APS NEWS

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Physics News in 1998

Honors & Awards

aps centennial

March 20-26, 1999

www.aps.org/centennial

APS Centennial Meeting Draws Record Crowds to Atlanta

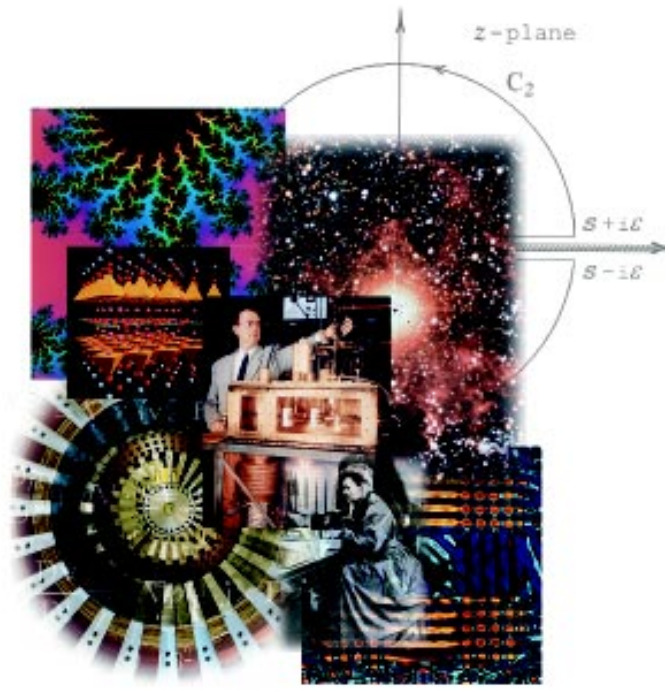
It's here at last! The APS will celebrate its 100th anniversary this month at the Centennial Meeting in Atlanta, Georgia. The conclave will constitute the largest physics meeting of all time, with an expected 10,000 physicists in attendance at the Georgia World Congress Center.

The scope is infinite, from atoms to the universe as a whole. All of the APS units will be represented, so one will be able to hear talks about quarks, protons, nuclei, atoms, molecules, DNA, living organisms, crystalline solids, gases, liquids, granular materials, planets, plasmas, stars, galactic clusters, and the microwave background. In temperature, the subject matter extends from billionths to billions of kelvin, in pressure from billionths to billions of pascals. Laser power starts with milliwatts and goes all the way up to petawatts, while computer power goes from single qubits to petabytes. Particles under discussion are sometimes free, or quasi-free, but more often than not are subject to some kind of restraining order while they are subjected to quantum dots, quantum wells, quantum contacts, quantum interference, quantum chaos, quantum gravity, quantum computers, quantum teleportation, quantum logic, and quantum pinball. Indeed, the confinement of electrons, and the implication of this for the movement of information (ultimately a trillion-dollar endeavor), is one of the primary motifs of the meeting.

Selected Technical Highlights

Photonic Crystal Lasers. Consisting of slender bars arranged in a regularly repeating pattern, a photonic crystal prevents the escape of light waves having a certain range of colors or wavelengths. Modifying the basic pattern of a photonic crystal can cause it to force light to travel in specific paths. As an "optical waveguide" it redirects light more than three times more efficiently than traditional waveguides. Such waveguides could cause light to bounce back and forth, in essence creating a highly efficient mirror. Physicists have hoped that such mirrors could serve as a basis for a new kind of low-power laser. Now, Attila Mekis of MIT and Lucent Technologies and his colleagues have built a photonic-crystal laser which guides light in two dimensions. They will present experimental measurements of this device. (Paper BC31.07)

Early Cancer Detection with Laser Spectroscopy. Many physics discoveries and techniques have been successfully applied to medicine. The laser is another example, and physicists are now exploring the ability of laser light to detect subtle visual signatures of disease at an early stage. In the body, the presence of disease alters the chemical composition and shape of the affected tissue. These microscopic alterations can be detected by shining laser light on tissue and studying the spectrum of light reflected from it, enabling diagnosis without the need for an invasive biopsy. Once detected with lasers, such diseased tissue may be treated, effectively ridding the body of the risk of developing potentially deadly diseases, such as cancer. Mary-Ann Mycek of Dartmouth College will illustrate the application of "laser-induced fluorescence spectroscopy" to the detection of epitelial dysplasia: a pre-malignant skin condition leading to cancer. (Paper FC32.01)



Photos courtesy of (from left to right): General Atomics; Anglo-Australian Observatory, Epping Australia; ISIS, Rutherford Appleton Laboratory; Charles Townes; Brookhaven National Laboratory; AIP Niels Bohr Library; and P. Tuffy, University of Edinburgh.

New Possibilities for DNA Computers. In the marriage of computer science and molecular biology known as DNA computing, scientists create fragments of DNA — whose letters represent computer data and instructions — and mix them together in test tubes to solve problems, such as the shortest path through a number of cities. Allen Mills of Bell Labs/Lucent Technologies will show that it is possible to use DNA to construct a massive neural network — computers modeled after the human nervous system — with a connectivity of 1 trillion synapses, or 1% of a human

Continued on page 6

Inside...

Corporate Sponsors Lend Support to Centennial Projects

The APS Centennial will feature several special events, exhibits and ongoing projects made possible by generous donations from corporate and government sponsors. [See the "Guide to Special Events" on pages 2-3 for specific times and locations.]

Fernbank Museum Gala

Numerous organizations have contributed to supporting the gala buffet dinner at the Fernbank Museum on Sunday evening, March 21, a formal affair celebrating the APS Centennial and the accomplishments of 20th century physics. In addition to dancing, there will be three screenings of "Cosmic Voyage" in the IMAX Theatre. Entertainment will be offered in the auditorium by Lynda Williams, "The Physics Chanteuse," and science magician Bob Friedhoffer. Primary sponsors include the American Institute of Physics, The Beacon Group, Herbert V. Friedman, and Hartford Life. Additional sponsors include Herbert L. Jamison & Co., Chroma Graphics, Inc., and Global Mail Ltd.

Timeline Wall Chart and Web Site

Numerous organizations are sponsoring various aspects of the Timeline Wall Chart, an educational outreach project entitled *A Century of Physics*. A compilation of photographs and text highlighting major developments and contributions of physics throughout the 20th century is displayed on eleven 40"x 26" panels. Each panel highlights one decade of 20th century physics. Lucent Technologies, the primary sponsor of the wall chart, has donated funds to cover printing costs. The National Science Foundation and Department of Energy are funding its distribution and the United Parcel Service will fund packaging. The educational timeline will be distributed free to high schools, junior colleges and universities, along with a teachers guide — developed with funds provided by the Lounsbery Foundation — as well as to science centers and libraries.

