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physics

## Mass Media Fellows Reflect on Internship Experience

Two physics graduate students spent several months last year learning the ropes of communicating science to the public, behind the scenes at a national magazine and a major news network. Nellie Andreeva, a graduate student in physics at the University of Maine in Orono, spent last summer at *Business Week* magazine in New York. Zohra Aziza Baccouche of Hampton University served her fellowship at CNN's Science and Technology unit in Atlanta, Georgia, last fall.

Andreeva received MS degrees in both physics and TV and radio journalism from Sofia University in Bulgaria in 1993, and began her graduate studies at the University of Maine last year. She has long been interested in combining her interest in physics with journalism. She spent six years as a producer, writer and director of TV shows for Bulgarian National Television, and has had two prior internships: one at the BBC in London, England, and another at WCAU-TV in Philadelphia, organized by the University of Delaware.

Andreeva's time at *Business Week* gave her the chance to work closely with professional science writers and to learn more about what it takes to communicate science to the public. "Science news is often presented too effectively in popular news maga-

zines," she says, referring to the oversimplification of scientific concepts that usually occurs. "I had to get used to presenting research in slang, but it's better for people to read very simple science texts than to skip anything related to science as boring."

Her first major feature for the magazine was an article on the phenomenon of "six degrees of separation," a mathematical study showing that everyone on the planet is connected through six people or less. She subsequently wrote numerous articles on such topics as la Niña and its possible economic effects; a temperature detector for frozen foods; micro-engines; a mathematical model that could relieve congestion and cut delays at US airports; genetically engineered peas; and a self-cleaning coating which uses natural ultraviolet light to break down dirt on floors, walls and cars.

Andreeva notes that although the magazine calls its section "Science and Technology," most of the stories that are published relate to technology or applied scientific research. There is very little published on basic scientific research, although "this is understandable because of the business orientation of the magazine," she says. On the whole Andreeva is appreciative of the support she received during her internship. And she was gratified

to receive positive feedback from readers on many of her published stories. She is continuing to write for *Business Week* even though her internship has officially ended.



Aziza Baccouche

After receiving a BS degree in physics from the College of William and Mary in 1995, Baccouche went on to earn an MS degree last year from Hampton University. She is currently pursuing her PhD in physics at the University of Maryland, College Park, working on a numerical calculation of the energy spectrum, wave functions and decay widths of heavy B and D mesons. She hopes to pursue a career in science communication after completing her PhD because of what she perceives as a "growing need" for better communication between scientists, the media, and the general public.

Baccouche held several prior media-related internships before joining the APS program, most with radio or television formats. So she had some preparation for the fast-paced environment of CNN's Science News unit, which is solely responsible for producing daily science packages for the

*Continued on page 5*

## Style and Substance Characterize APS Centennial Celebration

The APS celebrated its 100th anniversary with both style and substance last month in Atlanta, Georgia, drawing nearly 10,000 scientists from all over the world to make it the largest physics meeting of all time.

Subsequent issues of *APS News*, beginning with May and continuing through December, will feature detailed coverage of technical and nontechnical highlights, plenary lectures, special events, and much, much more. A selected sampling of future content is outlined below.

### Scientific Highlights:

Short features highlighting latest research results in atomic, molecular and optical physics, lasers, materials physics, astrophysics, biological physics, plasma physics and many more.

### Nontechnical Highlights:

- The future of science policy
- History of physics in the national defense
- Women in physics
- Impact of immigration on U.S. physics
- Renewable energy

### Special Events:

- Fernbank Museum Gala
- International reception and banquet
- Nobel Laureate luncheon/exhibit opening
- Adventures at the Physics Festival

Regular features in each issue will include monthly columns featuring APS units, as well as the first 100 years of APS history, culled from the popular Centennial exhibit. There will also be monthly profiles spotlighting many of the artists and performers featured at the Physics Festival, such as:

- Bob Friedhoffer, science magician (see page 3)
- Ken Laws and the "Physics of Dance"
- Felice Frankel, science photographer extraordinaire
- Robert Greenler, intrepid explorer of Arctic phenomena
- "Man-on-the-street" interview with "Albert Einstein"
- "Mr. Magnet" (a.k.a. Paul Turner)

### Centennial Bulletin Facts

- Number of printed abstracts = 8,783
- Number of pages = 2,080 (Part I - 896; Part II - 1,184)
- Weight of Centennial BAPS about 10 pounds
- Three 18-wheeler semis hauled them to Atlanta

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## INTERNATIONAL NEWS



## Dakar Workshop Fosters Research Collaborations in Africa

Scientists from the US, Europe and ten African countries — Cameroon, Ethiopia, Ghana, Ivory Coast, Kenya, Mali, Mauritania, Morocco, Senegal, and South Africa — gathered in Dakar, Senegal, December 14-18, 1998, for the *International Workshop On Spectroscopy and Applications*. Its purpose was to highlight recent developments in spectroscopy, with particular emphasis on basic atomic and molecular spectroscopy and applications in medicine, agriculture and environmental monitoring. It was also intended to stimulate interest in developing

research collaborations between scientists in Africa and their US and European counterparts, and to promote regional scientific cooperation in Africa.

The workshop was jointly sponsored by the APS and the African Physical Society.

*Continued on page 6*



Dennis Matthews (extreme left) and Kennedy Reed (extreme right) with hospital staff members during visit to Yoff Hospital in Dakar to discuss interests in medical applications of lasers.

# Yale Olympics Shows Students That Physics Can Be Fun

Constructing an electromagnet, vector navigation, and applying the principle of superposition were among the challenges tackled by the approximately one hundred high school students who attended the first ever Yale Physics Olympics on October 17, 1998, at Yale University, in New Haven, Connecticut. Jointly sponsored by Yale's physics department and Wright Nuclear Structure Laboratory, the event focused on experimental measurements using simple fundamental physics principles, unlike the more familiar International Physics Olympiad, which emphasizes theoretical concepts and problem solving.

"If young people see that physics can be fun, if they can be hosted in a university atmosphere for even a day, then perhaps they can be successfully encouraged to continue to study an important and nationally vital subject," said organizer Cornelius W. Beausang of the concept behind the event. "Even if not, they may go away with an enhanced appreciation of the role of physics in daily life." A professor of physics at Yale, he has organized similar events at the University of Liverpool in England for several previous years. The Yale Olympics was held simultaneously with the Liverpool Physics Olympics and a third event in Australia hosted by the University of Perth.

The Yale Physics Olympics consisted of five events—two of which were held outdoors—for teams of high school students consisting of four students per team. Each activity was an experiment or measurement based on fundamental physics ideas (forces, waves, magnets, etc.), which students completed as a team within 30 minutes. The results were compared to the correct answer, as defined by the judges, to determine team rankings for each event. "The idea was not to intimidate the students, who often had only just started to study physics,

with complicated experiments or ideas," said Beausang. "Instead, our plan was to give them tasks that they could complete with a limited knowledge of physics, a modicum of common sense, and a bit of team work."

One of the outdoor events required students to determine how large an overhang they could make by stacking 10 bricks on top of each other. A second outdoor event focused on vector navigation. The teams followed a series of directions all over a grass quadrangle, equipped with a meter stick, a piece of paper, a pencil, but no protractor. The teams were required to measure the distance to the center of the circle after completing a complex pathway.

In an event based on the principle of superposition, team members were connected by a piece of fishing line, which was threaded through eyebolts and wooden poles. Three team members moved along defined paths at constant speeds, with specified amplitudes and periods. The fourth member moved in such a way as to keep the string under tension, achieving the superposition of the other team members' triangular wave motions. Students also measured the lifting force of a helium-filled balloon using elastic bands, a meter stick, some string, and a selection of known masses.

By far the most attractive activity was the "Faraday Pickup," in which students were asked to construct an electromagnet from two nails, five meters of un-insulated wire, two meters of electrical tape, and two AAA batteries. The winning team picked up 80 paper clips, significantly more than the physics department faculty had managed the day before when testing the event.

The overall winning team hailed from Guilford High School in Connecticut, with one of the two teams from St. Joseph High School in Trumbull, CT, placing a close second. The grand prize was a large



Professor D. Alan Bromley with the "Gold" Medal Winners: Team Beam from Guilford High School, CT.

Photo from <http://wnsl.physics.yale.edu/events/olympics/facts.html>

"perpetual trophy", a model of a carbon atom constructed from a light guide and some ball bearings by the Yale Physics Department Gibbs Machine Shop. Individual "gold", "silver" and "bronze" medals (actually brass, stainless steel, and copper) were awarded to the top three teams overall. All participants received a T-shirt and mug commemorating the

event. Participating students were unanimously positive in their assessment of the Olympics.

