



Honolulu Hawaii

2004 Joint International Meeting

Meeting Highlights



Aloha and mahalo were often heard during the 2004 Joint International Meeting in Honolulu this past October 3-8, and the words symbolized the gracious approach to living in Hawaii. Meeting attendees quickly adopted the spirit of the island with Hawaiian shirts or other garb, sandals, and an unhurried approach as they moved about meeting rooms in hallways open to the fresh ocean air. The meeting marked the 206th gathering for the Society, and was co-sponsored by a very gracious partner, The Electrochemical Society of Japan (ECSJ). Further technical co-sponsorship came from the Japan

Society of Applied Physics (JSAP), the Korean Electrochemical Society (KECS), and the Electrochemistry Division of the Royal Australian Chemical Institute (RACI). Over 2,643 papers were presented in 46 symposia, with many sessions running on Sunday and Friday. The meeting's grand finale was a luau, where guests were greeted with shell leis and were entertained by Hawaiian hula and fire dancers, and lilt-ing Hawaiian songs. During the evening, a few ECS members were "encouraged" to demonstrate their dancing skills, without the aid of microscopes or computers.

The audience at the ECS Honors and Awards session on Wednesday was treated to an excellent award talk (see below) by ECS past president, and 2004 Acheson Award recipient, Wayne Worrell. Dr. Worrell has been a very active member of the Society, which he joined in 1970. He has received numerous other Society awards, including the Carl Wagner Memorial Award (1989) and the

Solid State Science and Technology Award in 1995. He was named an ECS Fellow in 1994 and an Honorary Member in 1996. Honored with certificates of appreciation were ECS past president Bruno Scrosati (2003-2004) and past secretary Paul Natishan (2000-2004). The 2004 ECS Class of Fellows was inducted and various other awards were given (see Student News, Section News, and Society News in this issue).

Plenary Lecture: The Future in Bioelectronics

Professor MASUO AIZAWA was introduced by Junichi Tanahashi, the President of ECSJ for 2004. After a stellar academic career at the Tokyo Institute of Technology in the field of bioelectronics and biosensors, Aizawa joined the administrative ranks there and is currently serving as president of the University. Professor Aizawa's lecture, entitled "Innovative Challenges of Bioelectronics," began with a discussion of the world changing to a globalized knowledge society. He identified



A successful meeting in Hawaii brought smiles to organizers and participants alike. Attendees were fortunate to hear a talk by MASUO AIZAWA (3rd from left) on the challenges of bioelectronics. Prof. Aizawa is joined here by (from left to right): TADASHI WATANABE, ECSJ organizing committee chair; ROQUE CALVO, ECS Executive Director; (Aizawa); JUNICHI TANAHASHI, ECSJ President; and ROBIN SUSKO, ECS President.



ECS President Robin Susko (center, front row) inducted the 2004 ECS Class of Fellows at the Honors and Awards Session on Wednesday. In the front row, from left to right, are: **G. TIM BURSTEIN**, **JAN TALBOT**, **MEYYA MEYYAPPAN**, (**SUSKO**), **M. STANLEY WHITTINGHAM**, **MASAHIRO SEO**, and **CLIVE CLAYTON**. In the back row, from left to right, are: **MICHAEL SHUR**, **GUY DAVIS**, **STEPHEN FONASH**, **M. JAMAL DEEN**, **JACQUES SIMONET**, and **JAMES F. RUSLING**. Unable to attend the ceremony was new Fellow **MARTIN STRATMANN**.

an emerging new frontier melding biotechnology, nanotechnology, and information technology in which electrochemistry could play a key role.

Bioelectronics is one field that has grown out of this synergy. Professor Aizawa then painted a historical backdrop of this field. He showed how Galvani's discovery of bioelectric events in a frog's leg spawned the disciplines of electrophysiology and molecular biology. Scientists subsequently began to be interested in how information was processed in the brain. These studies have focused on both inter-cellular (sensory, nerve, immune) and intra-cellular (signal transduction, gene expression) phenomena. The concept of "molecular information networks" took on new significance not only from a fundamental perspective but also in terms of practical applications (e.g., artificial intelligence). It is interesting that such studies have transcended the "hard sciences" of biology and physiology into disciplines such as psychology and biomedical engineering.

Professor Aizawa presented the notion of bioelectronics as providing a bridge for the gap between the bio-information world and the electronics information world in which molecules and electrons/photons could be regarded as the "transduction elements." As an example of the role that bioelectronics could play in this regard, he described electrically-controlled gene expression in a living cell. Specifically, the activation of nerve growth factor (NGF) gene expression by electric stimulation was described.

