Frist, Lieberman, Varmus Receive Y2K Public Service Awards

O n March 29th, Senator Bill Frist (R-TN), Senator Joseph Lieberman (D-CT), and Harold Varmus, former director of the National Institutes of Health (NIH), were awarded the first annual Public Service Awards on Capitol Hill, following a reception in their honor. The awards are jointly sponsored by the APS, the American Astronomical Society (AAS), and the American Mathematical Society (AMS), which collectively represent more than 100,000 scientists and mathematicians.

All three awardees have been instrumental in highlighting the interdependence of scientific disciplines and the need for a more balanced federal portfolio. Senators Frist and Lieberman were honored for their advocacy on behalf of increased federal investments in science and engineering research. They were among the original co-sponsors of the Federal Research Investment Act (S.298), which the Senate passed last year. The bill is currently awaiting House action. It would authorize doubling federal support of civilian science over the next decade. Now president of Memorial Sloan Kettering Cancer Center in New York, Varmus has been an outspoken promoter of all areas of science and oversaw an extraordinary five-year growth in the NIH budget during his term as director.

“An important public issue is how we can leverage and foster excellence in science and engineering, and these leaders have repeatedly stressed the importance of innovation and new science to health care and economic prosperity,” said APS Past President Jerome I. Friedman, who presented the award to Lieberman.

Frist graduated from Princeton University in 1974, specializing in health care policy at the Woodrow Wilson School of Public and International Affairs. He received his medical degree from Harvard Medical School in 1978 and spent several years in surgical training at Massachusetts General Hospital and Stanford University Medical Center. A former professor at Vanderbilt University Medical Center in Nashville, Frist is board-certified in both general and heart surgery. Elected to the Senate in 1994, he quickly established himself as an advocate of science, passing legislation to create the “Next Generation Internet” as well as the National Investment Act. “Research and development represent the cornerstone of our modernizing economy,” he said in February 1999 in response to a strong presidential budget request for scientific R&D.

Now in his second term in the Senate, Frist has gained national reputation as a thoughtful, effective legislator; winning kudos and endorsements from publications as diverse as the New York Times, the New Republic and the New York Post. Born in Stamford, CT, he received his bachelor’s degree from Yale College in 1964, earning a law degree there three years later. He was elected to the Connecticut State Senate in 1970, serving 10 years. From 1982 to 1988 he served as Connecticut’s attorney general and went on to win election to the U.S. Senate in an upset victory by just 10,000 votes. Re-elected six years later, he made history by winning the biggest landslide victory ever in a Connecticut race for a senate seat.

An Amherst undergraduate, Varmus earned a master’s degree from Harvard University and his medical degree from Columbia University College of Physicians and Surgeons, interning at New York’s Presbyterian Hospital. After two years as a clinical associate at the National Institute of Arthritis and Metabolic Diseases in Bethesda, MD, he spent much of his career at the University of California, San Francisco, beginning as a postdoctoral fellow in 1979. He was a co-recipient of the 1989 Nobel Prize for Physiology or Medicine with J. Michael Bishop.

Physicists Urged To Rally in Support of Proposed Nanotechnology Initiative

i n late 1959, Richard Feynman delivered one of his most famous lectures to a packed room at Caltech, entitled, “There’s Plenty of Room at the Bottom.” He spoke of a then-fledgling field of new physics at the atomic or nanometer scale, foreshadowing many of the research areas on the verge of fruition today: higher densities of information on scaled-down computers; the formation of micromachines (MEMS), the creation of designer materials; and the importance of biological techniques in controlling and manipulating matter at the atomic scale.

In 2000, President Clinton chose Caltech as the site to announce a bold new federal initiative on behalf of nanoscale science and technology. The FY2001 presidential budget request to Congress calls for a $227 million investment increase in nanoscale science and technology, for a total of $497 million.

The president’s proposal is indicative of a growing awareness on the part of government that technology is a critical economic driver, according to Thomas Weber of the National Science Foundation, speaking at a special symposium at the APS March Meeting in Minneapolis. He pointed out that unlike similar past proposals, the strongest push for the nanotechnology initiative did not originate with the White House Office of Science and Technology, but with the president’s National Economic Council. “The administration realizes that much of the profitability and comfort we have in life, and our strong economy, is a direct result of research that was funded over the years,” he said. “And they realize that if that standard of living is going to continue, the nation needs to invest right now so that the economy is still healthy 30 years from now.”