"I was very much impressed by the tremendous amount of fun the students, the teachers, and indeed our own faculty had during the day, and by the ingenuity of the students, who in a number of cases

*Continued on page 5*

## APS Resolution Urges Amending Data Access Law

Last fall, as Congress put the finishing touches on 4,000 pages of omnibus appropriations, Sen. Richard Shelby (R-AL) inserted a rider that requires Federal agencies to ensure that all data obtained under a federal grant be made available to the public under the Freedom of Information Act (FOIA). Shelby's action stemmed from a refusal by the Harvard School of Public Health to release data that the Environmental Protection Agency had used in proposing stricter air-quality standards two years ago. The new law, spelled out in OMB Circular A-110, has prompted many scientists to react with alarm. They view it as a threat to academic freedom, although Congress insists the intent is to keep federal agencies from rulemaking based on unpublished junk science. Ironically, more than a decade ago, the burning issue was just the opposite—government restriction on data dissemination. That threat prompted the APS Council in 1983 and again in 1988 to issue strong statements opposing constraints on communication "by exemptions to FOIA or any other means," except when national security was concerned. Taking cognizance of those statements, but responding to the potential dangers created by the breadth of the Shelby language, the APS Executive Board adopted a measured resolution at its February meeting. The Board affirmed that government agencies should rely only on scientific results that have been peer reviewed and subjected to fair and open appraisal when establishing federal regulations and policies. The Board also called for amending the Shelby language to define its scope more narrowly. The full text of the APS resolution follows.

The Executive Board of the American Physical Society affirms that government agencies in establishing federal regulations and policies should rely only on scientific results that have been peer reviewed and subjected to fair and open appraisal. To the extent that Section 101(h) of Division A of Public Law 105-277 (Title III of H.R. 105-4104, the Treasury and General Government Appropriations Act of 1999) addresses that issue, the APS Executive Board endorses its intent.

However, the APS Executive Board believes that the language contained in the Public Law is too broad and will lead to a number of unintended consequences that are extremely harmful to American interests. Specifically, by directing the Office of Management and Budget to amend Circular A-110 "to require Federal awarding agencies to ensure that all data produced under an award will be made available to the public under the Freedom of Information Act," the Law

- Creates the potential for releasing into the public domain flawed data that have not been subjected to adequate peer review;
- Compromises the privacy of individuals who participate in clinical research tests.
- Undermines the viability of university-industry partnerships and inhibits entrepreneurship by restricting intellectual property rights;
- Places an extraordinary burden on researchers to maintain their records for perpetuity through an absence of a statute of limitations; and
- Exposes researchers and their employers to potentially expensive excessive litigation, thereby raising the cost of research.

The APS Executive Board believes Congress should work with the Office of Science and Technology Policy and the Office of Management and Budget to develop perfecting language, which remedies these deficiencies.

The Board believes that the proposed revision published by OMB in the Federal Register (Volume 64, Number 23) provides a reasonable starting point. Final language, however should define the word "publication," establish a statute of limitations for maintaining records, provide a grace period to enable researchers and their institutions to file patent applications, safeguard the privacy of human subjects, and provide an explicit recognition that the normal costs associated with compliance will qualify for inclusion in indirect-cost allowances.

## APS News

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## FESTIVAL SPOTLIGHT

### Teaching the Science Behind the Magic

It's lunchtime in the Georgia Pacific Building Auditorium in downtown Atlanta, and magician Bob Friedhoffer (a.k.a. "The Madman of Magic") is demonstrating the principle of air pressure by trapping water in a plastic tumbler with a postcard over the top. As he subsequently explains to his audience, the postcard creates a vacuum within the glass, which holds the water in place as the glass is turned upside down. A slight twist of the glass allows air into the vacuum, and the water spills out.

That's the scientific principle. The magician's secret behind the "trick": the glass has a hole drilled in the bottom which the magician covers with his finger, until he is ready to break the vacuum and release the water. It's a simple illusion, and one that can be easily and cheaply assembled using materials found in the home. And it's just one of hundreds of magical tricks and illusions Friedhoffer employs to demonstrate the scientific principles behind the magic, and hopefully to communicate something of the magic behind science in the process.

His willingness to reveal the sleight of hand behind his illusions is a markedly different approach from other magicians. "Often magicians try to mystify their audience and leave almost everything unexplained," says Brian Schwartz, a professor at Brooklyn College who has worked with Friedhoffer repeatedly in education and learning environments. "Bob uses magic to capture the students' imagination, but then shows them the basic principles behind the magic and how they can use these principles for similar demonstrations before parents, teachers and their peers."

Employing magic to teach children and the general populace about science is becoming increasingly popular. "The last nine years have seen an emphasis on children's science/magic shows in schools, museums and libraries," says Friedhoffer, who has performed in every imaginable venue, including the White House (for President Carter), Atlantic City revues, corporate trade shows, universities, night clubs and comedy clubs, youth centers, churches and even private homes, as well as making numerous TV appearances. The AAPT has invited him to conduct a workshop at its annual meeting next year to show science teachers how to perform some basic tricks for classroom use, and he was recently appointed an adjunct professor at the University of Vermont's Graduate School of Education.

Friedhoffer first became interested in magic as a child, when he received his first magic kit. It continued well into high school and beyond, further fueled by his admiration for Don Herbert (television's "Mr. Wizard"), whom he still cites as one of his heroes. "I realized that magic was empowerment," he says of his devotion

to the practice. "I was able to do things other kids couldn't, and learn secrets that the average person didn't know." His high school science classes made him realize that science made much of magic work, and he began his lifelong exploration of the scientific principles behind the illusions.

Friedhoffer earned his BA in accounting from the University of Miami in Florida in 1970 and worked as an accountant for several years before going into magic full-time. "This was the era when society gave

**I realized that magic is empowerment.**

*Bob Friedhoffer*  
"The Madman of Magic"



Photo by Timothy White from *Magic Tricks, Science Facts*

everyone of my age group permission to drop out and do whatever we wanted," he says of his decision to leave accounting. His accounting experience served him well, however, in successfully running his own small business. Eventually Friedhoffer's interest in science led him to pursue graduate studies, completing his MA in the history and philosophy of science from the City University of New York in 1993.

Always on the lookout for new material, Friedhoffer is currently working with fellow magician Mark Salem, star of the off-Broadway show "Mind Games," on illusions involving biomechanics. For example, at the turn of the century there was a woman named Lou Hurst, known as the "Georgia Magnet," who weighed a mere 100 pounds, yet the strongest men were unable to lift her, largely due to her intuitive grasp of basic biomechanics. Hurst eventually went to college to study physics to better understand the science behind her ability.

In addition to his performances, Friedhoffer is the author of more than 25 books for children about science and magic. His last four books have focused on creating physics labs from products found in the supermarket, the home, and in hardware and housewares stores, emphasizing the physical principles underlying common household gadgets. He has also designed five magic/science sets through Educational Design of New York City, and is working on an additional kit focusing on the magic of Ancient Egypt.

*Want to know more? You can contact Bob Friedhoffer regarding performances, books, or science and magic kits at 212-794-9654, or via email at [scienctrix@juno.com](mailto:scienctrix@juno.com).*

## prominent physicists of the 20th century: A CD-ROM photo collection

The APS has developed a collection of portraits of late physicists for the APS centennial. The collection was initiated both to provide a pictorial history of distinguished physicists throughout the last century and to help illustrate talks given by speakers included in the APS Centennial Speakers booklet. The approximately 200 portraits of late physicists selected for the collection have been compiled on CD-ROM. The collection is indexed alphabetically and includes birth and death dates, in addition to a short description of the subject's contribution to physics.

How were the names chosen? The selection was done by a committee chaired by APS past President Andrew Sessler, consisting also of physicist-historians Stephen Brush, Gerald Holton, and Spencer Weart. They chose names that were likely to be mentioned in lectures on 20th century physics. But there were two important limitations.

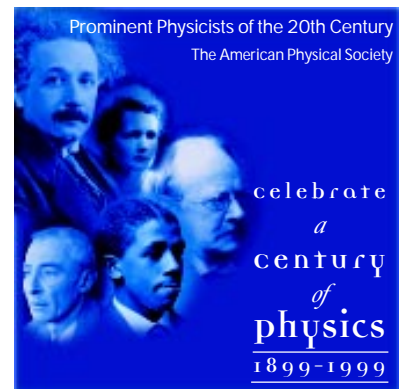
First, the committee did not include anyone who died before 1900, although it included a few physicists (such as Boltzmann and Roentgen) whose most important contributions, while made before 1900, had a major impact on 20th century physics. Second, it excluded persons still alive at the end of 1997. Thus you will not find pictures of Galileo, Newton, or Maxwell; nor, will you find entries in the current generation of active outstanding physicists. On the other hand, it interpreted the term "physicist" broadly, including several mathematicians, astronomers, chemists and earth scientists whose work is widely known and highly valued in the physics community.

