Council Statements Focus on Missile Defense, Science Funding

At its April meeting, the Council of the APS approved a statement on issues relating to the technical feasibility and deployment of the proposed National Missile Defense (NMD) program. President Clinton is scheduled to make a decision by this October as to whether to begin deployment of such a program, although a decision could be made as early as August. Some members of Congress, of both parties, have urged the President to defer a decision until the next administration. The text of the statement follows.

“The United States should not make a deployment decision relative to the planned National Missile Defense (NMD) system unless that system is shown through analysis and through intercept tests to be effective against the types of offensive circumstances that an attacker could reasonably be expected to deploy with its long-range missiles. The planned NMD system is intended to defend U.S. territory against tests of long-range ballistic missiles carrying biological, chemical or nuclear weapons. The ability of the NMD system to deal with countermeasures is a key factor in determining whether the system will be able to defend against the threats it is intended to meet.

This statement implies no APS position with respect to the wisdom of national missile defense deployment and concerns itself solely with its technical feasibility.”

Background information relating to the NMD statement can be found on the APS website at http://www.aps.org/statements/01.2.html.

The DOE Office of Science is responsible for the construction and operation of most major facilities in particle and nuclear physics, and for many other programs relevant to materials sciences, energy sciences, biology, and medicine. These efforts have been instrumental in the success of important national scientific programs.

The Council urges therefore the DOE to share fully, in FY2001 and in subsequent years, in the funding increases aimed at maintaining the health of the U.S. scientific enterprise. Funding in the areas of management and security issues should not obscure the need for sustaining and enhancing the essential DOE-supported science programs.”

Physics Chairs Meet at APS Headquarters

More than 120 physics department chairs spent two days in April at the American Center for Physics in College Park, MD, for a conference emphasizing undergraduate physics education. The meeting focused on the need for better teaching techniques, curricular issues, careers, responses to the new engineering accreditation requirements, and ways to improve the physics taught to prospective teachers. Roundup of the talks was posted on NSF and DOE funding priorities by Bob Eisenstein, Assistant Director for Mathematical and Physical Sciences (NSF) and Pat Delahanty, Acting Deputy Director of the Office of Science (DOE), and an overview of the Washington science policy scene by Mike Lubell, APS Director of Public Affairs. In the photo above, Steering Committee co-chair Peter Golovin of Swarthmore addresses the gathering. The conference was coproduced by APS and AAPT.

Re-"Creating Copenhagen" at CUNY Symposium

W hy did Werner Heisenberg make the risky journey to Copenhagen in 1941 to visit his former mentor, Niels Bohr? What did the two discuss, and why did they start their friendship? Was Heisenberg the atom, but who were now on opposite sides of World War II. Heisenberg, then chief scientist on the German atom bomb project, made a covert journey at great personal risk to see his former Danish mentor and his wife Margrethe in Copenhagen, but the meeting ended in acrimony. Nothing is known of why Heisenberg made the visit, or what the two men said to each other, yet it remains a defining moment of the modern nuclear age.

Re’s play extends the concept of quantum uncertainty to the realm of human motivations through a series of cyclic re-tellings of the same event from differing perspectives, and in Blakemore’s staging the actors move about the stage as if they are particles in a quantum system. Michael Cumpsty, the actor who plays Heisenberg in the Broadway opening of "Creating Copenhagen," won the prestigious Evening Standard Award for Best Play in 1998. The play is inspired by actual events that have in-cluded lectures on the science and history of the so-called “Copenhagen Interpretation” of quantum mechanics and the subsequent development of the atomic bomb. The CUNY symposium was timed to coincide with the Broadway opening of “Creating Copenhagen,” an award-winning drama by British playwright Michael Frayn that won the prestigious Evening Standard Award for Best Play in 1998. The play is inspired by actual events that have included lectures on the science and history of the so-called “Copenhagen Interpretation” of quantum mechanics and the subsequent development of the atomic bomb.
Month 300 Meeting Prizes and Awards Recipients

April 300 Meeting Prizes and Awards Recipients

That’s It Folks! For the Last Time: Even More Top Ten Physicists

About your list of top ten physicists: I think that although Heisenberg, Feynman, Schrödinger were very important, they are in the list because of either their characteristics (Feynman - why not Tomonaga or Schwinger; then 3 or because they summed up the advances of debates at their times (Heisenberg and Schrödinger - without the Bohm, Born, Mach, I do not think they would be there). I suggest to replace them with people like Faraday, Ampère, Coulomb, Gauss, who were more "stand-alone" geniuses, working as well in experimental as theoretical physics. The Curie, Fermi, etc. should also be in the list, which locks Anglo-German, quantum-mechanical, and XXth century biased to me.

