APS NEWS

JANUARY 1996 THE AMERICAN PHYSICAL SOCIETY VOLUME 5, NO 1

Sessler Chosen as APS Vice-President in 1995 Election

Members of The American Physical Society have elected Andrew M. Sessler, a senior scientist at Lawrence Berkeley Laboratory, to be the Society's next Vice-president. Sessler's term begins on 1 January, when he will succeed D. Allan Bromley (Yale University), who will become President-Elect. Sessler will become APS President in 1998. The 1996 President is J. Robert Schrieffer of Florida State University (see interview, page 2).

In other election results, Gerard M. Crawley of Michigan State University was elected as chair-elect of the Nominating Committee, which will be chaired by Martin Blume of Brookhaven National Laboratory in 1996. The Nominating Committee selects the slate of candidates for vice-president, general councillors, and its own chair-elect. Its choices are then voted on by the APS Membership. Susan J. Seestrom (Los Alamos National Laboratory), Donald Hamann (AT&T Bell Laboratories), Daniel Auerbach (IBM Almaden Research Center) and Ronald Walsworth (Smithsonian Astrophysical Observatory) were elected general councillors.

Vice-President

After earning a bachelor's degree in mathematics from Harvard University, Andrew Sessler received his Ph.D. in physics from Cornell University. He spent a year with Hans Bethe doing elementary particle physics research before joining the faculty of Ohio State University. In 1962 he moved to Lawrence Berkeley Laboratory, where he has remained ever since, with the exception of brief tenures at the Niels Bohr Institute, CERN, and Japan's KEK facility. He served as LBL's director from 1973 to 1980.

Sessler has also been active in arms control and human rights issues, chairing the Federation of American Scientists from 1987 to 1991, and co-founding Scientists for Sakharov, Orlov and Sharansky. He received the first APS Nicholson Medal for Humanitarian Service for the latter accomplishment. Sessler's extensive service with the APS includes stints as chair of the Panel on Public Affairs, the Committee on the International Freedom of Scientists, the Committee on Applications of Physics, and the Division of Physics of Beams. Describing himself as "an optimist and an activist," Sessler focused in his candidate's statement on ways the APS

Andrew M. Sessler

can take action on such far-reaching challenges as continued support of physics research by the federal government, the continued health of the profession in industry and academia, and the shrinking job market for Ph.D. physicists. The APS should also be concerned with the impact of electronic publishing on its journals, as well as continuing its efforts on behalf of physics education, women and minorities in physics, human rights, and stimulating physics in other countries.

Specifically, Sessler supports increased APS involvement in "selling" physics to the government, the universities and the industrial sector, which he believes is essential to creating new jobs and securing old ones for physicists. "Physicists are remarkably capable of performing in ways which constantly surprise non-physicists," he said of future employment opportunities. "We are admirably suited for 'nontraditional' jobs."

To this end, Sessler particularly advocates stressing ways physics can contribute to such pressing national issues as energy conservation, and reiterated the importance of U.S. involvement in ITER, as well as the need for a fusion facility in this country. He also supports a proposed APS-sponsored study on the status and technological potential of electricity generation from renewable energy sources. "Such unbiased studies can be of great importance to the government and the citizenry, and it puts the APS, in good light, into the public eye," he said, citing past work on safe reactors, high efficiency vehicles, and directed energy weapons as examples.

The Society's efforts against pork-barrel additions to the federal budget, as well as Congress' cancellation of the Superconducting Super Collider and the Advanced Neutron Source, are good examples of the APS assuming a vocal role in shaping national science policy, according to Sessler. He also believes the APS should continue to be a strong advocate for small science, which he deems essential to the continued health and vitality of the field. However, "At the same time, we clearly need in many subfields of physics a healthy national program built upon major facilities in the U.S., as well as vigorous international programs based upon jointly constructed major facilities," he said.

Chair-Elect, Nominating Committee

Gerard Crawley received BSc and MSc degrees from the University of Melbourne in Australia in 1959 and 1961, respectively, and a Ph.D. in physics from Princeton University in 1965. Following a postdoctoral appointment at Michigan State University, he was a Queen Elizabeth II Fellow at the Australian National University from 1966 to 1968. He returned to Michigan State University as an Assistant Professor in 1968 and has held a faculty appointment there ever since. He served as associate director of the National Superconducting Cyclotron Laboratory and chaired MSU's Department of Physics and Astronomy from 1988 to January 1994, when he assumed his current post as Dean of the Graduate School.

Crawley's research interests are in experimental nuclear physics, particularly in the simple modes of nuclear excitation. His APS service includes a stint as chair of the Division of Nuclear Physics from 1991 to 1992. He also co-chaired the division's Resource Committee. In this latter role, he was responsible for the production and circulation of a brochure which attempted to explain to a lay audience what nuclear physicists do and what society gains from an investment in nuclear physics. He chaired the Selection Committee for the APS Visiting Minority Lectureship in 1994 and is currently a member of the APS Committee on the Status of Women in Physics.

Crawley identified three major challenges facing the physics community in his candidate's statement: the continued tight job market for Ph.D. physicists, and the perpetuation of the myth that choosing a career other than faculty at research universities constitutes failure as a physicist; better representation of women and minorities in the physics profession; and the need for better communication with non-physicists, both in local and federal government, and the general public. "We must help them to

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IN THIS ISSUE

INSIDE THE BELTWAY

Freshman House Republicans Muscle Legislation to a Crawl

by Michael S. Lubell

When Congress returned from its summer recess shortly after Labor Day, the Republican leaders knew that they had a full plate before them. What they didn't know was how indigestible its contents would turn out to be. Working against the October 1 deadline for the new fiscal year, they could barely achieve enough consensus to send two of the thirteen appropriations bills to President Clinton's desk for his consideration. He signed the one for military construction, but vetoed the other for legislative branch spending.

To avoid shutting down the federal government, all parties in the budget debate were forced to agree to a Continuing Resolution. For six weeks, it allowed all agencies to spend money at a level that was 5 percent below the lowest figure contained in either the House or Senate appropriations bill or the actual spending for FY 1995. But in some instances the Senate or House appropriations bills had zeroed out activities of the federal government, such as the Advanced Technology Program administered by NIST. To deal with these, the Continuing Resolution provided for spending at a level 10 percent below the FY 1995 figure.

It took all of Speaker Newt Gingrich's considerable leadership skills to sell his House Republican freshmen on the temporary spending plan. But their public objections to the deal worked out with the White House made it abundantly clear to even the most casual of observers that these missionaries were not about to forego their November 1994 calling in the ensuing budget debate.

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Schrieffer Focuses on Improving Communication, Science Education

The impact of electronic publishing on APS journals, science education reform, and improving communication between the physics community and the general public are issues of particular concern for the APS in the eyes of J. Robert Schrieffer, who begins his tenure as APS president this month. A professor of physics at the University of Florida, Schrieffer succeeds C. Kumar N. Patel of the University of California, Los Angeles.

Schrieffer's interest in science developed early, with childhood interests in chemistry sets and ham radios. However, he didn't attend the standard physics class at his small high school in Illinois. The physics teacher there had minimal background in the subject, and, armed with a textbook used in MIT's introductory physics courses, he and Schrieffer pursued an independent course of study together. Ironically, Schrieffer initially intended to study electrical engineering in college, but switched his major to physics two years later.

He received his Ph.D. in physics from the University of Illinois in 1957, specializing in the theory of superconductivity. After holding faculty appointments at the University of Illinois, University of Chicago, and the University of Pennsylvania, he became Chancellor's Professor at the University of California, Santa Barbara, where he also served as director of the Institute for Theoretical Physics. In 1992 he was appointed University Professor at Florida State University, where he is also chief scientist of the National High Magnetic Field Laboratory.

A past recipient of the APS Oliver Buckley Prize, Schrieffer shared the 1972 Nobel Prize in Physics with John Bardeen and Leon Cooper for the microscopic theory of superconductivity. His current research centers on strongly correlated fermion systems and magnetic effects in solids. He has served on numerous committees of federal agencies, and was recently appointed chairman of the Scientific Council of the International Centre for Theoretical Physics in Trieste, Italy, a facility which fosters research in developing countries.

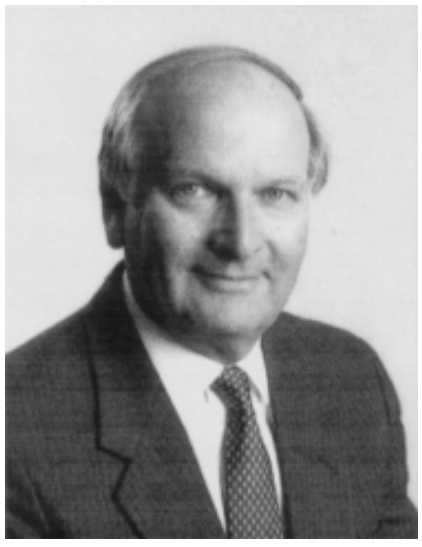
Q: One of your concerns is the need to improve communication between subfields of physics to unify the community, particularly in its approach to funding agencies. What are some ways the APS might help to accomplish this?

A: One way is by organizing cross-disciplinary symposia at APS meetings to give more visibility to people who work in one field, but who have expanded their interests into other fields and thus could address the exciting big questions that lie ahead. It's something that we really haven't moved very far on, but I think it's important.

The APS Executive Board and Council typically struggles with many issues on a very short time scale, and I've found that it's intellectually very frustrating to get an in-depth discussion going. I hope to devote some time to this kind of interaction between subfields during the annual Executive Board retreat in June. Perhaps we can come up with some more specific things that would be of help in this area.

Q: What can individual physicists do in the meantime?

A: It is very important to ensure that the physicists who are the best communicators become more active in spreading the word through general lectures. There were some outstanding candidates for the Lilienfeld Prize this year, for example, each of whom were wonderful communicators about their own research. It would be nice if we could expand this beyond one individual per year and have a group of APS-sponsored lecturers to give colloquia.



Q: A number of scientists have expressed concern about simplifying research to the point where most of the essence is lost, in their opinion. Many distrust the media's focus on flashier aspects and think less attention is paid to actual physics. So there's an inherent chasm between the two in terms of communication. How can we bridge that gap?