A third constraint was that the photo collection had to fit on a single CD-ROM. Thus it could not include every physicist recommended by one of the several groups consulted for suggestions. The selection committee used its judgment to eliminate many names. While we are confident that all the persons included do in fact belong in this collection, it would be surprising if we did not receive complaints about some of the many omissions. We are especially interested in learning how you found the CD-ROM useful and what changes would make it more so.

The production of this CD-ROM was made possible by the resources and cooperation of the staff of the AIP Niels Bohr Library and the Center for History of Physics at the American Center for Physics in College Park, Maryland, including the Emilio Segrè Visual Archives photograph collection. Please note that the images may only be used for projection at lectures; permission to reproduce them in publications or in any other form must be requested from the copyright owner, indicated in the credit line for each photo. The Center for History of Physics, owns the world rights to many of these photos.

The CD-ROM collection was produced with the assistance of Erika Ridgway, Elizabeth Buchan-Higgins, Kim Quigley and other APS staff members, and Stephen Norton, a graduate student in the History and Philosophy of Science Program at the University of Maryland, College Park.

The information on the CD-ROM is in pdf format (reader included) and will run on Windows 95, NT, 3.1, 3.11 or later versions, Macintosh, and Unix systems. It will be available for purchase at meetings of the Society throughout 1999.



Alfvén, Hannes Olaf Gösta	Einstein, Albert	Langevin, Paul	Richardson, Owen Williams
Alvarez, Luis Walter	Ellis, Robert A., Jr.	Langmuir, Irving	Röntgen, Wilhelm Conrad
Anderson, Carl David	Fairbank, William Martin	von Laue, Max	Rossi, Bruno
Appleton, Edward Victor	Fermi, Enrico	Lawrence, Ernest Orlando	Rutherford, Ernest
Aston, Francis William	Feynman, Richard Phillips	Leavitt, Henrietta Swan	Ratherford, Ernest
Ayrton, Hertha	Fowler, William Alfred	Lehmann, Inge	Sakharov, Andrei Dmitrievich
Bainbridge, Kenneth T.	Frank, James	Lemaitre, Georges	Salam, Abdus
Bardeen, John	Frank, Ilya Mikhailovich	Libby, Willard Frank	Schiff, Leonard Issac
Barkla, Charles Glover	Frank, Philipp	Livingston, M. Stanley	Schrödinger, Erwin
Becquerel, Antoine-Henri	Franklin, Rosalind Elsie	London, Fritz Wolfgang	Schwarzschild, Martin
Bell, John Stewart	Frenkel Yakov Ilyich	Lonsdale, Kathleen	Schwinger, Julian Seymour
Bhabha, Homi Jehangir	Frisch, Otto Robert	Lorentz, Hendrik Antoon	Segré, Emilio Gino
Bitter, Francis	Fukui, Kenichi	Lyman, Theodore	Serber, Robert
Blackett, Patrick Maynard Stuart	Gabor, Dennis	Mach, Ernst	Shockley, William
Blau, Marietta	Gamow, George	Marconi, Guglielmo	Siegbahn, Karl Manne Georg
Bloch, Felix	Geiger, Hans Wilhelm	Marshak, Robert Eugene	Slater, John Clarke
Blodgett, Katharine Burr	Gibbs, Josiah Willard	Matthias, Bernd Teo	Sommerfeld, Arnold
Bogolyubov, Nikolai Nikolaevich	Göppert-Mayer, Maria	McMillan, Edwin Mattison	Spitzer, Lyman, Jr.
Bohm, David	Goudsmit, Samuel Abraham	Meitner, Lise	Stark, Johannes
Bohr, Niels Henrik David	Grad, Harold	Michelson, Albert Abraham	Stern, Otto
Boltzman, Ludwig E.	Hahn, Otto	Millikan, Robert Andrews	Street, Jabez Curry
Born, Max	Hale, George Ellery	Minkowski, Hermann	Strutt, John William Rayleigh
Bose, Satyendra Nath	Heisenberg, Werner Karl	von Mises, Richard	Szillard, Leo
Bouchet, Edward Alexander	Hertz, Gustav Ludwig	Moseley, Henry Gwyn-Jeffreys	Tamm, Igor Yevgenyevich
Bragg, William Henry	Hess, Victor Franz	Mott, Nevill Francis	Thomas, Llewellyn
Bragg, William Lawrence	de Hevesy, George	Mulliken, Robert Sanderson	Thomson, George Paget
Brattain, Walter Houser	Hilbert, David	von Neumann, John	Thomson, Joseph John
Breit, Gregory	Hodgkin, Dorothy Crowfoot	Nier, Alfred Otto Carl	Tomonaga, Sin-Itiro
Bridgman, Percy Williams	Hofstadter, Robert L.	Noether, Amalie Emmy	Tuве, Merle Anthony
Brillouin, Léon Nicolas	Houtermans, Fritz George	Occhialini, Giuseppe	Uhlenbeck, George Eugene
Chadwick, James	Hubble, Edwin Powell	Oppenheimer, J. Robert	Urey, Harold Clayton
Chandrasekhar, Subrahmanyan	Imes, Elmer Samuel	Patterson, Clair Cameron	Van de Graaff, Robert J.
Chapman, Sydney	Ioffe, Abram F.	Paul, Wolfgang	Van Hove, Léon
Cherenkov, Pavel Alekseyevich	Jensen, Johannes Hans Daniel	Pauli, Wolfgang	Van Vleck, John H.
Cockcroft, John Douglas	Joliot, Frédéric	Pauling, Linus Carl	Walton, Ernest Thomas Sinton
Compton, Arthur Holly	Joliot-Curie, Irène	Payne-Gaposchkin, Cecilia	Weyl, K.H. Herman
Condon, Edward Uher	Kamerlingh-Onnes, Heike	Peierls, Rudolf E.	Wick, Gian-Carlo
Crookes, William	Kapitza, Pyotr	Perrin, Marguerite Catherine	Wideroe, Rolf
Curie, Pierre	von Kármán, Théodore	Perrin, Jean Baptiste	Wien, Wilhelm
Curie, Marie Skłodowska	Kastler, Alfred	Planck, Max Karl Ernst Ludwig	Wiener, Norbert
Davison, Clinton Joseph	Kemble, Edward Crawford	Pockels, Agnes	Wigner, Eugene Paul
DeBroglie, Louis Victor	Kerst, Donald William	Poincaré, Jules Henri	Wood, Robert Williams
Debye, Petrus	Klein, Oskar Benjamin	Powell, Cecil Frank	Wu, Chien-Shiung
Dicke, Robert Henry	Kramers, Hendrik A.	Prandtl, Ludwig	Yukawa, Hideki
Dirac, Paul Adrienne Maurice	Kurchatov, Igor	Purcell, Edward Mills	Zeeman, Pieter
Du Mond, Jesse William Monroe	Kusch, Polykarp	Rabi, Isidor Isaac	Zeldovich, Yakov B.
Eddington, Arthur Stanley	Land, Edwin Herbert	Rainwater, Leo James	Zernike, Fritz
Ehrenfest, Paul	Landau, Lev Davidovich	Raman, Chandrasekhara	Zwicky, Fritz
Ehrenfest-Afanassjeva, T.A.	Landé, Alfred		

# OPINION

## APS VIEWS

### History of the APS Forum on Physics and Society

by David Hafemeister

Physics is a major component of many of society's difficult issues: nuclear arms and their proliferation, energy shortages and energy impacts, climate change, and technical innovation. Because physics principles underlie so many of these societal issues and because physics offers a way to quantify some aspects of them, APS members should be encouraged to understand, analyze and debate them. That's precisely why the APS formed the Forum on Physics and Society (FPS). To those of us who have been long involved in FPS affairs, it seems but yesterday that we attended the organizing meeting at the 1972 APS San Francisco meeting. As the APS celebrates its Centennial by looking back over its first hundred years, it is fitting that the FPS also looks back at its own accomplishments, and looks ahead at the direction of its future activities.

