APS NEWS

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APS 1998 March Meeting

The 1998 APS March Meeting will be held 16-20 March 1998 at the Los Angeles Convention Center in Los Angeles, California. It is the largest and most varied of APS meetings. Eight APS divisions, three topical groups, and five forums will participate, representing the fields of condensed matter and materials physics, high polymer physics, chemical physics, biological physics, laser science, fluid dynamics, computational physics, instrument and measurement science, statistical and nonlinear physics, shock compression of condensed matter, and industrial and applied physics. There will also be sessions on international physics, physics history, education, and women and minorities in physics.

A list of invited speakers will be available on the APS Meetings homepage. This year there will be more than 90 invited symposia and over 550 invited speakers. Last year, contributed and invited submissions totaled over 4,500 papers, and the APS anticipates an even higher number of submissions for the 1998 meeting.

Focused technical sessions will be organized around such topics as magnetic field effects on biological systems and others areas of interest in biophysics; the chemical physics of photosynthesis; clusters, liquids and proteins; femtosecond surface dynamics; spectroscopy at high magnetic fields; and such areas of materials physics as nitride semiconductors, ferroelectric materials, and intragranular defects in high-temperature superconductors. A complete listing and descriptions of the various focused sessions in each field can be found in the October 1997 issue of *APS Meeting News*.

Because of the success of the electronic abstract submission process initiated two years ago, the complete program for the meeting will be available to the membership much earlier than it was when paper submission was the only option. Look for the 1998 March Meeting program to be posted on the APS home page by 15 January 1998, a full two months prior to the meeting itself. This will enable attendees to create their own schedule in advance and take advantage of reduced airfare by booking their flights earlier.

In addition to the regular technical program, the Division of High Polymer Physics will offer a two-day short course on *Challenges in Polymer Research for Microelectronics Technologies*. There will also be eight tutorial sessions offered on Sunday, March 15, prior to the start of the regular meeting. Tutorials are designed to give the attendees practical applications of a diverse set of tools, technology and theory. Topics will include vacuum gauging using total pressure measurements, fractile biology and chaos in medicine, fullerenes, quantum wires and dots, advances in microscopy, the physics and applications of magnetoresistance, and quantum computations. See the *APS Meeting News* insert for course and tutorial descriptions, as well as information on how to register.

APS Publication Oversight Committee Participants

The POC met on September 25 and considered such issues as prices for member subscriptions and plans for a new electronic journal.

Counter clockwise from right front: Alan Goldman (POC chair), Marty Blume (APS Editor-in Chief), Tom McIlrath (APS Treasurer), David Hertzog (POC member), Robert Kelly (Director of Journal & Information Services), Mina Chung (Assoc. Publisher), Stan Brown (Administrative Editor), Alan Chodos (POC member), Noemie Koller (POC member), Amy Halsted (Administrator of Operating Committees), Judy Franz (APS Executive Officer), Marty Goldman (1998 POC chair), Reid Terwilliger (Director of Editorial Office Services). Not in picture: John Wilkins (POC past chair).

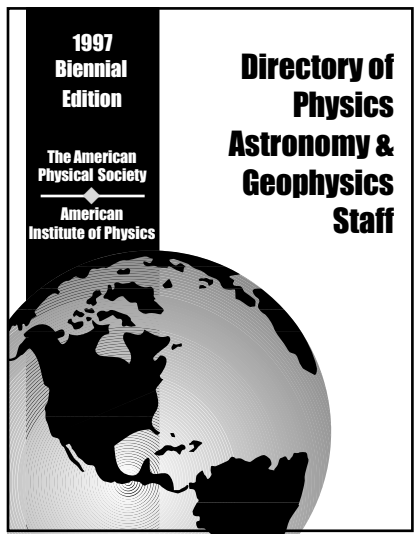
Inside...

APS President Urges Congress to Support Neutron Science

D. Allan Bromley (Yale University), APS president and former science advisor to President George Bush, sent a letter to Senator Alfonse D'Amato (R-NY) and Rep. Michael Forbes (R-NY) in response to their submission of companion legislation (S. 1140 and H.R. 2384) calling for the permanent closure of the High Flux Beam Reactor at Brookhaven National Laboratory, one of only four major neutron scattering facilities in the US Calling the action "unwise and unwarranted," Bromley also sent copies of the letter to all members of the House and Senate Energy and Water Development Appropriations Subcommittees.

In his letter, Bromley asked for the support of D'Amato and Forbes in convincing Congress of the necessity for a strong program in neutron science to maintain US status as a technological leader. He described Brookhaven as "one of the gems of our nation's scientific enterprise," and the High Flux Beam Reactor in particular as an "integral part" of the laboratory's program. He added that should Congress approve the legislation, "It is urgent that Congress provide the Department of Energy with the financial resources necessary to move forward rapidly with the development and construction of new neutron science facilities and upgrades of other existing facilities."

Bromley enclosed a copy of the statement adopted by the APS Council in April 1997 (see *APS News*, July 1997) and distributed to Congress on neutron scattering facilities, which stresses the critical role that neutron science plays in a wide range of technologies across many fields. The APS statement also called attention to the loss of American leadership in this area of research, and the risks that the nation will face if the problem is not soon redressed.



DPAGS Sent to Membership

The 1997 AIP Directory of Physics, Astronomy and Geophysics Staff (DPAGS) was distributed to all APS members in September. DPAGS is a useful compilation of over 2000 institutions and organizations employing physicists. DPAGS is a supplement, NOT a replacement, to the APS Membership Directory, which should be retained until reissued in spring 1998. DPAGS' organization-based structure means that some APS members may not be listed while some non-APS members are included.

Distribution of DPAGS was delayed several months because of problems with the printer, according to AIP. Members not receiving their copy or correcting contact information should contact AIP at: dpags@aip.org. A regularly updated online version of DPAGS will be accessible through the APS Homepage [www.aps.org].

Highlights from PC'97 Meeting

Computation at the Physics Interface

The annual International Conference on Computational Physics (PC'97) was held 25-28 August 1997 in Santa Cruz, California, highlighting basic and applied computational physics and its applications worldwide to the university, industrial and laboratory communities. The conference was the first to be jointly sponsored by the APS Division of Computational Physics (DCOMP), and the APS Forum on Industrial and Applied Physics (FIAP). The International Union of Pure and Applied Physics and the European Physical Society were additional co-sponsors. The scientific program consisted of seven half-day sessions of review, invited and contributed papers, and also featured several tutorials on applications and methods of computational physics, as well as a Wednesday evening banquet featuring Paul Horn, vice president of research at IBM, as the keynote speaker.

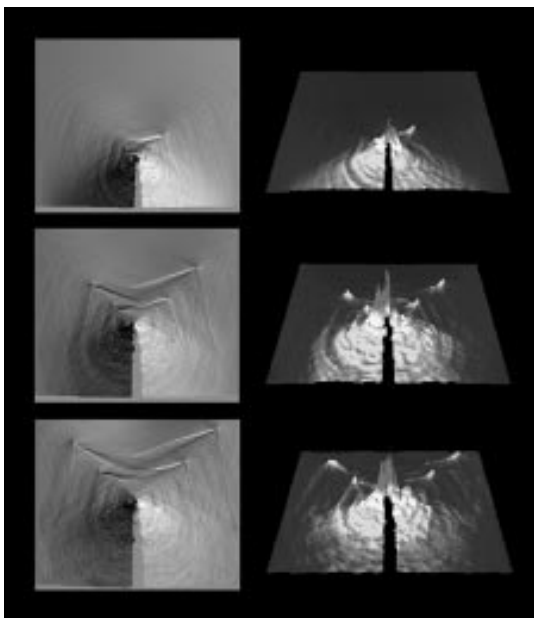
Plenary speakers were selected from the broad-based constituency of computational physics: academia, industry and government laboratories, according to Barry Klein (University of California, Davis), then chair of DCOMP. "The plenary talks illustrated the robust interaction between the various scientific communities regarding research problems of interest, and the increasing opportunities for cooperative work between the different constituencies," he said. "In the field of computer modeling especially, there is a blurring of the 'basic' and 'applied' physics interface. This was very apparent at PC'97, and to my mind it is very healthy for physics." Klein added that feedback from the meeting was "very positive," and there are plans to continue this multidisciplinary computational physics meeting, probably two years from now.

