Washington, DC

meeting highlights

***William D. Phillips**, (above and below left), winner of the 1997 Nobel Prize in Physics, presented the Society's Plenary Lecture on the subject of laser cooling and trapping. Phillips gave two practical demonstrations—using a "floating" magnet (above); and (below), what was probably the first ECS lecture to employ liquid nitrogen and exploding balloons.*

***David Schifler** (at center in the bottom right photo), Chairman of the Host Committee, is flanked by ECS Executive Director **Roque Calvo** (left), and ECS 2000-2001 President, **Carl Osburn**. Shifler, and other members of the National Capital Local Section, did an excellent job of greeting attendees and signing up new members for ECS.*

Although the famous cherry blossoms were behind schedule, the Society's 199th meeting offered plenty—in both technical sessions and during off-times—to keep everyone interested and entertained. From the plenary talk, with its exploding balloons and liquid nitrogen fog, to a new Sunday evening program, over 1500 attendees participated in 34 technical sessions, a poster session, and many other Divisional and Society activities.

Plenary Lecture

The technical program on Monday got off to a rousing start with a plenary lecture by Dr. William D. Phillips of the National Institute of Standards and Technology (NIST). Dr. Phillips shared the Nobel Prize in physics for his work on cooling and trapping atoms with laser light. The talk was highly entertaining; perhaps its most noteworthy aspect was the speaker's ability to distill, with remarkable clarity, complex ideas into understandable terms. Indeed this talk engendered "water-cooler" remarks from the audience such as, "One of the best plenary lectures in recent memory," and "Now I understand what laser cooling is all about." Phillips embellished his talk with practical demonstrations and a video clip or two. In true physics style, all the overheads were handwritten and this talk was a testimony (at least to this writer) that content is far more important than style in the scientific world.

Dr. Phillips began his lecture with an admission that he was not an electrochemist, although some of his best friends were. He also pointed out that his story was a partial one, in that many other scientists have contributed to the progress in the field of laser cooling of atoms. He estimated that there were over 100 research groups around the world working in this area.

The first part of the lecture dealt with how lasers cool atoms. This concept is rather counter-intuitive, in that one normally associates lasers with their heating capability, especially in an era of their widespread use in surgical applications. There followed a description of the use of multiple laser beams to create an "optical molasses" in the atom cell; thus slowing down atomic motion. This phenomenon was illustrated with a video clip of Cs atoms and also with a practical demonstration involving balloons being exposed to liquid nitrogen temperature. Dr. Phillips and his co-workers refer to their laser technique as inducing a "Sisyphus" cooling mechanism.

The next aspect of the lecture involved a lucid description of the use of a magnetic "bottle" for confining and trapping cold atoms. Once again, this strategy was explained with a demonstration and a video clip showing a floating magnet.

Temperatures as low as ca. 200 K have been attained and Phillips remarked how the results were actually much better than they had ever anticipated. Temperatures even lower in the pK regime are being achieved by Bose Einstein condensation strategies.

A primary motivation for Dr. Phillips's low temperature research relates to calibration of the atomic clock. He concluded his lecture with a peek into the future possibilities in this area, particularly in applications related to atomic microscopy, atom interferometers and tweezers, quantum computing, and holography. All in all, this lecture provided a propitious start to an outstanding technical program during the week.

Solid State Science and Technology Award

The Honors and Awards session on Wednesday morning concluded with an award lecture by Professor Arnold Reisman of North Carolina State University. The speaker was introduced in glowing and affectionate terms by Carlton Osburn, the Society President. Dr. Reisman began his lecture, entitled "Scaling, the √n, the √Dt, Hot Electrons, and the Making of Small Structures," with a quote from George Burns, "At my age, I don't even buy green bananas anymore." He also pointed out, tongue-in-cheek (*cf.* Phillips's plenary lecture), that "none of my friends are electrochemists!"

The first part of his award lecture provided fascinating insights into the early history of microelectronics and the role that industries such as IBM played in its evolution. Reisman is eminently placed to provide this perspective because of his career with IBM dating back to the 1950s. As a reference point, he used the Naval Ordinance Research Computer (NORC) with 20 kilobits of magnetic core memory and requiring 200 kW of power. Four technology movers—namely, magnetic tape, bipolar transistor, insulated gate field-effect transistor (MOSFET), and dynamic random access memory (DRAM)—played a key role in the subsequent efforts toward increasingly small device architectures. Compared with the NORC system, modern C-MOS processors operate at 1/100th mW power.

Dr. Reisman also touched upon the interesting trends in publications from industry vis-à-vis academia. He noted the dramatic drop-off in publications on silicon technology from industry in recent times. The changing face of the corporate world in the microelectronics industry was also pointed out with General Electric getting out of this business in 1985 and RCA (once a dominant player in MOSFET technology) no longer even in existence as a corporate entity.

