 papers in peer-reviewed publications, has five patents under submission, and has often been an invited speaker at universities, technical societies, and community groups. He is currently chair of the Arizona Section.



**VENKAT SRINIVASAN**, secretary of the Council, received his bachelors in electrochemical engineering from the Central Electrochemical Research Institute (CECRI) in Karaikudi, India, in 1995 and his PhD from the University of South Carolina in chemical engineering in 2000. His thesis topic included various

aspects in electrochemical capacitors and the nickel hydroxide electrode. He then worked as a research associate at the Department of Mechanical and Nuclear Engineering at Penn State University for 18 months where he was involved with projects in lead-acid, alkaline, Ni-MH, and Li-ion batteries. Subsequently he moved to the Lawrence Berkeley National Laboratory/University of California at Berkeley as a postdoc working on modeling iron phosphate-based Li-ion cells. Dr. Srinivasan is now a scientist at the Lawrence Berkeley National Laboratory where he contributes toward solving the multitude of problems that prevent Li-ion batteries from being used in hybrid electric vehicles.

Dr. Srinivasan's research interest is primarily in the field of energy storage devices (batteries and capacitors) where he uses both theoretical and experimental techniques to understand their behavior. His approach spans both fundamental and applied aspects of their operation. He also maintains an active interest in the electrochemical processes that are used in the semiconductor industry.

Dr. Srinivasan is a regular contributor to Tech Highlights (featured in *Interface*) and was author of the Industrial Electrolysis and Electrochemical Engineering report for 2002 and 2003. He can be reached at [Vsrinivasan@lbl.gov](mailto:Vsrinivasan@lbl.gov).