The FPS was born in the tumultuous 1960s and 1970s. The issues of that era — the Vietnam War, the debate over the Anti-Ballistic Missile system, the energy crisis, the start of the environmental movement, the civil/human rights revolution — impelled that generation of physicists to consider their professional responsibilities. Many felt that the APS should have a forum in which appropriate science and society issues would be debated by informed participants before the APS membership. Thus, the FPS became the first APS forum. Today its membership numbers roughly 4500, or 11% of the total APS membership. [For more on the early days of the FPS, see article by Mike Casper, *Physics Today*, May 1974.] One of the most important activities of the FPS has been to sponsor sessions at APS meetings on topical science-and-society issues. National security proved the most frequent topic, followed by the scientific process, energy, education and the environment, as well as miscellaneous topics. There are also FPS award sessions and numerous contributed sessions. To provide more in-depth background on certain issues, the FPS also offers occasional short courses, four of which have had their proceedings published in the *AIP Conference Series*. The AAPT has published three past FPS sessions as informative booklets for its members.

The goal of FPS sessions is to present both sides of an issue in a no-holds-barred debate. This is not always possible, since there are occasionally heretical views that don't make sense and confuse the debate. For example, at the 1986 APS Spring Meeting in Washington, DC, the FPS held a session on the Strategic Defense Initiative (SDI), inviting representatives from the Reagan administration and the Congressional Office of Technology Assessment, as well as some university professors. It never occurred to us to invite Lyndon LaRouche's Fusion Energy Foundation. However, since this group felt they should have been invited, they attempted

to shut down the session. Threatened with police action, they eventually quieted down, and the details of lasers in space were duly quantified and debated. The more interesting papers in FPS symposia frequently are published in *Physics and Society*, the forum's official newsletter, which serves to keep FPS members informed of current topics, and also provides a useful outlet for physicists who have some viable data or theory to publish. The newsletter publishes a wide variety of letters on both popular and unpopular topics, even when the editorial board disagrees sharply with the viewpoints expressed. With the passage of time the contents have shifted from more general commentary to the more technical aspects of physics and public policy issues. It has long been our goal to convert the newsletter from a "quasi-journal" to a full-fledged subscription journal.

The first "job crisis" for young physics PhDs took place in the early 1970s. The FPS responded by organizing two conferences at Penn State University in 1974 and 1977, to examine the data and possible responses by the physics academic community. Of course, there was no easy solution then, or now, to the vulnerability of young PhDs and postdocs to a tight job market, but the conferences developed a number of partial solutions, which were subsequently published by *Physics and Society* and in the *AIP Conference Series*.

Over the years, FPS members have played significant roles in such achievements as the formation of the hugely successful APS Congressional Fellowship Program, and of the APS Forum on Education. Today, a number of our members have moved on from FPS activities to larger roles. Examples include former FPS Executive Board members Vern Ehlers, who serves as a Republican Congressman from Michigan, and Rush Holt, recently elected to that position as a Democrat from New Jersey. I like to think that the forum's examination of the critical aspects of science and society issues not only helped send them on their way, but also shaped their approach to some of the issues that they deal with today. It is imperative that the FPS keeps the candle of professional responsibility well lit. We cannot slip backwards to the old days when APS meetings had no sessions on physics and society issues. The FPS continues to be a way for physicists in all fields of endeavor to easily keep abreast of the technical aspects of problems facing society.

David Hafemeister is a professor of physics at California Polytechnic State University in San Luis Obispo, California, and a founding member long active in FPS. This article was adapted from January 1999 *Physics and Society*, the FPS newsletter.



Forum of Physics and Society Chair Ruth Howes presented the Forum Award (now the Burton Forum Award) in 1992 to (L-R) Fernando Barros, Luis Maspari, Alberto Ridner and Luis Rosa, who successfully worked with their governments to renounce nuclear weapons and to mutually inspect their nuclear facilities.



Photo courtesy of David Hafemeister

## LETTERS

### Oh, Canada!

I was a little confused by the reference to Canada in Francis Slakey's January 1999 "Zero Gravity" article in *APS News*. "Choose your candidate and volunteer a few hours a week of your time. If you like it, you'll have gotten the experience you need to compete for a policy job in Washington. If you hate it, move to Canada." Perhaps he's suggesting that politics is friendlier in Canada? I'm not sure that's true. Or is it that people who don't like the democratic process would be happier in Canada, where he imagines there isn't any such thing? It does sound rather like the old right-wing reply to any criticism of the U.S. government: "If you don't like it, move to Russia." I doubt there are many Canadians who would appreciate their country being offered as the alternative (or opposite) to democratic politics.

Chris Paul, Sackville, New Brunswick, Canada

### Francis Slakey Responds:

Let me assure you that I have the utmost respect for the country that was kind enough to serve as a training ground for Doug Flutie. My country boasts "Give me your tired, your poor, the wretched refuse of your teeming shore" — but Canada truly lives the words.

### A Funny Thing Happened on the Way to the Meeting

I prepared my talk for DPF99, created transparencies, and looked forward to giving a talk which would highlight a physics puzzle and which, I hoped, would stimulate some interest in the subject on the part of experimentalists. Then I checked to see which day and which room my talk was scheduled for. It wasn't. As I soon learned, contributed abstracts by many other members were not scheduled either. Just during the past year I rejoined the APS. Years ago, in the 60's and 70's, when I first joined the APS, I remember that all members were allowed to present a 10-minute talk at any meeting. Recently, I rejoined the APS and have discovered that although the Bylaws have not changed in this regard, they have been interpreted to apply only to general meetings of the APS. Personally I disagree with the philosophy of rejecting contributed abstracts. The arbitrariness of the acceptance-rejection process makes it unfair to contributors and will tend to eliminate abstracts with new and different ideas. It seems proper to me that the APS allow all members to give a talk, if not at all meetings which the APS sponsors, at least at all Divisional Meetings.

Walt Perkins, Auburn, California

**Editor's Note:** Article XI of the APS Constitution and Article XII, 1. of the APS Bylaws [www.aps.org under the Governance button] essentially state that any member may submit one contributed abstract for any Meeting of the Society and, assuming it conforms with the submittal requirements and arrives before the deadline, that it will be scheduled. This policy was firmly established by Council in 1952. Although the policy originally applied to 10-minute contributed oral papers, it now applies to poster papers as well. However, the Society may specify the form of the presentation, oral or poster, based on factors other than the author's preference. That this policy applies to official Unit meetings was reaffirmed by the APS Executive Committee in February and all APS Units have agreed to follow this practice in the future.

### Don't Apologize for Feynman Fish!

In your January 1999 *APS News*, you appeared to be actually apologizing for "the Feynman Fish" one of the bumper sticker entries in the October 1998 "Zero Gravity." Almost every one of the bumper sticker/T-shirt entries were satires of pre-existing sayings and expressions. Why did you not apologize for making a "mockery" of these beloved clichés?

Let's say in a future issue of *APS News*, you publish a drawing the Earth. A member of the Flat Earth Society writes, saying that they are deeply offended and hurt by the portrayal of the Earth as round. Would you print a retraction begging forgiveness for "this inadvertent offense?" I dare say the percentage of the population offended by the fish reference is no larger than the percentage offended by a drawing of the Earth as round.

Jeffery Winkler

### Big Bang vs Big Brother

Charles McCutchen is quite correct in his letter to *APS News* [February 1999] about the appropriateness of the big bang model to industry in general and Xerox in particular. The quote that he cited was a misprint. It should have read "For those who are or wish to be 'players' in industrial R&D, you might consider three actions. First, the big brother value system is inappropriate in your new life; discard it." I regret that my proofreading was not as accurate as Mr. McCutchen's.

Charles B. Duke, Webster, New York

### More "Big Bang" Aftershock

I was disappointed by Charles Duke's article entitled "How to get value from industrial R&D" (The Back Page, *APS News*, December, 1998). Apparently the fact that competition has intensified and "globalized" justifies the suspension of the (sometimes chaotic) processes of scientific and technological development that have given the U.S. the world's healthiest economy and most admired higher education system. The most disturbing statement undoubtedly is the sweeping generalization, "Those who watch things happen comprise the bulk of the physics profession. Supported generously by government largess for more than three decades until recently, they could—and often did—look with disdain at the supposedly mundane world of industry." I find this assertion remarkable as it is fairly obvious that a lot of useful technology has been the product of university researchers working on "pure" knowledge in seemingly useless directions. Further, essentially all scientists and technologists received training at universities. Duke evidently overlooks the value of this training and the teachers who provide it. As a taxpayer and industrial scientist, I am happy to contribute to the NSF and other government funding agencies so teachers of future industrial scientists and engineers have some continuing, hands-on involvement with science, even if that science doesn't always have commercial value. It is undoubtedly true that there have been misunderstandings between university and industrial scientists and technologists and, as is evident, disdain from each side. We need discussions of the relationships between university and industry, of the role of the physicist in industry, and how physicists (and other scientists) can best apply their training in industry.