To complement the paper timeline wall chart, IBM is sponsoring the development of a timeline website, to become available later this month. The website is designed as an electronic version of the literal text and images of the wall chart, accessed through multimedia, interactive and external-link enhancements. It expands the amount of information available via the paper version, allowing more in-depth exploration of physics discoveries and their application to our world.

Nobel Laureate Luncheon

The Coca-Cola Company and the APS are jointly hosting the Nobel Laureate luncheon, scheduled for Saturday, March 20, which is intended to promote and highlight the importance of science education. This invitation only luncheon will honor an outstanding high school science teacher from each state and will be attended by science teachers and students from Atlanta, Georgia and surrounding areas, as well as more than 40 Nobel Prize winners in physics and chemistry. Students and teachers will have an opportunity to interact with the Nobel laureates. Delta Airlines is sponsoring the travel of selected dignataries to the Centennial. Vice President Gore has been invited to address the luncheon guests who will include APS leadership, local dignitaries and program sponsors.

Microscapes Exhibit

Lucent Technologies is also sponsoring an exhibit entitled *Microscapes: The Hidden Art of High Technology*, featuring 50 photographs that explore the convergence of art and technology, created in collaboration with the scientists and researchers of Lucent/Bell Laboratories. The exhibition has been shown in museums, art centers and universities through the U.S. and abroad. Available for viewing are such subjects as a fiber optic illumination of a silicon chip for echo-free conversations, a computer-simulated "fingerprint" of a superconductor, and a scanning electron micrograph of sulfur crystals. [For online text and graphics, see http://www.lucent.com/microscapes/microscapes.html

Students Receive Travel Grants to Centennial

The APS awarded 352 travel grants of $250 to enable undergraduate and graduate students from 141 institutions attend the Centennial. Student travel grants were funded by DOE, NSF and the APS.

A Guide to Special Centennial Events

As most of our members are now well aware, the APS will celebrate a century of physics accomplishments March 21 through March 26, 1999, in Atlanta, GA. The expanded technical meeting and exhibit program has been augmented with numerous special events and outreach activities. To help attendees navigate their way around the Centennial meeting, we offer the following guide to special Centennial events.

In addition to a Nobel laureate luncheon and exhibit opening involving teachers, students and Nobel Prize winners Saturday, there is an honorary international banquet on Saturday night, and a special gala buffet dinner at the Fernbank Museum on Sunday night. The cornerstone of the week's festivities is the Physics Festival in Atlanta: Mastering the Mysteries of the Universe. A series of popular physics talks will be offered, including a talk on Wednesday night by Stephen Hawking. Physics demonstrations will be offered throughout the week, along with special museum exhibits. Finally, local universities will host special on campus topical lectures and conferences just prior to the meeting.

SATURDAY, MARCH 20

Opening of the Nobel Discoverers Exhibit
GWCC; Level 3 Registration Area
1:30 PM - 3:00 PM (Exhibit on view throughout the week)

International Science Plenary Talks
GWCC, Conference Center
3:00 PM - 6:00 PM

International Reception and Banquet
Westin Peachtree Plaza
7:00 PM - 10:00 PM

National and local dignitaries as well as Nobel laureates will be invited guests at this event celebrating international cooperation in physics. Reservations required. A limited number of tickets are available at $40.00 per person.

SUNDAY, MARCH 21

Physics Demonstration: "Magnetism, Materials, Blue Sky Science and Life."
GWCC Lawn
11:30 AM and 12:30 PM

Sam Spiegel of Florida State University presents a light-hearted but heavy-handed look at the implications of magnetism through some clasic demonstrations and discussions with a twist. [Presented by the National High Magnetic Field Laboratory.]

Opening Centennial Session
GWCC
1:00 PM - 1:45 PM
Speaker: D. Allan Bromley

Gala at Fernbank Museum of Natural History
6:30 - 10:00 PM
Black Tie Optional


Courtesy of the Atlanta Convention and Visitors Bureau
Fernbank Museum

A gala buffet dinner celebrating the APS Centennial and the accomplishments of 20th century physics. In addition to dancing, there will be three screenings of "Cosmic Voyage" in the IMAX Theatre. Entertainment will be offered in the auditorium by Lynda Williams, "The Physics Chanteuse," and science magician Bob Friedhoffer. A limited number of tickets are available at $50 per person.

MONDAY, MARCH 22

Public Lecture: "Fractals and Scaling in Nature, Culture and Finance."
GWCC Auditorium
10:00 - 10:50 AM

Richard Voss, a professor of physics and mathematics at Florida Atlantic University, illustrates the impact of fractal geometry and chaos theory on practical applications from economics to DNA analysis.

Public Lecture: "The Physics of Dance."
GWCC Auditorium
11:00 - 11:50 AM

Ken Laws, a professor of physics of Dickinson College and long-standing ballet dancer and enthusiast, will analyze a sequence of ballet movements with a ballerina assistant using principles of physics.

Physics Demonstration: "What Does a Scientist Do?"
SciTrek Museum (Midtown)
11:00 AM

Sam Spiegel from Florida State University presents an engaging demonstration and discusion of what scientists do through the use of magic and observation. It is intended to challenge the common perception of white men with wild hair dressed in white lab coats, and encourage students to begin to explore the world around and within themselves through science.

Lunchtime Popular Lecture: "Ice Crystal Halos Over the South Pole."
Georgia Pacific Auditorium (Downtown)
12:15 - 1:15 PM

Robert Greenler, an adjunct professor of physics at the University of Wisconsin-Milwaukee, highlights his experiences at the U.S. research station on the South Pole, studying optical effects from the interaction of sunlight with ice crystals.

Physics Demonstration: "FUNdamental Physics with Toys"
GWCC Lawn
12:30 PM and 1:30 PM

Raymond Turner of Clemson University uses a variety of ordinary children's toys to demonstrate fundamental scientific principles, including Weebles that wobble, periscopes that invert images, balls that bounce (or don't bounce), and the use of infrared blasters or bungee jumpers to perform quantitative measurements.

