Richardson Vows to Keep DOE Labs Open in Keynote Address

Bill Richardson, US Secretary of Energy, delivered the keynote address at the APS Centennial meeting on Monday evening, March 22, to a packed room of physicists in town for the biggest physics meeting in the world. Following Monday morning’s opening plenary session, which culminated with the unveiling of the APS timeline wall chart — were APS President Jerome Friedman (Massachusetts Institute of Technology), William Britton of Lucent Technologies, and Robert Eisenstein of the National Science Foundation.

Richardson opened with a recognition of the vital role physics has played in the last century. “This century of physics has done more than merely make significant discoveries — it has fundamentally altered how we think of the universe and of the forces that bind us together,” he said. “Whether it is basic science, national defense, energy research or environmental quality, physics is the enabler and provider of solutions, an inseparable part of our livelihoods.”

But the majority of Richardson’s talk focused on the future, beginning with a summation of President Clinton’s efforts to promote world leadership in basic science, mathematics and engineering for the US, emphasizing the goals set out in the 1994 study Science in the National Interest, undertaken by the presidential Council of Advisors. These include enhancing connections between fundamental research and national policies, increasing funding to promote investments in fundamental science and engineering, and raising the scientific and technological literacy of all Americans. In addition, the Information Technology for the 21st Century initiative, will, he said, “enable us to develop and deploy new, faster computers for advanced simulation,” providing “powerful tools to design a new generation of cars, develop new pharmaceuticals, and help us improve our weather and climate research.”

Another area of concern to Richardson — one that has been echoed by many scientists and government representatives alike in recent years — is the “unchanging quantum foam of space-time. However, he refused to identify any ‘new children’:”

Hawking told reporters that after examining the data collected from distant supernova blasts, he has “reconsidered” his “theoretical preferences” about the cosmological constant that would cause space to inflate more quickly with time. “I now think it is very reasonable that there should be a cosmological constant,” he said. “I have had more time to consider the observations, and they look quite good.” Furthermore, he believes there is not enough known matter in the universe to halt its expansion, and thus “the universe may keep flying apart forever.”

Hawking also said that he believes there is a 50-50 chance that scientists will achieve a Grand Unified Theory (GUT) within the next 20 years. One of the best candidates, he said, is the so-called “M theory,” an extension of string theory that allows multiple universes to arise from an ever-changing quantum foam of space-time. However, he refused to identify any single example as the greatest development.

Hawking played recorded answers to questions submitted previously by reporters. Most notably, he endorsed the recent discovery that the universe may be expanding at an ever-increasing rate — listed as the “Breakthrough of the Year” by Science magazine in 1998. Initially skeptical, Hawking told reporters that after examining the data collected from distant supernova blasts, he has “considered” his “theoretical preferences” about the cosmological constant that would cause space to inflate more quickly with time. “I now think it is very reasonable that there should be a cosmological constant,” he said. “I have had more time to consider the observations, and they look quite good.” Furthermore, he believes there is not enough known matter in the universe to halt its expansion, and thus “the universe may keep flying apart forever.”

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To Advance & Diffuse the Knowledge of Physics

100 Years of the American Physical Society

Curator
Sara Schedel

Common Research

Researchers
George Trigg

Thurston

Exhibit Director
Barrett Ripin

Aide
Steve Norton

Exhibit Design

Fabrication
Pugh Design Inc.

Malone Displays

Origins of APS

Moving Forces

In 1899, thirty-six scientists met in New York to form a physics society. What was the context? What needs impelled them? Physics in America was a minor profession by European standards of the late 19th century. Its first professors were not appointed until the 1870s, and they often paid for apparatus out of their own pockets. University administrations respected teaching more than research. The public applauded technological achievements over abstract ones. In spite of these deterrents, the aspirations of American physicists were on the rise. So too were their numbers. During the 19th century, physical sciences became increasingly specialized. In one discipline after another, scientists formed their own professional societies. Section B of the AAS had been the primary meeting ground for physicists, but it met only a year or two.