Fleuro Calvayrac
Laboratoire de Physique de l’État Condensé, Université du Maine Faculté des Sciences

The Physics World review (not only the first 10 physicists) reveals a double bias.

First toward modern times and second in favor of theorists. Further, while it is in order to make a tenist list after a poll, there is no need for that in an individual choice. Here are my top ten physicists who have contributed to physics the most:

1. Archimedes (great physician, engineer, and mathematician), who laid the foundations of statics and hydrostatics.
2. Isaac Newton (great physicist and mathematician), who laid the foundations of dynamics and hydrodynamics, and the theory of gravitation.
3. Michael Faraday (arguably the greatest experimentalist of all time), who laid down the foundations (together with James Clerk Maxwell) of the physics of electromagnetism, the cornerstones of modern civilization.
4. James Clerk Maxwell, who by formulating the electromagnetic theory not only made a unification of two formally disparate fields, but introduced the notion of the physical field, probably the most important concept of modern physics.
5. Albert Einstein (arguably the greatest theoretical physicist of all time), who has revised at the most fundamental level Newton’s concepts of space and time, his theory of relativity and the equivalence principle (together with James Clerk Maxwell) of the physics of electromagnetism.
6. Galileo Galilei (great physicist and astronomer), who laid down the foundations of modern science, by introducing both mathematical and experimental methods into science and thus separated it definitively from scholasticism and metaphysics.
7. Ludwig Boltzmann (great theoretician and epistemologist), who has laid down foundations of thermodynamics, with Maxwell’s electromagnetic theory, considered the crown of 19th-century physics.
8. Ernst Rutherford, who has, by elucidating the structure of atomic systems, opened the door of the microscopic, previously inaccessible to our experience.
9. Erwin Schrödinger (great theoretician and polymath), who has formulated his equation, with Newton’s one the most important in the history of science and contributed decisively to the overall development of quantum mechanics, arguably the greatest theoretical achievement of science in general.
10. Paul Dirac (great theoretician), who laid down the foundations of relativistic quantum mechanics and quantum field theory, the latter being, as such, the most advanced achievement of physics of our time.

Petar Grujic
Belgrade, Serbia, Yugoslavia

While the names on the list are certainly among the outstanding physicists in history it seems strange that one name has been left out. A man who discovered not one, but two, but three universal laws, who was as responsible as Maxwell in unifying fields, who outwrote his accomplishments in physics and became a statesman, whose name is familiar among physicists from Seoul to Sao Paulo, who founded an institution which has benefited tens of thousands of the most underprivileged physicists, who kept open a channel to the West to physicists from behind the Iron Curtain when no one else would have them, certainly belongs on any list of ten outstanding physicists in history. I refer of course to Abdus Salam.

Munawar Karim, Professor
Department of Physics, St. John Fisher College

More on Who were the top ten physicists? Don Lichtenberg (April issue) made some good points but, like most others, he neglects experimentalists and underes-
tenuates the contributions of theoreticians. Was it easy to establish Coulou’s law or discover electricity (both circa 1790) than to observe the scatter ing of alpha rays (1913) or measure the speed of neutrons (~1940)? It was less significant for Laplace (also the inventor of cosmology) to formulate classical me chanics in terms of his equations than to derive a Laplacian formulation of quantum mechanics? What was more astounding: that light could be shown to produce very puzzling shadows indeed when passed through Young’s slits, or that “matter waves” also interfered? Inexucusable also, one would get the impression that this most im portant achievement of classical thermodynamics, thermodynamics, was not an essential part of physics. Maybe the problem with thermodynamics is that, like quantum mechanics, it was a collective sort of achievement. Don Lichtenberg could not have been aware of Heisenberg, Schrödinger and Dirac, similarly after hesitating between Carot, Clausius, Gibbs, etc., I chose Boltzmann! Experimentalists I order chronologically because the available technologies of their respective times makes them unparalleled.

Here I go then (after much agonizing)— Top five theorists: Newton, Einstein, Schrödinger, Maxwell, Boltzmann. Top five experimentalists: Galileo, Coulomb, Young, Fadun, Rutherford.

And how about old Archimedes? Wasn’t he one of them all?