Special Centennial Plenary Talks
4:00 PM - 6:00 PM

- Physics of the Very Big and Very Small; *Steven Weinberg, University of Texas/Austin*
- The Impact of Physics on Medicine and Biology; *Harold Varmus, Director, NIH*
- Physics and the Information Revolution; *Joel Birnbaum, V.P. Research, Hewlett-Packard Labs*

Welcome Reception
GWCC, Level 1 West
6:00 PM - 7:30 PM

Join your colleagues at the APS Welcome Reception at the Convention Center on Monday evening.

Public Lecture: "The Physics of Star Trek."
Rialto Theatre (Downtown)
8:30 - 9:30 PM

Lawrence Krauss, a professor of physics and astronomy at Case Western Reserve University and bestselling author of The Physics of Star Trek, relates examples from the popular TV series to illustrate concepts at the forefront of modern physics.


Copyright © 1998 Paramont Pictures
Lawrence Krauss will lecture on "The Physics of Star Trek"

TUESDAY, MARCH 23

APS Senior/Retired Member Buffet Breakfast
Rutherford Hall, Omni Hotel
7:30 AM - 9:00 AM
Cost: $10.00

Public Lecture: "Sunlight and Ice Crystals in the Skies of Antarctica."
GWCC Auditorium
10:00 - 10:50 AM

Robert Greenler recaps his South Pole experiences studying optical halo effects from the interaction of sunlight with ice crystals.

Public Lecture: "Nonsense and Non-Science: From Aliens to Creationism."
GWCC Auditorium
11:00 - 11:50 AM

Lawrence Krauss offers examples from various advertisements, TV shows, and movies to discuss the difference between science and fiction, and how the distinction between sense and nonsense is becoming blurred in popular discourse.

Physics Demonstration: "Mr. Magnet"
Sci Trek Museum (Downtown)
11:00 AM - Noon

Mr. Magnet—a.k.a. Paul Turner, a technical supervisor at MIT's Plasma Science and Fusion Center—will demonstrate the principles of magnetism and electricity and interesting applications in daily life, such as magnetic strips on credit cards, audio and video tape recorders, and automotive magnet motors, and magnetic sensors.

Lunchtime Public Demonstration: "The Science of Magic and the Magic of Science."
Georgia Pacific Building Auditorium (Downtown)
12:15 - 1:15 PM

Science magician and award-winning author Bob Friedhoffer—a.k.a. "The Madman of Magic"— uses magic to illustrate basic scientific principles, and shows how magic uses science to create its illusions.

Physics Demonstration: Adventures in Physics
GWCC Lawn
12:30 PM and 1:30 PM

Cynthia Keppel of Hampton University and several students present dynamic, interactive physics demonstrations illuminating physics principles, including a vacuum cannon, liquid nitrogen bath, bed of nails and exploding powder.

Public Lecture: "Fractals and Chaos: Bridging Science and Culture."
Atlanta College of Art, Woodruff Arts Center, Rich Auditorium (Midtown)
3:00 - 4:15 PM

Richard Voss reprises his discussion of fractal geometry and chaos theory for a general audience, focusing on how these new fields provide tools and unifying concepts that bridge the traditional boundaries between science, art and finance.

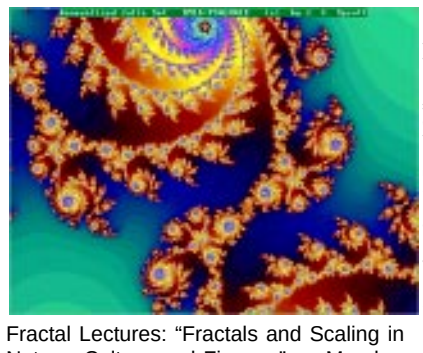


Image from Sprott's Fractal Galley website: http://sprott.physics.wisc.edu/fractals.htm
Fractal Lectures: "Fractals and Scaling in Nature, Culture and Finance" on Monday and "Fractals and Chaos:Bridging Science and Culture" on Tuesday.

Physical Review Drop-In Reception
Sponsored by *Physical Review*, *Physical Review Letters*, and *Physical Review Special Topics*
GWCC, 3rd Level Terraces
3:30 PM - 5:30 PM

The journal editors will be available to answer questions and share concerns about the journals. Stop by for refreshment - all are welcome.

Special Centennial Plenary Talks

- Physics and Technology; *Mary L. Good, Managing Member, Venture Capital*
- Physics and Materials; *Richard Smalley, Rice University*
- Physics and the American Culture; *Martin Klein, Yale University*

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Centennial Guide Continued

Public Lecture: "The Physics of Baseball."
Sci-Trek Museum (Midtown)
4:00 - 5:00 PM

Richard Brandt, a professor of physics at New York University, discusses the underlying physical principles of pitching and hitting in baseball, drawing on examples from the sport's long history.

Microscapes Exhibit Opening
Atlanta College of Art, Woodruff Arts Center, North Galleria
4:30 PM - 6:30 PM

Woodruff Arts Center will host an opening reception for the exhibit, "Microscapes: The Hidden Art of High Technology," sponsored by Lucent Technologies. [See "Exhibits" for more information.]

Alumni Reunions
GWCC Hall D
6:00 PM - 8:30 PM

As part of the Centennial Celebration many university and laboratory alumni groups will hold alumni receptions in the exhibit hall adjacent to the APS exhibits. Join your colleagues for an evening of relaxation and renewing old acquaintances.

Theatre: "Schrödinger's Girlfriend"
GWCC (Room TBD)
8:30 PM

A staged reading of the new romantic comedy by Matthew Wells in which love obeys the crazy laws of subatomic physics will have its world premiere at the centennial meeting.

WEDNESDAY, MARCH 24

Public Lecture: "The Physics of Brass Instruments Or, What do Horn Players Do With Their Right Hands, Anyway?"
GWCC Auditorium
10:00-10:50 AM

Brian Holmes, a professor of physics at San Jose State University who also performs regularly with the San Jose Symphony and Opera, reviews the physics of brass musical instruments throughout history.

Public Lecture: "The Physics of Baseball."
GWCC Auditorium
11:00 - 11:50 AM

Richard Brandt reprises his discussion of the underlying physical principles of pitching and hitting in baseball, and will focus on the 66 and 70 home runs hit by Sosa and McGwire, respectively, in the 1998 season.

Demonstration: "Adventures in Physics"
Sci-Trek Museum (Midtown)
11:00 AM and 12:00 Noon

Cynthia Keppel of Hampton University and several students present dynamic, interactive physics demonstrations illuminating physics principles, including a vacuum cannon, liquid nitrogen bath, bed of nails and exploding powder.