A: You have to get people who are not only very talented at this, but also enjoy doing it. Fortunately the field does have a number of people who have these talents. Historically, there have been a lot of scientists who've been wonderful communicators in physics and we should use these people more and help them realize that they have a very special talent. Unfortunately, many such communicators are viewed as less than outstanding scientists because they're simplifying things, and also injecting their own personality into it. So being standout communicators in some sense degrades their scientific image.

Q: You're also concerned with improving pre-college education. Most agree that it is vital to incite students' curiosity so that they seek out more information on their own. Can this be done in a traditional school structure, or are some drastic changes needed in our educational process?

A: We must at least have the intention of making big changes in order to achieve small actual changes. A very large force is necessary to move something of enormous inertia, and our present educational system has great inertia. Somehow the enthusiasm and excitement of new discoveries in physics never reach the high school classroom. This is partly because individual states include only basic facts in their physics requirements, such as the formula for water. Not a single concept, axiom, experimental technique, or even a sense of the intellectual structure of the field is included. Students are never taught how to reason or conceptualize anything.

We must bring education into the 21st century, perhaps by using canned videotaped lectures by outstanding communicators which are still flexible enough for teachers to insert them into standard curricula. It comes down to a knowledge-based versus a wisdom-based approach to education. Physics is probably one of the worst in this regard. We teach students all the techniques and expect them to acquire the complementary wisdom by osmosis.

Q: There is still a serious funding crisis for physics research, and an ongoing budget battle in Congress. How might physics have to change in order to survive in this changing economic climate? Will it have to adapt?

A: When physics enjoyed only a small fraction of its present funding level, outstanding research was done. The field has advanced some distance since then, but still the major breakthroughs are made by relatively few individuals. In all fairness, one can absorb any amount of funds. It all depends on how one distributes scarce resources. One can overfeed a field. The peer review system is very good for maintaining quality, but it also tends to focus resources on areas that have already been fertilized. I think the physics community needs to vigorously look for new areas of opportunity where investment could pay off. We could then get some of the more senior people to sanction these exciting new areas to attract not only funding, but scientists interested in doing research at the vanguard.

Q: International cooperation, particularly on large mega-science projects. There's still some debate as to whether the U.S. will participate in projects like the Large Hadron Collider, whether the U.S. is willing to become a cooperator as opposed to a leader and a star. How can the APS help in this debate?

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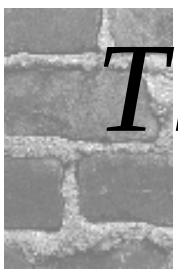

Thank you!

The following members participated in the Member-Get-A-Member Campaign by recruiting one or more new members. This list includes entries from October 19 through November 24, 1995.

Each member who recruits one new member receives an APS mug. Incentives increase according to the number of members recruited.

For more information on the campaign see the APS Home Page (http://aps.org). or email challenge@aps.org.

Daniel P. Aalberts
Sanjoy Banerjee
Hudong Chen
Umberto Cotti*
Cosmin Deciu
Trevor A. Delchar
Noburu Fukushima*
H. Von Geramb
Steven A. Gottlieb
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Joseph Haywood
Ian G. Hughes
Yasushi Ishii
Hiroshi Kajiyama
Jingwen Ma*
Takayuki Matsuki
Yasuhide Minonishi
Michael H. Reck
Chris Sorensen
Jeffrey P. Wolinski
Zhihao Yang

* These individuals recruited more than one new member.

INSIDE THE BELTWAY *(continued from page 1)*

With only one week remaining before the Continuing Resolution was due to expire, the contentiousness in the House had so tied up the legislative process that only one more appropriations bill had been sent to the White House. And even that one, which funds the Agriculture Department and which the President signed on October 21, created a deep split among the House Republicans, pitting the more seasoned Appropriations Committee leadership against the most hawkish of the GOP freshmen. Without Speaker Gingrich's direct intervention, that bill, too, might have died on the House floor.

Where does this internecine battling leave the science budgets? Amidst all the bloodletting that accompanied the anti-government fervor during the summer legislative activity, basic research stood out as one of the few areas where Democrats and Republicans of most stripes could come to a consensus on strong federal support, strong, at least, by comparison with other activities. Although there were some differences between the House and Senate spending plans, the National Science Foundation, for example, seemed headed for a cut of less than 1 percent from its FY 1995 level.

Within the Department of Energy, two research areas even made it into the plus column. The conference report on the Energy and Water Development Appropriations Bill, which was approved by both houses on Halloween, earned Basic Energy Sciences the title of big winner. The bill raised spending for BES to $782 million, an increase of slightly more than 10 percent. It also raised spending for high energy physics by almost 4 percent to $667 million.

Nuclear physics, however, fared less well. It received an 8 percent reduction to $304.5 million. And magnetic fusion, which unfortunately had its future spending tied to two new projects, ITER and TPX, suffered the largest hit of all. Budget cutters excised 30 percent of its FY 1995 base, despite last minute efforts by the Clinton Administration to establish a coherent set of priorities.

With the freshmen Republicans demanding that House leaders hew to their fiscal and social agenda in dealing with their more moderate Senate Republican counterparts, it is far from clear which appropriations bills will ultimately make their way onto the President's desk. And once they get there, it is far from clear which bills the President will find acceptable.

A series of Continuing Resolutions may avert the federal train wreck that some pundits inside the Beltway have forecast. But for many science activities that will be small solace, since the House Republican freshmen have vowed to make the stop-gap spending measures reflect deep cuts across the board. According to some sources on the Hill, those cuts could reach 20 or even 40 percent as the fiscal year progresses.

Bitter disputes over legislation to raise the debt limit and vitriolic debates over the mammoth Reconciliation Bill further dampen the possibilities of consensus building during the remaining year of the 104th Congress. The forecast: in spite of bipartisan support, many science activities may simply have to be put on ice until the 1996 elections.

Nobel APS Presidents

by Michael Scanlan, APS Meetings Manager

Eighty-two people have served as president of APS, and there are 147 winners of the Nobel Prize in Physics. There have been 21 APS presidents who have also won a Nobel Prize, before, during, and after their tenure. Thirteen received the prize before serving, seven after serving, and one was awarded the Nobel Prize while serving as APS President. The latter was Arthur Schawlow in 1981. Since the prize is announced in October, and the APS presidential term ends in December, it must have been doubly satisfying to win the Nobel and escape APS servitude at roughly the same time. What an exit! Bill Havens, then APS Executive Secretary, said "He arranged to have the 'President of the APS' send Schawlow a congratulatory letter.

John Bardeen won the Nobel Prize, served as APS President, and then won the Nobel Prize again, so obviously we didn't wear him out. We counted him as having won the prize before serving, since the second prize was obviously lagniappe.

Other Nobel Prize Facts:

- *Firsts.* The first APS President to receive the prize was Albert A. Michaelson, who served as APS president 1901-1902, and received the prize in 1907. The first Laureate elected APS president was Arthur H. Compton in 1934 (Nobel in 1927).

- *Longest Wait.* J.H. Van Vleck served as APS president in 1952. He won the prize in 1977.

- *Most Impressive Entrance.* Luis W. Alvarez won the prize in 1968 and became APS president in 1969.

- *Best Line-up.* In 1968, Charles H. Townes (Nobel in 1964) was immediate past-president, John Bardeen (1956 and 1972) was president, Alvarez (1968) was vice-president, and E.M. Purcell (1952) was vice-president-elect.

- *Brightest Future.* In 1954 Hans Bethe (1967) was president, and Eugene Wigner (1963) was vice-president-elect.

- *My Country 'Tis of Thee.* US-62, Germany-21, England-16, France-10, Russia-7, Netherlands-6, Sweden-4, Denmark, Italy, Japan, and Switzerland-3 each, Austria and India-2 each, Canada, Hungary, Ireland, Scotland, and Wales-1 each.

- *The List.* The first date is the prize, the second is APS presidency.

Albert A. Michaelson	1907	1901-1902
R.A. Millikan	1923	1916-1917
Arthur H. Compton	1927	1934
P.W. Bridgman	1946	1942
J.H. Van Vleck	1977	1952
Enrico Fermi	1938	1953
H.A. Bethe	1967	1954
E.P. Wigner	1963	1956
Felix Bloch	1952	1965
C.H. Townes	1964	1967
John Bardeen	1956,1972	1968
L.W. Alvarez	1968	1969
E.M. Purcell	1952	1970
W.A. Fowler	1983	1976
N.F. Ramsey	1989	1978
A.L. Schawlow	1981	1981
R.R. Wilson	1978	1985
V.L. Fitch	1980	1987, 1988
N. Bloembergen	1981	1991
B. Richter	1976	1994
J. Robert Schrieffer	1972	1996

IN BRIEF

- The APS Council approved two minor changes to the APS Bylaws regarding service of APS Congressional Fellows on the Physics Planning Committee (PPC) and the Panel on Public Affairs (POPA). Congressional Fellows are currently required to serve on POPA in the first year following their fellowship tenure. Under the new provisions, Fellows will serve as members of the PPC in the first year after their tenure, and in the second year serve as members of POPA. "The PPC and POPA feel that they can both benefit from the knowledge and experience the Fellows gain by having them serve as members," said Charles Falco (University of Arizona), chair of the Committee on Constitution and Bylaws, which proposed the revision. Members are invited to comment on these proposed changes before the changes are resubmitted to the APS Council for ratification at its Spring 1996 meeting. Comments should be sent to the Executive Office of the APS, One Physics Ellipse, College Park, MD 20740-3844; or by e-mail to <halsted@aps.org.>.

- Six APS representatives traveled to Tokyo in September to attend the Second International Conference on Research and Communications in Physics. They were joined by representatives from physics organizations around the world, including UNESCO, the International Union of Pure and Applied Physics, the Balkan Physical Union, the European Physical Society, the Eotvos Physical Society, and the physical societies of Russia, Poland, Uzbekistan, China, Sweden, Asia Pacific, Germany, Korea, Latvia, Malaysia, and Mexico. A joint declaration was issued following the conference, re-asserting the participants' commitment to basic and applied science as a global endeavor. APS President C. Kumar N. Patel gave a plenary lecture on physics in the 21st century, while APS Past President Donald Langenberg reported on activities of UNESCO's Physics Action Council. APS Executive Officer Judy Franz participated in a panel discussion on regional physical societies and later described physics education initiatives in the U.S. Other session topics included communications in physics, physics in industry, and the crisis in society journals brought on by electronic publishing. Former APS President Ernest Henley (University of Washington) and APS Editor-in-Chief Benjamin Bederson also spoke at the conference.