Bertend Ter raenfall
Université du Québec
Scientific Community Speaks Out on Behalf of FY2001 NSF R&D Budget

March and April were busy months for scientists working on behalf of the proposed Presidential science R&D budget for FY2001, which calls for an increased budget for the National Science Foundation. The Presidential request also calls for balancing the increase between focused research initiatives in nanoscience, information technology, biocomplexity and science education, on the one hand, and the core research programs in the natural sciences and mathematics on the other. The scientific community has been quick to speak out in favor of the proposed NSF increase, as evidenced by a three-page letter sent in March. In March, the APS Executive Board agreed to co-sign a statement supporting the FY2000 proposed NSF budget generated by the Coalition for National Science Funding (CNSF), which maintains that such an increase is “imperative to expanding the opportunities for more successful science and technological breakthroughs in the future.” The CNSF statement cited the major role federal R&D support has played in sustaining U.S. economic growth, along with its belief that the NSF’s badly in need of a $2 billion to $3 billion increase to ensure the nation’s continued economic health. “There is little doubt that nanoscience and information technology will be at the cutting edge of future research, and we are therefore strongly supporting the new initiatives identified in the President’s request,” he wrote. “At the same time, we are much encouraged by your goal of using half of the NSF increase for the improved funding of core research. Only by maintaining a wide base of scientific knowledge can we prepare ourselves to tackle the new frontiers, wherever they may appear.”

Finally, Robert Richardson of Cornell, Chair of the APS Physics Policy Committee, represented the APS during April Congressional hearings before the House Subcommittee on VA, HUD and Independent Agencies Committee on Appropriations. His testimony was part of a collaborative presentation with representatives from the American Chemical Society, the American Mathematical Society, and the Federation of American Scientists for Experimental Biology, and echoed many of the same sentiments as the CNSF statement and Langer’s letter, particularly in multidisciplinary research. “The boundaries between the traditional disciplines have become increasingly blurred, and the advances in the different disciplines have become increasingly interdependent,” he told subcommittee members. “The scientific frontier no longer seems to fit conveniently into one discipline or another. For this reason, we strongly support initiatives that cut across disciplines, such as those the President identified this year.”

Crunch Time

By Michael S. Lubell, APS Director of Public Affairs

A lame-duck presidency is like Joe Six Pack: a few ripples still drip down the triceps, but more than a few find their way into the flask showing in the gut. As the Clinton Administration nears the end of its long, bumpy ride, the White House is whether this president, who only a year ago suffered the ignominy of impeachment, will break the conventional mold. Intelligence sources in both parties think he will. Democrats, who loyally stood by him last year, see his staying power as ironic. Republicans, who gunned him down, view it as insulting. But privately, they all acknowledge that the White House is a master performer in the political arena.

Here’s why.

For every member of Congress, getting out of town early to campaign for reelection is highest on the list of priorities. That means precious little time for legislation.

In the case of the treaties, Congress holds all the cards. The Senate can simply refuse to take them up, and all the president can do is sputter.

In the case of the budget, the White House has all the trumps. If the president doesn’t like what Congress sends down Pennsylvania Avenue, he can send it back promptly with a veto. With insufficient votes for an override, Republican leaders will have four choices: shut the government down, strike a deal or pass a continuing resolution. Here’s why.

For the Republicans, getting through the final negotiations without humiliating defeat. But getting from June to October without committing political suicide will be their biggest challenge.

As they enter the appropriations arena, the Republican leadership has left itself little wiggle room. In February, President Clinton proposed a discretionary budget amounting to $622 billion. The Budget Resolution that made it through both houses of Congress puts the spending at just over $600 billion.

In addition, Senate Majority Leader Trent Lott (R-MS), at the prodding of Senator Phil Gramm (R-TX) mixed the presidential request for Fiscal Year 2000 supplemental spending for foreign and domestic emergencies. In fairness to the GOP leadership, it should be noted that by the time the request was about to reach the Senate floor, the $6 billion or so request from the White House reportedly had grown to more than $20 billion.

Still the Senate action, or, more properly, the lack thereof, leaves Congress with a gaping $27 billion dollar hole to repair. For civilian programs, the hole is a chasm, since Congress added more than $10 billion to the presidential budget for defense spending.

For science this means a shortfall of at least $100 million in DOE research accounts, compared to present spending. And in NSF accounts, it could mean even more.

Will these numbers stick after all the dust has settled? Will it be a cliff hanger? The only certainty is that Arlen Specter (R-PA) and Tom Harkin (D-IA) will hold sway in the Senate, and John Lott (R-MS), Trent Lott and Mike Enzi (R-WY) in the House, as they successfully nudge their colleagues to deliver another $2-billion increase for NIH.
Explosive Arithmetic

Your third “Physics Product Warning” (April 2000) raises a serious problem with the product “contains the energy equivalent of 85 million tons of TNT per net ounce of weight.” I have two problems with this:

1) Einstein’s equation is for the equivalence of mass and energy, not weight and energy.