Definitions of what constitutes nanotechnology are varied. Evelyn H. (University of California, Santa Barbara) defined it as “the construction and utilization of functional structures and materials with at least one characteristic dimension at the nanometer scale.” After 30 years of ingenuity, research, scientists now have the techniques and instrumentation required for nanoscale fabrication, and the application of nanotechnology to actual devices, such as quantum well lasers. But to fully realize its potential, Hu identified two critical issues: better control of critical dimensions and, in turn, microscopic properties of individual nanostructures, and the integration of those nanostructures into complex hierarchical systems, synthetically through the use of such natural templates as molecular self-assembly.

Beverly Inttag of Gordon Moore made his famous observation in 1965 — that the number of transistors on a chip will double every 18 months — much discussion has centered on identifying the fundamental limits of Moore’s Law. Inevitably, such studies target a date roughly 10 years into the future, according to Robert Dynes (University of Washington, Seattle). "Perfectly legitimate —"
To Advance & Diffuse the Knowledge of Physics

100 Years of the American Physical Society

Excerpts from an exhibit displayed at the APS Centennial Meeting.

Curator: Sara Schechner, Gronon Research
Organizer: Exhibit Director: Barrett Skip
With contributions by Harry Lustig, R. Mark Wilson, and others.

The American Center for Physics, headquarters of the APS, located in College Park, Maryland.

Membership: 42,622 World-Wide

- 93% PhDs (excluding students)
- Demographic Makeup
  74% Physicists
  12% Engineers
  6% Female (13% age under 31)
- Employment (excluding students)
  47% Academia
  28% Industry, Consulting
  22% Government, FFRRD

Journals: Over 93,000 PR & PRL Pages Published Annually

- Over 22,000 Manuscripts Received
- PR and PRL Aricle Origins (1998)
  36% North America
  30% Western Europe
  12% Japan

- All APS Journals Are Online
- Online-Only APS journals
  PR Special Topics: Accelerators and Beams
  PR Focus

Meetings: 12,000 BAPS Abstracts/Year
2 General Meetings (March and April)
8 to 10 Divisional/Topical Meetings plus 10 to 12 Sectional Meetings

Physics Outreach: $2.3 M/Year Expended

- Education
- Public Information
- Government Affairs
- International Relations
- Women and Minorities
- Career and Professional Development

Congratulations APS 101 years on 20 May 2000

Speaking as much to members today as to our founders 100 years ago, Henry Rowland proclaimed:

The study of nature's secrets is the ordained method by which the greatest good and happiness shall finally come to the human race...Let us go forward, then, with confidence in the dignity of our pursuit. Let us hold our heads high with a pure conscience while we seek the truth, and may the American Physical Society do its share now and in generations yet to come in trying to understand the great problem of the constitution and laws of the Universe.

Henry Rowland, The Highest Aim of the Physicist APS presidential address, 1889.
The death of Professor Xie Xide, on March 4, 2000, brought to mind her many contributions, and in particular her key role in the “China Scholar Program” during the 1980s. This program, more formally known as the APS-China Cooperative Program, in Atomic, Molecular, Laser and Condensed Matter Physics, had the goal of helping China to reestablish its physics community after the Cultural Revolution. The program included workshops and research grants, and its success has been instrumental in helping China to develop its physics community. TheAPS-Chinaprogram, established in 1987, has been a model for international collaboration in the sciences.

Remembering the APS-China Program

Editor’s Note: Benjamin Bederson, formerly provost of NYU and editor-in-chief of the APS, was chair of the American Coordinating Committee for the APS-China Program, 1987-1991.

APS to Implement New Journal Pricing Policies

Treasurer’s Report

To Promote the Advancement and Diffusion of the Knowledge of Physics. That is the noble purpose of the American Physical Society, as stated in its charter of 1899. In pursuit of that goal, the Society publications are the premier physics journals; Physical Review, Physical Review Letters, Reviews of Modern Physics. Over 13,000 articles in 90,000 pages were published in 1999. Over 1.6 million articles were downloaded from Physical Review Online in 1999. In order to make the literature accessible to everyone from their desktop anywhere in the world, the entire corpus of work published in APS journals since their beginning in 1893 is being placed in an online archive, PROLA, a project which will be complete early next year.