Lunchtime Lecture: "The Physics Chanteuse"
Georgia Pacific Building Auditorium
12:15 PM - 1:15 PM

Lynda Williams, a.k.a. "The Physics Chanteuse," offers Cosmic Cabaret, her unique blend of science and showtunes skewering a broad range of physics concepts. [See ZERO GRAVITY, *APS News*, February 1999] Williams will also be performing Monday at 8:00 PM at GWCC.

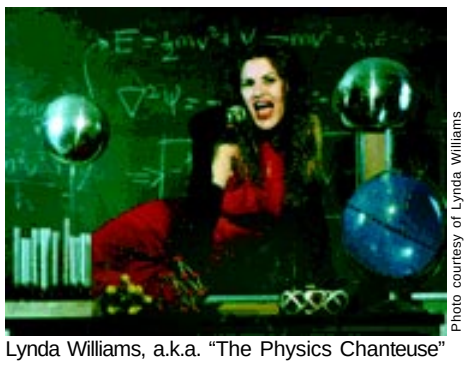


Photo courtesy of Lynda Williams

Lynda Williams, a.k.a. "The Physics Chanteuse"

Student's Luncheon
GWCC, Level 1 West, Maple Point
12:30 PM - 2:00 PM

All student attendees are invited to mingle with fellow physics students and enjoy complimentary lunch.

Demonstration: "The Science of Magic and the Magic of Science"
GWCC Lawn
12:30 PM and 1:30 PM

Bob Friedhoffer—a.k.a. "The Madman of Magic"— uses magic to illustrate basic scientific principles, and shows how magic uses science to create its illusions.

Awards and Retiring APS President's Address
GWCC Ballrooms II & III
4:00 PM - 6:00 PM

Public Lecture: "The Physics of Dance."
The Grand Salon, Fox Theatre (Midtown)
6:00 - 7:00 PM

Ken Laws again analyzes a sequence of ballet movements with a ballerina asistant using principles of physics, this time in conjunction with the dress rehearsal of a new work, "Requiem," by the Atlanta Ballet in the Fox Theatre, starting at 7:00 PM.

Lilienfeld Public Lecture: "The Universe in a Nutshell ."
Atlanta Civic Center
8:30 PM - 10:00 PM

Stephen Hawking, renowned theoretical physicist and author of the bestselling *A Brief History of Time*, will give the 1999 APS Lilienfeld Prize lecture (see honors insert for further information).

THURSDAY, MARCH 25

Demonstration: "The Science of Magic and the Magic of Science."
Sci-Trek Museum (Midtown)
11:00 AM

Bob Friedhoffer—a.k.a. "The Madman of Magic"— uses magic to illustrate basic scientific principles, and shows how magic uses science to create its illusions.

Lunchtime Popular Lecture: "The Physics of Brass Instruments."
Georgia Pacific Building Auditorium (Downtown)
12:15 - 1:15 PM

Brian Holmes reprises his talk on the physics of brass musical instruments throughout history.

FRIDAY, MARCH 26

Lunchtime Popular Lecture: "The Physics of Beer: Drinking and Eating the Foam We Love."
Georgia Pacific Building Auditorium (Downtown)
12:15 - 1:15 PM

Sid Perkowitz, a professor of physics at Emory University, explores the science behind the formation of foam and bubbles in beer, soda, bread, whipped cream, meringue and other delicacies.

Photo from *The New Brewer* website: www.aob.org/IBS/newbrewer/articles/nitrobrew.htm

"Physics of Beer"

NOTE: This schedule reflects all events, times and locations at press time, and is subject to last-minute changes. To check on updated festival events, see the APS Centennial website at http://www.aps.org/centennial, or refer to the Physics Festival booklet available at the APS Centennial Meeting.

http://www.aps.org/centennial

Exhibits

To Advance and Diffuse the Knowledge of Physics: 100 Years of the APS. Georgia World Congress Center entrance lobby. Open S-F. A curated exhibit of the origins and historical development of the APS. Display contents include: APS research journals, outreach programs, as well a number of interesting incidents that helped shape the character of the Society.

Felice Frankel Photography Exhibit: "Envisioning Physics." Fernbank Museum of Natural History. Open M-F, 9:00 AM - 5:00 PM. Award-winning science photographer and MIT Artist-in-Residence Felice Frankel presents a series of science-based photographs, many of which have appeared in major scientific journals and magazines.

Microscapes: The Hidden Art of High Technology. Woodruff Arts Center, North Galleria. Open T-F, 9:00 AM - 5:00 PM. The exhibit presents 50 photographs that explore the convergence of art and technology, created in collaboration with the scientists and researchers of Lucent/Bell Laboratories. [For online text and graphics, see http://www.lucent.com/microscapes/microscapes.html.]

Credit: Lucent Technologies

Soldering Iron Tip. Photomicrograph with reflected illumination John Carnevale. A soldering iron tip has been ground down to reveal the copper core within its iron sheath. The image reveals the crystal structure of the metals and the nature of the bond between them.

Virtual Earth. GWCC Auditorium (entrance). Open M-W, 9:00 AM - 5:00 PM. The National Center for Atmospheric Research offers a 3-D visualization of Earth.

APS Timeline Wall Chart: "A Century of Physics." Georgia World Congress Center. Open M-F, 9:00 AM - 5:00 PM. The timeline traces the development of physics throughout the 20th century.

APS Unit Exibits. Georgia World Congress Center Exhibit Hall D. Open M 10:00 AM - 5 PM; T 1:00 PM - 8:00 PM; W 10 AM - 3:00 PM. Twenty-seven APS Divisions, Topical Groups, Forums and Sections will highlight activity in their units.

The African-American Presence in Physics (two identical exhibits to be installed at Atlanta University Center Complex and at Georgia World Congress Center Exhibit Hall D). Open M-W at GWCC. Official opening reception on March 20 will coincide with the meeting of the National Society of Black Physicists.

Nobel Discoverers Gallery. The unique AIP W. F. Meggers collection of physics Nobel Laureate portraits will be exhibited during the Nobel Laureate Luncheon and, later, throughout the Centennial in the Georgia World Congress Center near the registration area.

Physics in Our Lives. An APS exhibit under development that illustrates to youth the impact that physics has on the exploration of Nature, saving lives and driving technology. It includes several interactive demonstrations.

On-Campus Topical Conferences

Industries of the Mind: Physics and Economic Growth. Georgia State University, New Student Center, Tuesday, March 16, 1999, 2:30 - 5:30 PM.