2) When I do the arithmetic, I get 21 trillion tons of TNT per gram or 607 trillion tons of TNT per ounce, not “85 million tons.” (1)

Have I done the arithmetic correctly?

Albert A. Bartlett
University of Colorado, Boulder

Sympathy for Wen Ho Lee is Misplaced

While I agree the poor treatment of Wen Ho Lee (APS News, April 2000) in prison seems out of proportion to his alleged crimes, I have been highly uncomfortable with the postulations from our society and others about his treatment. Have we lost a sense of perspective here? Lee was not only a scientist; he was a weapons laboratory; he was actually contributing to the design and development of weapons of mass destruction - objects whose purpose in use is to destroy the lives of millions of people. In that context, Lee’s prison conditions seem trivial. Those who work in our country’s armed forces understand that, in the line of duty, bad things can happen — among other things they can be mistaken for the enemy and hit by “friendly fire.” Perhaps that is what has happened here. If Lee’s imprisonment is causing recruitment difficulties at the weapons laboratories, surely this is only because of its effect as a reminder of what those laboratories are really intended for.

Newt Gingrich has called upon scientists to take more seriously their responsibilities as citizens. Our reaction to this case seems to only provide more evidence of how divorced our politicians are from real civic responsibility. Do we think the law that governs and regulates the communities and country where we have such freedom to work should have no application to us?

Arthur Smith
Selden, New York

Earth Science Not Given Its Due

The supplement to the April 2000 edition of APS News entitled “Physics News in Brief” (1) gives a poor understanding of the category “Earth Science/Geophysics.” In that section are listed five items that are supposed to be representing this category. But two of these, “cannon mass ejections” and solar wind disappearance, relate to solar physics, not earth science, and a fish on supernova material found in South Pacific, to do mostly with astrophysics.

Earth science is a separate discipline from solar physics or astrophysics. There were many important news events in 1999 in earth science. For example, the first satellite min radar flew on TRMM, and the Landsat 7 satellite launched on 25 April, 1999, began a global dataset of the Earth’s surface of unprecedented detail and global coverage. Both TRMM and Landsat inaugurated EOS, the “Earth Observing System,” a comprehensive array of satellites, continuing with 1999 launches of QuickScat for measuring wind over oceans, ACIM-SAT to measure soil moisture, and the 10 December 1999 launch of Terra, the flagship satellite of EOS, that gives three-dimensional information on clouds, aerosols, and Earth’s radiative energy budget.

Thus, 1999 was a watershed year for earth science, and you missed an important opportunity to report it, replacing major earth science stories with ones that, important though they are, have no direct bearing on observations of the Earth.

Robert F. Cahalan
NASA Goddard Space Flight Center

Park Goes Off the Deep End

This letter concerns your front-page article “...March Meeting Madness” especially in regard to the Robert Park spinoff on this theme page on 3 APS News, March 2000. It has been postulated for the courage he has shown in taking on pseudo-science and the paranormal, that one important respect he has gone off the deep end and needs to “get it right” himself. Things get pretty shaky when he claims expertise in fields he knows very little about.

For example, his objections to the 15 society and the colonization of space. He would have to base that claim on the current knowledge that there is a cheap way to get into orbit. But many alternative technologies already exist for inventing the cost of orbit. Does he know for sure that none of this can work?

On cold fusion there are some fine points that Park probably isn’t aware of. Certainly to begin with the results are phony. But in the late 1980s there were WKB quantum mechanical studies done of the probability of deuteron tunneling.

Newt Gingrich Corrected

I think Mr. Gingrich (March 2000 APS News, page 3) has his WWII history a little wrong. The Battle of the Atlantic was finally won by about May 1943, with short wave radar and long wave aircraft each being a much more significant contribution to victory than sonar.

Walter Baker
Hartford, New York

Cultural Differences

This month’s “This Month in Physics History” describes the Shelter Island Conference of June 1947, a landmark event that led deeper understanding of quantum field theory, in particular quantum electrodynamics, and to impressive agreement between theory and experimental result. It set the agenda for a whole program of research in both theory and experiment in the immediate post-war period. Feynman looked back on it as the most important conference he had ever attended.

The venue for that conference was a beachfront hotel on an island off the eastern tip of Long Island in New York. The hotel was just opening for the summer season, and it most certainly was in a “resort area.” In that light, it is interesting to contemplate DOE regulation O 110.3, which lays down a set of rules for DOE-sponsored conferences. In one section, conference organizers are admonished to “avoid selecting resort or recreational sites unless true cost savings will result.” This is just one of a host of restrictions and prohibitions contained in the document, but it serves to illustrate the attitude of its author toward the scientists to whom it applies. Just as one is not allowed to avoid a resort or recreational site if it will be more expensive; rather, if there are two sites, equally expensive, one is being instructed to choose the less expensive of the two.