On Monday morning, John P. McTague of Ford Motor Company addressed the use of high-performance computing in the automotive industry, including such applications as computer-aided vehicle design, crash simulation, modal analyses of vehicle vibrations, computational fluid dynamics, and air quality modeling. In the future, "Ultimately, production and manufacturing prototypes will rely completely on simulation," said McTague, adding that economic globalization will demand simulation of products and processes specifically tailored for local markets, and distributed computer systems will link a distributed automotive work force.

In the same session, Francisco Leon of Intel spoke of the electronics industry's need for a significant improvement in the sophistication of its processes and device simulation capability, driven by both technological and economic forces. Specifically, as transistor sizes approach limits imposed by material properties, and process control becomes impacted by atomic level variation, the industry is turning to more fundamental atomistic/modeling approaches of the physics and materials science communities, according to Leon. He added that innovations in basic algorithms and modeling methodologies are essential to the development of integrated circuit technology.

According to Lawrence Schwartz of Schlumberger-Doll Research, who spoke Tuesday morning, problems involving transport in porous media are of interest throughout the fields of petroleum exploration and environmental monitoring and remediation, especially those involving the flow of electrical current, viscous fluids, or fine-grained particles, as well as nuclear magnetic resonance, which is controlled by diffusion in the pore network. Schwartz described the development of two and three-dimensional models of porous media and the calculation of their physical properties, as well as the direct measurement of the pore structure by synchrotron X-ray microtomography.

On Wednesday morning, David DiVincenzo of IBM gave a general overview of recent advances in the theory of quantum computation, in which computation is performed not by a sequence of elementary boolean logic operations applied to a set of bits, but by a sequence of elementary unitary transformations applied to a set of quantum two-level systems. According to DiVincenzo, recent advances in quantum-computing algorithms have focused on finding speedups for classical mathematical problems, the most celebrated example of which is the prime-factoring quantum algorithm of Shor. But others have been pursuing the capability of quantum computers to efficiently emulate the real-time evolution of any other locally-interacting many-particle quantum system.



Later in the session, J. Maynard of the Defense Advanced Research Projects Agency (DARPA) described a new program in ultrascale computing to explore the domain of innovative computational models, methods and mechanisms — an effort to reach beyond the silicon digital paradigm by encouraging a complete rethinking of computing. "Development of these advanced computing technologies will offer spectacular performance and cost improvements beyond the threshold of traditional materials and processes," said Maynard.

Uzi Landman of Georgia Institute of Technology described simulations for the nanoscale regime during Thursday morning's plenary session. Specifically, Landman described classical and quantum mechanical modeling and simulation methodologies, as well as studies of nanoscale materials systems and phenomena. The latter included generation mechanisms of nanowires and their various properties; structures and thermodynamics of nanocrystals and their superlattice assemblies; simulations of the structure and rheology of nanotribological systems; and the evolution of physical and chemical properties of materials clusters.

Later in the session, Klaus Jensen of MIT described his methodology for linking different length scale models for the chemical vapor deposition (CVD) of thin films, an important reactive processing step in the fabrication of thin film composites for electronic and optical applications. "The complex coupling of transport phenomena with gas-phase and surface chemical kinetics on different length scales implies that more than one type of modeling approach is needed to understand the entire CVD process," he said.

Ray Selected as Ramavataram Fellow

Dr. Ranjan Ray, a reader (associate professor) in the Department of Physics at St. Xavier's College, Calcutta, arrived in the US in July to spend a year as the fifth APS Kilambi Ramavataram Fellow. The Ramavataram Fund was established in 1983 through donations from the family and friends of Dr. Kilambi Ramavataram, an Indian-born teacher and researcher in nuclear and molecular physics who died in 1977. Its aim is to improve undergraduate physics teaching in India by allowing outstanding Indian physics teachers to visit institutions in North America, to observe and study teaching methods. Recipients are named by a Ramavataram fellowship selection committee in India.

Ray is spending the first nine months of his visit in Michigan State University's Department of Physics, and will spend the final three months at the Lawrence Berkeley National Laboratory. At MSU, he is taking part in developing and implementing an introductory-level general physics course called "Multimedia Physics." Instead of attending lectures, students will learn the material from a Website, using their respective computers. Each can then follow the course according to their convenience and pace of understanding.

"Apart from text, the material we present online includes simulations and animations, both interactive," said Ray, adding that it also includes online video of live experiments and phenomena, including sound. Other interesting features include individualized home-work problems, with the software giving "hints" tailored to mistakes made by the student.

At Berkeley, the medium and the tools of the work will be similar, but the challenge will be at the "content" level — to cull matter from postgraduate/research level physics of particle beams in accelerators that may interest upperclass physics majors and beginning graduate students. Ray will also prepare a multimedia presentation to attract more to this field. This is a project funded by the APS Division of Physics of Beams. Ray expressed appreciation for the exposure to a wide variety of physics educational software during his fellowship tenure, which he hopes to make available of students back in India. "They take learning to a higher order of magnitude," he said, adding that physics teachers in India are becoming aware of this mode of instruction.

Ray received his PhD in solid state theoretical physics from the University of Oregon in 1978, with a thesis on observable properties of crystalline electrons in magnetic fields. In addition to his position with the physics department at St. Xavier's College, he is a part-time lecturer at the college's Computer Centre, which he helped establish in 1985. He has also served as a member of the editorial committee of *The Physics Teacher*, published by the American Association of Physics Teachers.

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Clinton Nominates Physicists for Key OSTP Positions

In August and September, President Clinton nominated two APS Fellows, Duncan Moore and Arthur Bienenstock, for key positions in the Office of Science and Technology Policy (OSTP). The OSTP was established in 1976 under the National Science and Technology Policy, Organization and Priorities Act.

Duncan T. Moore, a former APS Congressional Fellow, was nominated in August as the Associate Director for Technology in the Office of Science and Technology Policy (OSTP), Executive Office of the President. The Associate Director for Technology is responsible for setting federal policies that strengthen private incentives to develop and use productive new technology and to ensure a balanced portfolio of federal applied research in partnership with businesses and universities.

Moore is the Dean of the School of Engineering and Applied Science at the University of Rochester. He has also served at the Institute of Optics at the University of Rochester since 1974 as Assistant Professor, Associate Professor and presently as the Kingslake Professor of Optical Engineering. He has an extensive background in science and technology policy, both in scientific research and industrial applications of technology, and is the President and founder of the Gradient Lens Corporation, Rochester, New York.

In 1996 Moore completed service as President of the Optical Society of America, and in 1990 he served as Chair of NASA's Hubble Telescope Independent Optical Review Panel. From 1993 to 1994, Moore served as a Congressional Science Fellow in the office of Senator Jay Rockefeller through the APS fellowship program. He received a B.A. in Physics from the University of Maine, and an MS and PhD in Optics from the University of Rochester.

In September, President Clinton announced his intent to nominate Arthur Bienenstock as the Associate Director for Science at OSTP. The Associate Director for Science is one of the Administration's key positions in the area of science along with the Director of the National Institutes of Health and the Director of the National Science Foundation. The Science Division strives to maintain US global leadership in science, mathematics, and engineering. This division also participates in setting federal policies related to some of the most important health, agriculture, energy, education, and national security issues.

Bienenstock is the Director of the Stanford Synchrotron Radiation Laboratory, Stanford University, where he also serves as Professor in the Departments of Materials Science and Applied Physics. In addition, he has served as Vice Provost for Faculty Affairs at Stanford and was Stanford's first faculty affirmative action officer. Over the years he has been a member of many distinguished advisory committees, has organized major national and international conferences, and has been awarded distinguished research fellowships.