The Cost of Publishing and of Subscribing

Today the publishing of APS journals is a $26,000,000 business. Between one third and one fifth of that expenditure is for direct costs associated with mounting the journals online. PROLA has cost approximately $2,000,000 to date for another $2,000,000 to complete the task of taking the archive back to 1893. Maintaining online access and updating PROLA are permanent expenses. Eliminating page charges in the 1990s shifted more costs onto libraries and today over eighty percent of the cost of producing and distributing journals is paid by library subscriptions. Eliminating page charges for the large national laboratories and research universities, to small liberal arts colleges. Over 65% of the current publishing costs in the United States. In the past, the need for multiple subscriptions to service the full staffing of the large institutions meant that large research institutions supported a large portion of the cost of the publishing enterprise than the small colleges with a single subscriptions. The availability of online access has changed that. Now the largest research universities typically have the same number of subscriptions as the smallest schools, namely one subscriptions. The management and development and research groups and is accomplished through the campus wide online access which accompanies the subscription to the journal. The result is a triple bottom line, the benefit of supporting the distribution the results of physics research away from the large institutions onto the smaller ones.

Multi-tiered Pricing for Journals

To reprise these changes in publishing the physics literature, and to return the balance of surplus to publishing of physics research literature back towards its historic pattern, the APS will provide its journals to smaller, non-research oriented institutions at a lower price than that charged to research intensive institutions starting in 2001. The pricing will depend on the size of the subscribing institution as reflected in its Carnegie Classification. The Carnegie Foundation classifies U.S. academic institutions according to their size and research activity. The largest and most research active institutions are classified as Research institutions. Institutions providing doctoral degrees but with significantly lower research funding and doctoral production are categorized as Doctoral institutions. The remaining institutions include Masters, Bachelor, and two-year schools. See http://www.carnegiefoundation.org. Starting in 2001 there will be separate pricing for each category.

Online-Only Access Options

In 2001 the APS journals will be available for those institutions that wish them as an online-only option. The base price for the online journal, which is the price for all domestic academic institutions below the Carnegie Research or Doctoral classifications, will be 13% below the 2000 journal price. For Doctoral institutions the price will be 6% below the 2000 price and for Research Universities the 2001 price will be 2% above the 2000 price. CD-ROMs will be available at $50 per disc. The difference in the price of the online journal continues in 2001 will continue to be available. The lower cost of the online-only subscription reflects the savings from foregoing print production and delivery.

Pricing for Traditional Subscriptions

For those institutions which choose to continue their print-plus-online subscriptions, the pricing for those institutions beginning in 2001 will be 2% for base-price institutions, 11% for the Doctoral institutions and 20% for Research institutions. There will be no separate pricing for the online-only subscriptions. With this new pricing, approximately two thirds of the subscribing institutions will see a 13% decrease (online only) or a 2% price increase (online plus print) in 2001. This is made possible by the larger price increase for the remaining institutions.

Classification of Foreign Institutions

There are no convenient classifications for foreign institutions. Therefore, foreign institutions will be placed into equivalent categories with domestic institutions and charged accordingly, based on a comparison of their online usage with the median value of usage by the domestic Carnegie categories. A full priced price and an attempt to introduce usage based pricing. Rather, it is a move to put the larger burden for distributing of research information onto the research institutions. Online usage is only used to distinguish foreign institutions in an effort to obtain an objective identification of research institutions.

PROLA Online

It is recognized that the large price increases for the research organizations provides a real burden on tight library budgets. In order to provide some low cost options to subscribers, the option of online-only access to the journal (no print copy) is being offered. As discussed above, this option provides a price reduction in 2001 for all foreign institutions. For those institutions, paying air freight costs, would see an even greater savings. The APS feels this will be an especially attractive option because of the availability of the Physical Review Online Archive (PROLA). PROLA currently provides a full complement of the Physical Review literature from 1929 though 1999 (1997, 1998 and 1999 files are available on the current online journal platforms). By the end of 2000 the archive will contain Physical Review back to 1970. Physical Review Letters back to its beginning in 1958 and the Reviews of Modern Physics back to its beginning in 1929. Current plans call for all of the APS publications back to 1993 being in the archive by the end of 2001. PROLA will be continually updated to include all articles published more than three years before the current year. The more recent material will be on the current journal platform.Negotiations are underway to maintain a full current version of PROLA including current issues in several libraries at institutional libraries to create a true archive. The maintenance of PROLA in a current and readily accessible form is a responsibility which the APS has assumed for the community. Access to PROLA is included in the price for the APS packages (PRLA and APSALL) and is available at a modest cost for subscribers of individual journals. The cost for PROLA covers maintenance of the archive and access to PROLA provides perpetual access to the entire material.