Various Career Choices with Foundations in Physics. Spelman College, Cosby Center, Thursday, March 18, 1999, 9:00 AM - 12 Noon.

Reporting Science in the 21st Century. Emory University, Friday March 19, 1999, 9:00 AM - 5:00 PM.

The Influence of Physics on Developments in Other Disciplines During the 20th Century. Morehouse College at the Atlanta University Center, Thursday, March 18, 1999, 2:00 PM - 3:45 PM.

Centennial Meeting Tutorials

The APS is hosting five tutorials during the APS Centennial Meeting, to be held on Sunday, March 21, from 9:00 am to 1:00 pm. Arranged by MIT's Lawrence Rubin, the topics to be featured are listed below. Further information can be found in recent *APS Meeting Announcements*, inserts to *APS News*, or online at http://www.aps.org under the Centennial Meeting button.

Applications of Magnetic Force Microscopy in Magnetic Imaging of Materials. An overview of the development of magnetic force microscopy and its application in three major areas for the study of materials: imaging under external fields, quantitative studies, and using MFM as an imaging and measuring technique.

Cellular Automata Simulations with Mathematica. An introduction for students to the use of computer simulation as a tool for the study of natural phenomena in a wide range of fields. Specific topics to be covered include diffusive processes, solidification, interfacial diffusion fronts, solid electrolytes and fast ion conductors, coalescence, and surface adsorption-desorption.

The Physics of Cold Atoms at Millikelvin, Microkelvin and Nanokelvin Temperatures. An overview of the physics of laser cooling and its impact on various areas, such as a new generation of atomic clocks and atom interferometry. Laser-cooled atoms, which were crucial to the realization of gas phase Bose-Einstein condensation, were recognized by the 1997 Nobel Prize in Physics.

Perspectives on Career Choices in Industrial and Applied Physics. An overview of the goals, career choices, technical activities, motivation and other aspects of the professional life of industrial physicists, intended to broaden the scope and perspective of physics students, postdocs, and faculty.

Development of Key Concepts in Surface Science. An historical overview of the development of key areas of surface science up to the present frontiers. Topics include low energy electron diffraction, photon spectroscopy, dynamics of molecule-surface interactions, and key issues in atomic imaging.

APS Views: Physics and the APS, Then and Now

APS Purpose: *"In the firm belief that an understanding of the nature of the physical universe will be a benefit to all humanity, the objective of the Society shall be the advancement and diffusion of the knowledge of physics"*

The Highest Aim of the Physicist

by Henry Rowland, 1899 APS President

We meet here in the interest of a science above all sciences, which deals with the foundation of the universe, with the constitution of matter from which everything in the universe is made, and with the ether of space by which alone the various portions of matter forming the universe affect each other even at such distances as we may never expect to traverse whatever the progress of our science in the future.

We form an aristocracy, not of wealth, not of pedigree, but of intellect and ideals, holding him in the highest respect who adds the most to our knowledge or who strives after it as the highest good.

Let us cultivate the idea of the dignity of our pursuit, so that this feeling may sustain us in the midst of a world which gives its highest praise to the one who uses it for satisfying the physical rather than the intellectual needs of mankind. He who makes two blades of grass grow where one grew before is the benefactor of mankind; but he who obscurely worked to find the laws of such growth is the intellectual superior as well as the greater benefactor of the two.

> "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 unravel the great problem of the constitution and laws of the Universe.
>
> *Henry Rowland*
> *1899 APS President*

Thus, to encourage the growth of any science, the best thing we can do is to meet together in its interest, to discuss its problems, to criticize 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. Furthermore, let us encourage discrimination in our thoughts and work. Let us recognize the eras when great thoughts have been introduced into our subject and let us honor the great men who introduced and proved them correct. In choosing the subjects for our investigation, let us, if possible, work upon those which will finally give us an advanced knowledge of some great subject. What is matter; what is gravitation; what is ether and the radiation through it; what is electricity and magnetism; how are these connected, and what is their relation to heat? These are the great problems of the universe. But many infinitely smaller problems we must attack and solve before we can even guess at the solutions to the greater ones.

It is a curious fact that, having minds tending to the infinite, with imaginations unlimited by time and space, the bits of our exact knowledge are very small indeed.

Henry Rowland

All the facts which we have considered, the liability to error in whatever direction we go, the infirmity of our minds in their reasoning power, the fallibility of witnesses and experimenters, lead the scientist to be specially skeptical with reference to any statement made to him or any so-called knowledge which may be brought to his attention.

How shall we regulate our mind with respect to the imperfections of the knowledge of physics? The scientific mind should never recognize the perfect truth or the perfect falsehood of any supposed theory or observation. It should carefully weigh the chances of truth and error and grade each in its proper position along the line joining absolute truth and absolute error.

The ordinary crude mind has only two compartments, one for truth and one for error; indeed, the contents of the two compartments are sadly mixed in most cases. The ideal scientific mind, however, has an infinite number. Each theory or law is in its proper compartment indicating the probability of its truth. As a new fact arrives the scientist changes it from one compartment to another, so as to always keep it in its proper relation to truth and error. The ideal scientific mind, therefore, must always be held in a state of balance which the slightest new evidence may change in one direction or another. It is in a constant state of skepticism, knowing full well that nothing is certain. It is above all an agnostic with respect to all facts and theories of science as well as to all other so- called beliefs and theories.

Yet it would be folly to reason from this that we need not guide our life according to the approach to knowledge that we possess. Nature is inexorable; it punishes the child who unknowingly steps off a precipice quite as severely as the grown scientist who steps over, with full knowledge of all the laws of falling bodies and the chances of their being correct. Both fall to the bottom and in their fall obey the gravitational laws of organic matter, slightly modified by the muscular contortions of a falling object, but not in any degree changed by the previous belief of the person.

Natural laws there probably are, rigid and unchanging. Understand them and they are beneficent; we can use then for our purposes and make them the slaves of our desires. Misunderstand them and they are monsters who may grind us to powder or crush us in the dust. Nothing is asked of us as to our belief; they act unswervingly and we must understand them or suffer the consequences. What greater fool, then, than he who states that belief is of no consequence provided it is sincere.

