

Paris

Meeting Highlights

April 27-May 2, 2003



Photo by Elizabeth Brennfleck

The top floor of the Hotel Concorde afforded an exceptional view of the city.



Photo by Thierry Parant, Paris, France

Nobel Laureate **GERD BINNIG** (left) delivered the Plenary Lecture, entitled "Nanotechnology: The Path to Handling Complexity?" Dr. Binnig is shown here receiving a certificate of appreciation from ECS president **KARL SPEAR**.

April in Paris—The song mentions "chestnuts in blossom and holiday tables under the trees;" and whether you prefer Count Basie's take on the tune or the Doris Day film version, the ECS meeting in Paris truly did have a feeling "that no one can ever reprise." Perhaps it was the locale, or the inspiring technical program awaiting attendees, or both; but the meeting in Paris seemed to turn even the most focused scientific mind to a more philosophic reverie.

The Society's 203rd meeting attracted 2,942 attendees, who attempted to hear as many of the 2,939 papers as they could cram into less than a week. It was the second-highest attendance at a Society meeting, despite the double worry of the war in Iraq and the SARS virus. The seemingly endless corridors and levels of Le Palais des Congrès provided ample room for the symposia (57 in all), the Technical Exhibit, and the Poster Sessions. The environs were as one would expect in Paris—an endless choice of sidewalk cafés and enticing vistas. The nearby Bois de Boulogne was not only convenient but beautiful—an excellent choice for a pre-dinner run, to clear the mind of technical matters and to prepare to focus on the evening's selection of food and wine. Even a small *salon de thé*, just steps away from the registration area, offered an aesthetically-pleasing stop for a fortifying (albeit not low-calorie) bite to eat. The European flavor was certainly present in the technical program as well—from the plenary lecture by Gerd Binnig of IBM Zurich, to the first presentation of the European Section Heinz Gerischer Award and special symposium, to the many European students who were able to participate because of the convenient location.



Group photo by Thierry Parant, Paris, France

ECS presented its second set of Leadership Circle Awards to Contributing Members of long standing. In the photo above, from left to right are: In-Tae Bae of **DURACELL**, Gold Level (46 years); Agnes Rousseau of **ATOTECH**, Diamond Level (58 years); ECS president Karl Spear; Ivan Cisneros of **NACIONAL DE GRAPHITE, LTDA**, Bronze Level (7 years); Dayaldas Meshri of **ADVANCE RESEARCH CHEMICALS, INC.**, Bronze Level (5 years); Paul Seidler of **IBM CORPORATION**, Gold Level (47 years); and ECS Executive Director Roque Calvo.

Nanotechnology: The Path to Handling Complexity?

Gerd Binnig, an IBM Fellow and Nobel Laureate, gave the plenary lecture on Monday morning, entitled: "Nanotechnology: The Path to Handling Complexity?" He began his talk by introducing the Millipede project at IBM and mentioned that the project was divided into two groups: signal processing/coding and micro/nano-mechanics. Binnig first made a comparison between the stylus record player (turntable) and the atomic force microscope (AFM). Subsequent developments by Don Eigler's group at IBM on the use of a scanning tunneling microscope (STM) for moving atoms around were then highlighted. These points set the stage for a discussion of nanotechnology as the theme of this lecture.

Dr. Binnig underlined the advantages of the next-generation nanoprocessor chip in terms of being smaller, faster, denser, and potentially cheaper. He used a particularly vivid visual model by zooming in at various magnifications on a pattern. While at very high magnifications, the relationship of each element (pixel) to its immediate neighbors and to the overall picture remained obtuse, at lower magnifications, the objects began to assume a collective significance. Dr. Binnig used this visual aid to underline the fact that thinking is a complex procedure, which is needed to tackle a complex world. Machines that are able to handle this level of complexity can be regarded as "intelligent" and they can support our thinking capabilities. The need for such (artificial) intelligent tools will grow as new forms of complexity evolve in terms of a network of highly specialized parallel processing units.

For machines to think intelligently, new paradigms for software and hardware architectures are required. One such approach is the Millipede, which uses thousands of nano-sharp tips to punch indentations (representing individual bits) in a thin plastic film. These indentations can be annealed so that the storage technology is rewritable and can be operated at low power. A 32 x 32 array chip with a density of 100-200 Gbits/in² was demonstrated. Because a nanometer scale tip can address individual atoms (*i.e.*, has atomic resolution), Dr. Binnig claimed that even further improvements into the Tbit/in² domain (40 nm bit size) were possible. He ended his lecture with a video clip of the Millipede technology.

RICHARD B. FAIR (right) received the Solid State Science and Technology Award from ECS president **KARL SPEAR**. Dr. Fair delivered his award address on "Thirty Years of Silicon Process Simulation: Models, Measurement, and Imagination."



Photo by Thierry Parant, Paris, France

AKIRA FUJISHIMA (left) was the first recipient of the Heinz Gerischer Award of the European Section. Dr. Fujishima received congratulations from **BRUNO SCROSATI**, a past chairman of the European Section and president-elect of ECS.