Summary

There are tremendous pressures today on library budgets. The answer to that problem has to involve finding more efficient ways of distributing information. The APS strives to find the least expensive ways of publishing the physics literature consistent with the highest standards of peer review and electronic publication. We cannot predict what the future will bring in terms of ultimate products and costs. It is inevitable that changes will occur, but both the nature and the pace of those changes. The cost-cutting is implemented, and in the way the costs are distributed among the diverse group of subscribers. We anticipate and welcome continued, spirited discussions among the APS membership, the librarian community and other users as the changes evolve.

Librarians Speak Out

Editor’s Note: The following are quotes from librarians at various research and educational institutions around the country. Michael Fosmire comments in reaction to the new APS journal pricing plan. The responses are indicative of “spirited discussions” with this community regarding journal pricing and electronic publishing. All quotes are reprinted here with permission.

“fully support the new APS pricing structure. A 20% increase for research institutions seems eminently reasonable, given the large number of personal and institutional subscription cancellations over the past few years. Society publishing is providing an exemplary model for the dissemination of scientific literature. Research libraries, in particular, should be able to support a model that maintains a viable business model.”

Dana L. Roth
California Institute of Technology

“there have to be better ways to disseminate science and technology information that don’t entail the enormous amounts of money and inequitable distribution of routes and rights currently being paid by the publishers. Price increases like this make alternative publishing scenarios all the more attractive and I believe will only expedite their implementation.”

Greg Youngren
University of Illinois, Urbana-Champaign

“I certainly have a lot of sympathy toward supporting smaller institutions, having recently come from one myself, and I think the Physical Review was pricing them out of the market. The APS is remedying this situation. But I was under the impression this increase would be phased in gradually over the course of a few years, so there would not be a sticker shock from a one-time increase. A 20% increase for research institutions seems like a pretty big chunk to phase in all at once.”

Michael Fosmire
Purdue University

These scholarly society publishers have acknowledged the economic crisis we are in, and are doing their best to find the thread to the future, while still providing the peer review process and taking responsibility for long-term archiving. It is my opinion that we need to work together, across fields, types of organizations or institutions, libraries, and across alternatives in attempting to invent the best future for our scientist-scholars.”

Diane Forner
University of California, Berkeley
A mong the many new challenges facing the US physics community is the need to convince the public, and the Congress, of the importance of our work. We must make our case directly to the people who benefit from our work—its relation to not the particulars, but the broad significance of our country's resources. We make that case most directly by political advocacy in Washington, but our arguments cannot be convincing without the understanding and support of the public.

The APS has a strong record of public advocacy for physics. Bob Park, working out of our Washington Office, has been outstandingly successful in publishing commentaries in major national newspapers and in television and radio interviews. His frequent e-mail column, "What's New," is read with glee—and often with chagrin—by scientists, politicians, and bureaucrats throughout the country. More recently, the APS' Communications Director Randy Atkins as a media-relations coordinator working in close collaboration with the AIP at our Washington Office headquarters. Randy's responsibility is to serve as a resource for newspaper and television reporters, directing their inquiries to knowledgeable scientists and alerting them about important developments in physics. He has been with APS for less than a year but already is having a major impact.

Some participants were worried that the APS was letting the public and the media play these roles—whether we're char-acteristic or not. Don't hesitate to contact us for advice or comments. Also, don't hesitate to contact the APS' Communications Director Randy Atkins (301-209-3238; atkins@aps.org) for advice or comments. And be sure to read the APS' publications section of the APS News for more information on how to get your message across.