Physicists were inspired by the formation of the American Chemical Society and the American Mathematical Society. In the 1890s, Americans were startled by news that European scientists had discovered x-rays, radioactivity, and the electron. New friendships were forged at international electrical meetings in Chicago. U.S. physicists wanted to be part of the international community. To do this, they needed to meet more often and raise research standards in America.

Thus, self-definition, professionalization, and aspiration were the bedrock on which the American Physical Society was built.

To promote the advancement and diffusion of the knowledge of physics. Adopted 1899.

The American Physical Society was established one hundred years ago; the Physical Review six years before that. Together, they have shaped and promoted physics research in the 20th century.

This exhibit, commissioned for the APS Centennial, looks at the evolution of the American Physical Society and its research journals, their responsiveness to the needs of science, and their dynamic relationship with American culture.

APS News will serialize excerpts from this exhibit throughout the Centennial year. Next month: Early Years of the Physical Review.

Henry A. Rowland
First president of APS, and physics professor at Johns Hopkins. His presidential address set the tone for the Society:

“To encourage the growth of any science, the best thing we can do is to meet together in its interest, to do problems in, to collate each other’s work and, best of all, to provide means by which the better portion of it may be made known to the world.”

Marcia Keith
Marcia Keith of Mount Holyoke, in her lab, and Isabelle Etienne of Vassar were among the 36 founding members.

Albert A. Michelson
First vice-president and second president.

“Father of the American Physical Society”oundation of Physics

Professor of physics at Clark University, Webster organized the first APS meeting at Fayerweather Hall, Columbia University on 20 May 1899.

Tomas Friedman*
Past-President

Andrew M. Sessler*

James S. Langer*

David Aspnes*, Arthur Hebard, Zachary Fisk*

Robert Callender

Division and Forum Councillors

Chair, Panel on Public Affairs

AIP News

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Mission:

To promote the advancement and diffusion of the knowledge of physics. Adopted 1899.

Fayerweather Hall Columbia University was the site of the first meeting and remained the home of APS for 60 years.

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“When the organization of a science society is undertaken, it is important that the number of members be large enough to give it sufficient weight and authority, and to enable it to perform its usual functions, yet small enough so that the members may be active and take an interest in the business of the society.”

Marcia Keith
Marcia Keith of Mount Holyoke, in her lab, and Isabelle Etienne of Vassar were among the 36 founding members.

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“Father of the American Physical Society”
Envisioning Science Through the Camera’s Eye

Revelers at the APS Centennial gala hosted by the Fernbank Museum in Atlanta (see page 2) had the opportunity to view a new exhibit of work by American photographer Felice Frankel. Frankel is currently artist in residence in the Visual Science Program, a professor of physics, and a scientist in electrical engineering and computer science at the Massachusetts Institute of Technology (MIT). Her photographs, which are the result of her collaboration with scientific researchers, have appeared on the covers and inside pages of such noteworthy publications as Nature, Science, the American Journal of Physics, and Physical Review Letters. Several of Frankel’s photographs are on display at the APS Centennial in Atlanta.

Several of Frankel’s photographs hit the mark: a scientist foraging in a glass beaker, a ferrofluid on a glass surface, with 7 circular magnets, from On the Surface of Things: Images of the Extraordinary in Science by Frankel and George M. Whitesides. The book opens with a brief history of the science and technology of ferrofluids and how it is currently being used in medicine and engineering. It is currently artist in residence in the Visual Science Program, a professor of physics, and a scientist in electrical engineering and computer science at the Massachusetts Institute of Technology (MIT). Her photographs, which are the result of her collaboration with scientific researchers, have appeared on the covers and inside pages of such noteworthy publications as Nature, Science, the American Journal of Physics, and Physical Review Letters. Several of Frankel’s photographs are on display at the APS Centennial in Atlanta.

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A Brief Review of Physics in the 20th Century
by D. Allan Bromley

Science and its applications — which today we call technology — has from its very beginning been an important part of the American experience. Indeed, during the close of the 20th century, it is entirely appropriate that we celebrate the role of our particular sector of this science and technology in the development of human civilization.