- U.S. Representative and physicist Vernon J. Ehlers (R-MI) was elected to APS fellowship. His citation reads, "For contributions to atomic physics research, physics education, and dynamic leadership in the pursuit of bettering the health and welfare of science in the United States." Ehlers received his Ph.D. in nuclear physics from the University of California at Berkeley in 1960 and then spent two years as a postdoctoral fellow, one at Berkeley and one at the University of Heidelberg in Germany. Following his tenure as a research physicist at Lawrence Berkeley Laboratory, he joined the faculty of Calvin College in 1966, leaving in 1983 to pursue his political career. A long-standing APS member, Ehlers was involved with the fledgling Forum on Physics and Society in the early 1970s and also served on the Panel on Public Affairs. He first entered public politics in 1975, when he was elected as a county commissioner, and was sworn into the 103rd U.S. Congress in January 1994. The APS Council elected a total of 180 APS members to Fellowship in November. Their names and citations will be published in the March issue of *APS NEWS*. A complete list is also available on the Fellowship section under the Prizes, Awards & Fellowship button of the APS Home Page (http://aps.org).

- The APS Division of Biological Physics is sponsoring a workshop on physical techniques in biological sciences on Sunday, March 17, just prior to the 1996 APS March Meeting in St. Louis, Missouri. The course is intended for researchers who are unfamiliar with the types of information about biological systems that can be obtained using modern physical techniques, and are interested in a series of overview lectures on the subject. "Significant advances in the understanding of biological systems can be made by applying a variety of physical techniques to their study," said Denis Rousseau of AT&T Bell Laboratories, who organized the workshop. "Some are particularly powerful for the study of the active site of enzymes, whereas others yield information of a more global nature." The four techniques covered in the course are electron paramagnetic resonance, raman scattering, atomic force microscopy, scanning tunneling microscopy, and x-ray absorption fine structure.

- A new study, "1994 Salaries: Society Membership Survey," released by the American Institute of Physics shows that the median annual salary for a full-time physicist in the U.S. is $60,000. Among the different employment sectors, physicists (actually, some of the society members surveyed were non-physicists, such as engineers) in a medical/ hospital setting make the most, $77,000, and those at four-year colleges the least, $45,000. Geographically, the Pacific states pay the most, $66,000, and the West North Central states the least, $50,000. Adjusting for the cost of living, Houston has the highest physicist salaries among selected cities and San Diego and Boston the lowest. Comparing the salaries of male and female physics Ph.D.s is complicated by the fact that median female age is invariably lower. Factoring in the lower earning power that comes with fewer years of experience, females still earn less than their male counterparts in all categories. The adjusted male/female salaries (in thousands of dollars) in selected job areas are as follows: 78.1/68.4 for those working in industry; 67.6/59.4 in government; 67.9/61.5 for full professors (9-10 month salaries), 48.5/46.2 for associate professors, and 42.6/42.0 for assistant professors. [Item courtesy of Philip F. Schewe of the American Institute of Physics.]

Insights Into Nuclear Structure Featured at 1995 DNP Fall Meeting

New insights into nuclear structure, superheavy elements, and future applications of basic nuclear research were among the topics featured at the annual fall meeting of the APS Division of Nuclear Physics (DNP), held 25-28 October 1995 at the Indiana University Memorial Union in Bloomington, Indiana. The meeting consisted of six invited sessions, including the plenary session on basic research in nuclear physics, and 22 contributed sessions. A town meeting was also held on Friday afternoon to provide an opportunity for a large segment of the nuclear science community to be exposed to and contribute to the ongoing discussion regarding future challenges and priorities for the field.

Future of Nuclear Physics Research. Nuclear physics played a major role in the development of nuclear reactors and nuclear weapons 50 years ago. Today, according to John C. Browne of Los Alamos National Laboratory, neutrons have the potential of playing an even more important role, thanks to advances in high power accelerator technology initially developed for nuclear physics research. Browne opened the Thursday morning plenary session on the future of nuclear physics with a discussion of possible applications, focusing on concepts for burning defense and civilian nuclear waste using intense sources of spallation neutrons in accelerator-driven subcritical systems.

Electrostatic accelerators are finding important applications in materials analysis and materials modification. Particle-induced x-ray emission is used in fields from art history through environmental sciences, and in the area of security, x-ray imaging using electron beams and fast-pulsed neutron analysis is proving useful for plastic explosive and drug detection. Accelerator-based mass spectrometry is used in a number of fields which rely on counting extremely rare isotopes in small samples, and materials modification is having a significant impact on the semiconductor industry. According to G.A. Norton of the National Electrostatics Corporation, virtually all semiconductor devices now rely on ion implantation with ion beam energies ranging from a few kilovolts to several MeV.

Recent developments in magnetic resonance imaging (MRI) have significantly improved anatomical imaging, and have also added novel dimensions, such as the ability to measure and image functional, physiological and metabolic parameters in the human brain. Furthermore, the recent introduction of high magnetic fields for the use of human studies aids these applications, which are limited by the signal-to-noise ratio of the MRI methodology.

Nucleon and Nuclear Structure with Electronmagnetic Interactions. Scientists at MIT's Bates Linear Accelerator Center have made recent measurements of coincidence reactions with proton, deuteron and carbon targets, using a newly constructed proton focal plane polarimeter. The initial measurements were of the spin transfer coefficient in elastic scattering of polarized electrons from hydrogen, and in quasielastic scattering from the deuteron. According to MIT's S.P. van Verst, preliminary analysis indicates that in quasifree kinematics, the spin transfer coefficients on deuterium are consistent with those on hydrogen to within a few percent, and all three components of the proton polarization appear consistent with many-body theory.

Using the same technique, Van Verst and his colleagues also completed recoil polarization measurements of the deuteron away from quasifree kinematics. In addition, with an unpolarized beam, they measured the induced proton polarization with a carbon target, and the normal component to the proton polarization with a proton target. Future measurements of the beam helicity dependent polarization components are also planned.

New experiments with gaseous internal targets at the NIKHEF Internal Target Facility in the Netherlands have produced measurements of target asymmetries with unprecedented accuracy for the elastic and the break-up channel of tensor-polarized deuterium. Planned upgrades to further improve luminosity will allow researchers to extend these measurements even further. According to NIKHEF's C.W. de Jager, in future experiments, the availability of a longitudinally polarized beam with a high degree of polarization will be used in combination with polarized targets of ^{3}He and D to measure the neutron electric form factor and various aspects of the internal structure of those elements.

New Aspects of Nuclear Structure. Neutron rich nuclei are of particular interest to scientists since they might reveal new aspects of nuclear structure associated with an excess of neutrons, such as a new region of deformation, shell effects, and modes of excitation. According to I.Y. Lee of Los Alamos National Laboratory, deep-inelastic reactions have been shown to produce neutron-rich nuclei with a high multiplicity of gamma-ray emission.

However, the lack of sensitivity of available gamma-ray detector arrays have made it difficult to study these reactions. Lee and his colleagues carried out gamma-spectroscopy studies of neutron rich nuclei using a silicon-strip detector to detect the projectile-like fragments, and coincident gamma rays were detected in the gammasphere. The group also studies pairing strength as a function of spin, and the variation of the interaction strength of the first backbending.

Scientists at Argonne National Laboratory have been investigating the positron and positron-electron line phenomena in heavy ion collisions using a new device called APEX, which was designed specifically for this purpose. Earlier work reporting the observation of line structure in the spectra of positrons produced in low-energy collisions of very heavy nuclei has persistently puzzled researchers. But according to LANL's Alan Wuosmaa, the new data obtained with APEX, measured under similar conditions, do not show evidence for the reported lines. In fact, in the case of the isolated two-body decay of a neutral object, the cross section limits obtained were far below those implied by the previous results.

Superheavy Elements. New results of research on the synthesis and investigation of properties of heavy nuclei at Russia's Flerov Laboratory of Nuclear Reactions have led to the observation of a new region of nuclear stability near the closed deformed shells of 108Z and 162N, predicted by the macro-microscopic theory. The experiments were conducted with beams from the facility's heavy ion accelerator using a gas-filled separator of recoils. The discovery of this new region allows scientists to make much more accurate assessments regarding the properties of heavy nuclides.

According to K.E. Rehm of Argonne National Laboratory, the study of heavy-ion induced fusion reactions at sub-Coulombic barrier energies reveals a rich and interesting interplay between reaction dynamics and nuclear structure. Considerable progress has been made in recent years advancing present understanding of the sub-barrier fusion enhancement by including additional degrees of freedom, such as static deformation, vibrational motion, and nucleon transfer reactions. New measurements at ANL involving transitional nuclei exhibit especially strong enhancement effects, Rehm reported, and these processes are expected to significantly influence the fusion of very heavy nuclei using stable and radioactive beams.

APS Honors Two Young Physicists With 1995 Apker Award

Two promising young physicists have been named by The American Physical Society as recipients of the 1995 Apker Award for their research achievements as undergraduates. Frederick B. Mancoff and Benjamin F. Williams will each receive a $3000 stipend, a certificate, and a travel allowance to attend the 1996 Joint APS/AAPT Spring Meeting in Indianapolis, Indiana, in May, where the awards will be presented. They will also be invited to present papers at an appropriate technical session during the meeting.

As a senior at Stanford University, Mancoff designed and carried out an experiment to study the magneto-transport of a two-dimensional electron gas system under a random dipolar magnetic field. While the system forms the analogical basis for the current understanding of the quantum Hall system at even denominator filling fractions, there has been little experimental work to date in that area. In the course of this project, Mancoff mastered semiconductor microfabrication techniques, including photolithography, mask design, and wire-bonding, as well as low-temperature experimental techniques. He also aided graduate students in the operation of the laboratory's helium liquefier and the transfer of liquid helium into a storage dewar for operating the dilution refrigerator necessary for his measurements.

Mancoff's experiment revealed that the magneto-resistance of the two-dimensional electron gas increases one-order of magnitude under the influence of the random magnetic field. The experiment's importance may one day move beyond the even-denominator quantum Hall effect to more practical application of the giant magneto-resistance. He presented his findings as an invited speaker during a symposium on mesoscopic physics at the 1995 APS March Meeting in San Jose, California, perhaps the first undergraduate student to be invited to speak at an APS meeting.