What is the national policy? I think of two. First, the DOE, even if money is not actually being wasted, must avoid the appearance of enjoying itself at the public’s expense. Second, scientists, are inherently irresponsible creatures, and if you turn them loose in a recreational area, they won’t spend every waking hour attending the meeting, which is what the DOE wants them to do.

One could just shrug one’s shoulders at this attitude, were it not for real-life examples of conferences, typically ones with organizers who are DOE employees or DOE contract employees (e.g. physicists at national labs), that may be affected by O 110.3. The accumulation of restrictions and prohibitions on who may attend these meetings, where they may be held, and what may be reimbursed is so onerous that their very existence is in jeopardy.

Other instances of burdensome government regulations are not hard to find. For example, in considering complicated conference sites, the APS decided to hold its March meeting in Montreal in 2004. The favorable Canadian exchange rate made this a particularly economical choice. Recently, though, travel to Canada has been reclassified as “foreign travel.” (The reader may think that of course travel to Canada is foreign travel, since Canada is a foreign country. But this is really an administrative classification, independent of national boundaries. For example, travel to Hawaii could be designated as “foreign travel.”) The consequent bureaucratic entanglement will make it much more difficult for the participants to help DOE with their expenses. The reason for the classification is presumably to travel to a foreign country. But the ring of an exotic boondoggle even if it is actually less expensive, and therefore must be actively discouraged.

While it seems dealing with this kind of government regulation, scientists are by now used to the irritating and the illogical. Still it is tempting to dream a little about a time when times of 1947 when newly released from the shackles of war-time security, a group of two dozen scientists could avail themselves of a couple of thousand dollars from the National Academy, isolate themselves in a pleasant locale, and spend three days attending one of the most productive and historic conferences of the twentieth century.

— Alan Chodos

Physics Can Lead to Divine Truth

I am deeply disappointed in the opinion piece by David Markowitz (APS News, March 2000), in two key ways. First, it is clear that Markowitz knows nothing about the role of women in the Catholic Church. What a shame for a distinguished educator to make such statements out of ignorance. Were he to do that in physics, he would lose all respect.

Second is the statement that “I think reference to God in this enlightened age is largely a ploy.” I truly am sorry if Markowitz has known only religious hypo-

crimes. Shame on his hubris to assert that this attitude, were it not for real-life examples of conferences, typically ones with organizers

concerning the role of women in the Catholic Church.

What is Science” Statement Ignores Religious Element

The 2 April 1988 issue of the London Sunday newspaper The Observer published an article by Michael Ignatief under the heading “Defenders of (Salman) Rushdie (are) the ultimate enemies of freedom.” The Observer, which has a large circulation, then dated 24 March 1989, the heading was “The Observer is not a place for the thought of the left.” The Observer is a weekly newspaper published in London.

I note that the article on the APS’s Council approval of the revised “What is Science?” statement (APS News, January 2000) does not address the above objection. It thus regrettably fails to convince the significant proportion of Americans who are religious (mostly Christian) fundamentalists.

Theo Theocharis
London, England

Let us know who you are, and we will send you something about our God are charlatans, and that the only way to truth is through physics. This narrowness of thinking is considerably less than enlightenment, and an offense to many who find faith another way to truth. We are more than mere physical beings. While faith can lead to truth, I generally don’t depend on my faith in God to lead me to truths in physics; but I do revel in physics leading me to still more truths about God.

David W. Knobel
Tupelo, Mississippi

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A P S N E W S

June 2000

OPINION

LETTERS

VIEWPOINT...
Satisfaction High for Undergrad Physics Bachelor

After many years of steady decline, the number of undergraduates earning bachelor's degrees in physics appears to have finally stabilized, according to a recent report by the graduating class of 1998, compiled by the American Institute of Physics (AIP). U.S. colleges and universities awarded a total of 3,821 B.S. degrees in physics, according to Patrick Mulvey of AIP's Education and Employment Statistics Division. However, the decline persists in larger physics departments that also maintain graduate programs in physics. Among these schools, the cumulative drop in degrees has now reached 27% since 1992.

Mulvey says satisfaction levels among physics bachelor recipients are quite high, with 86% indicating they would still major in physics if they had to do it over. An overwhelming majority of the respondents said they chose to study physics because they enjoyed the subject, not because of the potential career opportunities it offered, although physics seniors believe they will have strong employment prospects with their degrees.