What, then, is physics? The best definition I have encountered is that of my old friend, the late Edward Purcell. In 1976 he wrote: “A physicist is one who knows something about infinite nature is physics — no matter the most limiting and universal things that he knows make up physics.” We physicists have the arrogance to believe that the laws we deduce from our measurements on earth apply throughout the universe, and that what is true today was true throughout the entire lifetime of the universe. Our measurements support that arrogance. Purcell goes on to say, “As he gains more knowledge, what would have appeared complicated or capricious can be seen as essentially simple and in a deep sense, orderly.” Turning to applications, he said, “To understand the enormous impact that our ability to manipulate the atom and its component electrons has had on such diverse areas of modern civilization as communications, computers, and medicine, it is necessary to see how, within environmental constraints and the limitations of wisdom, better to accommodate nature to man and man to nature.” Many have noted that the 20th century of science truly began in 1897 with J.J. Thompson’s discovery of the electron. This revelation of the fundamental quantum mechanical nature of the atom and of its component electrons has had on such diverse areas of modern civilization as communications, computers, and medicine.

The 1930s closed with the discovery of complex radioactivity, and the recognition of the potential military consequences came rapidly, with the establishment of the Manhattan Project as well as M.I.T.’s Radiation Laboratory, devoted to the development of nuclear devices. These activities ushered in a total seachange in the social and political environment of the world. One of the most important things that we learned from that era was that very small actions have important consequences, and that our ability to deduce from our measurements on earth applies throughout the universe.

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Another Alert Reader Weighs In...

This note relates to the Back Page article, “Discovering our Roots: The PhD Lineage” (May 1999). In that piece the author uses the word “geneology” or “genealogist” several times. I would like to point out that “genealogy” is properly spelled with an “a” instead of an “o”, as opposed to most other “—ology” terms. This results from the “genealogist” of the word itself — it is traced back to the Greek word genea, meaning descent, plus logos, meaning discourse. [See Webster’s New Colle- giate Dictionary, G & C Mertian Co (1951)]. Note also that my spell checker (WordPerfect 4.2) catches the erroneous spelling. How come yours didn’t?

Robert A. Levy
El Paso, Texas

Editor’s Note: Is it too early to blame the error on the Y2K bug?

Scientific Travel and Nuclear Proliferation

In a situation where two neighboring countries with nuclear weapons capabilities maintain a hostile posture, bringing together scientists from the two sides to discuss the situation and alleviate tensions was, in our opinion, an entirely reasonable course of action. Therefore, as citizens and scientists belonging to Argentina, Brazil, India, Israel, Pakistan, Sri Lanka and the US, we had enthusiastically welcomed the efforts of the American Physical Society to host a round-table discussion at the Atlanta Centennial Meeting to identify the role of physicists to build bridges between nations which otherwise may be having conflicting interests on nuclear issues or issues related to physics. Some of us had even arranged discussions on the same issues in our institutions to take advantage of these visits. To our disappointment, we subsequently learned that the invited speaker from India, Dr. T. Jayaraman, was denied leave to participate in the APS discussion by the Director and the authorities of the Institute of Mathematical Sciences, Chennai, where he works as a theoretical physicist. The acting director for the Institute of Theoretical Sciences’ participation was not in the interests of “...the institute and the nation.” Several appeals did not change the Director’s decision. Subsequently the Director stated that as the Institute is under travel restrictions by the U.S. government, and the APS was unable to remove these restrictions, it would not be appropriate for Jayaraman to participate in the APS panel. On the contrary, the American Physical Society has succeeded in removing such restrictions in specific cases and has continued to work for the removal of all impediments to the free circulation of scientists through both public appeals and by close interaction with U.S. governmental agencies.

We feel that the present age compels us to think in global terms and thus the denial of leave to Dr. Jayaraman to participate in the panel discussion is a violation of his academic freedom and has done disservice to the cause of promoting international peace. We urge the Director of the Institute of Mathematical Sciences, and the Government of India, to desist from applying such restrictions in the future.