Currently, Bienenstock is serving as a Member on the National Research Council on Condensed Matter and Materials Physics of the National Academy of Sciences. For a number of years he was the Vice Chairman of the Board of Trustees for the Cystic Fibrosis Foundation. Artie has also been generous with his time for the APS. He served on APS Council from 1993-1996 and on the Committee on Applications in Physics (CAP). Bienenstock received a B.S. and an MS in Physics from Polytechnic University of New York and a Ph.D. from Harvard University in Applied Physics.

zero gravity

OUR FUTURE SCIENTISTS

The following are all quotes collected from the science exams of elementary school students:

- Water is composed of two gins, Oxygin and Hydrogin. Oxygin is pure gin. Hydrogin is gin and water.
- Some oxygen molecules help fires burn while others help make water, so sometimes it's brother against brother.
- Nitrogen is not found in Ireland because it is not found in a free state.
- When you breath, you inspire. When you do not breath, you expire.
- Dew is formed on leaves when the sun shines down on them and makes them perspire.
- The pistol of a flower is its only protection against insects.
- The tides are a fight between the Earth and moon. All water tends towards the moon, because there is no water in the moon, and nature abhors a vacuum. I forget where the sun joins in this fight.
- Vacuums are nothings. We only mention them to let them know we know they're there.
- Vacuum: A large, empty space where the pope lives.
- Magnet: Something you find crawling all over a dead cat.
- Water freezes at 32 degrees and boils at 212 degrees. There are 180 degrees between freezing and boiling because there are 180 degrees between north and south.
- A vibration is a motion that cannot make up its mind which way it wants to go.
- Many dead animals in the past changed to fossils while others preferred to be oil.
- We say the cause of perfume disappearing is evaporation. Evaporation gets blamed for a lot of things people forget to put the top on.
- To most people solutions mean finding the answers. But to chemists solutions are things that are still all mixed up.
- I am not sure how clouds get formed. But the clouds know how to do it, and that is the important thing.

IN BRIEF

- The APS Texas Section held its annual fall meeting 9-11 October 1997 at the University of North Texas in Denton, Texas. It was held jointly with the American Association of Physics Teachers (AAPT) and Zone 13 of the Society of Physics Students. Friday and Saturday morning featured plenary talks by distinguished speakers on such topics as the application of small accelerators for industrial problems, nonlinear dynamics, industry and physics, quantum optics, atomic physics, novel semiconducting materials, and a status report on materials science in metroplex. This year the meeting was preceded on October 9 by a joint colloquium on ion beam and surface interactions co-sponsored by the Texas Section and the Greater Southwest Implant Users Group. The program was designed to explore several issues in the applied physics of ions at and on semiconductor surfaces, an area of interest for many industrial and academic members of these two groups. The colloquium featured invited talks by representatives from Sandia National Labs, Texas Instruments, Advanced Micro Devices, and Applied Materials.

- The APS Ohio Section held its fall meeting that same weekend at Miami University in Oxford, Ohio, organized around the theme, "Curriculum Development: Beyond the Introductory Course." The meeting was held in conjunction with AAPT's Southern Ohio Section. Invited presentations on Friday afternoon and Saturday morning were featured, covering such topics as using computer simulation to visualize physics concepts; a look at advanced undergraduate laboratories at Miami University; contemporary laboratory experiences in astronomy; and the A-O modulator in undergraduate optical measurements. Friday evening featured an after-dinner lecture by Eugene Hecht of Adelphi University entitled, "Physical Optics in the Everyday World."

- Later in the month, the APS New York State Section held its annual fall meeting, 17-18 October, at Skidmore College in Saratoga Springs, New York. On Friday afternoon, participants heard lectures on general relativity and particle physics, focusing on such issues as quantum gravity and the unity of physics, the discovery of the electron, and the discovery of the top quark. Friday evening's banquet featured an after-dinner lecture by Mary Crone of Skidmore College on "The Scientific Takeover of Cosmology." Saturday morning began with a session on xrays and superconductivity, including such topics as the development of computed tomography, modern use of xrays in diagnostic imaging, and superconductivity in molecular conductors. The meeting closed with an overview of physics at the end of the 20th century by Sam Schweber of Brandeis University, as well as a presentation by MIT's Jed Buchwald on "The Death of the Ether and the Birth of the Microworld."

- Finally, the APS New England Section held its annual fall meeting 24-25 October at Air Force Phillips and Rome Laboratories in Hanscom AFB, Massachusetts. Friday afternoon's session focused on research in the US, opening with an overview on current trends in science policy by Mildred Dresselhaus of MIT, currently president of the American Association for the Advancement of Science. Other topics included geophysics research at the Phillips Laboratory, electromagnetics and condensed matter research at the Rome Laboratory, as well as at the MIT Lincoln Laboratory, and topical information storage, processing and display.

  Saturday morning featured a workshop on physics in industry, with representatives from American Superconductor Corp., Raytheon Co., and Vectron Technologies, among others, presenting an overview of what their companies do and what they look for when hiring new graduates. The meeting closed with a session on marketing high technology, with talks on the development of miniature microphones and new venture start-ups and managing broad research applications. Friday evening's banquet was followed by three special presentations on creativity in physics and technology transfer, the discovery of SAW minimum diffraction cuts, and the discovery of the diode laser.

- The APS is entering into a collaborative effort with the Department of Energy's (DOE) Office of Energy Research to electronically deliver the full text of scientific and technical information found in journals to the desktop computer in DOE headquarters. "This initiative seeks to establish a new paradigm to ensure that the scientific and technical information intended for and contained within journal articles is available to DOE researchers in a more timely and cost-efficient manner," a formal press release announced. Traditionally, the DOE has provided such journals to its researchers in paper format. The first step in this no-cost effort is for the Office of Scientific and Technical Information (OSTI) to make the DOE Electronic Journals Pilot available to DOE Germantown from 1 October of this year through 1 March 1998. The pilot is expected to serve as a mechanism to ascertain the level of interdisciplinary interest in physics based electronic journals beyond the traditional users and subscribers of paper journals. It will also determine what issues and problems exist in the delivery of this information.

- Congress voted to keep the high flux beam reactor at Brookhaven closed for one year. Any restart would be delayed until after 30 September 1998. The DOE is also directed to undertake an environmental impact statement of the HFBR. It can not be predicted at this time whether the reactor will be re-started. (See report on Bromley's letter to Congress on page 1.)

OPINION

APS VIEWS

FAQs About Electronic Abstracts

by Danita Boonchaisri, APS Meetings Department & Adrienne Mosley Vincent, Electronic Publication Specialist


Danita Boonchaisri


Adrienne Vincent

Abstract season is upon us again in the Meetings Department of the APS. With the deadlines for spring meetings looming, we are readying ourselves for the nearly 9,000 abstracts we will receive electronically over the next couple of months. During this time, we will spool, format, sort, acknowledge, organize, read, file, print, copy, and mutilate (just kidding!) an array of physics research from around the world.

So that you can help us, as well as to ensure that you have a trouble-free electronic submission experience, we offer answers to some of the more frequently asked questions about the process:

How do I begin?

The first thing you'll need to submit an abstract electronically is the electronic template or form. You can receive the template by sending an e-mail to **abs-request@aps.org** and including the phrase "Request (meeting ID)" in the body of your e-mail. For example, if you are requesting the template for the March 1998 meeting, you would use the phrase "Request MAR98." In response to this request, you will be sent several files, including a README file, instructional file, and the actual template.

How do I find my meeting ID?

The Calendar of Meetings, found on the meeting page of the APS website and the back cover of the *APS Meeting News* lists meeting IDs next to the meeting name. Meeting ID codes may also be obtained by sending an e-mail message to **abs-info@aps.org**.

What is LaTeX and do I need to know it to be able to submit an abstract?

No, you do not need to know LaTeX to submit an abstract. You may need to know a few LaTeX commands if your abstract includes subscripts, superscripts, Greek letters or mathematical symbols. A list of common LaTeX commands can be found at http://www.aps.org/meet/instruct.html under the *LaTeX Help* heading.

How will I know if my abstract is formatted correctly?

You can test your abstract by using the online abstract tester at http://flux.aps.org. The tester will allow you to view your abstract in its final format. You can also make sure that any LaTeX commands you may have used have formatted properly. Soon, the APS will be offering a web-based submission form so that abstracts can be submitted directly from the web. Watch for future announcements!