For his senior thesis at Middlebury College in Vermont, Williams conducted an extensive search of the nearby spiral galaxy M31, known as Andromeda, for supernova remnants, using large format charge-coupled device (CCD) images from the Burrell Schmidt telescope at Kitt Peak Observatory in Tucson, Arizona. However, the angular resolution of the Schmidt telescope system is too coarse to observe real structure in the remnants, making it difficult to measure their sizes accurately. Thus, Williams perfected techniques for making large digital mosaic images, resulting in exceptionally smooth images with excellent signal-to-noise ratios, which enabled him to search with much greater sensitivity than his predecessors. He also conducted an analysis of the statistical distribution of the remnant sizes, as well as the implications for remnant evolution and the supernova rate in the M31 galaxy.

The project was hugely successful. Where research by several international groups over the past 20 years has led to the identification of 12 confirmed remnants and 12 other candidate objects, Williams identified 100 candidates, the largest optical sample of supernova remnants known in any galaxy. The vastly expanded pool will provide a rich resource for studying the structure and chemical composition in interstellar medium in the Andromeda galaxy, which is thought to be very similar to our own Milky Way galaxy. Williams was awarded his department's only physics prize upon graduation, and plans to apply to graduate schools later this year.

"The selection committee had a difficult task in reaching a decision, because all the finalists submitted superb work and demonstrated outstanding potential for future achievements in physics," said Donald Langenberg, chancellor of the University of Maryland System, who chaired the committee. Since 1994, the committee has sought to select two recipients, one from a Ph.D.-granting institution and one from a predominantly undergraduate institution.

Established in 1978 through an endowment by Jean Dickey Apker in memory of her fellow solid state physicist and husband, LeRoy Apker, the Apker Award is given annually in recognition of outstanding achievement in physics by undergraduate students, so as to encourage young physicists who have demonstrated great potential for future scientific accomplishment. All students at U.S. colleges and universities who were undergraduates during at least part of the year prior to the deadline for nominations are eligible to apply.

Challenge to Scholarly Surveys Again Rejected

Judge Leonard B. Sand, of the United States District Court for the Southern District of New York, issued a decision on November 2, 1995, reaffirming the First Amendment right to publish surveys analyzing the prices of scientific journals. The decision represents a significant confirmation of the legal protection afforded speech of importance to the scholarly community.

In 1986 and 1988 The American Physical Society (APS) and the American Institute of Physics (AIP) published surveys prepared by Professor Henry Barschall of the University of Wisconsin/Madison analyzing the comparative prices of physics journals. A suit challenging the articles was brought by Gordon & Breach Science Publishers (G&B). As noted by Judge Sand, "[a] s it happened, journals published by AIP and APS scored near the top of the articles' rankings and several of G&B's journals were ranked at or near the bottom." G&B filed suit in New York, as well as a series of related actions in Europe, claiming that the articles constituted false or misleading advertising.

The recent decision arises from G&B's request that the court modify its previous decision holding that publication of the articles was speech entitled to constitutional protection. Judge Sand stated that "it is plainly *inconsonant* with justice to grant [G&B's] requested relief," noting that G&B "seek [s] back-door entry to revisit the issue, after undertaking the exact discovery that the Court cautioned against in the first instance."

G&B also challenged various "secondary uses" of the surveys, including advertising, letters, and presentations by APS and AIP officials. Judge Sand ruled for AIP and APS on several of these claims, but found there were factual issues as to others that had to be resolved at trial. For the remaining secondary uses, G&B will now have to show that the surveys were false or misleading — claims that have been previously rejected in Switzerland and Germany after thorough review.

Dr. C. Kumar N. Patel, President of The APS and Dr. Roland W. Schmitt, Chair of the Governing Board of the AIP stated that "we are extremely gratified by Judge Sand's decision. His action provides important protection for studies of an issue of significant importance to libraries and the scientific community as a whole — the escalating price of journals in a period of declining library budgets."

They said, however, "we are distressed that, in having to litigate the remaining secondary uses, AIP and APS will have to defend again in the U.S. what has previously been found in Germany and Switzerland — that the surveys are not false or misleading. Although we are confident that we will prevail on the remaining issues, the scholarly community is not served by the diversion of scarce resources into the defense of G&B's lawsuits."

For further information or a copy of the decision, contact Joan Wrather (301) 209-3093, fax: (301) 209-0846, or email: (jwrather@acp.org).

DNP Workshops Explore Transition Physics, Education Reform

The APS Division of Nuclear Physics (DNP) organized two workshops on October 25, just prior to, but in conjunction with, its annual fall meeting in Bloomington, Indiana. The first was on physics at the transition, and the second focused on the changing goals for graduate education in nuclear physics.

The "transition" regime in the strong interactions spans energies from where a purely baryon and meson description is appropriate, to where a perturbative description in terms of quarks and gluons emerges. The purpose of the workshop on transitions was to elucidate the complementarity of the research programs at several electron and hadron facilities. A systemic exploration of the transition regime will be the specific mission of new and proposed accelerators at CEBAF, ELFE, COSY and Light-Ion Spin Synchrotron. Experiments at these facilities will provide crucial tests of QCD models of hadron structure, and will explore the interface between non-perturbative and perturbative QCD descriptions of hadron interactions. Topics covered during the workshop included physics near the strange and charm production thresholds, flavor dependence of the quark sea in nucleons and nuclei, the search for QCD exotica, the search for color transparency, charmed hybrid mesons, and the search for parity and time-reversal violations between hadrons.

The workshop on graduate education addressed potential changes in the graduate education of nuclear physicists to meet the challenges of the future. While similar questions are being addressed in a wider context elsewhere by the APS and other organizations, workshop organizers said that the DNP workshop allowed professionals and students to discuss the particular ramifications for nuclear physicists of the changing environment in which physicists work and live.

The workshop featured a panel discussion, moderated by APS Executive Officer Judy Franz, summarizing various perspectives of the issue, including those of graduate student organizations, research universities, industry, and more teaching-oriented institutions. Participants then broke into discussion groups to explore such topics as alternate minors, matching training with employment opportunities, the role of funding agencies in graduate education reform, and how much and what type of teaching might be required. The program concluded with an open discussion led by panel members, and an informal reception for the participants.

Southeastern Research Opportunities Featured at SES Fall Meeting

Emerging new research opportunities in the Southeast, in such areas as magnetic fields research, free electron lasers, and the quark structure of matter, were among the highlights of the 62nd meeting of the APS Southeastern Section, held in Tallahassee, Florida, in November. Hosted by the National High Magnetic Field Laboratory (NHMFL), whose facilities house some of the most powerful research magnets ever developed, the conference also featured invited sessions on nuclear waste management, astrophysics, and computer applications in physics teaching.

A number of new facilities in the Southeast are opening up many diverse research opportunities in the region. For example, Construction of the Holifield Radioactive Ion Beam Facility at Oak Ridge National Laboratory has been completed. The scientific program, affording new research opportunities in nuclear structure and nuclear astrophysics, will begin operation in the spring of 1996.

Louisiana State University opened its Center for Advanced Microstructures and Devices two years ago, containing the first commercially built electron storage ring in the U.S. with a maximum energy of 1.5 GeV. Applications include basic research, chemical and structural analyses, and microfabrication, including the printing of electronic circuits and production of microdevices. Duke University's Free Electron Laser Laboratory is making advances in applications of these accelerator-based light sources to such diverse fields as nuclear spectroscopy, surgery, multiphoton processes, X-ray holography, and analytical microscopy. Finally, the completion of the Continuous Electron Beam Facility is expected to produce seminal new insights into the quark structure of matter.

Opportunities for scientists also exist in magnetic field research. Magnetophotoluminescence (MPL) spectroscopy has proven to be a powerful technique for studying the interband optical transitions in quantum well-type semiconductor heterojunctions, and the NHMFL has established a facility to optically study the properties of two-dimensional electron systems at high magnetic fields in the quantum limit using this technique. Other promising areas of research include the continued improvement of high-resolution nuclear magnetic resonance, which is expected to reach 1 GHz in the near future, and strongly correlated electron systems at extreme limits.

Southeastern colleges are discovering innovative applications of computers to education. For example, L.C. Dennis of Florida State University described a project known as the Cyberspace Middle School (http://www.scri.fsu.edu/~dennisl/CMS.html), a World Wide Web site for math and science education which emphasizes hands-on activities. Access to the school's home page currently exceeds 750 visitors and electronic requests for science information or project ideas are received weekly.

Other efforts include computer systems developed for introductory physics laboratories at the University of Tennessee and the University of Florida, which feature user-friendly software programs for creating experiment-specific acquisition programs, and spreadsheet programs to aid student data analysis. Kinesthetic apparati in the Worldshop Physics program at Dickinson College help students relate natural phenomena to the laws of mechanics, while North Carolina State University uses instructional computer animations in its physics courses.

Over the next several years, approximately 100 tons of excess weapons plutonium in the U.S. and former Soviet Union will be produced from existing nuclear stockpiles, growing at a rate of about 70 tons per year. Public opposition, nuclear safeguard issues, and long-term critical stability of fissile material are causing scientists to explore alternatives to geologic storage. For instance, Los Alamos has developed Accelerator-Driven Transmutation Technology (ADTT), which couples a high-power accelerator to an efficient neutron-producing target and a subcritical fission assembly to destroy nuclear waste.

Another alternative for plutonium disposition is to fabricate the weapons-grade plutonium into mixed-oxide fuel and then irradiate in either advanced or existing pressure water reactors (PWR) to a depleted level similar to that of commercial spent fuel. According to M.R. Buckner of Westinghouse Savannah River Company, studies of his company's PWR designs demonstrate the potential for timely disposition of the material at relatively low cost, and its existing four-loop reactors can safely dispose of 0.94 megatons of plutonium each year.

Speakers at a Friday morning session on astrophysics described work on crucial questions in the field by leading Southeastern researchers. Topics included new supercomputer simulations of core collapse supernovae, nuclear probes of stellar evolution, recent observations of gamma ray bursts at the Compton Gamma Ray Observatory, and the assembly of a large database of odd star clusters in the Milky Way using recent advances in telescope technology at the Space Telescope Science Institute in Baltimore, Maryland.