Physicists have an important role to play as promoters of peace. Preventing open scientific exchange is an instrument to advance the international scientific enterprise and to develop comity among scientists, to advance our common culture and to contribute to the welfare of nations.

Luis Maquroy, Argentina; Luis Pfingstl Rosa, Brazil; T.R. Govindananda, India, M.K. Shastri, India; Zia-Mun, Pakistan; A.P. Balachandran, India, Jeeya Anandan, US/France, Lanka; Saeed Durand, UK/Pakistan; Anner Cohen, UK/France, W.K.H. Panovsky, US/M. Engineer, India; Pervez Hoodbhoy, Pakistan, Irving Lerch, US

FIP Resolution Objects to New State Department Advisory

The APS Forum on International Physics (FIP) has issued a resolution objecting to a new “advise from the U.S. State Department with likely negative effects on the issuance of visas to scientists from the People’s Republic of China coming to the U.S as scientific visitors or students.” According to an urgent communication sent out to FIP members by 1999 FIP Chair Joseph L. Birman (City College, City University of New York), the wording of the State Department advisory is vague, applying to “Applicants who are nationals of the Peoples Republic of China and who will be involved in an activity related to materials technology.” Says Birman, “We are concerned that it will be interpreted to encompass many fields in physics, materials science, chemistry, and related areas.” The advisory requires that the application must get an additional “advisory opinion” from Washington before being issued, an extra step that could take at least one additional month, or longer.

RESOLUTION

The Forum is deeply concerned by the recent U.S. State Department advisory [refer- ence to Section 221 (g) of the Immigration and Naturalization Act] which restricts visa applications from The Peoples Republic of China. While we are mindful and support appropriate security measures that are necessary to maintain the security of our society, we do question the advisability of placing the effect of the advisory is to deviate from the principle of The Free Circulation of Scientists to which the United States has committed itself along with the international scientific community. We believe this principle is fundamental to the freedoms and the restrictions imposed by other countries. The Forum is disturbed by the generalization of the possible adverse activities of one individual to a larger group, and the singling out of one group based on nationality. Our National Security depends in no small part on the ability of the scientific enterprise — and this enterprise is at risk by the State Department advisory. Thus, the Forum urges the leadership of the American Physical Society to protect the State Department Advisory at the highest levels, and to publicly state its opposition to the advisory. The Forum also urges the American Physical Society to reach out to the entire membership to inform them of the seriousness of this measure.
Tuxedos and gowns, fine dining and dancing were the order of the day for those attending the APS Centennial gala celebration, hosted by Atlanta’s Fernbank Museum. While not everyone opted for the formality of black tie fashion, most seemed to relish the opportunity to leave their meeting badges and hefty volumes of abstracts behind and don the requisite finery, mingling and mingling with both old and new acquaintances in the distinctly elegant surroundings.

The catered buffet dinner featured three menus from different geographical regions, while a jazz combo provided accompaniment in a side room for anyone desiring to dance. Guests milling about the upper balcony could stay close to the open bar while viewing a special exhibition by award-winning science photographer Felice Frankel [see page 3], constructed around the theme of “Envisioning Physics.” Commissioned by the APS specifically for the Centennial meeting, the exhibit is available for touring at venues around the country. An online version can be found at http://web.mit.edu/feliceF/www/aps1.html. Those desiring additional entertainment had the option of viewing the popular IMAX film, “Cosmic Voyage,” at various screening times. Meanwhile, in the auditorium, science magician Bob Friedhoffer delighted audiences with clever asides and magical sleights-of-hand, alternating 20-minute shows with Lynda Williams, “the Physics Chanteuse,” who wowed them with her cosmic cabaret, featuring such crowd-pleasing tunes as “Solid State of Mind” and “Carbon is a Girl’s Best Friend.”

Finally, alert attendees circling the room might have noticed the appearance of a few especially stellar celebrities: Albert Einstein (two versions, in fact, for those who thought they were seeing double), Marie Curie, and a dapper J. Robert Oppenheimer were on hand to greet the guests and pose for photographs, all in the name of celebrating a century of physics.