What is the length limit for abstracts?

Contributed abstracts are limited to 1,300 characters; invited abstracts are limited to 2,000 characters. This limit includes the title, author listings, footnotes, titlenotes, and the abstract body.

How do I submit my completed template?

After completing your template, cut and paste, or write the completed template into a new e-mail message, and send it to **abs-submit@aps.org**.

How will I know if my abstract has been received?

Within 24 hours of submitting an abstract, you will be notified that we have received a file from you. Within 72 hours, you will be sent a log number assignment. **Please remember:** these automatic notices are sent to the e-mail address from which the abstract was sent.

What if I discover an error in my abstract after I have submitted it, but before the deadline?

You may resubmit a corrected version of your abstract up to the meeting deadline. You should put a note in the Special Instructions field of your corrected template stating that you are resubmitting an abstract and indicate the log number of the abstract that you are replacing. If no Special Instructions are included, we will use the higher-numbered abstract and ignore all previous submissions with the same title and authors.

What if I have further questions?

The following URL is full of helpful advice — **http://www.aps.org/meet/instruct.html**. You can also send us an e-mail at **abs-help@aps.org** or call **301-209-3290**.

Do you still accept paper (mailed) abstracts?

Yes, you may submit a paper abstract. However, if an abstract is submitted on paper, only the title and authors will be printed in the meeting program (BAPS). Paper submissions should be sent to the APS Meetings Department, One Physics Ellipse, College Park, MD 20740-3844. Paper abstracts must be received by the abstract deadline. The APS cannot be responsible for mail delays.

Final Tips

DO NOT WAIT UNTIL THE LAST MINUTE! We cannot stress this enough. Our system becomes quite busy during the last hour of a major deadline. The system traffic can drastically reduce the response time of our server. As a result, e-mail messages, including template requests and log number assignments, are often delayed. Send your abstracts early to avoid delays and aggravation.

Make sure your meeting ID is correct — for example, MAR98, not APSMAR 98 or MARCH98.

Do not delete bracket sets {} or command lines (which start with a "\") in the electronic template. The system requires this information to read the file.

Send only uncompressed and unattached files in ASCII format with line breaks. If your word processing program does not allow you to save with line breaks, you will have to manually insert them. Line breaks ensure that the body of your abstract does not truncate before the abstract is complete.

Make sure your abstract is correct (i.e. spelling of author names, titles, etc). We cannot accept resubmissions or corrections after the abstract deadline has passed.

Send your abstract to the **abs-submit@aps.org** address; do not simply "reply" to the message that included the template.

Good luck!

LETTERS

Budget Numbers Speak for Themselves

I would like to add a few thoughts to the continuing discussion of budget priorities that has appeared in the *APS News*, mainly in reaction to the May 1997 Back Page piece by Senator Domenici. The above talk about science funding vs. entitlements completely forgets about other forms of corporate welfare. The following numbers from World Watch (Jan/Feb 1996) may be of interest:

Net amount the US government paid to manage publicly owned land used by cattle ranchers for grazing livestock in 1994: $76 million.

Amount the US government spent to build and maintain roads through national forests, largely for use of timber companies in 1994: $100 million.

Net amount paid by the world's governments to subsidize their fishing industries in one year $27 billion.

Mineral value of the Mount Emmons molybdenum deposit in Colorado $3 billion. The US government will charge the Cyprus-Amax company for the right to extract and keep this wealth, although the land belongs to the US public.

The numbers speak for themselves. There is clearly room to free up money for scientific research without cutting defense too much and without overdoing the capping of entitlements.

Edith Borie
Institut fur Technische Physik
Forschungszentrum Karlsruhe

Only Lean Budgets Will Encourage Reform

Congressman George Brown, bless his heart, is at it again: talking sense (Back Page, *APS News*, August/September 1997). The problem is, who is listening? He has championed academic science, he has written and spoken eloquently on scientists' needs to relate to their patron society in every way. Brown now clearly shows that excessive federal funding of science has created a "runaway" situation. More research dollars equals more universities chasing those research dollars, which in turn means more PhDs, more demand for money, more proposals, more wasted time, and less money per researcher. It also means less emphasis on education (especially undergraduate) as a result, and hence — you guessed it — more pleas for more money for education.

To fix this, Brown says, "... reform requires the active involvement of the higher education community (HEC)." Having spent 50 years in that group, I know that the HEC has only one value or goal in common: more money for academic science, however it is defined. But Brown has been around long enough to know that "metanoia" without repentence and restitution in action is hollow.

Here is another example of life in the HEC. Every speech by every university president, every analysis, every report of higher education, has harped on the mantra of "Interdisciplinary research" for 40 years. Brown, as an observant sympathetic scientist, has written about it. Yet today, literally billions of dollars of federal bribes later, the HEC is as discipline-dominated as ever.

I write from experience. With a group of colleagues I started the first interdisciplinary graduate program in materials in 1959. The HEC is not intrinsically committed to it in any way.

The forces for real change, based on new ideas, reason, and argument within the HEC are miniscule, weak and pusillanimous. Well-intentioned supporters of reform in the universities have all unwittingly made the problem much worse by providing far too much money, which merely reinforces the status quo. Only lean times will focus the HEC mind on real reform.

Furthermore, no one in Congress has dared to simply demand accountability in objective data from the university for results. Show us your interdisciplinarity in tenured professorships, and we'll reward you. Show us your new broadened undergraduate program in action, and we'll reward you. Quantify for us your coupling to industry in research dollars received, and we'll reward you. No more promises.

Brown's article has the seeds to the correct answer to the problem: less money from the federal governmnt. Thank you, George Brown, for helping us to think the unthinkable questions.

Rustom Roy
Pennsylvania State University

Career Directions

On the opposite page, we have introduced a feature to appear occasionally in *APS News* called ***Career Directions***. *Career Directions* are written by physicists who have recently successfully undergone the process of landing a job. Most articles will focus on changing fields, as is the case of the first article by Hugues Sicotte. Authors will describe why they did it, how they did it, and, often offer practical advice to others contemplating a similar move. *Career Directions* will also be posted under the Career/Employment button on the APS Homepage [www.aps.org].

Please let us know if you find this column useful. For those who have recently gone through a significant career change and would like to have an article considered for *Career Directions*, please contact Barrie Ripin, Editor, *APS News* at: [ripin@aps.org].

Career Directions

Starting a Pyramid

by Hugues Sicotte, National Library of Medicine, National Institutes of Health

Physics graduate education is a pyramid scheme where the upper levels have strong financial and professional incentives to recruit and use people below. When the pyramid scheme fails to add another level, the lower levels of the pyramid must do something else with the education they thought would get them up the pyramid. What can you do with this education? Simple arithmetic dictates that most of us will have to change fields, whether it's a lateral move toward another field of physics or toward another field entirely. This is how I went about making a big change in my career.

New career opportunities start when someone realizes that a physicist can do a job for which there is a shortage of trained people and no formalized training system. The word spreads around and other physicists get into the new field. Eventually within about five years, either all the slots fillup or, for highly growing fields, universities react and produce graduates with the proper training, closing opportunities for career-changing physicists. So one has to either find one's own new opportunities or act quickly. This applies both to physics and non-physics emerging fields.

Lesson 1

Look for fields where there is a large potential for growth, where there is not yet any institutionalized training program, and where some of the skills physicists have are required to do the work.

The first step is to decide what career to pursue. In grad school my excuse for not thinking about this was that if you spend too much time worrying about alternate careers, you'll work yourself right out of a career in physics. While there is wisdom in this, you have to ask yourself: What do I want to have achieved 10-15 years from now? This whole process is very personal, so instead I will concentrate on ways to find out about interesting opportunities.

About one year into my thesis work I saw, as my advisor had warned me, how really bleak the future was. So much for solving the mysteries of the universe and getting paid for it! My first thought was that since I had already invested much time toward my PhD, I should finish my thesis. Many interviews have since convinced me of the wisdom of this.