Friday evening's banquet featured the presentation of the George B. Pegram Award to Joseph Ferguson of Mississippi State University, and the Jesse W. Beams Award to George Samuel Hurst of the University of Tennessee. Awarded annually by the section for more than 20 years, the awards consist of a gold medal and certificate citing the recipient's accomplishments for which he or she is being honored. The Beams Award is intended to recognize a physicist in the Southeastern region who has conducted significant research in physics, while the Pegram Award honors an individual who has demonstrated excellence in the teaching of physics.

OPINION

APS VIEWS

The Hard Realities of International Science

by Irving Lerch, APS Director of International Scientific Affairs

The U.S. physics community faces some alarming questions with discordant international overtones: What will be the consequences to high-energy physics if the U.S. refuses to support the Large Hadron Collider (LHC) at CERN? What will happen to fusion research if ITER self-destructs? What will physicists do if there is no domestic or international development of next-generation intense synchrotron and neutron sources? What can we do to promote dialog among nations concerning the implementation and management of major new collaborative programs? And finally, what role will physicists play in the Megascience Forum of the Organization for Economic Cooperation and Development (OECD)?

Some questions, like the first three, wrench our vitals. The last seems benign, almost petty. But rephrasing the question makes the issue more immediate: How will physicists affect the debate among the industrialized nations about where, when and who will benefit from the next big science project? The implication is that we may find ourselves excluded from the decision-making process which will mold the complexion and fate of physics for a generation or more.

However, despite all the lip-service to the contrary, there is little evidence that the international community is moving toward ever-increasing cooperation in big science research. The credibility of the U.S. as a partner in international ventures is open to question as Congress and the Administration inflate and collapse the bubble of support for collaborative programs.

The instruments at our disposal for international participation are few. In the post-war period, foreign regional projects like CERN were viewed as peripheral chips in our national mosaic dominated by Fermilab and SLAC. United Nations programs such as the International Atomic Energy Agency were engineered by the member states as mere extensions of their foreign policies. The International Union of Pure and Applied Physics moved along at its leisurely pace, badly underfunded and only occasionally seeking larger relevance through the organization of international committees on specific subjects.

By far the largest programs for support of U.S. scientists in international collaborations came from the Department of Energy, the Department of Defense and other government funding agencies. But many of these programs are imploding and the very survival of some agencies is at risk.

With this in mind, it's important to focus on the last two questions above in the context of current problems. We are familiar with the recommendation of the Drell Panel which requested funds for U.S. participation in the LHC. What will happen if funding is not provided? Is it at all certain that the long-standing policy of open access to the best qualified U.S. physicists will not be abrogated?

Not necessarily. At a meeting of the UNESCO Physics Action Council at CERN this past June, Director-General Chris Llewellyn-Smith asserted that the CERN council will probably feel compelled to impose at least some restrictions on non-member participation in the absence of contributions to operations.

Is this ingratitude for the open policy that hosted thousands of European scholars at U.S. institutions over the past two generations? More likely, this reflects the hard realities of an organization seeking to implement a difficult program while laboring under declining financial resources. It also illustrates the fear of some CERN members that U.S. participation, now fourth behind England, Germany and France in the existing experimental program, will shoulder out the smaller dues-paying members. This is not an idle fear. More than 500 U.S. physicists are now involved in the preparation of LHC experiments, whereas there are fewer than 270 physicists for Italy, Germany, France and the U.K., respectively.

What about the OECD Megascience Forum — the one-time vision of APS Vice-President D. Allen Bromley during his tenure as President Bush's science advisor? Both the U.S. Liaison Committee to IUPAP and the UNESCO Physics Action Council have expressed their apprehension that the physics community will be excluded from the process or relegated a secondary role as expert "advisors." And there are many in the scientific community who have yet to face the reality that large science programs must reflect the individual interests of nations and the collective interests of regions. Scientists cannot decide where a facility is best sited, the size of each participant's contribution, and how such facilities will be funded.

Whether we like it or not, OECD represents the economic and political interests of its members, not the intellectual interests of scientists. Thus, if the physics community is to play a substantive role, it must enlarge its horizon and call upon its leaders to face the broader facts of life. Physicists are no longer able to conjure the ghosts of their cold war status. We are now forced to demonstrate anew what physics contributes to international amity, prosperity and peace.

These are the hidden beasts that stalk us in the international wilds. While the industrialized nations talk about the need to collaborate, they are increasingly unwilling as individuals to make the necessary investments. What is needed is a new international regime with sufficient access to funds and the best scientific intelligence, enabling us to act wisely and decisively to maintain the vigor and vision of science.

LETTERS

To The Editor, APS News

Barrett Ripin's editorial ("Why Belong?", *APS News*, November 1995) made some very relevant points. However, I was disappointed that on the most important question of the PhD glut, he chose to concentrate entirely on the demand side (to which the efforts of APS and its members represent a small perturbation at best) and to ignore the supply side, where they could (given the will to do so) solve the problem in a short time. Suppose, for example, that granting agencies required applicants to list, along with papers and previous grants, names and addresses of all previous PhD and MS advisees, and solicited from each of these a confidential letter assessing the value of their graduate training to their present employment. This would have more effect than all the "alternative careers workshops" that have ever been held.

Pieter B Visscher
University of Alabama

Eliminate Postdoctoral Positions

Given the employment situation in science, I strongly feel that it would be in the best interests of our field, of young, and of mature scientists, if the position of post doc were eliminated from American science. This could be done by universities, national labs, funding agencies, and accreditation agencies working cooperatively or independently.

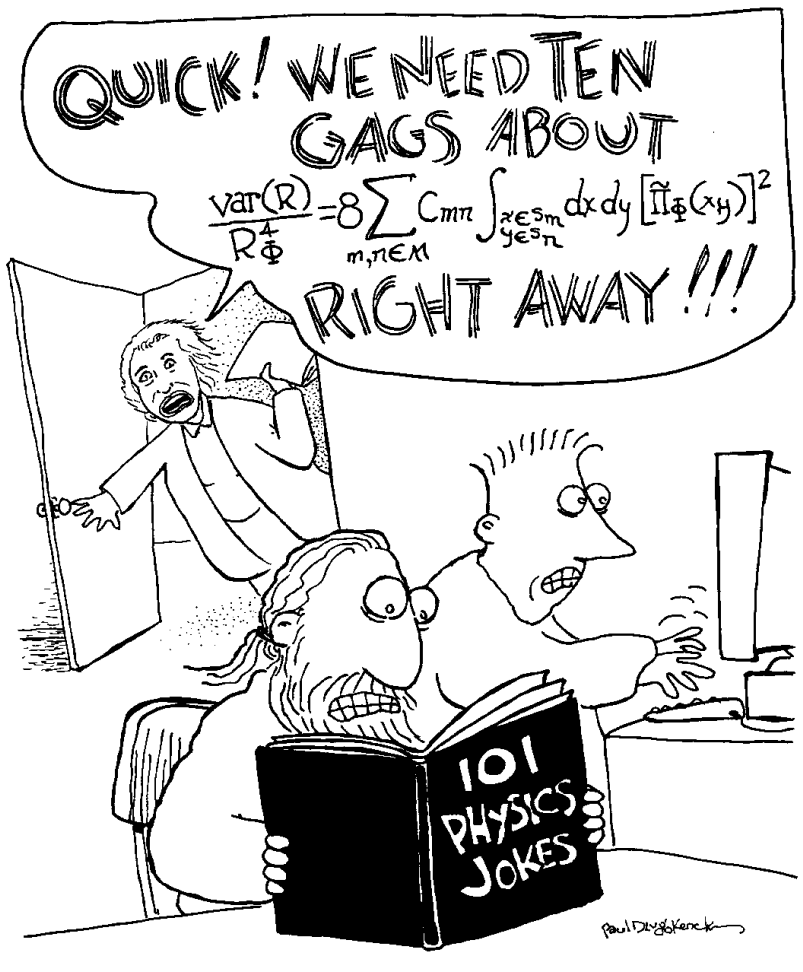
From what I have read and observed, when a student finished his Ph.D degree, the next step is a never ending merry go round of post docs, each of which lasts one or two years. This is especially true in the university and national lab sectors, important employers of Ph.D scientists. These post doc position are often in very different parts of the country. The negative impact on a person's family life is almost incalculable. Usually it is not possible for a post doc to do his best work, since much of his attention is necessarily focused on his next position. I believe these positions exploit young scientists; they are not optimum for employers either. Also in a field with the economic prospects of ours, to somehow suggest that a new Ph.D needs additional education before he is really qualified to work, is laughable. Naturally, a scientist's education never ends, and there are many ways a scientist could profitably spend time in a university or national laboratory. However such visits are best arranged as exchanges between employed persons.

These days, the fact that many people work on soft money is one of the vicissitudes of our field; it will probably get worse before it get better. Never the less there are still better ways to employ young scientists given this constraint. Many universities have research staff positions, and may national labs contract out work. Universities may be able to use independent contractors also. I strongly believe these should be the vehicle through which young scientists are hired, not post docs. This way the recent Ph.D is hired into what at least may be a permanent position. If he does not work out, he can be terminated just like any other employee. On the other hand, as grant support shifts, the company or research staff may or may not want to retain the person.

It is probably true that the available support can employ more post docs than permanent employees. However this is more of a reason to eliminate the post doc position, in my opinion. If the field cannot support a scientist, better he should know after he completes his Ph.D than after bouncing around the country for ten years, completing five post docs.

I strongly believe the post doc position is simple exploitation. It should be eliminated.

Wallace M. Manheimer
Naval Research Laboratory



OPINION

How I Went From Comedy Writer to Science Teacher in 65 Easy Lessons

by Casey Keller

Well it's finally happened: responsibility for the education of America's future scientists has been passed on to a couple of guys who used to write for "The Loveboat" and "Who's the Boss?". What's wrong with you people? What can you be thinking?

My partner, Richard Albrecht, and I had spent 15 years writing situation comedies when we interviewed for a job as head writers on a new show called "Beakman's World." We watched a ten-minute presentation tape. On it, we saw a bizarre man with bizarre hair in a bizarre laboratory talking about the most excruciatingly boring subject we had ever considered — and making it fascinating and fun. Best of all, it made us laugh.