Physicists Step Out in Style at Fernbank Gala

The lavish interior of Atlanta’s Fernbank Museum, site of the APS Centennial Gala Celebration.

"Albert Einstein" takes a turn with "Marie Curie" during the APS gala celebration at the Fernbank Museum.

APS President Elect James Langer soaks up the elegant atmosphere with wife, Lily.

Above: Blowing giant soap bubbles at the Fernbank Museum’s interactive science exhibit, open to all those attending the APS gala celebration.

At left: Listening to the tones produced by a giant wind harp at the Fernbank interactive exhibit.
At right: Will the real “Albert Einstein” please stand up? Gala guest gets double the fun with a different kind of special relativity.

Below: B.S. Chandrasekhar of CSI, APS Executive Officer Judy Franz, Charles Duke of Xerox R&D Center, and gala organizer Brian Schwartz observe the festivities from a quiet corner.

Above: An Illustrious “Nobel” Trio: Valentine Telegedi, Leon Lederman and APS President Jerome Friedman pause in their revels for the camera.

At left: Ken McNaughton, editor of The Industrial Physicist magazine, gets a brush with greatness as he hobnobs with “Marie Curie” and a dapper “J. Robert Oppenheimer.”

Emory University’s Sid Perkowitz admires the fashionably “vintage” bowtie of APS Associate Executive Officer (and APS News editor) Barrett Ripin, while Marilyn Ripin looks on. Sara Schechner, curator of the Physics Works! and APS History exhibits, enjoys conversation at the table.


Above: Science magician Bob Friedhoffer enchants young partygoer with a demonstration of the principles of air pressure.

At right: Isaac Chuang of IBM/Almaden investigates acoustic resonance.

Physics Festival

At left: Science magician Bob Friedhoffer elicits a smile from 1999 Lilienthal Prize winner Stephen Hawking.

Below: Centennial meeting attendees peruse the APS History Exhibit featured in the GWCC lobby.

Sid Perkowitz answers students questions following a Friday public lecture on the physics of beer.

Noontime passerby takes in Eric Heller’s exhibit on Fractals and Chaos, on display outside the Georgia Pacific Building auditorium.

Atlanta art students take in the Microscapes exhibit sponsored by Lucent Technology.


At left: “Star Trek” guru Lawrence Krauss explains the finer points of the Enterprise’s many (as yet un-invented) technological marvels.
At right: Even baseball, the All-American pastime, has benefited from understanding physics principles, as demonstrated by NYU’s Richard Brandt.

Below: AIP Executive Officer Marc Brodsky crouches in the quantum corral, part of the Physics Works! exhibit at the Georgia World Congress Center (GWCC).

At right: Robert Greenler demonstrates the geometric structure of ice crystals responsible for ‘halo effects’ at the South Pole during a lunchtime public lecture.

Above: Noon time demonstration of air pressure by Hampton University demo team.

At right: ‘Fractals and Art’ lecturer Richard Voss following his presentation at the Woodruff Arts Center.

Ken Laws and his best ballerina demonstrate the physics of dance.

Brian Holmes employs various brass instruments to demonstrate the basic physics principles behind them.
ESPN2 Series Investigates the Science in Sports

S

cience educators looking for new
d ways to pique their students’
interest should be pleased to hear about
SportsFigures, an innovative, award-winning educational television series that explores sports celebrities, interesting facts about popular locations, lively hosts, cool graphics and a fast pace to engage kids and get them interested in learning. Produced in association with ESPN, the series premiered in 1995 as part of the industry-wide program, Cable in the Classroom. It’s designed to teach 4th to 12th graders the principles of physics and math using sports to grab their attention and provide them with realworld experience.

Each weekly, commercial-free, halfhour show features two segments in which a celebrity athlete takes the math or physics problem out of the classroom and into the field, exploring such questions as why a curve ball changes, and why a gymnast spins faster in the air. In the 1998-1999 season features segments on baseball, soccer, rail, sailing, race cars, snowboarding, basketball, snowboarding and golf.