Finally, we must give our peers the benefit of the doubt when a report is written inaccurately. Misstatements very likely are the fault of sloppy journalists, not inert scientists. Even with inevitable imperfections, communicating science to the public is vital, and the media provide our most efficient vehicle for doing this. Public dia-logue has become, quite simply, a part of our jobs as scientists. We need to commu-nicate science in media-savvy ways, showing especially its human side. The APS public-affairs experts unabashedly believe that some of us will become media stars. Those that reach that status may be unusual characters, with wit and char-isma, but not that's quite how things people. Not all of us have such gifts, but we must appreciate those who do. Our APS media-relations office is ready to help us play these roles—whether we're char-ismatic or not. Don't hesitate to contact Randy Atkins (301-209-3238; atkins@aps.org) for advice or comments. And be sure to read the APS' publications section of the APS News for more information on how to get your message across.

The Physics of Pynchon

I am responding to Robert A. Levy's challenge to consider the physics genealogy of Thomas Pynchon. I am an author known as Thomas Pynchon's Rainbow (APS News, February 2000). Personally, I have found reading Pynchon to be not unlike doing research. The Proval Moment in the narrative at which disparate plots and themes converge is just as likely to come in the midst of a loud, paeanthetical digression as in the main flow of things. It's important to pay close attention to everything, whether it seems to be part of the plot or just an interesting aside. It is not possible to skim Thomas Pynchon.

I would disagree with Levy's allegation that Pynchon is "long overlooked" by physicists whose "widespread ignorance" so alarms Levy. In my own reading, I have found Pynchon's work often brilliant, but frequently elliptical and pretentious. Yet there may be something about Pynchon that actually appeals to scientists. Perhaps it is the style of loving something others cannot quite grasp. Some participants were worried that the APS was letting the public and the media play these roles—whether we're characteristic or not. Don't hesitate to contact us for advice or comments. Also, don't hesitate to contact the APS' Communications Director Randy Atkins (301-209-3238; atkins@aps.org) for advice or comments. And be sure to read the APS' publications section of the APS News for more information on how to get your message across.

Markowitz Statements SADLY Pessimistic

In his article on page 5 of the March 2000 issue, David Markowitz writes, "Sure, lots of folks believe in God and family values and few wish to argue against them. But their main purpose is what they earn for their promoters: money to do research on the one hand, and votes to pump them into office on the other (my italics)." I wonder if the author realizes how sadly pessimistic his statement is? Finding meaning, purpose, and value in life through the love and grace of God and the family is something that man has always been doing. It is just that there are now many others in the world who do not believe in that, and they contribute to society as well.

I would disagree with Levy's allegation that Pynchon is "long overlooked" by physicists whose "widespread ignorance" so alarms Levy. In my own reading, I have found Pynchon's work often brilliant, but frequently elliptical and pretentious. Yet there may be something about Pynchon that actually appeals to scientists. Perhaps it is the style of loving something others cannot quite grasp. Some participants were worried that the APS was letting the public and the media play these roles—whether we're characteristic or not. Don't hesitate to contact us for advice or comments. Also, don't hesitate to contact the APS' Communications Director Randy Atkins (301-209-3238; atkins@aps.org) for advice or comments. And be sure to read the APS' publications section of the APS News for more information on how to get your message across.

The value of teaching is that it helps many others cannot quite grasp. Some participants were worried that the APS was letting the public and the media play these roles—whether we're characteristic or not. Don't hesitate to contact us for advice or comments. Also, don't hesitate to contact the APS' Communications Director Randy Atkins (301-209-3238; atkins@aps.org) for advice or comments. And be sure to read the APS' publications section of the APS News for more information on how to get your message across.
Spallation Neutron Source Features Superconducting Linac

One of the three accelerators making up the linac at the Spallation Neutron Source, now under construction at Oak Ridge National Laboratory, will consist of superconducting niobium cavities cooled with liquid helium to an operating temperature of 2K. This part of the linac will perform the final stage of acceleration of the negative ions, from about 200 MeV to 1 GeV. The high intensity beam expected is to be the technology of choice for many future accelerators, and will enhance the capabilities and longevity of the SNS. The Spallation Neutron Source (SNS) facility began on December 15, 1999, with groundbreaking at the Oak Ridge National Laboratory. The linac is expected to be completed by 2005, and the SNS is scheduled for completion in 2006. The project is funded by the U.S. Department of Energy (DOE) Office of Science and is being designed and constructed by a partnership of six DOE national laboratories (Argonne, Brookhaven, Jefferson, Lawrence Berkeley, Los Alamos, and Oak Ridge), which is unique for such a large-scale facility. When the SNS is complete, it will be the most powerful pulsed neutron source in the world. As such it will provide research opportunities unavailable elsewhere.