Lesson 2

A PhD will open more doors, finish it if you've started it.

Many physicists can move toward industrial physics, but for many theorists this is not an option. Although a theorist, I have enough experimental background that I could probably have made the transition using a Canadian program (I am a Canadian citizen) that, for two years, provides half the salary of an academic physicist to make the transition toward industrial physics (http://www.nserc.ca/programs/irfen.htm).

We've all heard of the financial services career path as Quant Jock (see http://www.jpmorgan.com/CorpInfo/Careers/NA/PhD_top.html for career paths info) or computer programmer but I wanted something else. I like science and I want to be part of a world-changing enterprise like the harnessing of nuclear energy or the semi-conductor electronics revolution.

Lesson 3

It's not only what you can do that matters, it's what you want to do.

Near the end of my thesis my funding ran out and I earned money as a teaching and lab assistant in the chemical engineering department. This turned out to be helpful later on as it gave me a base to understand many experimental biology procedures.

Lesson 4

Broaden your skills and acquire marketable skills whenever you can. This means that everybody should use C or C++ at least some of the time instead of FORTRAN.

I kept asking myself where are the jobs?, which field will be booming? Some of the best leads I got were from talking to friends, colleagues, and acquaintances, as recommended many times in stories I read on the Young Scientist Network.

Lesson 5

Ask for advice from people you know.

A friend, working at Bell Labs, is convinced that wireless communications will revolutionize the world. Another friend started doing commercial artificial intelligence (you can start your searches at http://www.ai.mit.edu/) and was convinced that there lies the future. But something else fascinated me even more.

To keep my finger on the scientific pulse of our time, I subscribed to *Science* magazine. What's great about *Science* is that many important scientific articles are summarized so that a physicist can understand a biology piece and vice-versa. One day I read a *Science* special issue about bio-informatics. The more I thought about it, the more I got excited! I could be part of the next revolution that would change humanity, the control of the genetic material! Since there was no unique training path, I could apply my computational and data analysis skills to those problems while learning the required biology. I nevertheless noticed that most people in that field had a biological background and were learning the computing aspects, so I probably needed to learn a minimum of biology.

While questioning discretely (you don't want to be tagged as somebody leaving the field) certain colleagues whose research had some biological connotation, I learned that some of my colleagues were working on a bio-informatics topic in their spare time. I learned as much as I could about their research, and that got me started. I knew I could do that kind of work, and I found a way to make myself valuable from day one. When you're being retrained, somebody has to gamble on you. They are more likely to gamble if they can see the immediate return.

Lesson 6

Use your alma mater and present institution. Researchers in your own institution will usually talk to you, even if you are not in their field.

To find a position, there is no magic. Find out who has money and power to hire you, what they do, and how your skills might be relevant to their needs. Decide what skills you have (or will have) to offer, what you can bring to the work, and what you expect to get. Be ready to explain why you want to change fields.

To find job leads I started by using Lycos, Alta-Vista, and Webcrawler (These services, unlike "best-of" services like Yahoo, index anything they can find on the web) to navigate around. A good trick to find out who has money, and who does what, where, in a field you don't know is to search the funding agencies' web-sites.

Lesson 7

Follow the money trail.

Search the NSF (http://www.nsf.gov/verity/srchawd.htm), DOE (http://www.doe.gov/), NIH (http://www.nih.gov/), and ARPA(http://www.arpa.gov/) web sites for any information on funding and on projects which recently got funded. This is also a great source of ideas for career path changers. This will give you a much better idea of the direction of research than the literature. What is being funded now is what will get published in a few years. Searching these sites will also give you the names, location, and interests of a number of PIs.

Lesson 8

Published is perished; Any published data, web or otherwise, lags behind the knowledge that people have.

So only use the web as a tool to get you in touch with people, to acquaint yourself with what interests them, and to set up visits.

A good clearinghouse of funding and training source for Human Genome Research is (http://www.ornl.gov/hgmis/funding/fund.html). One opportunity for retraining in bio-informatics are the fellowships offered by the Sloan foundation (http://www.sloan.org). See the announcement on page 6. The Sloan foundation policy tries to identify fields were there is a national need and a lack of organized training. This is a very useful to young scientists.

Eventually I got a few leads and a few interviews/visits set up over email. This was somewhat awkward in my case as I was a postdoc in France at the time and I wanted to return to the US It's important to visit people who friends, colleagues, or professors recommend, (see Lesson 5,6) even if they don't have a job to offer. You'll learn something and you might meet somebody else who may have leads. For example I visited my graduate alma-mater and talked to some bio-physics professors I knew, one of whom connected me to a postdoc at NIH. That post-doc introduced me to a few NIH people when I visited him. Make sure you do your research and find out (from the websites and from literature searches) what the people you will be talking to do. In the bio-medical fields you can search all abstracts for free at http://www.ncbi.nlm.nih.gov/Pubmed (that's where I work). One thing that helped me is that I prepared a journal-club type talk on the recent bio-informatics work I had studied. The point was that I showed I was able to use the jargon (partly thanks to my stint in chemical engineering) and do the technical work. I also made sure to point out how the physics work I did for my thesis and postdoc gave me skills useful for the job.

I'm very happy with my switch in career paths. But, this particular path is rapidly closing. There will soon be enough computer literate biologists to fill the niche. There were two new physicists hired since I was, in addition to two already there, but I believe that opportunities will only last another year or two. While it is possible to get programming-only jobs with bio-informatics companies or with sub-contractors (an often neglected source of employment), longer term employment will mostly come to those who can learn the biology to participate in the drug or diagnostic discovery.

Lesson 9

Think about the long-term career prospects.

New career paths for physics graduates will not come from established fields, they will come from areas without formal training programs where the physicist's general problem solving, mathematical, and computational skills can be used. I also believe that there are some new fields of physics that will open up, but the physics community needs to be accepting of physicists who don't follow the straight undergrad-to-tenure-track research career paths.

Lesson 10

Start a new pyramid.

Hugues Sicotte received his physics PhD from Princeton University in 1995 specializing in cosmology. After a postdoctoral position in France at Université d'Aix-Marseille II, he returned to the US and began a new career in molecular evolution/genomics.

Sloan-DOE Postdoctoral Fellowships in Molecular Biology

The Alfred P. Sloan Foundation and the US Department of Energy are supporting ten postdoctoral fellowships to catalyze career transitions into computational molecular biology from physics, mathematics, computer science, chemistry and related fields. These fellowships will give young scientists an intensive two-year postdoctoral opportunity in an appropriate molecular biology laboratory. Ideal candidates will have strong educational backgrounds in such fields and wish to bring these backgrounds to bear upon computational molecular research questions.

The focus of this program is on those aspects of computational molecular biology related to data and information resulting from the study of human and other genomes. The goal is to foster interactions between the mathematical and biological sciences and to provide rigorous training for scientists in this new interdisciplinary area.

The principal selection criteria will be the potential of the applicant and the proposed postdoctoral research and training plan. The capabilities of the proposed scientist in computational molecular research, and support by the department chair or laboratory director will be an important selection element.

The deadline for receipt of all application materials from applicant, sponsoring scientist, and related reference letters is 19 January 1998. Send applications to: Dr. Michael S. Teitelbaum, Sloan-US DOE Joint Postdoctoral Fellowships in Computational Molecular Biology, c/o Alfred P. Sloan Foundation, 630 Fifth Avenue, Suite 2550, New York, NY 10111. Selections will be announced in May 1998 and funding can commence any time after 1 September 1998.

Further details and application procedures and requirements may be obtained from Christine Trance, Alfred P. Sloan Foundation, phone: 212-649-1649; email: trance@sloan.org.

Physicists To Be Honored at November Meetings

Five physicists will be honored for their work in fluid dynamics and plasma physics in November. The 1997 Fluid Dynamics Prize and Otto Laporte Award will be presented during the annual fall meeting of the Division of Fluid Dynamics in San Francisco, California. The 1997 James Clerk Maxwell Prize, Excellence in Plasma Physics Award, and the Outstanding Doctoral Thesis in Plasma Physics Award will be presented during the annual fall meeting of the Division of Plasma Physics in Pittsburgh, Pennsylvania.