Fourth Annual Pegasus Awards

Awarded by the James Randi Educational Foundation

On April 1st of each year, we at the James Randi Educational Foundation (JREF) award the coveted Pigasus Awards in four categories, for accomplishments in the year previous. The awards are of course announced via telepathy, the winners are allowed to predict their winning, and the Flying Pig trophies are sent via psychokinesis. We send; if they don't receive, that's probably due to their lack of paranormal talent.

This year we honor the following individuals:

Category #1, to the scientist who said or did the silliest thing related to the supernatural, paranormal or occult: The award this year goes to a specific scientist, not to a specific field. We generically award it to Larry Smarr of the University of California, San Diego because he claims to have witnessed the “inverse Snell effect,” in which he says light from a moving source appears to the observer to be moving in the same direction as the energy flow. This is a violation of the laws of physics and results in a field of study that has been untested and unproven.

Category #2, to the psychic performer who fooled the greatest number of people with the least talent: The award is given this year posthumously to Michel de Notredame, Nostradamus, the 16th-century French prophet who predicted back in 1558 that the world would suffer a major catastrophe in July of 1999, if not the end of the world as we know it. While major panic reigned and timorous and not-too-bright folks worldwide hid in stores of water, food, and other supplies, most of them were just part of a1999 marketing scheme. But they were fooled! The reason is that they were so afraid that they didn’t question the evidence.

Category #3, to the media outlet that reported the most outrageous supernatural, paranormal or occult claim: The award goes to the British Broadcasting Corporation (BBC) for their coverage of the story of a woman who claimed she was the reincarnation of Jesus Christ. The story was covered worldwide and was seen by millions of people.

Category #4, to the psychic performer who fooled the greatest number of people with the least talent: The award is given this year posthumously to Michel de Notredame, Nostradamus, the 16th-century French prophet who predicted back in 1558 that the world would suffer a major catastrophe in July of 1999, if not the end of the world as we know it. While major panic reigned and timorous and not-too-bright folks worldwide hid in stores of water, food, and other supplies, most of them were just part of a1999 marketing scheme. But they were fooled! The reason is that they were so afraid that they didn’t question the evidence.

Topsy Turvy: Researchers Announce First True “Left-Handed” Material

Satisfaction High for Undergrad Physics Bachelor
Writing Workshops Teach Basics of Communicating with Public

Physicists with a penchant for communicating science to the public received a crash course in the fundamentals of writing for the general interest media at a meeting held at both the March and April meetings of the APS. Originally suggested by a special APS task force on informing the public, the workshops were hosted by Robert Park, APS Director of Public Affairs, whose weekly electronic newsletter “What’s New” reports on science policy developments and other science-related public issues. He is the author of numerous articles and editorials for the general media, as well as the recipient of the Presidential Citizens Medal. “The Reid from Foolishness to Fraud (see APS News, March 2000).

“Don’t be even-handed…you need to have some bite for an Op-Ed.”

Park drew on his considerable experience and success in this area to offer helpful tips to scientists aspiring to write for their local media, from the general reporting perspective to more focused journalistic endeavors. “The road to Foolishness to Fraud is a good news peg to draw the interest of the reader and concretely illustrate one’s point of view,” said Park.

“With the range of jobs available in today’s job market, it has never been more important for physicists to have an accurate and comprehensive view of their career options and the skills necessary to compete.”

Stein, giving a brief background of the CPDL program and a summary of the day’s agenda. Roman Czujko of AIP’s Education and Employment Statistics Division provided the backdrop for the day’s sessions: some statistics on the most recent data available. Czujko reviewed the numbers of Bachelors, Masters, and PhD physicists in the workforce and put those numbers in the context of career opportunities, needed job skills, titles and salaries. After the keynote address, participants were divided into groups of 15 or 20 to choose from more than 30 sessions featuring institutions and individual scientists who have succeeded in modifying their academic programs to account for the changing employment environment for physicists. Three focused on better preparing students for jobs in industry, through innovative master’s degree programs and industrial internships, for example. Dave Bentla, Director of Career Services at the University of Delaware illustrated how university career services departments have automated their systems so as to serve students and employers virtually 24 hours a day. He also gave examples of computer science departments working closely with local and national industrial companies and the physics departments to link students with industrial jobs. John Biglen of the American Institute of Physics, who teaches a course at the University of Maryland, discussed the importance of having departmental liaisons at local, national and international companies. “It was good to see that the issues that are important to me are also shared by others in the country,” he said. The participants said they would like to hear from more physicists in industry about what employers in that sector are looking for. Several also said that they would like to see more departments participating in future workshops, especially small departments at non-PhD granting institutions. Members of the APS Committee on Careers and Professional Development agreed that more liaisons should attend workshops and remarked that future workshops will likely have sessions where attendees from each type of university background can separately discuss issues relevant to them. They remarked that they want these workshops to give the liaisons the information they need in order to better connect students in their departments.