The final part of the lecture dealt with challenges for the future in bioelectronics. The first category involves evolving therapeutics including cell-based devices for tissue prosthesis and on-demand production of insulin. Drug delivery is another important application of bioelectronics. The second category seeks cell-based biodevice alternatives for animal testing—obviously important from both ethical and cost-cutting viewpoints. Thus the living cell substitutes for an animal to probe the effect of chemical and drug-induced stress. Other aspects in this category include bioanalytical approaches for diagnostics based on patch clamp, optical, or electrode array methodologies.

The last challenge identified was the scale progression from macrolevel biosensors to the "ultimate" biodevices based on DNA chips or bio-MEMS and micro-TAS. This bionanotechnology interface encompasses challenging problems such as single molecule detection and on-the-fly monitoring of dynamic molecular interactions within living organisms.



WAYNE WORRELL (center) was the 2004 recipient of the Edward Goodrich Acheson Award, one of ECS's most prestigious awards. **Subhash SINGHAL** (right) presented Dr. Worrell at the Honors and Awards Session, and ECS President **ROBIN SUSKO** (left) presented Worrell with the Acheson Medal.



STUART B. ADLER (right) received the inaugural Charles W. Tobias Young Investigator Award from ECS President **ROBIN SUSKO**.

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All in all, this plenary lecture kept a packed audience in the hall thoroughly engaged in envisioning the exciting possibilities with bioelectronics in the biodevices and bioanalysis areas. Perhaps, the notion of popping a diagnostic biosensor pill that instantly reports back on everything going on inside our body real-time via a "reading" device may not turn out to be science fiction after all.

Edward Acheson Award Lecture: Solid Oxide Fuel Cells

Subhash Singhal introduced the Acheson Award recipient, Professor **WAYNE WORRELL**, to the audience assembled at the ECS Honors and Awards session on Wednesday morning. Worrell, a Rock Island, Illinois native, grew up in Memphis, Tennessee, and after graduate education and post-doctoral training at MIT and UC Berkeley respectively, he joined the University of Pennsylvania in 1965 as an assistant professor in materials science. He has been at this institution ever since, having also served in many administrative positions there. Professor Worrell has won many awards and recognitions, including several from The Electrochemical Society itself, including the Carl Wagner Award, the Solid State Science and Technology Award, and being named a Fellow of the Society. Of course, Society members would remember his tenure as the ECS president in 1992-93 during a previous joint international meeting. Worrell and his wife Judy have two children and three grandchildren.

Professor Worrell began his award lecture by noting how much he has enjoyed his involvement with the Society for 30 some years. He particularly noted with pride how ECS has evolved from a national organization to a society of truly international status. He acknowledged the steadfast support of his wife Judy throughout his career and true to form, she was very much a prominent member of the support squad present at the front of the audience comprising also of many of his associates and former students.

His award talk, entitled "Recent Advances in Solid Oxide Fuel Cells," centered on the contributions of his graduate students and post-docs and featured the work of nine of these co-workers. He began his lecture by showing why solid oxide fuel cells (SOFCs) were attractive compared to polymer electrode membrane (PEM) counterparts for technology applications. He then discussed the two major SOFC configurations, namely tubular and planar, and compared their attributes in terms of power, cost, and other features such as the requirement of seals. Mass production and the attendant economies of scale were noted as the key to securing the all-important cost reduction for these devices.

Professor Worrell's lecture turned to highlights of the important contributions of his co-workers including Singhal (new electrodes), Gorte (device stability issues), Nguyen Minh and Chun Lee (tape-calendered cell design), and Visco (thin film cell fabrication). The temperature range of 650-750 C was identified as a performance "sweet spot" for metal-supported cells. The fabrication of low-cost planar SOFC devices was also discussed.

Finally, the talk centered on future challenges in this area on aspects related to cells, interconnects, seals, manufacturing issues, and system integration. The award lecture was informative and interesting to both specialists and neophytes in fuel cell science and technology. ■



Three long-term corporate supporters of The Electrochemical Society were presented with Leadership Circle Awards by ECS President Robin Susko (far right). From left to right, are: **THOMAS JARVI**, UTC Fuel Cells, Bronze Award for five years of support; **NATHAN ISSACS**, Mine Safety Appliances Company, Bronze Award for six years of support; and **PAUL SKARSTAD**, Medtronic, Energy and Component Center, Gold Award for 25 years of support.



ECSJ President **JUNICHI TANAHASHI** (third from front) and ECS President **ROBIN SUSKO** arrive in style at the luau.



The Thursday evening luau was a culinary and visual feast, with local food specialties and exotic dancers.

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