An only child lies on a bed of illness. The physician says that the disease is total: a minute plant called a microbe has obtained entrance in the body and is growing at the expense of its tissues, forming deadly poisons in the blood or destroying some vital organ. Can we doubt there is a remedy which shall kill the microbe or neutralize its poison? Why, then, as he not used it? The answer is ignorance. The physician is waiting for others to discover it, or perhaps is experimenting

Continued on page 5

Meeting Challenges of the 21st Century

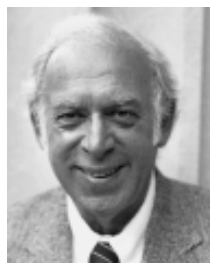
by Jerome Friedman, 1999 APS President

The APS has the responsibility of providing opportunities for the physics community to communicate scientifically, both within fields and across fields, by means of meetings and journals. This central function must be continually strengthened, but the APS must do more to ensure the health of physics at a time when science in general is facing serious challenges. This month — in fact, this entire year — is a celebration of 100 years of the APS, and 100 years of remarkable advances in physics. But we also want to use this event as an opportunity for extensive outreach to the general public, to policy makers and to students. The continued support of physics will depend on our ability to articulate to the federal government and the public at large the contributions that physics makes to society. The APS has been playing an important role in organizing and leading this effort, and the Centennial celebration is the beginning of new efforts in this direction.

Today the pursuit of science is under great budgetary pressures in a period of budget caps and major social problems. With the end of the Cold War, the social contract between science and society embodied in Vannevar Bush's ground-breaking report, Science: The Endless Frontier, has begun to erode. In the decades following the end of World War II, the support of science was regarded as a wise investment. However, in recent years there have been some in government who have questioned this premise. They do not accept the view that the pursuit of scientific knowledge has social as well as intellectual value; and they have wanted guaranteed, short-term benefits as the justification for their support of science. We must transmit the message that the support of science and technology is an investment that is critical for the future of the nation, and that an appropriate portion of the federal budget should go into both basic and applied research.

The way we live today is very much a product of the scientific discoveries of the past and the technologies developed from them. These advances have also shaped how we see our place in the universe. Science has played and is playing a vital role in improving our lives. This view is clearly expressed in Vern Ehlers' recent report, Unlocking Our Future, which updates the Bush report. This report and the Frist-Rockefeller Bill, S.2217, which seeks to increase federal funds for science by a factor of two in twelve years signify a changing climate in Washington with regard to support for scientific research. But this change is far from complete and the scientific community must work hard to bring it about and maintain it.

The nation has many diverse needs, and we, the scientific community, must ensure that the public and our policy makers are aware of the importance of research when political choices are being made. Our community should undertake a general educational role which explains the nature and value of physics. We must also make better contact with science journalists to amplify our message and enlarge our audience. In the long run science can prosper only if the public truly supports it.



Jerome Friedman

The more unified the physics community is the greater its political effectiveness will be. Because of the diverse range of subfields represented within the Society, the APS works to enable the physics community to speak with one voice. The same principle applies to the scientific community in general. The APS and over 100 other scientific and technical societies are now working together as a unified advocate of better funding for basic and applied science.

The public today is largely disengaged from science. They are the product of a K-12 school system that has failed to provide scientific literacy. The young people of today are not being equipped to succeed in a technological society. Another serious issue is that a scientifically uninformed public cannot effectively participate in political decisions related to science and technology.

The APS must continue to strengthen and develop its programs to improve physics education in the elementary and secondary schools. We should extend our existing efforts by increasing our associations with science teachers, helping them devise more effective curricula. We should encourage an increase in the participation our members, providing them with the support they need to work effectively at the local level. Our community also has the responsibility to bring to the public and political leaders those scientific insights and facts that bear upon scientific issues in specific political decisions. The Society should continue to play an important role in this area.

Finally, although we are the American Physical Society, the world is getting smaller, and greater involvement in international issues is inevitable. Today we have many members outside the U.S.,and most of the manuscript submissions to our journals are from foreign authors. In the international arena the APS should pick its goals carefully, focusing on issues in which we can be effective, such as promoting human rights and the free flow of scientific information.. Above all, we must continue to foster good collaboration with physical societies in other parts of the world, with joint meetings and other activities.

To accomplish these broad goals, we must look within our own ranks for both ideas and help. Our objectives must reflect the consensus of our members. In this regard we must continue to make the Society more responsive to the needs of its members, communicating with them to find out how to

Continued on page 5

Court of Appeals Affirms Victory for APS and AIP in Litigation Over Survey of Journal Prices

On January 25, 1999, the U.S. Court of Appeals for the Second Circuit unanimously affirmed the decision by U.S. District Judge Leonard B. Sand that the publication and promotional use of a survey of journal prices did not constitute false or misleading advertising. The suit had been brought by Gordon and Breach Science Publishers S.A. and affiliates ("G&B") and alleged that a survey conducted by Professor Henry Barschall and published by the American Institute of Physics ("AIP") and The American Physical Society ("APS") should be enjoined. The survey showed that G&B's physics journals were, on average, far more expensive in terms of cost per thousand characters than those of other publishers.

Following a seven-day trial, Judge Sand issued a decision in August 1997 in which he stated that "Barschall's methodology has been demonstrated to establish reliably precisely the proposition for which defendants cited it— that defendants' physics journals, as measured by cost per character and by cost per character divided by impact factor, are substantially more cost-effective than those published by plaintiffs." (The impact factor is a measure of citation frequency.) See http://barschall.stanford.edu for the decision, for background information, and for copies of the late Professor Barschall's original articles. Although G&B had raised a variety of issues in its appeal of Judge Sand's decision, the Court of Appeals found that none warranted specific mention. In an opinion that issued just two weeks after oral argument, the Court stated simply that "[w]e affirm for substantially the reasons stated by the district court in its opinion."

In setting the context for the dispute, Judge Sand had observed that "defendants introduced evidence that G&B has engaged in an aggressive corporate practice of challenging any adverse commentary upon its journals, primarily through threatened (and actual) litigation. This evidence persuasively demonstrated that the present suit is but one battle in a `global campaign by G&B to suppress all adverse comment upon its journals.'" Because the relevant statute allows the recovery of attorneys fees in "exceptional" cases, AIP/APS sought fees. Although the Court of Appeals observed that G&B's suit "may not have been strong on the merits," it affirmed Judge Sand's denial of fees.

Marc Brodsky, the Executive Director of the AIP, stated that "we are extraordinarily pleased with the outcome because it allows the free flow of information that bears on the difficult problems that libraries confront in dealing with the rising costs of journals." Tom McIlrath, the Treasurer of the APS, observed that "G&B has repeatedly attacked the societies for the publication of the Barschall survey and it is gratifying to have such sweeping vindication in the U.S. courts. Unfortunately, we are still under attack in French and Swiss courts for using exactly the same data and methodology that the U.S. courts found be completely acceptable."