The recent recipient of a Parent’s Choice Award for educational television, SportsFigures’ only problem seems to be that no one knows of its existence, no doubt due to the air time: Monday mornings at 5:30 AM on ESPN2. Hopefully that will soon change. ESPN recently announced that, through sponsorship with Infoseek’s GO Network, it will distribute the new series on the Internet. Here’s hoping a portion of the $10 million in revenue from the GO Network will be directed to the SportsFigures program.

The 1998 season features segments on “Running with Chipper” and “The Sounds of Summer.” The 1999 season features segments on “Bouncing Basketballs,” “Unlocking Our Future,” and “A Washington Analysis.”

The Official 1998 Pigasus Awards

Awards by the James Randi Educational Foundation (JREF) announced the coveted Pigasus Awards in four categories, for accomplishments in the period from January 1 to December 31, 1998. The awards were announced via teleplay, the winners are allowed to predict their winning, and the Flying Pig trophies are sent via psychokinesis. “We send, if they are sufficiently psychic, the trophy to their lack of ability,” the foundation insists. This year, the foundation awarded the prizes to the following folks:

Science: Dr. Jacques Benveniste Category #1, to the scientist who said or did the silliest thing related to the supernatural, paranormal or occult, goes to Dr. Jacques Benveniste, for his insistence that the magical qualities of homeopathic medicines can be transmitted via the internet in digital form, transferring curative qualities from a bottle of homeopathic water located in Paris, France, to a bottle of quite ordinary water located in Albuquerque, New Mexico. For this amazing discovery, Dr. Benveniste also became the only individual to have received the Ig Nobel Prize awarded by the Annals of Improbable Research for “Simply French pseudoscience can take pride in this distinction.” (The JREF has offered a one-million-dollar prize to any homeopath who can distinguish his homeopathic and non-homeopathic water.)

Funding: Mr. Joe Firmage Category #2, to the organization that supported the most useless study of a supernatural, paranormal or occult claim, goes to Mr. Joe Firmage, the computer genius who gave up his $2.1 million company to pursue humanity’s potential resonance with space aliens, despite a personal government conspiracy to conceal the abundant evidence he says exists. He points to “zero research,” which he says explains the existence of the transistor, which ordinary mortals were unable to develop without first finding the physics of the feedback loop. He says the transistor remains largely unproven. Holt says for right or wrong, you could almost hear stepping stones hit the floor.

Surprise there, you say. Put a Demon-

crat and a Republican on the same platform, and chances are you’ll be able to quantify it.

Episode 3 — Airs May 10, 1999

“Bouncing Basketballs” features New York Yankees All-Star shortstop Derek Jeter. Explores the travel of light and sound and how a game is broadcast.

Golf is a Drag. Features PGA golfer Harrison Frazee: Hooks and slices plague golfers. The physics of aero-}

dynamics can help solve the problem.

Episode 4 — Airs May 17, 1999

In Golf, Features: PGaanter Brad Faxon. Explores how understanding topography can help you master your putting.

Tracking Speed. World champion and Olympic gold medalist decathlete Dan O’Brien sprouts through the physics of motion to explore speed versus acceleration.

Episode 5 — Airs May 24, 1999

The Trig to Soccer. Olympic team gold medalist Julie Foudy talks about right and left parabolas in the physics of projectile trajectory and force vectors.

Sailing Through Bernoulli. Professional sailboat racer Scott Dickson and his crewmen explain the physics of a sailboat in terms of the Bernoulli principle and force vector.

Math Under Pressure. Richard Murphy, director of the Jeann-Michel Cousteau Institute, helps demonstrate the principles of atmospheres and pressure along with some algebra.

Episode 6 — Airs May 31, 1999

Shooting Stats. Features the NBA’s second highest scorer, Ruthie Bolton-Hoffeld of the Sacramento Monarchs and Olympic Dream team, and explains what statistics mean in the context of basketball.

Episode 7 — Airs June 7, 1999

Big Air Rules. Features world-class brother/sister snowboarders Mike and Tina Basich. Explores the physics of projectile trajectory and parabolas through the jumps of snowboarders.