William Edelman, G.E. Research Labs

**Mass Media Fellows,** *continued from page 1*

evening news program and for the weekly *Science and Technology* show-case. Still, "making a transition from a physics laboratory to a news room environment takes some adjustment," she admits. She learned to persistently take the initiative to pursue story ideas, and to seek assistance when needed.

During her internship, Baccouche had the opportunity to produce several science news packages, including stories on mercury-eating plants, making it easier for the blind to surf the Internet, and remote vehicle monitoring. Like Andreeva, she bemoans the fact that "almost all of the science stories covered attempt to address the concern of how a particular story may affect people's lives," she says. "While I think this concern is important, some stories should be covered even though they don't include this element."

Baccouche expressed appreciation

for her supervisor's understanding of her sight impairment and help in finding ways to make her stories accessible to those without vision impairment. "Unlike print journalism, television is visually based," she says. "You always have to write to what you have in tape. The pictures should tell the story."

The APS Mass Media Fellowship Program was established in 1997 as a means of improving public understanding and appreciation of science and technology, and to sharpen the ability of the fellows to communicate complex technical issues to non-specialists.

**For more information on the APS Mass Media Fellowship Program, contact Nancy Passemante at the APS Washington Office, 202-662-8700, opa@aps.org, or access the APS Web site, <http://www.aps.org/> under the Public Affairs button.**



**Too Good To Be True: Our Favorite Net Myth**

"Net Myths" are vastly entertaining stories circulating on the Internet that are presented as fact — even though they aren't. [See <http://www.urbanlegends.com>] By far our favorite is a reportedly genuine letter from one Harvey Rowe, curator of antiquities at the Smithsonian, in response to the latest submission of amateur paleontologist Scott Williams of Newport, Vermont, who digs up found objects out of his back yard and sends the "specimens" to the Smithsonian Institute, labeling them with scientific names and insisting they are genuine archaeological finds.

Not surprisingly, the story is false. Harvey Rowe doesn't exist, nor does the Smithsonian have an Antiquities Department. And there is no Charleston County in Vermont, and hence no hopeful backyard paleontologist. This tongue-in-cheek letter first debuted on the Internet on the newsgroup rec.humor.funny, and within a month was being forwarded via email as factual. True or not, the "letter" reprinted below became an instant classic tale of a man, a shovel, and an unbridled passion for anthropology.

*Smithsonian Institute—Paleoanthropology  
207 Pennsylvania Avenue  
Washington, DC 20078*

Dear Sir:

Thank you for your latest submission to the Institute, labeled "211-D, layer seven, next to the clothesline post. Hominid skull." We have given this specimen a careful and detailed examination, and regret to inform you that we disagree with your theory that it represents "conclusive proof of the presence of Early Man in Charleston County two million years ago." Rather, it appears that what you have found is the head of a Barbie doll, of the variety one of our staff, who has small children, believes to be the "Malibu Barbie." It is evident that you have given a great deal of thought to the analysis of this specimen, and you may be quite certain that those of us who are familiar with your prior work in the field were loathe to come to contradiction with your findings. However, we do feel that there are a number of physical attributes of the specimen which might have tipped you off to its modern origin:

1. The material is molded plastic. Ancient hominid remains are typically fossilized bone.
2. The cranial capacity of the specimen is approximately 9 cubic centimeters, well below the threshold of even the earliest identified proto-hominids.
3. The dentition pattern evident on the "skull"

is more consistent with the common domesticated dog than it is with the "ravenous man-eating Pliocene clams" you speculate roamed the wetlands during that time. This latter finding is certainly one of the most intriguing hypotheses you have submitted in your history with this institution, but the evidence seems to weigh rather heavily against it. Without going into too much detail, let us say that:

- A. The specimen looks like the head of a Barbie doll that a dog has chewed on.
- B. Clams don't have teeth.

It is with feelings tinged with melancholy that we must deny your request to have the specimen carbon dated. This is partially due to the heavy load our lab must bear in its normal operation, and partly due to carbon dating's notorious inaccuracy in fossils of recent geologic record. To the best of our knowledge, no Barbie dolls were produced prior to 1965 AD, and carbon dating is likely to produce wildly inaccurate results. Sadly, we must also deny your request that we approach the National Science Foundation's Phylogeny Department with the concept of assigning your specimen the scientific name "Australopithecus spiff-arino." Speaking personally, I, for one, fought tenaciously for the acceptance of your proposed taxonomy, but was ultimately voted down because the species name selected was hyphenated, and didn't really sound like it might be Latin. However, we gladly accept your generous donation of this fascinating specimen to the museum. While it is undoubtedly not a hominid fossil, it is, nonetheless, yet another riveting example of the great body of work you seem to accumulate here so effortlessly. You should know that our Director has reserved a special shelf in his own office for the display of the specimens you have previously submitted to the Institution, and the entire staff speculates daily on what you will happen upon next in your digs at the site you have discovered in your back yard. We eagerly anticipate your trip to our nation's capital that you proposed in your last letter, and several of us are pressing the Director to pay for it. We are particularly interested in hearing you expand on your theories surrounding the "trans-positating fillification of ferrous ions in a structural matrix" that makes the excellent juvenile *Tyrannosaurus rex* femur you discovered take on the deceptive appearance of a rusty 9-mm Sears Craftsman automotive crescent wrench.

Yours in Science,  
*Harvey Rowe, Curator, Antiquities*

**Yale Olympics,** *continued from page 2*

devised better solutions than did our faculty, who created the problems in the first place," said D. Allan Bromley, former APS president and Sterling Professor of the Sciences at Yale, who attended the event. "Were many of our American universities to put together something similar to this Olympics, I believe that it would be extremely helpful as far as getting excitement back into undergraduate physics programs, and attracting high school students into undergraduate physics."

APS members, colleges and universities interested in participating in future Olympics, or organizing their own, should contact Cornelius Beausang (cornelius.beausang@yale.edu), or call the Yale Physics Olympics hotline: 203-432-5179. Further information can be found online at <http://wnsl.physics.yale.edu/events/olympics/>.



Another brick in the wall: Another case where theory meets the road...

Photo from <http://wnsl.physics.yale.edu/events/olympics/facts.html>

**Quoteworthy Science**

"X rays. Their moral is this: that a right way of looking at things will see through almost anything."  
— Samuel Butler, British writer (1835-1902)

"There are sadistic scientists who hurry to hunt down error instead of establishing the truth."  
— Marie Curie, Polish chemist/physicist

"For the rest of my life, I will reflect on what light is."  
— Albert Einstein, German-American physicist. (C. 1917)

"One may say the eternal mystery of the world is its comprehensibility."  
— Albert Einstein

"[The wave-particle view of physics is like a struggle] between a tiger and a shark: each is supreme in his own element but helpless in that of the other."  
— J.J. Thomson, British physicist (1925)

"I am become Death, the destroyer of worlds."  
— J. Robert Oppenheimer, American physicist (1945)

"In some sort of crude sense... the physicists have known sin; and this is a knowledge which they cannot lose."  
— J. Robert Oppenheimer (1947)

"What we observe is not nature itself, but nature exposed to our method of questioning."  
— Werner Karl Heisenberg, German physicist (1958)

"All that glitters may not be gold, but at least it contains free electrons."  
— John Desmond Bernal, British X-ray crystallographer and author (1960)

"[The wave-particle duality] is absolutely impossible to explain in any classical way... [It] has in it the heart of quantum mechanics... it contains the only mystery."  
— Richard Feynman, American physicist (1966, 1985)

"Basic research is like shooting an arrow into the air and, where it lands, painting a target."  
— Homer Adkins (1984)

**"Breaking News at the APS Centennial Meeting"**



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## Take \$100 Off a New Life APS Membership

In celebration of the Centennial, the APS Committee on Membership has initiated a \$100 discount off new life memberships between March 1, 1999 and February 29, 2000. A life membership, which ordinarily costs 15 times the regular current annual dues rate, includes a free life membership in one dues-requiring unit.

To take advantage of this special offer, look for details in your next invoice renewal packet. The offer is not valid on an existing or previously purchased Life membership. Questions may be directed to the APS Membership Department at 301-209-3280 or membership@aps.org.