The litigation was handled for the societies by Richard A. Meserve of Covington & Burling in Washington, D.C. Meserve commented that "the case is important because it shows that the full protection of the First Amendment applies to the publication of scholarly works, even in the face of alleged commercial motive." Meserve, who is both a physicist and a lawyer, is a Fellow of The American Physical Society.

For further information or questions, please contact Phil Schewe, (301) 209-3092.

Rowland, *continued from page 4*

in a crude and unscientific manner to find it. Thus the present generation suffers for the sins of the past, and we die because our ancestors dissipated their wealth in armies and navies, in the foolish pomp and circumstance of society, and neglected to provide us with a knowledge of natural laws. In this sense they were murderers and robbers of future generations of unborn millions, and have made the world a charnel house and place of mourning where peace and happiness might have been. Only their ignorance of what they were doing can be their excuse, but this puts them in the class of boors and savages who act according to selfish desire and not to reason and to the calls of duty. Let the present generation take warning that this reproach be not cast on it, for it cannot plead ignorance in this respect. All sciences are linked together and must advance in concert. The human body is a chemical and physical problem and these sciences must advance before we can conquer disease. But the true lover of physics needs no such spur to his actions. He strives to understand the universe on account of the intellectual pleasure derived from the pursuit, but he is upheld in it by the knowledge that the study of nature's secrets is the ordained method by which the greatest good and happiness shall finally come to the human race.

Henry Rowland was the first elected president of the APS. Adapted from Rowland's presidential address, delivered at the second meeting of the APS on October 28, 1899. The full text of his speech can be found on the APS Web page: http://www.aps.org

Friedman, *continued from page 4*

best serve their needs, as well as those of the physics community at large. The APS should be an inclusive society, integrating the entire physics community. It should represent physicists in every sphere of activity: academia, industry and government laboratories; those working in basic and applied research; and those with Bachelor's degrees, Master's degrees, and PhDs.

We have had 100 years of spectacular physics advances, and we can envision similar achievements for the future. There is no question that the intellectual questions to be answered are very deep and manifold. There will be major discoveries that we cannot even anticipate, as well as new revolutionary technologies, and much more interdisciplinary work. Physics in the 21st century will require an environment in which all of its various manifestations can flourish. The APS will play an important role in fostering such an environment by continuing and strengthening its outreach activities.

My personal vision is an APS that enhances the ability of physicists to do their work, contribute to society, and play a role in establishing educational levels of excellence. I would like us to be seen as an organization that serves society as well as physics.

Jerome Friedman, a professor of physics at Massachusetts Institute of Technology, assumed the APS presidency on January 1, 1999.

zero gravity

Brain Teaser Limericks

Physicists love their limericks. That's what we discovered a couple of years ago when we first requested submissions of science-themed limericks, and received literally hundreds of replies. [Winners appeared on The Back Page of the [March 1997] issue of *APS News*. A complete collection of limericks can be found at http://www.aps.org/apsnews/.] Encouraged by this success, *APS News* announced a second limerick contest last summer, this time requesting verse in the form of "brain teasers" (*APS News*, August/September 1998). The responses this time were not nearly as prolific; nonetheless, some clear winners did emerge.

A note on selection criteria: We adopted a rather liberal interpretation of what constitutes a "brain teaser:" some limericks were intended as cleverly phrased exam questions, others as riddles, still others as standard "brain teaser" story problems. We also allowed some minor divergence from strict adherence to the rules of scansion in the limerick form. Call it "poetic license." It's all in the spirit of fun, after all, and we hope our readers find these entries entertaining, challenging, and perhaps even useful as an educational tool.

B. Ripin, Editor

First prize goes to Fred Bortz, physicist and author of numerous science and technology books for young readers [http://www.cherryvalleybooks.com/DrFred], and a self-proclaimed "limerician at large." He offered the following as a replacement to any exam question asking for a description and explanation of the Anomalous Zeeman Effect:

1. The famed mathematiker Riemann
Shared manifold cocktails with Zeeman.
Their degenerate state
Split in six. (They saw eight.)
How anamolous can spectra be, Mon.

Advises Bortz: "It works best when read by a Leighton-type reader affecting a Carribbean accent, accompanied by a Feynman impersonator on bongos."

Kay DeVicci of Moorestown, NJ, submitted several sample limericks, from which we selected the following:

2. The sum of 3 numbers is 4;
The product is (-2) more;
The sum of their squares,
If anyone cares,
Is just 14 less than a score.

For those desiring more of a mathematical challenge, DeVicci's "quadruple limerick" in four parts warrants an honorable mention, not just for level of difficulty, but also for its wry commentary on the meager rewards of mathematical proficiency:

3. Consider a cube for a minute
And imagine the largest square in it.
If you're a math whiz,
Tell me how big it is;
It's tricky to even begin it!

Now let us move up one dimension:
Find the cube of the largest extension
That fits (neatly packed)
Into one tesseract,
And, boy, will you have stress and tension!

Martin Gardner proposed this last question,
And I solved it, at no one's suggestion.
It took 15 years
Of blood, sweat and tears,
And gave me severe indigestion.

My proof fills up 100 pages;
'Til I solved it, it stumpled all the sages.
It was recently checked
And pronounced quite correct,
But it hasn't augmented my wages.

Marion Cohen, a mathematician and writer at Drexel University whose husband is a physicist, credits *APS News* with inspiring her to begin writing math-related limericks. Although her many submissions were more in the line of limerick riddles than brain teasers, we picked one dealing with differential equations — as an honorable mention in our contest:

4. We were known by Dirac and Wigner
But not knowing brings no stigma
'Cause we simply ooze
With n's, m's, and 2's,
And don't forget x and big-sigma.

Maurice Macholver of St. John's University in Jamaica, New York, submitted his own version of a limerick riddle:

5. A real, square matrix named "A"
Asks you, "Is this Yea or Nay?"
If I were orthagonal
And also diagonal
My name would be Delta-IJ.

Finally, Thomas Walnut, emeritus professor of chemistry at Syracuse University, adopted Bortz's approach, submitting a limerick which poses an interesting question and asks for an explanation:

6. The distant planet Gazoo
Has lakes made of helium II
There're some might tough snakes
Who live in those lakes
Can they swim in that very cold goo?

Walnut did not supply an answer, "because I am not sure what it is," although he offered to supply the answer "if pressed." We prefer to let our members figure it out for themselves.