We had reservations about taking the job. We're not scientists, we're comedy writers. Mark Waxman, the show's executive producer, assured us that our lack of scientific knowledge would not be a problem. The research people would write the lessons. All we had to do was add jokes.

Mark Waxman isn't a liar, but he was badly mistaken. "Beakman's World" is about teaching science in new and exciting ways. Those new and exciting ways are the jokes. Our research staff did an heroic job, but they could not deliver on Mark's promise. That was really up to us.

It turned out to be great fun. We immersed Beakman in a tank of water to explain displacement. We had Josie and Lester sing "Bee-Barf-A-Loo-La" to remind our viewers that honey is regurgitated from the stomachs of bees. Beakman, Lester and Liza got their hands dirty fixing a clogged drain pipe to explain how doctors treat heart attacks. We call these gags that make you laugh and learn at the same time the "ahas." It's that moment where the light bulb goes off over the heads of our audience.

I had to turn from comedy writer to science teacher overnight. And the weirdest thing happened. All that old stuff I thought I hadn't learned back in Mr. Creen's ninth grade science class jumped up out of my unconscious memory and into my conscious memory. Weirder still, it started making sense. Suddenly, Archimedes' Law became clear as a bell and I finally understood the difference between potential energy and kinetic energy. (Don't laugh. I told you I'm not a scientist.)

Sixty-five episodes later, "Beakman's World" has won three Emmys, the Cable Ace Award for best children's show, and the Ollie Award for Excellence in Children's Programming. More importantly, my children love the show and love to talk about science. On a recent vacation, Zoe, my five-year-old, took the pilot of our plane aside to tell him that the four forces of flight are thrust, drag, lift and weight.

As I said, I'm not a scientist, I'm a comedy writer. But I have learned a few things during my time at "Beakman's World."

Children don't hate learning — they just hate school. And why shouldn't they? As important as it is, school is the process by which we harness up our children so they can be put to work for our society. We impose structure on their unbridled free spirits. For a few hours each day we take away their spontaneity and make them focus their energies on things that often don't interest them. School is where many children get their first tastes of failure and inadequacy. At "Beakman's World," we receive thousands of letters every week from school kids who want answers to their questions. Nobody tells them to write to us. They do it because they want to know. The hunger for knowledge is out there.

Get the kids on your side. "Beakman's World" is the opposite of school. Instead of imposing structure on our audience, we appear to be chaotic. Our irreverent comedy, our underground comix style animation and our sound effects — particularly the sound effect you hear coming from Lester, a guy in a rat suit — tell the audience that we're not their parents or teachers. We're the bad boys (and girls) of science.

Don't talk down to the kids. Kids know when you're patronizing them. By writing a show we enjoy and that makes us laugh, we are assured of never talking down to our audience. Of the thousand letters that arrive at "Beakman's World" every week, some of my favorites are from adults who write to confess that they watch our show even though they don't have kids.

You can eat a whole cow if you do it one hamburger at a time. There is no principle, scientific or otherwise, so complicated that children cannot learn it. The trick is to break it down into bite-sized pieces that little minds can consume. It's also critical that we explain the little things that may seem terribly obvious to us, but are not to our youngest viewers.

All television is educational television when kids are watching. Those powerful little brains are sponges, soaking up everything they see and hear on that small screen. But those little minds don't have the tools to discriminate between things worth learning and things not worth learning. If you doubt me, ask my son, Max, to recite TV commercials for our local Ford dealer.

Since all television is educational whether we intend it to be or not, it's our job as parents to help our children choose the shows they watch. The things our kids learn from "Sesame Street" are extremely valuable, empowering and life affirming. The things they learn from their local news show may not be. More importantly, it's our job as broadcasters to provide shows for children that are worth watching and lessons that are worth learning.

I've picked up a bit of scientific knowledge over 65 Beakman episodes. I've learned that the main purpose of every life form on earth is to pass on its genetic information. But we humans are probably the only species that has something else to pass on besides our genes. We have to pass on our culture and our civilization. Not just because it's a nice thing to do, but because it's essential to our survival.

We must equip our kids with the knowledge they need and the skills to acquire that knowledge if we're going to keep our civilization alive. There were two and half billion people on this planet when I was born. Today, there are close to six billion. Who knows how many people there will be by the time my kids are young adults. We've got to equip these people with the knowledge they'll need to survive. We've got to empower them with the learning skills and thinking skills they'll need to keep civilization civilized — or as close to civilized as it gets.

And it's not just my kids, Max and Zoe, who need this empowerment. The quality of their lives and their survival depend on everybody's kids learning, and more important, learning to learn.

Casey Keller is a television writer-producer with a long list of credits in situation comedy. "Beakman's World" can be seen on CBS affiliates and on cable's The Learning Channel. With his partner, Richard Albrecht, he recently created another educational show, "A.J.'s Timer Travelers," which premiered in syndication this fall.

This article originally appeared in the newsletter of the APS Forum on Education, Summer 1995.

Communicating Physics to the Public is a Valuable Skill

by Ruth Howes

Panel after distinguished panel recommends improving the communications skills of physics students. We in the physics community heartily endorse their recommendations. Unfortunately, neither the physics community nor the assembled experts describe exactly what "communications skills" we need to improve. Research results are judged by publication and presentation to critical peers. Current teaching techniques include having students write up lab reports for *Physical Review Letters*, or using class for 10-minute physics papers, or even requiring proposals for senior projects. But today the survival of physics research depends on constituencies outside physics and science itself.

For years, industrial physicists have pointed out that they interact regularly with engineers, mathematicians, chemists, and even biologists. Today's corporations are moving away from central labs dedicated to basic research towards research tied closely to specific product development. Certainly small start-up companies tie research activities to production. In these arenas, physicists must work closely with business types trained in marketing and management.

Recent budget debates demonstrate that the general public (including politicians) does not understand science in general and physics in particular. The images of physics and physicists on popular television programs are problematic to say the least. Consider the recent commercials for tires, soft drinks and tennis shoes that claim to voilate the laws of physics, use physics jargon to repel unwanted sexual advances and mangle the principles of physics to win games. Dare to ask a casual passerby what physics is or what physicists can do. The results can be startling.

We physicists can no longer afford the luxury of talking mainly to ourselves. We must learn to appreciate the skills of the journalist, and yes, the public relations guru. Physicists must involve the media and the public they serve with physics and its exciting results.

Our students should practice writing press releases on their research projects, as well as *Physical Review Letters*. Physics students should explain their work not only to classmates, but also to groups from other disciplines and members of the public, such as middle school students. We must recognize that communication includes receiving as well as broadcasting. Attending seminars in other disciplines, our students should analyze them as physicists. Real-world problems present themselves in ordinary language. Therefore students must learn to recast them in physics terms — and, of course, explain their physics results in ordinary language.

Finally, we must recognize that those who communicate physics to the public and to students possess a unique talent and a practiced skill. Not all of us can push the envelope of physical understanding. Nevertheless, all physicists should have a solid understanding of the major ideas of physics and the fundamentals of physics research. Not all of us can explain frontier research results to the person on the street. But all physicists must learn to do this adequately, see that our students' skills exceed our own, and value those among us who can communicate.

Ruth Howes is a professor of physics at Ball State University and chair of the APS Forum on Education. This article originally appeared in the Forum on Education newsletter.

Election Results *(Continued from page 1)*

become aware of the value and excitement of our discoveries, which enrich society both materially and intellectually," he said.

General Councillors

Daniel Auerbach received B.S., M.S., and Ph.D. degrees in physics from the University of Chicago. He held research positions at the FOM Institute for Atomic and Molecular Physics, Amsterdam, and the University of Chicago and served on the faculty of the Johns Hopkins University before joining IBM in 1978. His research interests center around the dynamics of gas surface interactions, including the determination of potential energy surfaces, the study of energy transfer processes, and the investigation of the detailed mechanisms of chemical processes on surfaces.

Auerbach has a broad range of professional activities. He served as an associate editor of *Chemical Physics Letters* and is currently on the editorial board of *Surface Science Reports and Applied Physics.* He served in various capacities in the American Chemical Society, including Chairman of the Division of Physical Chemistry. He is a member of the American Vacuum Society, the American Chemical Society, and is a Fellow of The American Physical Society.

In his candidate's statement, Auerbach identified his chief goal as strengthening and initiating new activities for the APS aimed at defining, expanding and communicating the value of physics and physicists to society as a whole. He believes this is especially important to meet the difficult challenges facing the physics community today. This does not imply abandoning basic research in favor of more directed research. "Basic research is an essential component of the value physics provides," he said. "But it does mean forging new relationships among the broad constituency represented in the Society: physicists in academia, government labs and industry."

Donald Hamann received his B.S. in 1961, and his Ph.D. in 1965, both from the Massachusetts Institute of Technology. He promptly joined the Theoretical Physics Research Department at AT&T Bell Laboratories, and was appointed head of that department in 1979. He assumed his present position as head of the Surface Physics Research Department in 1981.

Hamann's initial research was in many body physics, with a focus on the low temperature properties of dilute magnetic alloys. He has also made contributions to the subjects of intercalated graphite, oxide superconductors, and quantum Monte Carlo theory. Hamann was awarded the Davisson Germer Prize of the APS in 1979 for his research on the electronic structure of surfaces, and served on the Executive Committee of the APS Division of Condensed Matter Physics. He also served on various program committees and review panels, and chaired the Panel on the Theory of Surfaces of the DOE Council on Materials Science.

In his candidate's statement, Hamann called for a more substantive APS response to the crises in physics employment and research support, maintaining that many proposals focus primarily on improved public relations. "The academic, governmental and industrial constituencies which underwrite our activities have a legitimate self-interest in our results. Like it or not, their needs form a context for our research," he said. He does not believe that choosing research directions that addresses the needs of those constituents will prove detrimental to basic research; rather, it will expand the range and diversity of fundamental problems to which the methodology of physics can be applied. Providing graduate students with such a context for their thesis research can help prepare them for a broad range of career options.

Susan Seestrom received her Ph.D. in experimental nuclear physics from the University of Minnesota in 1981. She did post-doctoral research at Los Alamos National Laboratory from 1981-1983 and at the University of Minnesota from 1983-1986. In 1986 she returned to Los Alamos as a technical staff member, where she has remained until the present time. Her research interests include weak interaction nuclear physics, fundamental symmetries studied using neutron beams, nuclear structure and reaction mechanism.