At a later presentation (photo below), ECS president Karl Spear presented a Bronze Level Award to Peter Foller (right) of PPG INDUSTRIES, INC., for 7 years of membership.



This was a fascinating talk by an immensely gifted scientist; those present at this lecture were truly fortunate to have heard him speak. Indeed, this talk kicked off the meeting in fine style.

Thirty Years of Silicon Process Simulation

Richard B. Fair of Duke University presented his award address, "Thirty

Years of Silicon Process Simulation: Models, Measurement, and Imagination," on Wednesday evening. Established in 1971, this award is the Society's most prestigious one in solid-state technology. After an introduction by the Society president, Karl Spear, Dr. Fair centered his talk on the role of vacancies and interstitials in Si impurity diffusion and electron devices.

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Photo by Jan Talbot

For those with some free time during this very busy week, there was plenty to see in this magnificent city. One spot that may have interested ECS members was this building, with the intriguing name of "Electron Libre," actually an artists' cooperative at 59, rue de Rivoli.



The Heinz Gerischer Award of the ECS European Section honored AKIRA FUJISHIMA at a special reception. Joining Dr. Fujishima (second from right) were (left to right) MRS. ULRICH GERISCHER, RESHEF TENNE, CLAUD LÉVY-CLEMENT, (Fujishima), and ECS president KARL SPEAR.

Specifically, analytical models based on first-generation measurements such as sheet resistance and angle lap/stain led to current versions underpinned by secondary mass spectrometry (SIMS) data and 2D impurity profiles. The "Imagination" portion of the talk title pertained to the predictive ability of these models in mapping the device junction profiles and impurity distribution in the Si host matrix.

The talk provided an historical perspective on developments from ca. 1970 to 2000. Some of the early work on Si process simulation and computer modeling was reviewed, along with an identification of the key players involved. It was emphasized that these early models were constructed with very little experimental data. Subsequent developments on the understanding of vacancy-As complexes, P diffusion and B diffusion through ultra-thin silicon oxide and nitrided oxides were outlined. Other topics addressed included ion implantation damage, photonics effects on As activation, damage-assisted diffusion of impurities, and optical vs. thermal annealing.

The award address concluded with a look back at what was achieved in the area of Si process simulation over a 30-year period. Dr. Fair's assessment of the challenges involved was that "it takes a village and a bank and none of us have got it right." The lecture was fast-paced and was enthusiastically received.

Fullerenes, Nanotubes, and Carbon Nanostructures Division Symposia Highlights

The newest Division of the Society—Fullerenes, Nanotubes, and Carbon Nanostructures—sponsored eleven different symposia on various aspects of fullerene nanostructures and for the first time, a new symposium on "Porphyrins and Supramolecular Assemblies." The Sunday program of the Division opened on April 27 with a session entitled Research Overviews, and was attended by many Division and Society members. The keynote speaker was Prof. Wolfgang Krätschmer of the Max Planck Institut für Kernphysik. He has developed bulk-scale fullerene production techniques and made fullerenes accessible to experimentalists around the world. Prof. Krätschmer delivered a fascinating talk on "Preparation of Fullerenes: A Case of Interdisciplinary Research." In this talk, he described the main steps in the discovery of fullerenes, the subsequent journey toward production, the identification of carbon-containing interstellar molecules, and a summary of the vigorous research activity on fullerenes. In recognition of Prof. Krätschmer's pioneering contributions to the field of fullerenes research, he was honored with a plaque of recognition from the Division. Other overviews on various aspects of fullerenes research followed. These included a presentation from Sydney Leach of the Observatoire de Paris-Meudon on the spectroscopy of fullerenes, one by Niyazi Serdar Sariciftci of Johannes Kepler University of Linz on fullerenes solar cells (see *Interface*, spring 2003, p. 16), and another by Patrick Fowler of the University of Exeter on the role of theory in understanding fullerene isomerism and derivatization.

In addition to the ten regular symposia on various aspects of fullerenes and carbon nanotubes, the Division also organized a symposium on "Porphyrins and Supramolecular Assemblies." One of the main motivations for this symposium was that many supramolecular assemblies involve fullerenes linked with other molecules such as porphyrins and phthalocyanines. The 35 research papers presented in this symposium pointed out the importance of supramolecular and nanostructured systems in several aspects of interdisciplinary research. Many of the talks highlighted the importance of porphyrin-fullerene conjugates in solar energy harvesting while others covered the synthesis of novel supramolecular assemblies and their electrochemical and spectroscopic properties.

Heinz Gerischer Award of the European Section

A symposium in honor of the late Prof. Heinz Gerischer entitled, "Nanostructured Semiconductor Materials and Interfaces," was held with packed audiences and a technical program that spanned four days. Prof. Gerischer is known as the father of modern semiconductor electrochemistry and photoelectrochemistry, although he also made important contributions to many other areas of electrochemistry and electron transfer including fast reactions in solutions and on electrode surfaces, electrocatalysis, dye sensitization, metal deposition, and corrosion.