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## IN BRIEF

### Clinton Names Fermi Award Winners

In February, President Clinton named Maurice Goldhaber and Michael E. Phelps as the winners of the Enrico Fermi Award, given for a lifetime of achievement in the field of nuclear energy. Goldhaber will receive the Fermi Award for research in nuclear and particle physics. Phelps will receive the award for his contributions to the invention and use of Positron Emission Tomography (PET). Energy Secretary Bill Richardson will present the awards on April 16 in a ceremony in Washington, D.C.

Goldhaber, 87, is a physicist and distinguished scientist emeritus at the Department of Energy's Brookhaven National Laboratory, Upton, NY. He is also an adjunct professor at the State University of New York at Stony Brook, where he has taught from 1961 to the present. Goldhaber was the first to accurately measure the mass of the neutron, and his later experiments provided key support for the Standard Model, the theory of fundamental particles and forces. Since his retirement, Goldhaber has continued the study of neutrinos, most recently as part of the international collaboration of scientists who, in 1998 at the Super-Kamiokande detector in Japan, found evidence that neutrinos have mass.

Phelps, 59, is chairman of the Department of Molecular & Medical Pharmacology at the University of California at Los Angeles School of Medicine, where he is also a professor of biomathematics in addition to his other administrative positions. He contributed to the invention and use of the medical imaging technique known as PET. He specifically contributed to PET's use in research and patient care in neurological disorders, cardiovascular disease and cancer, and also established and directed the first PET clinic for patient care.

### AIP Launches Online Heisenberg Exhibit

A new online exhibit devoted to Werner Heisenberg traces the birth of quantum mechanics, the wartime effort to build a German atom bomb, and other episodes from a remarkable life. Prepared by leading Heisenberg biographer David Cassidy, the exhibit is now available on the website of the Center for History of Physics ([www.aip.org/history/heisenberg](http://www.aip.org/history/heisenberg)), the premier clearinghouse of physics-related archived papers, photos, and 3000 hours' worth of taped interviews. Located at the American Institute of Physics in College Park, Maryland, the Center possesses several valuable collections of papers and provides support to other institutions in their efforts to archive the papers of important physicists. In addition to the Heisenberg site, the Center website is also home to two other widely popular exhibits, one devoted to Albert Einstein and one to J. J. Thomson's discovery of the electron. Soon an exhibit devoted to Andrei Sakharov will also be available.

### National Science and Technology Week To Be Held in April

The National Science Foundation (NSF) will sponsor National Science and Technology Week (NSTW) April 25 - May 1, focusing on the general theme "Find Out Why," to encourage the curiosity that spurs science, mathematics and technology. Another focus will be on "The Science of Everything." Established in 1985 to increase general public awareness of the importance of science and technology, NSTW has since been expanded to include observance on national, regional and local levels.

Several sites in the NSTW Regional Network will be distributing Teaching Activities packets this month, containing innovative, hands-on science, mathematics and technology learning activities for students in elementary and middle school grade levels. Information on NSTW '99, as well as updates on scheduled plans and events, can be obtained by contacting NSTW, NSF Office of Legislative and Public Affairs, Room 1245, 4201 Wilson Boulevard, Arlington, VA 22230; phone: 1-800-682-2716; email: [nstw@nsf.gov](mailto:nstw@nsf.gov). This information is also available on the official NSTW Web sites: <http://www.nsf.gov/od/lpa/nstw/start.htm>, or <http://www.nsf.gov/findoutwhy>.

## Dues to Increase in July

At its November 1998 Meeting, the APS Council approved a \$5 increase in Regular member dues for FY2000. For the last four years, dues for APS Membership have remained the same while services have expanded. The new Regular dues rate will be \$95; Junior and Senior dues will therefore increase to \$47.50 (half the Regular rate). Student rates will remain at \$25 and unit fees will not be affected for the coming fiscal year.

Life membership will again be calculated at 15 times the Regular rate or \$1,425. The Centennial special, \$100 off a new Life membership, will remain in effect until February 29, 2000, lowering the price of a Life Membership to \$1,325.

Billing with the new rates will begin in May 1999 for those members with a July to June membership year. Any questions regarding member invoices may be directed to the Membership Department at 301-209-3280 or membership@aps.org.

### International News, *continued from page 1*

sored by The University Cheikh Anta Diop in Dakar (UCAD), the European Physical Society (EPS) and the American Physical Society (APS). Other sponsors who provided support were The International Centre for Theoretical Physics (Trieste, Italy), the International Program in Physical Sciences (Uppsala, Sweden), the Centre National de la Recherche Scientifique (France), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Union of Pure and Applied Physics (IUPAP), and Lawrence Livermore National Laboratory (LLNL).

The principal organizers of the workshop were Ahmadou Wague (from UCAD), Annick Suzor-Weiner (from University of Paris-Sud, and a representative of EPS), and Kennedy Reed (from LLNL, and a member of the APS Committee on International Scientific Affairs). Reed was an ICTP Visiting Scientist at UCAD in 1997, and has spearheaded an APS initiative to increase interactions between the American and African physics communities.

The scientific program covered a spectrum of topics in basic and applied AMO physics. It included lectures on molecular spectroscopy by Delores Gauyacq from University of Paris, Orsay, and on the spectroscopy of doubly excited states in helium-like systems by UCAD's Ahmadou Wague. Augustine Smith, from Morehouse College, described his work with high resolution x-ray spectroscopy at LLNL's Electron Beam Ion Trap Facility, conducted under the auspices of the LLNL Research Collaborations Program for Historically Black Colleges and Minority Institutions. LLNL's Reed lectured on electron impact excitation and ionization of highly charged ions. Some contributed talks by African participants involved applications of spectroscopy in agriculture and environmental monitoring, as well as spectroscopic methods in chemistry.

Elias Sideras-Haddad of the University of Witwatersrand in Johannesburg, South Africa, discussed his work in Accelerator-based Mass Spectrometry (AMS) which can be applied in diverse interdisciplinary research efforts in Africa. He also described applications of AMS to paleontology, archeology, and anthropology - a topic which proved especially fascinating in light of recent discoveries in Africa related to the origins and early history of humans. Haddad is working to create an AMS center in South Africa which will serve as a nucleus for research collaborations involving countries throughout the African continent, and will also be a training center for

graduate students and post-doctoral researchers.

One session was devoted to medical applications of lasers. S. Avriplier from Orsay discussed the use of lasers for medical diagnosis and Dennis Matthews, program leader of the Joint Medical Technology Program at LLNL, spoke on the use of lasers for a variety of medical treatment applications. R. Diouf from UCAD in Dakar, showed how lasers have been successfully used in the treatment of laryngeal papillomatose, a type of throat tumor which occurs in some parts of Africa. And Seringne Gueye, a urologist at UCAD, described the use of lasers in prostate surgery and in treatments of several urological disorders.

A group discussion on collaborations and scientific cooperation, chaired by Samuel Adjepong, Vice Chancellor from the University of Cape Coast in Ghana, brought out frustrations and pitfalls of working on international collaborations involving developing countries. One major problem is the lack of governmental or local support in the developing countries. Participants from the US and some European countries noted that the agencies in their countries do not offer much in terms of support for physical science research in developing countries.

Participants were given tours of the UCAD physics laboratories at the university. These featured demonstrations to show research being done with laser-induced fluorescence for studies of local plants, and atomic physics experiments making measurements of hyperfine interactions. Graduate students from the university manned the demonstrations providing a good opportunity for interaction with the students.

According to Reed, the workshop also provided an opportunity for some of the American and European participants to see how African physicists work with very limited resources and yet manage to produce some interesting results and to train students. For example, one UCAD scientist owns a small shop, which he uses to make crafts. He sells these in order to help support his research in material science at the university, and also uses the shop to make parts for some of his experiments.

Overall, participants considered the workshop an enormous success. "Hopefully workshops such as this one can promote more international interactions for African physicists," Reed said. Additionally, American and European scientists can benefit from the training and expertise of the African scientists, and learn from their resourcefulness."

# Announcements

## Summer Intern in the APS Washington Office

We're looking for an undergraduate physics major with fantastic writing skills and a genius IQ — although we're prepared to be flexible. Contact us at <[opa@aps.org](mailto:opa@aps.org)> for details. Other interns in Washington have become both rich and famous.

## Call for Nominations for Y2K APS Prizes and Awards

Members are invited to nominate candidates to the respective committees charged with the privilege of recommending the recipients. A brief description of each prize and award is given in the March 1999 *APS News Honors and Awards* insert, available online at [www.aps.org](http://www.aps.org) under the APS News button, along with the addresses of the selection committee chairs to whom nominations should be sent. Please refer to the APS Membership Directory, pages A21-A40, for complete information regarding rules and eligibility requirements for individual prizes and awards or visit the Prize and Awards page on the APS web site at [www.aps.org](http://www.aps.org) under the Prize and Awards button.