Although the United States pioneered the development and use of early neutron sources, European and Japanese scientists developed newer sources that have been the best in the world for the past 15 to 20 years. Since the 1960s start-up of the Institut Laue Langevin in France, Europe has been the leader in neutron-scattering research. In scientific terms, however, even the newest existing facilities are quite old. With the construction of the SNS, that situation is about to change. The SNS design calls for an accelerator system consisting of an ion source, a 1-GeV linear accelerator, and a proton accumulator ring that will deliver a 2-MW beam to a liquid mercury target. A prototype negative hydrogen (H⁻) ion source has already been tested.

To produce the short, sharp pulse of neutrons needed for optimal scientific results, the linac will be a second target station dedicated to superconducting technology. The SNS is at a critical stage as it approaches the end of construction. The linac, superconducting niobium rf cavities, cooled with liquid helium to an operating temperature of 2K, will be employed in the linac. The superconducting linac described above is preceded by a drift-tube linac and an acceleration tube. The beam, which consists of a mixture of copper and operonite at room temperature, will produce the short, sharp pulse of neutrons needed for optimal scientific results. The H⁻ ion from the linac must be compressed more than 1000 times.

The enormous power of the 1-GeV proton beam will deposit in the target, a liquid mercury target will be used instead of a solid material such as tantalum or tungsten. The SNS will be the first scientific facility to use mercury as a target for a proton beam. Cryogenic moderators will be located above and below the target, and one anvil-like moderator will be located below the target.

An opportunity for future development will be a second target station dedicated to the use of long-wavelength neutrons provided with a longer pulse separation (i.e., a lower pulse rate) than in the first station. The SNS is working with the National Science Foundation to explore avenues by which their grants could participate in the SNS project by developing this future target station and its associated instrumentation.

SNS Instrumentation

During SNS commissioning and operating at 2 MW, it will offer more than an order-of-magnitude higher flux than any existing facility, with potential for research in chemistry, condensed matter physics, materials science and engineering, and biology. A world-class suite of instruments is being developed that is suited to the needs of users across a broad range of disciplines. The SNS will be a user facility, and the scientific user community has been heavily involved in establishing performance requirements for the SNS and in selecting the initial instruments to be included in the facility. The current instrumentation budget allows for 10 or 11 best-in-class neutron-scattering instruments out of a total of 24, which can ultimately be accommodated on the high-power target station. The SNS construction budget for instruments is supplemented by a significant R&D program.

For the SNS, the criteria for instrument selection are the scientific program requirements determined by the instrument team and the need for the unique capabilities of the SNS. The goal is seamless user access and instrument optimization across the facility. Plans are in place to obtain input at the Users Meeting and Instrumentation Workshop to be held May 22-24 in Washington, D.C. Additional information about the conference or comments and suggestions for the SNS may be directed to the SNS Experimental Facilities Division Director, Dr. Thomas Mason (mason@ornl.gov) or the SNS Information Coordinator, Dr. Kent Crawford (kwcrawfof@lanl.gov).

The SNS is at a critical stage as it emerges from the design phase into its physical construction. Endowment by the Solid State Sciences Committee of the National Research Council and the recent resolution of support from the Council of the American Physical Society have both stressed the national importance of the SNS. More information on SNS is available from the SNS web site at http://www.ornl.gov/sns/.
Out of Africa: Using Fractals to Teach At-Risk Students

Fractal geometry is intrinsically relevant to traditional African design, according to Ron Eglash, an assistant professor of science and technology studies at Rensselaer Polytechnic Institute in Troy, New York. He has documented fractal patterns in corn-row hairstyles, weavings and architecture of African villages, as well as in traditional metalwork and clothing. His research led to the publication last year of a book entitled, "Out of Africa: Using Fractals to Teach At-Risk Students." The book, which is subtitled, "Technosocial Systems," he entered the field and became a principal of "physlets," a series of JAVA applets designed to be used in many different browser contexts. Howard Goldick of the University of Hartford described how he has developed courses to teach physics to physical and occupational therapy students. His Web site features an "Eglash Material Classroom," he says. "I was able to take classes in anthropology and graduate seminars in math and computer science. Intrigued by the prospect of gaining a more cultural perspective on what he terms "technosocial systems," he entered the field and became a principal of "physlets," a series of JAVA applets designed to be used in many different browser contexts.