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The symposium featured an award session on Tuesday where Prof. Adam Heller (The University of Texas, Austin) gave a moving tribute to the life and work of the great German chemist. Heller noted that Gerischer belonged to the famous electrochemistry school of Ostwald, Nernst, and Bonhoeffer in Europe. He also noted how Gerischer had endured considerable personal tragedy during the Second World War. Gerischer had completed his doctoral studies on oscillating electrochemical reactions in 1945-46 and after career stops in Göttingen and Stuttgart, came back to the Fritz Haber Institut in Berlin in 1970 as director of the institute. Then followed the most productive years of his career till his untimely death in 1994. A fuller account of Gerischer's career and contributions to the field of electrochemistry and photoelectrochemistry may be found in the Heinz Gerischer Memorial Issue of the *Journal of Physical Chemistry B* (Volume 101, Number 14, April 3, 1997).

Deservingly enough, the first Gerischer Award recipient was Prof. Akira Fujishima. Prof. Fujishima, along with his doctoral mentor, Prof. Ken-ichi Honda, spawned a whole generation of studies worldwide on solar energy conversion using semiconductor-electrolyte interfaces. Their papers on water splitting using sunlight and n-TiO₂ photoanodes remain classics to this day. After an introduction by Prof. Honda, Prof. Fujishima gave a thoroughly entertaining and informative award lecture entitled: "TiO₂ Photoelectrochemistry and Photocatalysis." He reviewed the many contributions of his group on the development of practical photocatalytic systems for disinfection and indoor air cleaning. Self-cleaning tiles and antifogging TiO₂ coatings were also described, as were fundamental studies aimed at a better understanding of photocatalysis reaction mechanisms.

The award session concluded with a wine and cheese reception where some members of the Gerischer family, the symposium co-organizers (Profs. C. Lévy-Clement and R. Tenne), the awardee, Society officers, and other symposium participants mingled. The evening was made all the more pleasant with a spectacular bird's eye view of the Paris city landscape from the reception room and by the fine French wines and hors d'oeuvres. All in all, the Gerischer symposium was a resounding success and the European Section must be congratulated for their efforts in organizing it. The plans are to hold the symposium (and the award ceremony) every two years.

Leadership Circle Awards

The Society's Leadership Circle Awards, established in 2002 to demonstrate appreciation for the loyal support of ECS's Contributing Members, were presented by President Karl Spear to the following organizations: **ATOTECH USA, Inc.**, Diamond Level (58 years), accepted by Agnes Rousseau, Research Chemist; **IBM CORPORATION**, Gold Level (47 years), accepted by Paul Seidler, Manager of Science and Technology, IBM Zurich Research Lab; **DURACELL**, Gold Level (46 years), accepted by In-Tae Bae, Research Scientist; **NACIONAL DE GRAPHITE, LTDA**, Bronze (7 years), accepted by Ivan Cisneros, Research Manager; and **ADVANCE RESEARCH CHEMICALS INC.**, Bronze (5 years), accepted by Dayaldas Meshri, CEO. At a later ceremony, **PPG INDUSTRIES, INC.** Chemicals Group Technical Center received the Bronze Level Award (7 years of membership), which was presented to Peter Foller, Associate Director of Research and Development. ECS was pleased to have the opportunity to publicly show appreciation for the long-term support of these member companies.

Two New Society Awards Announced

The Board of Directors approved the creation of two new Society awards, the Oronzio de Nora Industrial Electrochemistry Fellowship of The Electrochemical Society, and the Charles W. Tobias Young Investigator Award of The Electrochemical Society. Both prestigious awards are geared toward improving opportunities for young scientists and engineers, and have been funded through the efforts of the ECS Centennial Campaign.

The Oronzio de Nora Industrial Electrochemistry Fellowship will be given to a postdoctoral scientist or engineer for research in the field of industrial electrochemistry. The Charles W. Tobias Young Investigator Award is intended to recognize outstanding scientific and/or engineering work in fundamental or applied electrochemistry or solid-state science and technology by a young scientist or engineer. The awardee must show promise as a developing leader of research in these fields. Calls for candidates for both awards can be found in this issue of *Interface* (see page 61), and both awards will be presented for the first time in 2004—the Oronzio de Nora Fellowship in the spring and the Tobias Award in the fall.

The Oronzio de Nora Industrial Electrochemistry Fellowship is funded by the Fondazione Oronzio de Nora and the award will be in the form of a \$25,000 fellowship for one year, twice renewable based on successful research progress. The Charles W. Tobias Young Investigator Award honors the memory of Charles W. Tobias, and was funded by his friends, family, students, and ECS Divisions. Over the years, Tobias played a seminal role in electrochemical engineering, and nearly every practitioner in this field was associated with him, directly or indirectly. His example, counsel, and advice had an impact on many young people, encouraging them to seek excellence in teaching, research, and professional contributions to basic and interdisciplinary science and engineering. The Tobias Award consists of a \$5,000 cash prize and an ECS life membership. ■

Meeting Highlights was written by Krishnan Rajeshwar and Mary Yess, Interface's Editor and Managing Editor, respectively. Thanks also to Francis D'Souza (Wichita State University) for contributing text about the Fullerenes, Nanotubes, and Carbon Nanostructures Division symposia.