The second part of the award lecture dealt with the theme that "the road to smallness is strewn with tolerances." He began this discussion with the well-known statistical principle dealing with the standard error of the mean and the central limit theorem. Namely the smaller the sample size is, the larger the spread of the sample means about the true mean. In other words, tolerances deteriorate as the dimension shrinks in a downscaling (*i.e.,* miniaturization) exercise. A second aspect relates to the thermal budget or the time available for device processing. The √Dt diffusion law translates to a decrease in the nominal processing time from 625 s to 10 s when the device dimension is shrunk from 0.25 mm to 0.031 mm. The above back-of-the-envelope calculation assumes a diffusion coefficient (D) of 10^{-12} cm^2s^{-1}.

The talk concluded with some future perspectives on solid-state science and technology. The topic of hot electrons could not be discussed because of time constraints but he did identify some topics in the next frontier to conquer in the microelectronics world.

The first of the Society's new Sunday Evening Tutorials was held on Sunday evening; this one featuring "Fullerenes for the Rest of Us." ***Prashant Kamat*** *(top photo, left), Chairman of the Fullerenes Group, and* ***Jan Talbot*** *(right), ECS 2001-2002 ECS President, greeted* ***Fred Wudl*** *(center) of UCLA, who gave the inaugural talk.*

Arnold Reisman *(bottom photo, right) delivered the Solid State Science and Technology Award Address, "Scaling, the √n, the √Dt, Hot Electrons, and the Making of Small Structures: The Road to Smallness Is Strewn with Tolerances." ECS President* ***Carl Osburn*** *presented the medal to Dr. Reisman.*

Fullerenes for the Rest of Us

The technical programs at ECS meetings continue to evolve, with a constant influx of innovative ideas for improving their quality and accessibility. An interesting and successful experiment involved a Sunday evening lecture designed to

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These meeting highlights were written by Krishnan Rajeshwar and Mary Yess, Interface's Editor and Managing Editor, respectively.

Photographs by Mattox Photography.

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introduce scientific topics at a level suitable to a broader audience of meeting registrants for those not familiar with the field. The debut lecture in this experiment was given by Prof. Fred Wudl, of UCLA, on fullerenes and was entitled, "Fun with a Nearly Spherical Molecule." This lecture attracted a large audience (over 200 attendees); indeed, it appears that a "popular lecture" series is a viable concept that deserves a continuing look by all the Divisions/Groups in the Society. This would also provide a convenient mechanism whereby new technologies could be introduced to the ECS membership.

Annual Society Meeting

Every spring, ECS holds its annual luncheon meeting. New officers were announced: Jan B. Talbot, University of California, San Diego, was elected President; and Robin A. Susko, IBM, was elected Third Vice-President. Members who attended this year were asked to vote on proposed changes to the Society's Constitution. The first proposed amendment would eliminate the requirement for a new member applicant to obtain recommendations from two active members in order to be elected to membership in the Society. Considering the size and geographic scope of the Society, this requirement has become an unnecessary obstacle for election to membership.

The second proposed amendment is intended to simplify the admissions process by eliminating the Admissions Committee, and the requirement for the Board of Directors's approval of the new member candidates. Neither the first nor the second of the proposed amendments changes the qualifications for membership.

The third change would re-name "Local Sections" to "Sections," and allows the appropriate corresponding changes to be made to numerous other Society documents.

All items were approved and a ballot with the proposed changes will now be sent to all Society members.

Board Highlights

At the Board meeting on Thursday, Secretary Paul Natishan reported that the Society would award four Summer Fellowships for 2001. The Ways and Means Committee reported that several Committee Health updates had been received, for Honors and Awards, Finance, and Financial Policy; all were reported to be in "good health." The Finance Committee reported that the Society was in excellent shape financially, with the income for the General Operating Fund in 2000 exceeding expenses by $266,908.

In the publications area, a number of activities were in progress. The Publication Committee reported that it had met with the Symposium Subcommittee in order to obtain feedback and ideas for addressing issues concerning the ECS proceedings volume series. Subcommittee members provided good feedback and the Publication Committee will continue to solicit feedback from other sources and prepare some recommendations for the San Francisco meeting. The Board voted to include a CD-ROM of the meeting abstracts for all attendees of the upcoming San Francisco meeting in September 2001, at no additional cost.

In the journals area, the Board voted to approve the appointment of Mark E. Orazem as an Associate Editor for a term of five years. In good news for the Society's online journals, the Board also voted to approve a budget addition that would allow ECS to convert pre-2001 online journals content to the AIP OJPS platform. This will give readers and authors a greater archive of material, including all issues of *Letters*, and all 1999 and 2000 issues of the *Journal*.

The Board also voted to allow ECS to apply for "Affiliate Society" status with the American Institute of Physics (AIP). This status, which comes a result of ECS having chosen AIP to produce and host its online journals, would provide further benefits, primarily in the area of networking with the Society's peers.

Lively discussion surrounded a request for ECS to provide matching funds to two symposia in developing technical areas, one sponsored by the Fullerenes Group, and the other sponsored by the Organic & Biological Electrochemistry Division. Because initiatives such as these are important to maintaining the strength and vitality of ECS's technical areas, the Board voted to approve funding of $5,000 to each symposium, and removed the requirement that the amounts be matched.