1997 FLUID DYNAMICS PRIZE

Established in 1979, the prize is now supported by the American Institute of Physics journal *Physics of Fluids* and friends of the Division of Fluid Dynamics to recognize and encourage outstanding achievement in fluid dynamics research.

Louis Norberg Howard
Florida State University

Citation: *"For fundamental theoretical concepts in the theory of turbulence, stability, rotating and stratified fluid flows, and other fluid dynamical problems, including upper bounding theory of statistically stationary turbulence, semicircle theorems for the stability of geophysical flows, the spin-up problem, and reaction-diffusion and double-diffusion problems."*

Howard received his PhD in mathematical physics from Princeton University in 1953. After lecturing there in mathematics and a short tenure at the California Institute of Technology, he joined the faculty of MIT in 1955, where he has been professor emeritus since 1984. Earlier, in 1981, he moved from Florida State University, becoming professor emeritus in 1996. His work has largely been in the field of fluid mechanics, especially hydrodynamic stability, geophysical fluid dynamics and some aspects of turbulence. Other aspects of applied mathematics have also received his attention, especially reaction and diffusion equations and, most recently, models of semicrystalline polymers.

1997 OTTO LAPORTE AWARD

Established in 1985 by Friends of Otto Laporte and the Division of Fluid Dynamics to recognize outstanding research accomplishments pertaining to the physics of fluids.

Marvin Emanuel Goldstein
National Aeronautics & Space Administration

Citation: *" For his seminal theoretical elucidation of the roles of receptivity and nonlinearity in the transition to turbulence of shear flows, for his discovery that capillary force can be the source of absolute instability in a liquid jet, for his lasting contribution to aeroacoustics and rapid distortion theory and for his exemplary roles in the fluid dynamics community."*

Goldstein is currently chief scientist of NASA's Lewis Research Center. His research areas include transition and turbulence in fluids, aeroelasticity and aeroacoustics, and fundamental theory of turbomachinery. He has served on the Executive Committee of the APS Division of Fluid Dynamics, has published more than 100 technical papers and authored a book on aeroacoustics which has been translated into Russian and Japanese.

1997 AWARD FOR EXCELLENCE IN PLASMA PHYSICS RESEARCH

Established in 1981 by friends of the APS Division of Plasma Physics to recognize a particular recent outstanding achievement in plasma physics research

Fred Michael Levinton
Fusion and Physics Technology, Inc.

Citation: *" For his conception and development of the Motional Stark Effect diagnostic technique for measuring the local magnetic field inside a plasma, providing information critical to understanding magnetic plasma confinement."*

Levinton received his PhD in physics from Columbia University in 1983. Following postdoctoral work, he joined the Plasma Technology Division of JAYCOR in 1984 and worked at the Princeton Plasma Physics Laboratory on the S-1 spheromak, studying equilibrium and confinement. On the PBX-M tokamak, he developed the motional stark effect (MSE) diagnostic to measure the internal magnetic field in a high-temperature plasma. In 1990, he was a founding member of Fusion Physics and Technology, Inc. He has since been investigating current profile effects on the sawtooth instability in plasmas. Using the MSE diagnostic, he developed a reversed magnetic shear q-profile which led to the enhanced reverse shear mode on TFTR. His recent efforts have been to study the effect of reversed magnetic shear on plasma transport and stability, and the extension of the MSE diagnostic to measurement of electric fields of plasmas.

1997 OUTSTANDING DOCTORAL THESIS IN PLASMA PHYSICS AWARD

This award, established in 1985 and currently sponsored by General Atomics, is intended to provide recognition to exceptional young scientists who have performed original doctoral thesis work of outstanding quality and achievement in the area of plasma physics.

Stefano Coda
M.I.T.

Citation: *"For development and application of phase-contrast imaging techniques to measurements of turbulence in high temperature plasmas, including critical comparisons to theory and the discovery of radial modes in the plasma edge."*

Born and raised in Italy, Coda received his undergraduate Laurea degree in physics from the University of Pisa, Italy, in 1986. For his undergraduate thesis, he worked for one year on the JET tokamak in Culham, UK. After two years with the Versator-II team at MIT, he moved to General Atomics in San Diego, where he carried out his graduate dissertation research. He received his PhD degree in 1997 from MIT. Coda is presently working on electron-cyclotron heating and confinement studies on the TCV tokamak at the CRPP laboratory of the Swiss Federal Institute of Technology in Lausanne, Switzerland.

1997 JAMES CLERK MAXWELL PRIZE

Established in 1975 and funded by Maxwell Technologies, Inc. to recognize outstanding contributions to the field of plasma physics.

Charles F. Kennel
U.C.L.A.

Citation: *"For his fundamental contributions to the basic plasma physics of collisionless shocks, magnetic reconnection and quasilinear theory, and to plasma astrophysics - including the Van Allen radiation belt and the Crab Nebula."*

Kennel received his PhD from Princeton University in Astrophysical Sciences in 1964. He has been a tenured member of the UCLA Department of Physics since 1967, and was its Chair from 1983-86. For the past thirty years, Kennel has been a leading plasma theorist in space physics and has made fundamental contributions to basic plasma physics and plasma astrophysics including developing relativistic MHD wind theory has been widely used in astrophysics. He has served on a wide variety of scientific panels, advisory boards, and councils, serving most recently as Associate Administrator of NASA for Mission to Planet Earth from 1993 to 1996 and in 1996 assumed his position as Executive Vice Chancellor at UCLA.

Two Young Physicists Receive DAMOP Thesis Award

Paul A. Vetter and Barry C. Walker were selected as the 1997 recipients of the DAMOP Thesis Award. Sponsored by members and friends of the APS Division of Atomic, Molecular and Optical Physics (DAMOP), the award is intended to recognize doctoral thesis research of outstanding quality and achievement in atomic, molecular or optical physics, and to encourage effective written and oral presentation of research results.

Barry C. Walker
State University of New York, Stony Brook

Citation: "For his thesis entitled, 'One- and two-electron ionization of atoms by a strong laser field.'"

Born and raised in Oklahoma, Walker received his B.S. in physics and chemistry from Point Loma Nazarene College in San Diego, California, and his PhD in physics from the State University of New York at Stony Brook in 1996. His research expertise is in the experimental study of light matter interactions, specifically investigating atoms and molecules in perturbative "multiphoton" and nonperturbative "strong" optical fields. During his graduate study, he worked as a research assistant at Brookhaven National Laboratory, researching the interactions of atoms with intense laser radiation and two electron ionization dynamics, which formed the basis for his doctoral thesis.

Walker is currently a research assistant at the University of California, San Diego, where he designed and built a unique "hybrid" compressor for terawatt peak power lasers. He intends to continue his investigations of intense field phenomena by extending the field strengths, and is also interested in the time dependence of 50 to 200 eV single photon processes.

Paul A. Vetter
University of Washington

Citation: "For his thesis entitled, 'Precise measurement of parity nonconserving optical rotation in atomic thallium as a test of the electroweak standard model.'"

Vetter received his B.A. in physics at Amherst College in 1990, working on a new technique for highly precise Stark frequency shift measurements in alkali atoms. He received a Ph.D. from the University of Washington at Seattle in 1995. His thesis work was a precise optical rotation measurement of a parity violating atomic transition amplitude in thallium. The parity violating amplitude is about 10^{-7} times the allowed electromagnetic transition of interest. Measurements of atomic parity violation help to constrain various theoretical extensions to the Standard Electoweak Model and are also uniquely sensitive to internucleon weak interactions.

Today, Vetter is a postdoctoral research fellow at Lawrence Berkeley National Laboratory. His current projects include magneto-optic trapping of radioactive Na^{21} to improve measurements of fundamental weak interactions in beta decay, and a measurement of the beta-gamma directional correlation in Na^{22}.