Aspects of the workshop rated most useful by participants were the importance of alumni in establishing industrial contacts and illustrating its value to current students.

Liaisons are provided with the latest career and employment information and also benefit from the ability to network with their colleagues at other institutions.

Different physics career tracks, as well as increased awareness of employment resources currently available. Many participants were especially interested in the concept of providing more focus on those with undergraduate physics degrees who choose to go directly into the workforce.

From the APS viewpoint, the workshop provided information on how the physics departments can better serve their students a return on their educational investment, and help its industrial and applied members develop the necessary workforce. The liaisons reported especially benefitting from the information provided scientists and other liaisons who have worked on career issues and gotten through the pitfalls.

Future plans for the Career & Professional Development Liaison Program include more workshops, perhaps at APS section meetings, consistently updating the CPDL website, and working with other scientific societies to provide the best information available.
Re- “Creating Copenhagen,” continued from page 1

of superstring theory geared for a general audience. Speakers at the second session offered broad-based analyses of the scientific and historical events of the era in which the play takes place, including the reasons why the Germans did not achieve their institutional libraries in the APS Journal Outreach Program. In each of the next four years, a maximum of one (1) journal is available at member rates. They will also receive APS News and Physics Today.

Relief is at hand for physicists living in developing and hard-currency-poor countries through the APS Matching Membership Program. Established in 1983, the program allows individuals receiving reduced-cost memberships to support members of their national scientific societies — to apply for a reduced cost APS membership. Membership is available in one of two categories, with the associated benefits of each outlined below:

- A half-price membership at $45 is available for those with an individual or institution with whom in kind payback can be arranged. This level can subscribe to a maximum of one (1) journal at member rates and register for APS meetings at member rates. They will also receive APS News and Physics Today.
- A graduated, reduced cost membership beginning at 20% of the full membership rate in the first year is available to individuals on a limited basis. Applicants who are unable to pay and who do not have a sponsor may request APS support. Members in this category will receive APS News  and Physics Today for APS meetings at member rates. No journal privileges are included, but members who have difficulty accessing APS journals may apply to the APS Office of International Affairs to enroll their institutional libraries in the APS Journal Outreach Program. In each of the next three (3) years, membership dues will increase by 10%. Upon reaching 50% in the fourth year, a maximum of one (1) journal is available at member rates.

Membership will be renewed on a yearly basis via invoice. Each member sponsored through this program may participate for no more than six (6) years in order to accommodate as many physicists as possible. At the completion of the six-year term, all participants will be billed the full member rate. Enrollment is limited to 1.5% of the total APS membership level. Thus, in 2000, the program can accommodate 640 participants.

For further information about the APS Matching Membership Program, please contact the Membership Department at (301) 209-2580 or membership@aps.org.

APS MATCHING MEMBERSHIP PROGRAM

The APS Undergraduate Physics Student Competition

2000 APKER AWARDS

For Outstanding Undergraduate Student Research in Physics

Endowed by Jean Dickey Apker, in memory of LeRoy Apker

DESCRIPTION

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FURTHER INFORMATION

(See http://www.aps.org/praw/apker/ descriptor.html)

DEADLINE

Send name of proposed candidate and supporting information by 16 June 2000 to:

Dr. Alan Chodos, Administrator, Apker Award Selection Committee
The American Physical Society, One Physics Ellipse, College Park, MD 20740
Telephone: (301) 209-3268, Fax: (301) 209-3652, email: chodos@aps.org

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Winners of the Physics Trivia!

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- Maxwell
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- Feynman

and we asked our readers to figure out what the scoring system was. We have received just one correct answer, from Jeffrey Winkler, who writes:

“In your physics trivia section, the scoring system is the number of times they were married.”

Winkler will receive a copy of the handsome souvenir volume “Physics in the 20th Century” by Curt Suplee.

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American Physical Society market place

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2000 – 2001

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Member News:

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The Coming Revolution in Physics Education

By David Goodstein

This essay will end on an optimistic note, but first, the bad news. Let me be blunt. The profession of teaching physics at the college level in America today has become a zero-sum game: one man’s gain is another man’s loss. One is to produce physicists, and the other is to act as a gatekeeper, keeping the unworthy out of certain professions such as engineering and medicine. We will always need physicists, but not very many of them. And, indeed, the number of physics majors in colleges all across the country today is said to be at its lowest point since Sputnik, more than forty years ago. Our other role, as gatekeeper, is the dark side of our profession, and it is, darkly, unworthy of us. The simple fact is, if teaching physics were a business, we would be filing for bankruptcy.