### PRIZES

WILL ALLIS PRIZE FOR THE STUDY OF IONIZED GASES  
HANS A. BETHE PRIZE  
BIOLOGICAL PHYSICS PRIZE  
TOM W. BONNER PRIZE IN NUCLEAR PHYSICS  
OLIVER E. BUCKLEY CONDENSED MATTER PHYSICS PRIZE  
DAVISSON-GERMER PRIZE IN ATOMIC OR SURFACE PHYSICS  
DANNIE HEINEMAN PRIZE FOR MATHEMATICAL PHYSICS  
HIGH POLYMER PHYSICS PRIZE  
FRANK ISAKSON PRIZE FOR OPTICAL EFFECTS IN SOLIDS  
JULIUS EDGAR LILIENTHAL PRIZE  
JAMES C. MCGRODDY PRIZE FOR NEW MATERIALS  
LARS ONSAGER PRIZE  
GEORGE E. PAKE PRIZE  
W.K.H. PANOFSKY PRIZE IN EXPERIMENTAL PARTICLE PHYSICS  
EARLE K. PLYLER PRIZE FOR MOLECULAR SPECTROSCOPY  
I. I. RABI PRIZE IN ATOMIC, MOLECULAR AND OPTICAL PHYSICS  
ANEESUR RAHMAN PRIZE FOR COMPUTATIONAL PHYSICS  
J. J. SAKURAI PRIZE FOR THEORETICAL PARTICLE PHYSICS  
ARTHUR L. SCHAWLOW PRIZE IN LASER SCIENCE  
PRIZE TO A FACULTY MEMBER FOR RESEARCH IN AN UNDERGRADUATE INSTITUTION  
ROBERT R. WILSON PRIZE

### AWARDS

LEROY APKER AWARD (15 June 1999 Deadline)  
JOSEPH A. BURTON FORUM AWARD  
MARIA GOEPPERT-MAYER AWARD  
JOSEPH F. KEITHLEY AWARD FOR ADVANCES IN MEASUREMENT SCIENCE

### MEDALS AND LECTURESHIPS

DAVID ADLER LECTURESHIP AWARD  
EDWARD A. BOUCHET AWARD  
JOHN H. DILLON MEDAL  
LEO SZILARD LECTURESHIP AWARD

### DISSERTATION AWARDS

OUTSTANDING DOCTORAL THESIS RESEARCH IN BEAM PHYSICS AWARD  
NICHOLAS METROPOLIS AWARD FOR OUTSTANDING DOCTORAL THESIS WORK IN COMPUTATIONAL PHYSICS  
DISSERTATION AWARD IN NUCLEAR PHYSICS

**NOMINATION DEADLINE IS JULY 1, 1999,  
UNLESS OTHERWISE INDICATED.**

## Physics in the 20th Century

By Curt Suplee; Edited by Judy R. Franz and John S. Rigden

The discoveries and inventions of physicists in this century have revolutionized modern life. One hundred years ago, scientists questioned the very existence of atoms and knew almost nothing about the cosmos. Today, physicists can arrange individual atoms on a surface and make an image of the result, and have begun to unravel the history of time and the universe. In this book, Curt Suplee, science writer and editor at *The Washington Post*, documents one of the most remarkable flowerings of knowledge in human history. The extraordinary illustrations focus mainly on the remarkable images—from the atomic to the cosmic scale made possible by the instruments of advanced physics. Also included are photographs of experimental equipment—massive particle colliders are beautiful in their own right—and pioneering inventions.

This stunning volume is sponsored by the APS and the AIP on the occasion of the centennial of the American Physical Society. You will want a copy on your own coffee table and another for your parents and children who have always wondered why you find physics so fascinating. Now they will know!

Alternate selection of the *Book-of-the-Month Club*.

225 illustrations, 125  
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## APS UNDERGRADUATE PHYSICS STUDENT COMPETITION

### 1999 APKER AWARDS

#### For Outstanding Undergraduate Student Research in Physics

Endowed by Jean Dickey Apker, in memory of LeRoy Apker

#### ► DESCRIPTION

Two awards are normally made each year: One to a student attending an institution offering a Physics Ph.D. and one to a student attending an institution not offering a Physics Ph.D.

- Recipients receive a \$5,000 award; finalists receive \$1,000. They also receive an allowance for travel to the Award presentation.
- Recipients' and finalists' home institutions receive \$5,000 and \$500, respectively, to support undergraduate research.
- Recipients, finalists and their home physics departments will be presented with plaques or certificates of achievement. The student's home institution is prominently featured on all awards and news stories of the competition.
- Each nominee will be granted a free APS Student Membership for one year upon receipt of their completed application.

#### ► QUALIFICATIONS

- Students who have been enrolled as undergraduates at colleges and universities in the United States at least one quarter/semester during the year preceding the 15 June 1999 deadline.
- Students who have an excellent academic record and have demonstrated exceptional potential for scientific research through an original contribution to physics.
- Only one candidate may be nominated per department.

#### ► APPLICATION PROCEDURE

The complete nomination package is due on or before **15 June 1999** and should include:

1. A letter of nomination from the head of the student's academic department
2. An official copy of the student's academic transcript
3. A description of the original contribution, written by the student such as a manuscript or reprint of a research publication or senior thesis (unbound)
4. A 1000-word summary, written by the student, describing his or her research
5. Two letters of recommendation from physicists who know the candidate's individual contribution to the work submitted
6. The nominee's address and telephone number during the summer.

#### ► FURTHER INFORMATION (See <http://www.aps.org/praw/apker/descrip.html>)

#### ► DEADLINE

Send name of proposed candidate and supporting information by **15 June 1999** to: Dr. Barrie Ripin, Administrator, Apker Award Selection Committee, The American Physical Society, One Physics Ellipse, College Park, MD 20740-3844; Telephone: (301) 209-3268, Fax: (301) 209-0865, email: [ripin@aps.org](mailto:ripin@aps.org)

## 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. Titles and brief descriptions of the articles in the April 1999 issue are provided below. If you would like to subscribe to the paper or online version of *RMP*, please contact the APS Membership Department at [membership@aps.org](mailto:membership@aps.org) or (301) 209-3280. George Bertsch, Editor.

**Theory of Bose-Einstein condensation in trapped gases**—Since the first observation of condensates in atomic traps in 1995 there has been rapid progress. Many aspects of this new quantum liquid are amenable to simple theoretical understanding, as *F. Dalfovo et al.* explain in this review.

**Top-quark condensation**—The origin of masses and symmetry breaking, a fundamental problem of particle physics, has been sought in many ways, including a condensation of the top-quark vacuum. *G. Cvetic* explores the theoretical idea of top-quark condensation and problems with this mechanism.

**Precision tests of the electroweak interaction at the Z pole**—The properties of the Z boson, measured at  $e^+e^-$  colliders, provide an unprecedented test of the standard model of electroweak interactions. In this review *M. Martinez et al.* discuss the empirical properties of the Z as well as the implications for theory.

**High-transition-temperature superconducting quantum interference devices**—An important application of high- $T_c$  superconductivity is in SQUIDS for magnetic-field measurements. This review by *D. Koelle et al.* emphasizes the understanding of noise and its control in the devices.

**The electrodynamic response of heavy-electron compounds**—The heavy-electron metals have unusual optical properties and excitation spectra, which are reviewed by *L. Degiorgi* and contrasted with normal Fermi-liquid behavior.

**Drift waves and transport**—Transport of particles and energy in most real plasma is caused by drift waves. *W. Horton* presents the current status of this vast subject.

**Structure and phase transitions in Langmuir monolayers**—Experiments in the last decade have revealed that the phase diagram of liquid monolayers is quite complex, but, as *V. Kaganer et al.* explain, only a few order parameters are needed to describe them.

**Colloquia: Adventures of a Rydberg electron in an anisotropic world, by W. Clark and C. Greene**—The exquisite precision of Rydberg-level atomic spectroscopy shows the presence of momentum-dependent interactions that were predicted in 1990.

**Chaotic motion in the solar system, by Jack Lissauer**—The motion of smaller objects in the solar system is chaotic, with profound consequences for the formation of planets.

**Dynamic transitions and hysteresis, by B. Chakrabarti and M. Acharyya**—The responses of complex many-body systems to time-dependent external fields require theory beyond the usual perturbative treatment.