Presentation of check to endow the APS Joseph F. Keithley Award for Advances in Measurement Science

Pictured are (from left to right): Allan Clark (chair, Keithley Award Selection Committee), Judy Franz (APS Executive Officer), Tom McIlrath (APS Treasurer), Robert Erdman (Keithley Instruments and past chair of Topical Group on Instrument and Measurement Science), and Barrie Ripin (APS Associate Executive Officer)

Announcements

APS Mass Media Fellowship Program - Summer 1998

Deadline: 15 January 1998

In affiliation with the popular AAAS program, APS will sponsor two ten-week fellowships for physics students to work full-time over the summer as reporters, researchers, and production assistants in mass media organizations nationwide.

▶ PURPOSE

The intent of the program is to improve public understanding and appreciation of science and technology and to sharpen the ability of the fellows to communicate complex technical issues to non-specialists.

▶ ELIGIBILITY

Priority will be given to graduate students in physics,or a closely related field, although applications also will be considered from outstanding undergraduate and postdoctoral researchers. Applicants should possess outstanding written and oral communication skills and a strong interest in learning about the media.

▶ STIPEND

Remuneration is $4,000, plus a travel allowance of approximately $1,000.

▶ TERM

Following an intensive three-day orientation in early June at the AAAS in Washington, winning candidates will work full-time through mid-August.

▶ SELECTION PROCESS

During February, a review committee will screen completed applications received by the January 15 deadline. Files of the four or five most qualified applicants will be submitted to host media organizations for final selection in April.

▶ TO APPLY

The following materials must be received at the address below by **15 JANUARY**:

- Completed application form (available from the program office, below, or at http://www.aps.org/public_affairs.html)
- A copy of your résumé
- Brief sample(s) of your writing (3-5 pages on any subject, written in language understandable to the general public — no technical papers, please), on single-sided, 8 1/2" x 11" paper, unstapled
- Three letters of recommendation (to be mailed directly to the program). Two of these letters should be from faculty members; one should be a personal reference.
- Transcripts of your undergraduate and graduate work (to be mailed directly to the program)

▶ MAIL TO

APS Mass Media Fellowship Program
529 14th Street, NW, Suite 1050, Washington DC 20045
(202) 662-8700 • email: opa@aps.org

APS/AIP CONGRESSIONAL SCIENCE FELLOWSHIPS: 1998-1999

The American Physical Society and The American Institute of Physics are currently accepting applications for their 1998-1999 Congressional Science Fellowship Programs. Fellows serve one year on the staff of a senator, representative, or congressional committee. They are afforded an opportunity to learn the legislative process and explore science policy issues from the lawmakers' perspective. In turn, Fellows may lend scientific and technical expertise to public policy issues.

QUALIFICATIONS include a Ph.D. in physics or a closely related field, a strong interest in science and technology policy and, ideally, some experience in applying scientific knowledge toward the solution of societal problems. Fellows are required to be US citizens and, for the AIP Fellowship, a member of any of the AIP Member Societies at time of application. In exceptional cases, the Ph.D. requirement may be waived for applicants with compensating experience.

TERM OF APPOINTMENT for both fellowships is one year, beginning 1 September 1998 with participation in a two-week orientation in Washington, organized by the American Association for the Advancement of Science. Choice of congressional assignment is reserved to Fellows.

A STIPEND of up to $46,000 is offered, in addition to allowances for relocation, in-service travel, and health insurance premiums.

APPLICATIONS should consist of a letter of intent, a two page resume, and three letters of reference, accompanied by a cover sheet indicating: name, address, phone, email, references, US citizenship, Ph.D. status, society membership, and where you learned about the programs. All submissions should be on standard 8.5" x 11" paper, single-sided and unstapled, and should be sent directly to the address below. Candidates should state in the letter why they are applying and briefly describe their public service experience. Letters of reference should discuss not just the candidate's competence as a physicist, but also the education, experience, and attributes which would particularly qualify the candidate to serve as a Fellow. Unless otherwise specified in the letter, the applicant will be considered for both APS and AIP fellowships.

ALL APPLICATION MATERIALS MUST BE POSTMARKED BY 15 JANUARY 1998.

APS/AIP Congressional Science Fellowship Programs
529 14th Street, NW, Suite 1050
Washington, DC 20045
(202) 662-8700 • email: opa@aps.org
APS and AIP home pages: www.aps.org and www.aip.org

Please note that other physics-related Congressional Science fellowship programs are run by The American Geophysical Union (202-462-6900) and The Optical Society of America/The Materials Research Society (contact: Gail Oare/ 412-367-3004). Please contact these societies directly for information on their Fellowships.

DISTINGUISHED LECTURERS FOR PLASMA PHYSICS

The Division of Plasma Physics of the American Physical Society is pleased to announce the Distinguished Lecturers for Plasma Physics for 1997-1998. This program is intended to share with the larger scientific community the most exciting recent advances in plasma physics.

The following Distinguished Lecturers have been chosen by the Division of Plasma Physics of the American Physical Society:

Dr. William Kruer, "The interaction of plasma with intense lasers and the quest for fusion" Lawrence Livermore National Laboratory, Email: kruer@icf.llnl.gov

Professor Thomas O'Neil, "Equilibria and dynamics of pure electron and ion plasmas" UC San Diego, Email: jacpla@sdphu1.ucsd.edu

Professor Stewart Prager, "Dynamo and chaotic magnetic fields in plasmas" Univ. of Wisconsin, Email: prager@juno.physics.wisc.edu

Professor Francis Chen, "Computer chips to potato chips: the challenge of plasma processing" UCLA, Email: ffchen@ee.ucla.edu

Dr. Michael Zarnstorff, "Suppression of turbulence in plasmas: an experimentalist's view" Princeton Plasma Physics Laboratory, Email: zarnstorff@pppl.gov

Under the Plasma Travel Grant Program funded by the Department of Energy, the Lecturers are available for talks at US colleges and universities for the academic year 1997 - 1998. Their travel expenses will be supported by the grant; preference will be given to invitations from colleges and universities that do not have substantial programs in plasma physics. The Lecturers may be invited by contacting them directly.

Additional information about the Plasma Travel Grant Program can be obtained from the DPP Homepage, which can be found through the APS Homepage at [www.aps.org] or from the Chair of the DPP, Prof. Richard Hazeltine, University of Texas at Austin, Email: rdh@hagar.ph.utexas.edu.

CAUGHT IN THE WEB

Notable additions to the APS Web Server. The APS Web Server can be found at http://www.aps.org

APS News Online latest edition

APS Committees and Governance
- Industrial & Applied Physics Speaker List updated
- APS Statements allow easy printing
- Physics Internet Resources updated
- Int'l Affairs: CIFS page updated

Units
- NE Section Fall Newsletter
- FIAP Jobs Engine added to FIAP homepage

Meetings
- SES and DFD Meeting Programs
- Meeting Calendar updated
- March, April Invited Paper Nominations

DISTINGUISHED TRAVELING LECTURER PROGRAM IN LASER SCIENCE

The APS Division of Laser Science is inviting applications from host schools for next year's awards for the Distinguished Traveling Lecturer Program. The DTL Program is intended to bring distinguished laser scientists to predominantly undergraduate colleges and universities for two day visits, which generally include lectures and informal meetings with faculty and students.

Lecturers for the past academic year and their topics were Phil Bucksbaum (University of Michigan) on high-field laser physics, Steve Leone (JILA and University of Colorado) on chemical physics, Bill Phillips (NIST) on atom cooling and trapping, Geraldine Richmond (University of Oregon) on surface nonlinear optics, and Jagdeep Shah (AT&T Bell Labs) on quantum optics. The lecturers for the current academic year will be named soon.

Detailed and up-to-date information about the program and the application procedure is availiable on DLS Homepage on the World Wide Web at [http:// www.physics.wm.edu/~cooke/dls/p_dtl.html].

THE BACK PAGE

NSF Is Still Making Key Investments in Science and Technology

by Neal Lane

The topic of change and its relationship to our souls reminds me of a time in my cherished academic life when a colleague defended the budget for the physics department to the university provost. The provost sighed and said, "Why is it that you physicists always require so much expensive equipment? The math department requires nothing of me but money for paper, pencils and erasers. And the philosophy department is better still. It doesn't even ask for erasers."