Seestrom was a member of the Executive Committee of the APS Division of Nuclear Physics from 1993-1995, and a member of the DNP Program Committee from 1986-1988. She has also been an active user of the Los Alamos Meson Physics Facility, serving on the Board of Directors of the LAMPF Users' Group from 1990-1992.

In her candidate's statement, Seestrom identified the lack of support and understanding of the importance of basic research in science by the general public and government as the most important issue facing the APS. "It is essential that we...convince non-specialists of the value and interdependence of basic and applied research," she said, calling for improved educational efforts and increased participation by women and minorities to achieve that end, as well as less infighting between the subdisciplines of physics. "If we demonstrate through our actions that we do not appreciate the science being pursued by our colleagues, it will be difficult to persuade the public of its importance."

Ronald Walsworth received a B.S. in physics from Duke University in 1984, and a Ph.D. in physics from Harvard University in 1991. In 1991 he joined the Smithsonian Astrophysical Observatory where he is now a staff physicist.

His research interests cover a wide range of basic and applied topics. He currently heads a research group working on the following problems: the development of improved atomic clocks; the experimental investigation of low temperature atomic and condensed matter physics; searches for physics beyond the Standard Model through precise tests of physical laws and symmetries; and the development and application of new tools for biomedical imaging and spectroscopy.

Walsworth identified four main goals he deemed important for the APS in his candidate's statement: further improving communication between the physics community and Congress and the general public; fostering analysis, discussion and action regarding the career problems facing all scientists; continuing to publish highly regarded journals and to hold top quality conferences; and working to break down barriers to multi- and cross-disciplinary research. "Some of the most exciting work today in both fundamental and applied science involves the crossing and merging of disciplines," he said. "It is vital to eliminate barriers within funding agencies and research and educational institutions to such efforts."

Ballot Survey Indicates More APS Members Are Going Electronic

APS members are making greater and more frequent use of electronic services such as email and the World Wide Web, but are less familiar with emerging electronic preprint servers, according to the results of a member survey that accompanied the 1995 general election ballots earlier this year.

The APS began including survey questions on the annual election ballot last year, when the company that provides the service, Interactive Computerized Elections (ICE), offered the feature at no additional cost, depending on available space. "Since the electronic capabilities of our members are changing quickly and are important to the services we offer, the APS officers and staff decided to include questions that would give us data to guide us towards improving member services," said Tracy Alinger, APS information services manager. Last year the ballot survey feature was used to determine how many APS members used electronic mail, and to update their email addresses.

More than 9,000 members responded to the survey. Eighty-three percent of the respondents said they had accessed electronic mail to and from the Internet, and 78 percent did so on a regular basis. Nearly 67 percent of respondents had accessed the World Wide Web, with 44 percent regularly using the service, and similar percentages used electronic ftp services. However, only 30 percent had made use of electronic preprint servers, with 13 percent using them regularly.

Nearly half (47 percent) of the respondents regularly use Windows PC systems, with MacIntosh and UNIX workstations ranking second in popularity, each used by 37 percent of respondents. Only 19 percent said they used PCs with DOS only. Apparently a number of members use more than one computer system since the total of the above numbers exceed 100 percent.

The ballot survey also included a box that members could check to request that information be sent to them on either *Physical Review Letters online* or the members-only version of *Physical Review B Rapids.* Both electronic products have recently been introduced by the APS (see *APS NEWS, February 1995*). Twenty-five percent requested *PRL-o* information and 12 percent requested *PRB-RC* information. Alinger emphasized that the confidentiality of the ballots was not compromised by doing so. "We never saw the actual ballots," she said. "ICE merely sent us a set of labels for those who requested information."

Schrieffer *(continued from page 2)*

A: Personally, I believe that science must be internationalized, not only on large-scale projects, but on small-scale research as well. However, it is difficult for the APS to address this issue, because it relates to the future of a specific field, and most fields identify first with their own house, and then with the APS. It's a shame when a particular subfield of physics feels much more tightly bound to itself than to the body politic of physics as a whole.

Science, at least historically, has not been like the professions. We've traditionally been interested in the good of the field rather than the practitioners of the field, although we try to take care of our own generally, because doing so benefits physics. John Bardeen was able to move between applied physics and fundamental physics with ease, and without any judgment as to which was the best. In fact, I think he felt the best physics was that which transcends these compartmentalizations.

Q: The APS recently formed the Forum on Industrial and Applied Physics to give its members employed outside of academia an official voice in the Society. Should more be done to foster better ties with industry?

A: There has been this feeling for a long time among physicists in corporate environments that the APS is dominated by basic academic scientists who look down their noses at applied and industrial research. I don't think this is true, but the APS hasn't pushed hard enough to serve them, and I think this is an important area. I feel very positively about our efforts to date in this area, but the Society has a long way to go, so that not only do our industrial members feel welcome, but also that they benefit from their involvement in the APS.

Q: The emergence of electronic publishing is raising serious questions about the future of APS journals. What should the Society be doing to address this issue?

A: Most of the Society's income derives from its publications. While the APS is developing electronic versions of its journals, the prevailing concern is how to maintain subscriptions and avoid having someone post *Physical Review Letters* on the World Wide Web, for example, providing universal access free of charge. It's a very real concern.

I think that if we're going to have a viable Society in the future, we must find areas to serve the members which are over and above publications and meetings. We must think creatively about what businesses the APS will be involved with 8 to 10 years from now, and how it will serve its members. If we don't address this issue, time will overtake us. Still, in general I feel very good about the future.

The American Physical Society

NOMINATION BALLOT

Council and Committee Positions

(To be Completed by Members of the Society Only)

(Please Attach Appropriate Supporting Biographical Documentation)

For Vice-President

Nominee: **Affiliation:**

For General Councillor

Nominee: **Affiliation:**

For Chairperson-Elect, Nominating Committee

Nominee: **Affiliation:**

For Membership on the Nominating Committee

Nominee: **Affiliation:**

(Continued on Reverse)

NOMINATION BALLOT

Council and Committee Positions *(continued)*

For Chairperson-Elect, Panel on Public Affairs

Nominee: **Affiliation:**

_____ _____

_____ _____

_____ _____

_____ _____

For Membership on the Panel on Public Affairs

Nominee: **Affiliation:**

_____ _____

_____ _____

_____ _____

_____ _____

Signature and Address of Nominator

_____

_____

_____

Please Address your Envelope to:
The American Physical Society
One Physics Ellipse
College Park, MD 20740-3844
Attn: Amy Haltsed
(301) 209-3266
fax: (301) 209-0865
email: halsted@aps.org

The deadline for receipt of this ballot is 3 February 1996.

Nomination for APS Fellowship

(continued)

Nominee's most significant contributions and principal publications (list four publications):

_____

_____

Suggested Citation to Appear on Fellowship Certificate if Nomination is Approved (30 words or less):

_____

_____

_____

_____

Supporting Paragraph Enlarging on the Citation and Indicating the Originality and Significance of the Contributions Cited:_____

_____

_____

_____

Sponsor's Data (Each nominee must have two sponsors who are members of the APS.) **(PLEASE PRINT):**

1 Sponsor's Name:_____ Signature:_____

Sponsor's Address:_____

Sponsor's Recommendation: _____

_____

_____

2 Sponsor's Name:_____ Signature:_____

Sponsor's Address:_____

Sponsor's Recommendation: _____

_____

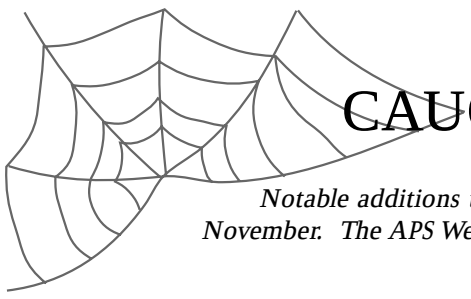
_____

3 Additional Information Required: (a) Curriculum Vitae or Biographical Information; (b) Supporting Letters

PLEASE NOTE: To facilitate this nomination, be sure you have answered every question. Enclose original and duplicate of nomination form.

For information on deadline dates for specific units consult the APS WWW Home Page (http://aps.org) under the Prize, Awards & Fellowship button, or call the APS Honors office at (301) 209-3268.

ANNOUNCEMENTS



CAUGHT IN THE WEB

Notable additions to the APS Web Server for the month of November. The APS Web Server can be found at http://aps.org

Access Information:
APS News Online-login as **apsnews** with new password of **F=ma**

***APS Member Directory* Search**-login as **directory** with new password of **F=ma**
Note: logins and passwords are case sensitive.

New/Updated Links:

Honors
- 1996 Prizes and Awards
- 1995 Fellows with Citations

Units
- DCMP Public Interest Articles
- History of Physics Newsletter

Meetings
- 1996 March Meeting Housing Bulletin Board

Miscellaneous
- CRDF for the Independent States of the FSU
- Challenge to Scholarly Surveys
- On Belonging to the APS

Now Appearing in RMP...

Reviews of Modern Physics ***is a quarterly journal featuring review articles and colloquia on a wide range of topics in physics, as well as a listing of review articles appearing in other journals and serial publications. Titles and brief descriptions of the articles in the January 1996 issue are provided below. Reprints of individual articles may be obtained by sending a written request to the American Institute of Physics, Attention: Circulation and Fulfillment Division, 500 Sunnyside Boulevard, Woodbury, NY 11797-2999.***

Quantum Nondemolition Measurements: the Route from Toys to Tools. V.B. Braginsky and F.Ya. Khalili describe recent experiments that demonstrate the feasibility of quantum nondemolition (QND) measurements in quantum optics, and discuss some fundamental physics problems to which QND methods could be applied.

Strongly Correlated Fermions: the Local Impurity Self-Consistent Approximation. Antoine Georges, Gabriel Kotliar, Werner Krauth and Marcelo J. Rozenberg describe recent progress in the study of strongly correlated systems through the construction of a consistent dynamical mean-field theory, based on a mapping of lattice models onto quantum impurity models.

Sub-Poissonian Processes in Quantum Optics. Luiz Davidovich describes the basic concepts and main experimental achievements to date in the emerging field of nonclassical sources of light in quantum optics. He also presents recent derivations of the laser theory which allow him to analyze systematically four strategies for achieving quantum noise reductions in lasers and masers.