How Sweet It Is. Features Atlanta Braves All-Star Third Baseman Chipper Jones. Explores the physics of standing waves and vibrational modes, such as when hitting a ball with a bat sometimes hurts your hands.

Cost, and there’s bound to be some quaking. But, right or wrong, you could almost hear stepping stones hit the floor.

Only a few days earlier, Holt and Ehlers, the only two physicists in Congress, had voted against the House National Missile Defense bill on the grounds that technolo-
gical and scientific feasibility of the system remains largely unproven. Holt put it succinctly in the floor debate: “We have in the Pentagon a new missile defense system.”

But if Mark, whose assertion represents the strongest position yet articulated by a member of the Clinton Administration, was looking for a fight, Holt and Ehlers refused to meet the occasion. Would they have, had the Washington media been paying attention? A Beltway? Perhaps it was just Atlanta etiquette: compose and Southern comfort.

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Buri...
**Announcements**

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**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 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 under the Prize and Awards button.

**DEADLINE**

15 June 1999

**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)

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**MEETING BRIEFS**

- The APS New England Section held its annual spring meeting April 9-10 at Yale University’s Sloane Physics Laboratory in New Haven, Connecticut. Friday afternoon’s sessions focused on the history of physics, with talks on Lass Ossager’s tenure at Yale, W.J. Gibbs at the beginning of the 20th century, and the physics of water. The session was followed by a banquet at the New Haven Lawn Club, featuring a keynote address by Yale’s Bradley Schaefer on superfluorescence, Sun-like stars. On Saturday morning, Gregor Novak of Purdue University discussed how to use the World Wide Web to teach physics, while Robin Oliverhead of the University of Guelph gave an update on recent results from the Sudbury Neutrino Observatory.

- The APS New York State Section held its annual spring meeting April 23-24 at Lucent Technologies in Murray Hill, New Jersey. The sessions were focused on processes, products and metrology; and materials simulation and ultrasmall transistors.

- The APS Ohio Section held its annual spring meeting April 30-May 1, at Kettering University in Flint, Michigan, on the theme of industrial and applied physics. Speakers at the Friday afternoon and Saturday morning sessions addressed such topics as MEMs; thermoelectrics; optics for processes, products and metrology; and materials simulation and the workplace. Friday evening’s banquet featured a keynote address by Leonard Brillson of Ohio State University on the changing roles of researchers in industry.

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

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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, toward undergraduate research.
- Recipients, finalists and their home physics departments will be presented with plaques or certificates of achievement.

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
In the nineteen-sixties the fluid dynamist Yukiuro Manabe was running global climate models on the supercomputer at the Geophysical Fluid Dynamics Laboratory in Princeton. Manabe began—considered (at home fashionable) to run models of climate with variable amounts of carbon dioxide in the atmosphere. He ran models with carbon dioxide at two and four times the present abundance, and saw in the computer output the rise in average ground temperature that is now called Global Warming. He told everybody not to believe the numbers. But the press was not fooled. They wanted numbers, he gave them numbers, so they naturally believed the numbers.

It was not unreasonable for politicians to believe Manabe’s numbers. Politics and science are very different. In science, you are not supposed to believe the numbers until you have examined the evidence carefully. If the evidence is dubious, a good scientist will suspend judgment. In politics, you are supposed to make decisions. Politicians are accustomed to making decisions based on shaky evidence. They have to vote yes or no, and they generally do not have the luxury of suspending judgment. If the numbers were clear and simple. They said if the carbon dioxide goes up, the planet will get warmer. So it was reasonable for politicians to believe them. Belief for a politician is not the same thing as belief for a scientist.

Manabe’s numbers were unreliable because his computer models did not really simulate the physical processes going on in the atmosphere. Over and over again he said that his purpose when he ran computer models was not to predict climate but to understand it. But nobody listened. Everyone was accustomed to using climate, everyone believed his numbers.