Before Franklin could put his proposal into practice, Frenchman Thomas François D’Alibert used a 50-foot-long vertical rod to draw down the "electric fluid" of the lightning in Paris on May 10, 1752. One week later, M. DeTerre repeated the experiment in Paris, followed in July by an Englishman, John Canton. But, although his experiment was a success, the unfortunate physicist did not fare so well. Geheim Wilhelm Reimann attempted to reproduce the experiment, according to a Franklin-trained boy standing inside a room. A glowing ball of charge traveled down the string, jumped to his forehead and killed him instantly — providing hölzer a first documented example of hail lighting in Paris. To add insult to injury, Russian chemist Mikhail Lomonosov successfully performed the same experiment a few days later.

As for Franklin, he was apparently unaware of these other experiments when he undertook his own version during a thunderstorm in June 1752, on the outskirts of Philadelphia. Unlike Reimann, he placed himself under a steeple to ensure he was holding a dry, non-conducting portion of the kite string. Impressed with lightning’s power and potential danger, he went on to develop the lightning rod as a protective measure. As for Franklin, he was apparently unaware of these other experiments when he undertook his own version during a thunderstorm in June 1752, on the outskirts of Philadelphia. Unlike Reimann, he placed himself under a steeple to ensure he was holding a dry, non-conducting portion of the kite string. Impressed with lightning’s power and potential danger, he went on to develop the lightning rod as a protective measure.
Nanotechnology Initiative,
continued from page 1
mate reasons. (The current cutoff point is expected to be reached by 2010.) "But the curve just keeps crashing right through them," he said. The reason is that scientists keep coming up with new materials, algorithms, architectures, and other innovative ways to overcome past technological barriers. "I allege that Moore’s Law will continue as long as the scientific and engineering community remains healthy," said Dynes. "But if we do not continue to function as an intelligent, creative society, Moore’s Law will be limited."

Unfortunately, Dynes has observed some worrying signs that the future is not necessarily bright for science and engineering. While the life sciences have flourished since 1970, federal funding levels for engineering and the physical sciences have been relatively flat. More worrisome is the import of this proposed initiative."
Top Twenty Technological Screw-ups of the 20th Century

By Marc Abraham

Selected by the Ig Nobel Board of Governors
Commissioned by Wired News and the Annals of Improbable Research

In a century crammed with hussie and screw-ups, a century that gave birth to Murphy’s Law (“If anything can go wrong, it will.”), it’s difficult to choose a mere twenty outstanding screw-ups. Inevitably and unfairly, several hundred thousand worthy achievements were left out. We chose for style and symbolic value, as well as for substance or lack thereof. We kept in mind that technology is a combination of things, techniques, and the people who devise, make, and use them.

The people mentioned here had reasons—in many cases very good reasons—for doing what they did. (In at least one case, that of Corrigan, some contend that the entire screw-up was cleverly planned as such.) These screw-ups can serve as fodder for thought, argument, or pure, unabashed wonder.

On April 14, 1912, the ocean liner Titanic, described by its manufacturer as unsinkable, sank on her maiden voyage.

During World War I, nearly all the world’s technological innovation was poured into the battlefields of Europe’s Western Front. Both sides expected their technology would quickly break the impasse. Instead, they produced three years of deadlocked trench, barbed wire, rifle, grenade, machine gun, artillery, gas, tank, and aeroplane warfare, and the deaths of millions of people.

On May 6, 1937, the hydrogen-filled dirigible Hindenburg, arriving in Lakehurst, New Jersey, after a transatlantic flight, caught fire and disintegrated.

On July 17, 1938, pioneer aviator Douglas (ever after to be called “Wrong Way”) Corrigan, took off for California from an airfield in Brooklyn, New York. He landed in Ireland.