Phase Diagram and Correlation Exponents for Interacting Fermions in One Dimension. Eugene B. Kolomeisky and Joseph P. Straley discuss aspects of one-dimensional, interacting Fermi gas that are of interest in higher-dimensional materials, especially the cuprate superconductors.

Nonlinear Dynamics of Radiative Condensations in Optically Thin Plasmas. Baruch Meerson describes recent progress in understanding the process of radiation condensation in plasmas, using reduced nonlinear models which illuminate a wide variety of condensation phenomena, including bubble formation, shock-wave propagation, and singularity development.

Decay Widths and Total Cross Sections in Perturbative Quantum Chromodynamics. Levan Surguladze and Mark A. Samuel review the status of very-high-order perturbative calculations for several important quantum chromodynamic cross-sections and decay widths, as well as discussing ambiguities in the renormalization scheme and scale dependence of expansions in the strong coupling.

RMP Colloquia. This section contains short, broadly accessible articles describing recent research at the frontiers of physics, particularly those concepts that link many different subfields of physics.

Sputtering of Ices in the Outer Solar System. R.E. Johnson discusses the differing physical processes of the sputtering of particles from icy surfaces, and the consequences for plasmas, atmospheres, and surfaces of the far planets.

STOP!
THINK!
NOMINATE!

Which of your APS member colleagues do you admire most? Who shares your views and concerns? Who has the best combination of knowledge and experience to represent you, and lead the APS in the right direction? Well, why not nominate the person (who could be you) to be a candidate for an elected position in the APS?

The Nominating Committee depends on APS members to propose candidates for positions elected by the membership: Vice President, Chair-Elect of the Nominating Committee, and General Councillors; and those elected by the Council: members of the Panel on Public Affairs and of the Nominating Committee.

A nomination form appears on page 9-10. Send your nominations to Amy Halsted, Administrator for Operating Committees, APS, One Physics Ellipse, College Park, MD 20740-3844, phone: (301) 209-3266; fax: (301) 209-0865; (email: halsted@aps.org). Please provide biographical/supporting material on your nominees. The deadline is February 2.

CRDF Announces Cooperative Grants Program

On November 6, 1995, the U.S. Civilian Research and Development Foundation (CRDF) announced a call for proposals for its new Cooperative Grants Program. This program will allow teams of former Soviet and U.S. scientists and engineers to apply jointly for support of cooperative projects in any area of civilian research and development. Teams may apply for $10,000 to $80,000 of funds for a two-year period.

The CRDF intends to allocate over $6 million for Collaborative Grants Program awards. Proposals must be submitted to the CRDF's office in Arlington, Virginia by March 1, 1996. Based on the results of a competitive peer review process, the CRDF Board of Directors will announce the first awards and award levels by July 1, 1996, and will announce all awards by September 1, 1996.

The CRDF is a private, non-profit foundation created in August 1995 as an American response to the ongoing crisis facing science and engineering in the former Soviet Union. The mission of the CRDF is to encourage productive civilian employment alternatives for former FSU defense scientists while providing opportunities for FSU and U.S. scientists to pursue mutually beneficial entrepreneurial R&D activities expected to strengthen market economies and stable democratic regimes in the region.

The creation of the CRDF was originally authorized in 1992 Congressional legislation sponsored by Congressman George Brown of California, then-Senator Al Gore of Tennessee, and Senator Joseph Lieberman of Connecticut. Its imminent creation was announced by President Clinton at the May 1995 Summit Meeting in Moscow.

The CRDF's initial funding derives from a $5 million allocation from the Department of Defense's "Nunn-Lugar" program to promote demilitarization in the FSU and from a matching $5 million gift to the National Science Foundation (NSF) by philanthropist George Soros. The NSF, as directed by the 1992 legislation, used these combined funds to establish the CRDF, and also appointed its Board of Directors.

For more information on the CRDF Cooperative Grants Program, please contact the U.S. Civilian Research and Development Foundation, 1800 North Kent Street, Suite 1106, Arlington, Virginia, 22209; Phone: (703) 526-9720; Fax: (703) 526-9721; email: information@crdf.org; WWW: http://www.internext.com/crdf.

THE BACK PAGE

Looking Ahead: It's Time To Defend All of Scientific Research

by Martha Krebs

As I write this, it is Thanksgiving eve here in Washington, DC. Most federal workers have just returned from a forced vacation following the battle between the Republican Congress and the White House over a framework for balancing our nation's budget by the year 2002. Although many of our colleagues in other science agencies were among those on furlough, the Department of Energy (DOE) operated on carry-over funds and the Energy and Water Development Appropriations bill signed by President Clinton on November 31, 1995.

Although the budget battles over the FY1996 programs are not finished, it is a good time to reflect on them and to look forward to what the coming year may bring. The DOE spent much of 1995 fighting for its existence and caught up in the freshmen Republican members' zeal for reducing the number of cabinet agencies. In large measure, the energies of Energy Secretary Hazel O'Leary and her immediate staff were absorbed in that contest, and it looks like we have survived to fight another year.

Below that grand scale, different DOE programs have been under different levels of support and attack. Our energy technology programs for efficiency and renewables have been caught up in the controversy that support for applied research is corporate welfare by another name, and look like they will be reduced by approximately 30 percent. Our atomic weapons programs with their focus on science-based stockpile stewardship and a recommitment to the three weapons laboratories have been well received and are increased above the President's request. Our massive program to repair the environmental damage at former weapons' sites faced serious scrutiny, was reduced below its request level by $300-$400 million, but also received $50 million for a peer-reviewed basic science program.

Although the general state of DOE may be interesting, I know that when physicists think about DOE, they usually think about the Office of Energy Research — the home of basic science in the DOE, the investor in major scientific user facilities that provide vital infrastructure to thousands of researchers supported by industry and other federal agencies. In our case, it's been a mixed year. Our FY 1996 request went to Congress at $2.7 billion and came back at $2.5 billion.

High energy physics has been reasonably treated, up $40 million from FY 1995 but $20 million below the original DOE request that would have honored the HEPAP recommendations. We will go forward with discussions for U.S. participation in the Large Hadron Collider, in collaboration with the National Science Foundation.

Nuclear physics was reduced $10 million below our request and continues to languish. The RHIC project was cut $5 million for budget balancing purposes only. As a result, we expect the total project costs to increase about $20 million and stretch project completion by six months to one year. As NSAC is about to deliver its long-range plan to a $325 million budget projection, Congress is giving Energy Research a discouraging message that will likely bring some tough decisions in the next few years.

"Another problematic action by Congress is the dramatic reduction of the fusion energy program. Reduced by one-third…"

More positive was the message to the Basic Energy Sciences programs where increases for operation and instrumentation at the major synchrotron and neutron scattering facilities was strongly supported. New programs will also be started for basic research that supports the Partnership for a New Generation of Vehicles and environmentally sound materials and chemical processes.

Our environmental programs faced some early challenges as "claptrap" science by some members of Congress, but our appropriators recognized the quality and independence of DOE's investigators in our global climate and ozone research programs. By comparison to some of the other agencies who support work in these areas, Energy Research was well treated. The irrationality of these attacks in the face of peer-reviewed programs is frustrating to everyone involved, but especially the staff of the federal science agencies. They have worked hard through different administrations with changing political perspectives to establish programs and bring scientific results forward that illuminate policy decisions, but do not reflect the political views of individual scientists. The cheap shot attacks by politicians and scientists who have not been subject to peer review in these fields are deeply distasteful to me.

Another problematic action by Congress is the dramatic reduction of the fusion energy program. Reduced by one-third from $363 million to $244 million, the program must be fundamentally restructured away from a time-driven effort. What the character and scope of the new program should be is a tremendous challenge to the fusion and plasma scientists. Personally I think the Congressional action was unwise, foolish and tragic in the face of what we know will be the energy requirements of the U.S. and the world by the middle of the next century. It is also a tragedy for many individuals who have had a profound commitment to making fusion energy happen. A cut of this size, a shift in direction this sudden, will leave human and scientific wreckage; there is no avoiding it. In spite of this, Congress has made a clear statement and its FY 1996 funding level is based on the expectation that the restructured fusion science program will cost significantly less in the future. This is not the time for denial, delay or recrimination. It is a time for imagination.

"This is a time for defending all of science, not particular fields and institutions."

So what do we make of all this? What can we expect next year? What should we do? As a member of President Clinton's administration, I believe that we have made a strong commitment to federal investments in science and technology that should both drive the economy and protect the environment. These investments must also sustain our leadership in world-class science, math and engineering based on peer review. Having said this, we face a period where the federal science investment is not likely to grow with inflation. This is in spite of good words from the Republican Congressional leadership. The budget agreement between Congress and the President will put more pressure on the discretionary parts of the Federal budget.

There is no way that the science budgets will not be more deeply scrutinized than they already have been by both Congress and the Administration. The NSF and the National Institute of Health will undoubtedly receive favored treatment, but growth will be harder and harder to come by. The basic research programs in DOE, NASA, and the Department of Defense will continue to be squeezed, and defending the important benefits received from these investments must receive the attention of professional societies, not just divisions representing subfields. Funding that leaves programs like fusion will not go to other areas of science. Funding that leaves national laboratories will not go to other areas of science. Funding cut from applied research will not be added to basic science.

This is a time for defending all of science, not particular fields and institutions. This is a time for articulating the benefits our nation has received from its investments in science and scientists. It is a time for speaking to all of our public representatives, federal and local, and especially when they are not based in Washington, DC. This is a long-term job that will not take place in D.C., nor will it be finished once we know the final determination for the budget for FY 1997.

Martha Krebs is the Assistant Secretary of Energy Research, Office of Energy Research, at the U.S. Department of Energy.

The Back Page is intended as a forum to foster discussion on topics of interest to the scientific community. Opinions expressed are not necessarily those of the APS, its elected officers, or staff. APS NEWS *welcomes and encourages letters and submissions from its members responding to these and other issues. Letters must be signed and should include an address and daytime telephone number. The APS reserves the right to select and to edit for length or clarity. All correspondence regarding* APS News *should be directed to: Editor,* APS News, *One Physics Ellipse, College Park, MD 20749-3844, or email: <letters@aps.org>.*