Of course, those of us who teach in universities have another educational role, mentoring our graduate students. Here the situation seems profoundly different. The American PhD is the only role in our entire system of education that the rest of the world admires. Yet the role too has its dark side. On the average, each professor in an American university turns out about 15 PhD’s in the course of a career. In a steady-state world of scientific activity, one would expect that for any time in the foreseeable future, each professor need produce only one PhD’s in the next generation. If each of the 15 PhD’s want to become professors and turn out 15 more PhD’s, it’s easy to see why physics has become a profession of widespread frustrated expectations. And, since the undergraduate physics major is largely perceived as preparation for graduate school, it’s also easy to see why there are so many undergraduate physics majors. Let’s face it: the system is broken.

The undergraduate physics major should be the liberal arts education of the twenty-first century!

All right. Let us, for just a moment, pretend that our profession is a business, and take stock of our situation. Our production line is obsolete, and there is little demand for our product. What can we do about it?

The first step is to turn the problem around and ask, do we have any valuable assets that might be worth saving? You bet we do! What we have is nothing less than the wisdom of the ages. It is that vast body of knowledge, the central triumph of human intelligence, our legacy, which when properly distributed, could be restructured to serve purposes beyond choosing the elect and discarding the rest? The obstacles are immense. We are, part of the problem, but we are not the whole problem. It seems to me that the problem has three tightly linked components: societal, educational and pedagogical.

What physics needs is something that plays the role that the GUI plays for computers.

The societal part has mostly to do with one’s expectations. We physicists have gained a pretty good understanding of how the world works. Imagine a society in which it is routinely expected that every person in every serious profession shares that knowledge, at least in reasonable measure. Could such a thing happen in America, where nearly everyone (two-thirds of all high school graduates) goes to college and is therefore “educated”? I don’t know what the answer to that is, but if the purpose of education is to render our citizens capable of coping with an increasingly complex technological world, something like that just may become necessary.

For the educational part, picture a world in which every high school teacher (not just physics teachers) commands the pay and professional status that would justify a doctoral-level education in whatever subject they teach. Approximate that was true in Europe before World War II, but then few people got as far as the equivalent of high school. Could it happen here? Maybe not everywhere and for everyone, but that’s the road we have to go down. If that were true, then the need to provide those teachers would utterly transform university education at both the undergraduate and the graduate level. Let me be very clear: I am not talking about merely plugging today’s excess PhD’s into high school classes. What I am imagining instead is a truly profound societal transformation.

Finally, we come to the pedagogical part. Is it possible to teach physics to those who weren’t born to it? There has been much research and a wide variety of decades, in physics pedagogy, much of it directed at overcoming the obstacles to turning people who are not like us into people who are like us, that is to say, into proficient solvers of physics problems. That, I suspect, is the wrong approach. What we need to do instead is to figure out ways to show them the high ground and to teach them a few of our more useful tricks, without the slightest intention of turning them into physics foot-soldiers. Just a few years ago, the computer was a device used by nobody but the likes of us. Then the graphical user interface (GUI) was developed and in no time, tens of millions of people were using computers. The GUI makes the computer less efficient, less flexible, less suitable for real, hard-core professionals, but it makes the computer available nearly everybody. What physics needs is something that plays the role that the GUI plays for computers. That does not mean dumbing physics down. In the 1980’s, I directed the production of a television series called The Mechanical Universe, that was intended to be the basis of a physics course, with calculus, for nearly everyone. The idea was that we could help teachers overcome the barriers by giving them real physics, in a rich historical context, with beautiful images and terrific computer animation to show their students. There was considerable skepticism that this could be done, so a test was arranged, in which the material was taught to non-physics majors at a liberal arts college. It turned out that the students had no trouble at all with the derivatives and integrals that we taught them how to do. In fact, they quite liked our little mathematical tricks. The experiment failed however, because, although we assured we would have to teach them calculus, we also assumed, wrong, that they had some trigonometry in high school. Of course, that problem might get solved if we were to undergo the societal transformation I’ve tried to outline.

We physicists cannot produce that transformation all by ourselves. But we are in a better position than anyone else to take the first few steps. So here is my challenge to us: Let us devise ways to teach physics that will make the subject so vital and appealing that it will be unthinkable for any educated person in the twenty-first century not to have mastered its elements. If we can manage that, it’s just possible that the rest of that transformation might follow.

David Goodstein

David Goodstein is the Frank J. Gilloon Distinguished Teaching and Service Professor and Vice Provost at the California Institute of Technology.