The biosphere of the earth contains four reservoirs of carbon: the atmosphere, the ocean, the vegetation and the soil. All four reservoirs are of comparable size, so that the problem of climate is inescapably mixed up with the problems of vegetation and soil. The interwoven behavior of the four reservoirs is so strong that it makes no sense to consider the atmosphere and ocean alone. Computer models of atmosphere and ocean, even if they can be made reliable, give at best a partial view of the problem. The large effects of vegetation and soil cannot be computed but must be observed and measured.

The way the problem is customarily described to the public is seriously misleading. The public is led to believe that the carbon dioxide was the only cause of climate and a single consequence. The single cause is fossil fuel burning, the single consequence is global warming. In reality there are multiple causes and multiple consequences. The atmosphere is the only tail of the dog. The dog that wags the tail is the global ecology: forests, farms and cities, factories and automobiles. And the increase of carbon dioxide in the atmosphere has other consequences that may be at least as important as global warming—increasing crop yields and growth of forests, for example. To handle the problem intelligently, we need to understand all the causes and all the consequences.

A third highly successful program of local observation has been started in recent years. One program is measuring directly the fluxes of carbon dioxide moving between the atmosphere and the biosphere. This is done by putting instruments on towers above the local trees or other vegetation. In daytime in the summer, the vegetation is vigorously absorbing carbon dioxide. At night or in winter, the flux is going the other way, with plants giving off carbon dioxide by respiration. The soil also gives off substantial fluxes of carbon dioxide, mostly from respiration of microbes and fungi. The instruments do not distinguish between vegetation and soil. They measure the total flux leaving or entering the atmosphere.

During the last few years, instrumental sites have been built in many countries around the world. Within a few years, we will know for sure how much of the carbon released by fossil fuel burning is absorbed by forests and how much by the ocean. And the same technique can be used to monitor the carbon fluxes over agricultural croplands, wetlands and grasslands. It will give us the knowledge required, so that we can develop management intelligently to regulate the carbon in the atmosphere. Whether we can manage it foolishly, we shall at least know what good or harm we are doing to the atmosphere.

The amount of money spent on local observations is small, but the money has been well spent. The Department of Energy is funding another successful program called Atmospheric Radiation Measurement (ARM). ARM’s activities are mainly concentrated at a site, a permanent site in Oklahoma, where systematic observations of radiation fluxes in the atmosphere are made with instruments on the ground and on airplanes flying at various heights. Measurements are made all the year round in a variety of weather conditions. As a result, we have a database of radiation fluxes, in a clear sky and in cloud and in heavy cloud conditions.

One of the most important measurements is made by two airplanes flying one above the other at different heights. Each airplane measures the fluxes of radiation coming up from below and outgoing to the atmosphere. The difference measures the local absorption of radiation by the atmosphere. The measured absorption of radiation turns out to be too powerful, considerably larger than expected. The unexpected absorption was derived partly from theory and partly from space-based measurements. The discrepancy is still unexplained. If it turns out that the anamalous absorption measured by ARM is real, this will mean that all the global climate models are using wrong numbers for absorption.

To summarize what we have learned, there is good news and bad news. The good news is that we are at last putting serious effort and money into local observations. Local observations are laborious and slow, but they are essential if we are ever to have an accurate picture of climate. The bad news is that the climate models on which so much effort is expended are unreliable because they still use fudge-factors rather than physics to represent important things like evaporation and convection, clouds and rainfall.

Besides the general prevalence of fudge-factors, the latest and biggest climate models have other defects that make them unreliable. With one exception, they do not predict the existence of El Niño. Since El Niño is a major feature of the observed climate, any model that fails to predict it is clearly deficient. The bad news does not mean that climate models are worthless. They are, as Manabe said thirty years ago, essential tools for understanding climate. They are not yet adequate tools for predicting climate. If we persevere patiently with observing the real world and improving the models, the time will come when we are able both to understand and to predict.

Until then, we must continue to warn the politicians and the public; don’t believe the numbers just because they come out of a supercomputer.

The Back Page is intended as a forum to foster discussion on topics of interest to the scientific community. Opinions expressed are not necessarily those of the APS, its elected officers, or staff. APS News welcomes and encourages letters and submissions from its members responding to these and other issues. Response may be sent to: letters@aps.org.