On November 7, 1940, the Tacoma Narrows Bridge, in Washington State, twisted wildly and collapsed. The twisting was caused by wind forces the designers had ignored.

In the early and middle parts of the century, powerful new antibiotic drugs were developed, saving countless millions of lives. By century’s end, careless over-use of these drugs fueled many microbes to evolve resistance to them, thus endangering countless millions of lives.

In 1952, the de Havilland Comet, a commercial jet aircraft, made its debut. Twenty-one of this first model were built. Seven of them crashed due to a kind of metal fatigue that the designers had not considered.

On December 5, 1959, the Malpasset Dam in the Reyvan Valley on the French Riviera cracked and burst. Its foundation, which was seated next to a seam of clay the designers had ignored, had shifted, causing the crack. More than 420 people died.

During the years 1956-62 a Chinese government-managed technological revolution called “The Great Leap Forward” caused food production to plummet, which led to massive famine. Under-orned, people over-orned and misused techniques that were copied from the Soviet Union (soil was plowed too deeply, seeds planted too densely, irrigation projects engineered badly if at all, etc.) Bureaucracy on all levels exacerbated the problem by decreeing that there was no problem. The death toll from the famine is estimated at 30-50 million people.

In 1962, Mariner I, the first US spacecraft sent to explore the planet Venus, went off course shortly after launch because of an error in its guidance computer program. The error was small: a wrong punctuation character in code. The result was large: instead of going to Venus, Mariner I went into the Atlantic Ocean.

In the early 1970s, the new, 60-story Hancock Tower in Boston, one of the first tall buildings clad entirely with large mirrored windows, one by one. The window material had been used in much smaller buildings, where it caused similar problems; the Hancock designers overlooked this fact. Sheets of plywood—more an acre of them—were put up in place of the missing windows, and for years the streets in the neighborhood were covered with tunnels to protect pedestrians from the falling glass. The building also caused neighboring utility lines and foundations to crack, and induced nausea in its occupants when heavy winds blew.

On September 1, 1983, the Soviet Tu-15 jet fighter mistakenly shot down a Korean Air civilian airliner near Sakhalin Island, USSR, killing 260 people.

On December 3, 1984, the Union Carbide chemical plant at Bhopal, India leaked toxic gas, killing more than 6000 people and injuring and/or debilitating many more.

On January 28, 1986, the space shuttle Challenger exploded shortly after lift-off because a sealing ring failed. The sealant material was known to be brittle in the cold, and the rocket had spent many hours sitting in cold weather prior to launch.

In April 1986, the Chernobyl nuclear power plant in Russia suffered a partial meltdown due to design deficiencies and sloppy maintenance. More than thirty people were killed in the short term, thousands more suffered severe illness and/or impairment, and a vast expanse of land, water and air was laced with radioactive contaminants.

On July 3, 1988, the US naval vessel Vinceennes mistakenly shot down a civilian Iranian aircrewliner, killing 250 people.

In 1989, Martin Fleischmann and Stanley Pons, chemists at the University of Utah, announced their discovery of “Cold Fusion,” a simple, inexpensive way to produce nuclear fusion. The method promised a future in which energy would be cheap and plentiful. The announcement triggered wild financial speculation and frenzy, unsuccessful attempts worldwide to demonstrate cold fusion. Later, it appeared that Fleischmann and Pons had based their claim on poorly documented, sloppy experiments, and were refusing to discuss the details. The insistence, extraordinary claim, together with the lack of information that would allow others to test it, made Fleischmann and Pons—and their idea—pariahs to much of the science community.

Juan Pablo Davila worked for the Chilean government-owned Cablecom Company. In 1994, while testing a computer, Davila accidentally typed “buy” when he meant to type “sell.” After realizing his mistake, he went into a frenzy of buying and selling, ultimately losing approximately 5% of the country’s gross national product. His name thereupon became a verb, “davila,” meaning “to screw up royally.”

And finally, comes the Y2K computer bug, the nature of which is all too well known to turn-of-the-century men.

Marc Abraham is the editor of the Annals of Improbable Research (AIR) and host of the long-standing annual Ig Nobel Prizes, awarded each fall in a special ceremony at Harvard University in recognition of “achievements that cannot or should not be reproduced.” (See APS News, December 1999, for last year’s Ig Nobel Prize recipients.)