For an instant, perhaps, my colleague might have wished he had been a stereotypical philosopher in that situation — assured of existence in that often intangible and unmeasurable environment. However, tangibility and accountability are now even more the order of the day in academe as well as government. The Government Performance Results Act (GPRA) is upon us. The US Congress passed the Act, and President Clinton signed it into law, in 1993. It is designed to improve the operation of all government programs by establishing a system of program performance goals and a method to measure the results. Starting with FY 1999, all federal budgets will be performance based.

I doubt that any one of us disagrees with the statement that excellent research in science and engineering does benefit society in countless ways, making it one of the best investments taxpayers can make for the future of their country. Moreover, many researchers choose their fields and projects with societal benefits in mind, even if the research itself is quite fundamental and intellectually challenging. But, measuring those benefits, let alone predicting them rightfully, gives us pause. And, increasingly, that is what we are going to be asked to do in a balanced budget environment.

With that in mind, I'd like to talk about some of NSF's key investments in science and engineering for the coming year. Our FY98 budget request strongly reaffirms our commitment to academic research, and to linking the research process with teaching and learning. Our bottom line increases by 3 percent, to just under $3.4 billion. Most of our research budget focuses on core support of excellent research in all disciplines of science and engineering.

The NSF's request for the Physics Division for FY 1998 is $148.22 million, up from $138.72 million in FY 1997, which represents a 6.8 percent increase. Research project support constitutes roughly $104 million of this figure, with the remaining $44 million funding being put towards facilities both national and international in scope. I should also note that these numbers do not include construction for the Laser Interferometer Gravitational Wave Observatory (LIGO), most of which did not come from the physics budget.

In addition to providing strong support for the core programs of each of the disciplines, we are focusing some of our budget on a few broad areas that the research community considers to have particular promise. One of these is Knowledge & Distributed Intelligence (KDI), a broad-based, multi-disciplinary effort to keep academic science and engineering at the leading edge of information technologies and to insure that the necessary research is supported to advance those technologies. It is perhaps the most encompassing venture NSF has ever pursued, cutting across all fields of science and engineering research and touching education at all levels. Clearly, it is relevant to the trends and technologies that are driving growth and opportunity in our economy and society, from networks to sensors to virtual reality systems.

KDI will support research to help make the next quantum leap forward in terms of both scientific progress and consequent economic and societal benefit. New approaches to computing, intelligent Web browsers, technologies for learning, and smart, efficient and reliable methods of handling huge amounts of data of all types are just a few of the advances and benefits that have deep roots in academic research across a wide range of fields and disciplines.

For FY98, we are seeking an increase of nearly $60 million for our portfolio of KDI activities. This will cover NSF's role in the Next Generation Internet, as well as a set of multidisciplinary activities such as learning and intelligent systems and knowledge-based networking. The research focus in these areas will include how to merge computation, data and representation for highly complex problems such as real time storm predictions and environmental modeling. More broadly, we'll be trying to determine ways to manage and make productive use of the flood of information released by emerging technologies.

An overarching theme for KDI and NSF's programming generally is our commitment to linking research with education. NSF is launching an experimental, $20 million activity to broaden graduate training known as the Integrative Graduate Education and Research Training Program (IGERT). In our FY98 request, programs like Research Experiences for Undergraduates and Grant Opportunities for Academic Liaison with Industry (GOALI) are all slated for major increases. All of these aim to make research and discovery an essential part of the learning process for both graduate students and undergraduates.

Instrumentation remains a high priority for NSF. In FY 1998 we are continuing our support for major research instrumentation, as well as providing on the order of $180 million for instruments and equipment through grants and other support mechanisms. In addition to LIGO, we have several major construction projects in the FY 98 request. Others, such as the Large Hadron Collider (LHC), are on the near horizon.

One of the important framework elements of the discussion regarding the federal budget has been the Budget Agreement developed in May by the President and the Congress. This agreement laid out the blueprints for a plan to balance the budget by the year 2002. For all of us who care about research and education however, this long-sought agreement does not mean everything is fine and our work is done. Quite the contrary. Our voices will need to be heard more clearly than ever.

The focus of the Budget Agreement was on discretionary programs rather than entitlements to achieve the majority of the savings necessary to balance the budget. To some extent, this further shrinks the pool of money available for federal R&D, and it certainly increases the competition for ever-scarcer resources, especially among nondefense programs. Discretionary spending includes most of what we think of as "government": parks, prisons, highways, food safety, and many other functions, including NSF, NASA, EPA, and other nondefense R&D activities.

Thirty years ago, non-defense discretionary spending activities accounted for nearly a quarter of all Federal spending. Today they constitute barely 1/6 of the total. Even more disconcerting is that this 1/6 of the pie will shrink to roughly 1/7 over the next five years, as entitlements grow by more than 20 percent. The implications for science and engineering should be of concern to all of us.

While the Budget Agreement does not translate immediately into reality, I do view its implications for federal R&D as one of a series of particularly significant "warning shots across the bow." I also view it as a cautionary signal which provides us some time and opportunity to communicate to Congress how vital this country's investment in science and engineering is to the nation's welfare.

You may have heard the story about how Albert Einstein's theories and investigations were an almost impenetrable mystery to his second wife, Elsa. "Couldn't you tell me a little about your work?" she complained one day. "People talk a lot about it, and I appear so stupid when I say I know nothing." Einstein thought for a minute or two, frowning deeply as he searched for a way to begin his explanation. Then his face cleared and he proclaimed, "If people ask, tell them you know all about it, but can't tell them, as it is a great secret!"

While we might appreciate Einstein's humor, the reality is, the general public believes that we scientists do want our work to be a great secret. Unfortunately, we have not done a very good job of sharing the excitement of new scientific knowledge or the adventurous nature of scientific discovery with the world at large. Yet it is the rest of society that supports the opportunity for us to pursue that satisfying work. I believe it must be our responsibility, in the role of "civic scientists," to provide them the opportunity to learn about that which is so satisfying to us as scientists, and so important to society's well-being.

The communication should not be a one-way process in which the scientists talk and teach and the public listens and learns. On the contrary, the research community has as much or more to learn from the public. How then does that happen? There is a social, political, and philosophical context in which all activity takes place in a society. This critical process of dialogue cannot be learned overnight when a new development emerges or when a crisis occurs. It must be firmly in place and functioning with trust on both sides.

NSF surveys show a strong public interest in science and appreciation of its value. Nevertheless, those same surveys indicate that the public has little confidence in its ability to understand that same science. This says more about the science community than it does about the public. Over the last 50 years, we scientists have been accustomed to working in the relative isolation of universities and laboratories, immersed in the autonomy of our own work. At the same time, the world outside has been increasingly defined in scientific and technological terms. Thus, the public does not have good grounding for most issues of science and society. And the science and engineering community does not have good grounding in dialogue with the public about either the science or its societal implications and concerns. We cannot afford for this situation to continue.

The point is not to know the difference between a quark and a lepton. Even Ph.D. scientists and engineers can not have thorough grounding in every field. What is needed is the ability to probe, to question, to grasp concepts, and to develop some confidence in the consensus that forms in the research community about a discovery or advance. The ability to grasp concepts, principles, and processes is a path to holistic comprehension.

We often find it hard to abandon even briefly the detail of our disciplined work. However, in order to bridge the gap between science and society, and between the scientist and the public, we will have to move to a different level of discourse. We can begin to depict our knowledge more in terms of the process by which we learn and discover: the demanding, testing, skeptical regimen of the scientific method. We can portray our work in the way that physicist and novelist C.P. Snow suggested when he said, "Science is the refusal to believe on the basis of hope." Our challenge is to learn that the detail and obscure terminology of our fields is not the path to public understanding of our work. We need to incorporate analogy and metaphor as tools for helping others to understand.

Scientists are powerful players in contemporary society but we are discovering that the exercise of that power to do research and create new abilities from new knowledge carries with it responsibilities beyond our laboratories. We must help the public understand the nature and the value of science. Whatever our national languages, we must speak in ways the general public can understand. We must listen and learn from the society at large in order to be better researchers, teachers, and communicators.

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