# THE BACK PAGE

## Authorship Credit in Science: Junior Physicists' Perceptions

by Eugen Tarnow

Research scientists attempt to discover, describe, and understand phenomena of nature. The information that results is published in books and journals. These books and journals are continuously appended with new information that slowly replaces or enhances what was there before. It is one of the most successful endeavors of humanity.

One of the reasons for the success may be the immediate feedback given in the publication process: scientists are rewarded by being listed as authors on the publications. This simple device, authorship, also allows the funders of the scientific endeavor a basis for decisions about which scientists should be given resources to perform future research.

The current scientific work on the designation on authorship is limited to four statistical studies covering various academic disciplines. This is not very many, considering the importance of authorship to careers in science. INSPEC, an online database covering physics and engineering since 1990, shows not one article about the ethics of authorship out of a total of 1.2 million articles. MEDLINE, covering the health sciences, includes about 100 opinion articles by journal editors and letter writers corresponding to 0.006% of all articles.

This article is one of the first inquiries into how authorship is distributed in every-day research collaborations. Our investigation focuses on perhaps the most important class of all research collaborations: junior scientists in non-permanent positions (postdoctoral associates or postdocs) supervised by senior scientists. The results are based on the postdocs' interpretation of the situation.

A questionnaire was distributed in 1996 which examined the process leading up to authorship assignment as perceived by physics postdocs (see *APS News*, May 1996, page 4). It consisted of respondent background information, information about the immediate research group (including, e.g., the postdocs' perception of the importance of recommendation letters from the research supervisor, and of published papers), and whether the postdoc had seen the APS ethical statement regarding authorship. Using this ethical statement as a reference, the postdocs were asked about the appropriateness of the authorship assignment on the last five papers the postdoc authored in his/her present position, as well as how much authorship decisions were discussed with the supervisor.

Two groups of postdoctoral associates were sampled: 99 randomly picked from a mailing list of all postdocs at a very large national laboratory, and 92 randomly picked from a list of university physics postdocs. The respective return rates were 59% and 47%, including incomplete questionnaires. For example, questions eliciting authorship details were answered by 65-70% of the returned surveys, giving an effective return rate of 34-37%.

### Results

The APS ethics guidelines give "minimal standards of ethical behavior" that are important for the creation of an environment of "mutual trust" in which physics is "best advanced." [APS Guidelines for Pro-

fessional Conduct, <http://www.aps.org/statements/91.8.html>] The sentence relating to authorship reads, "Authorship should be limited to those who have made a significant contribution to the concept, design, execution and interpretation of the research study." The results were based on the postdoc's interpretation of this ethics statement.

The survey results indicate that 26% of respondents have seen the ethical statement above, but the majority have not. Moreover, there is sometimes little agreement among respondents as to what the APS ethical statement means. For example, the postdocs were asked, "Do you consider, according to the ethical statement above, that obtaining grants and other funding for a project qualifies as a 'substantial contribution' that warrants authorship?" Forty-nine percent of the respondents answered affirmatively, while the rest are of the opposite opinion.

Respondents reported publishing an average of two papers per year. Guided by the APS ethical guidelines, in 14% of papers with the supervisor as an author, respondents indicated that the supervisor should not have been listed. The supervisor was an author on 92% of all papers the survey respondents authored. Similarly, in 33% of papers with authors in addition to the supervisor or the postdoc, one or more authors should not have been listed as such. Forty-six percent of all postdocs answering the question reported that at least one paper on which he/she was an author had at least one inappropriate author; 22% of postdocs reported that at least one paper had the supervisor as an inappropriate author. In 1% of all papers, respondents indicated that they were themselves inappropriate authors.

In 75% of postdoc/supervisor relationships, authorship criteria had never been discussed: in 61% of relationships the criteria for the postdoc's authorship were not clearly agreed upon, and in 70% the criteria for designating others as authors were not clearly agreed upon. Reasons cited for the inappropriate attribution of authorship fell into four categories: relationship building, minor contributions, previous or expected contributions, and crediting staff that are close in a social sense, for example, part of the same research group.

### Conclusions

Two main conclusions of this study stand out. First, *the distribution of authorship is a relatively undefined undertaking*. It is typically not something that postdocs and supervisors have discussed or agreed upon. The single ethical statement available to the community — the APS Guidelines for Professional Conduct — has not been seen by a majority of postdoc authors. Furthermore, these guidelines allow broad interpretation. For example, the statement on authorship does not clearly indicate whether obtaining funding for a research project qualifies a person for attribution as author, since half of survey respondents believe that it does, while the other half do not.

Second, using the existing APS guidelines as a standard, *postdocs perceive there to be a substantial amount of inappropriate authorship*. The supervisor, a joint author in 92% of the papers, is inappro-

propriately given authorship in 14%. In 33% of papers with additional authors other than the supervisor, one or more authors were perceived as inappropriately listed. In contrast, the postdoc was an inappropriate author on only 1% of all papers.

There are considerable forces acting against addressing the issue of assignment of authorship among postdocs and senior scientists. For example, one postdoc who held an elected position with the APS told me that the present study was "offensive," a "hot issue," and that he feared "isolating himself" should he bring it up in an APS committee meeting. Second, a committee that was to create the authorship guidelines for the APS some years ago worked in an "atmosphere of hostility," according to one former committee member. The guidelines brought difficult issues to the table, including due process, defamation of character, deprivation of rights, whether an individual accused would have the right to face his/her accusers, and other legal ramifications. The proposed guidelines had to be "watered down" before the current version was approved.

Although legal issues influence the scientific community with regard to procedures for assignment of authorship, there are at least three other relevant factors. First is the desire to avoid a process that could involve conflict. A second factor is that postdocs generally believe their supervisors' recommendation letters are very important for future job prospects. Accordingly, fear of obtaining bad recommendations may prevent postdocs from raising the topic of authorship with their supervisors. A third factor is that the power to legislate the rules of authorship is in the hands of more senior scientists. At this stage in their career, senior scientists may not perceive the issue as important — for example, no supervisor exists who can easily appropriate authorship from them — or, they may see authorship as an entitlement of their senior status.

There is also a relative absence of efforts with respect to authorship in the scientific community beyond just physics. The 1995 report from the Commission on Scientific Integrity ([www.faseb.org/opar/cr.html](http://www.faseb.org/opar/cr.html)), perhaps the largest attempt by the government to deal with ethics in science, said little about designation of authorship. It is also noteworthy that a common standard of scientific misconduct promoted by the National Academy of Sciences — fabrication, falsification and plagiarism — does not include the bulk of possible misconduct relevant to the designation of authorship.

### Future Action

If one believes that authorship, in particular accurately assigned authorship, is important to the scientific endeavor, one must ask whether there are useful ways to better define and operationalize the procedure of authorship assignment?

One possible option is to follow the patent authorship model and have an attorney or another disinterested party inquire into the research work and, according to existing legal standards for patent authorship, write down the list of authors. A second option would be to more accurately assign authorship by adding a section at the end of each



Eugen Tarnow

paper explaining what each author contributed. Both approaches would counteract major reasons that underlie honorary authorship found in this study — relationship-building, social closeness, previous and expected work — in the first instance because of the participation of a disinterested party, and in the second because of the public disclosure of what each person actually accomplished. The latter procedure might also respond to concerns about minor contributions, since the extent of these would be clearly stated.

To date, the scientific community, has not adopted formal procedures with respect to inappropriate authorship. The impetus to enact such may come from single institutions that take it upon themselves to protect the work of young scientists and/or the American judicial court system which can require the scientific community to do so.

Institutions may start to compete for the limited pool of young scientist applicants not just with the strength of its brand name but also by adopting standards of authorship that promise to protect their intellectual work. This way, a less well-known institution that protects the intellectual work of their junior workers would be able to attract junior scientists more so than a more well-known institution which does not have such protection in place. If one university starts the cycle, another may follow and so on.

The future may also hold a recasting of inappropriate authorship in terms of theft of intellectual property. I am hopeful that a cause of action for such theft will be recognized in American jurisprudence because these cases involve real injury to real parties which deserve redress.

Finally, I would like to challenge the APS leadership to take action in the area of authorship by adding one word to the Guidelines (see above). Authorship in physics should explicitly promote original thinking rather than, for example, the ability to get grants. The APS should require that the "significant contribution" necessary for authorship be a "significant intellectual contribution."

*Eugen Tarnow is a scientist with Avalon Business Systems Inc., in Riverdale, NY. A more detailed article based on this survey was published in Science and Engineering Ethics, Vol. 5, January 1999, page 73.*