ANSWERS TO BRAIN TEASER LIMERICKS

1. ??
2. 1, 1, and 2
3. The side of the largest square in a cube of unit side is the square root of 9/8. The side of the largest cube in a tesseract of unit side is the square root of A, where A is the smaller of the two real roots of: 4 x **4 - 28 x **3 - 7 x **2 + 16 x + 16 = 0. Numerically, sqrt (A) is approximately 1.007435.
4. Legendre functions
5. ??
6. [Your answer here]

CORRECTIONS

• On page 2 of the January 1999 issue, *APS News* made an error in the last item on the "Friedman Fact Sheet." Jerome Friedman shared the Nobel Prize in 1990 with Kendall and Taylor demonstrating the existance of quarks as constituents of matter — not, as was erroneously stated, for demonstrating the existence of the top quark.

• Also on page 6 of the same issue, James Vary was incorrectly affiliated. Vary is the director of the Iowa State University's International Institute of Theoretical Physics.

• On page 7 of the same issue, George Snow of the University of Maryland was omitted from the photo caption accompanying the Apker Award article.

We apologize to Professors Friedman, Vary and Snow for the oversights.

Centennial Meeting Draws Crowds, *continued from page 1*

brain. Simon Berkovich of George Washington speculates that the DNA in a biological organism serves a role comparable to a barcode: it provides classification, so that small differences are enough to distinguish between species, and it provides a unique ID number that is responsible for the biological individuality of an organism. (Session BC31)

Black Silicon. Silicon, the raw ingredient of computer chips and modern electronics, often has a dark bluish-grey color. However, researchers have discovered that changing its color may lead to more efficient solar panels. By repeatedly shining pulses of femtosecond laser light, Claudia Wu and her Harvard colleagues have made microscopic black spots on silicon. As it turns out, these spots absorb significantly larger amounts of light than comparable areas on traditional silicon. The researchers believe that such "spiked" silicon can lead to highly efficient light absorbers for solar cells and photodetectors. (Paper IC07.10)

Fertilize Locally but Think Globally. Anthropogenic carbon flow is primarily in the energy sector and has an immense effect on the worldwide economy. The corresponding nitrogen flow is primarily in the agricultural sector and its effects more evident on a local level. For example, fertilizer runoff has created a 1000-square mile hypoxic deadzone for fish where the Mississippi meets the Gulf of Mexico. For these reasons, argues Robert Socolow of Princeton, the sustainability of nitrogen use ought to receive greater attention. (Paper VB15.03)

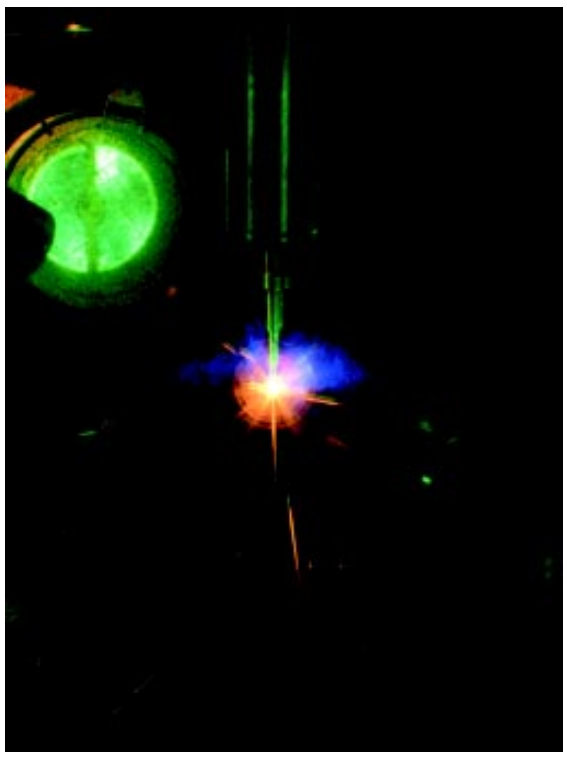
Petabyte Recreation of the Early Universe. When particles smash into each other at high energy accelerators a miniature fireball is ignited; in a volume less than the size of an atom, hothouse conditions resembling those of the very early universe are created. The fiery collisions are often followed by a prompt blizzard of secondary particles spawned courtesy of $E=mc^2$. Tracking, sorting, and assessing this jumble requires the world's fastest electronics, consisting of such items as silicon microstrip detectors, lead glass scintillators, vertex trackers, and drift chambers. At the highest energy colliders, such as the Tevatron at Fermilab, the Relativistic Heavy Ion Collider (opening later this year at Brookhaven), and the Large Hadron Collider (at CERN by 2005), computers will have to keep up with, and control, the furious pace of data collection, probably at the petabyte scale. (Session OB09.)

History of Physics in National Defense. Hans Bethe, who wrote out the nuclear reactions that govern the production of energy in the Sun, was in charge of the theory division on the Manhattan Project, which lead to the construction of the first atomic bombs. He will discuss his personal recollections of the World War II project, including the Trinity test in New Mexico where the first atomic bomb was exploded. C. Paul Robinson, the president of Sandia National Labs, will argue that the success or failure of the international Chemical Weapons Convention and the proposed Biological Weapons Convention will depend upon new technology to enable the monitoring of these challenging and unique threats. A.D. Wheelon of the National Oceanic and Atmospheric Administration will discuss details about physicists' role in developing strategic reconnaissance programs during the Cold War. (Session SA03)

The Rental Car Problem. Kristen Joan Russell of the Northwestern State University of Louisiana will discuss an intriguing mathematical connection between Fermat's principle — in which light chooses a path that minimizes the time of travel as it passes through different substances — and the often vexing "rental car problem," in which one tries to minimize the cost of fuel in a round trip between cities with varying prices of fuel along the way... all while returning with a full tank. (OC38.17) Incidentally, Russell is an undergraduate. This talk and many other examples of creative undergraduate physics research will be showcased at four Society of Physics Students sessions. (BC11, IC11, LC11, OC38)

Nuclear Physics with Lasers. Irradiating solid targets at very high intensities with a very short pulse of laser light from a short-pulse laser like Livermore's Petawatt laser (the most powerful in the world) can create not only very high-energy electrons, but also provides very bright beams of gamma rays that can induce nuclear reactions in the target materials. Following up on late-breaking results presented in November, Tom Cowan of Livermore will provide a review and update on these experiments, which includes the creation of 100 MeV electrons (a new record for electrons coming from a solid), positrons moving at relativistic speeds, and various photo-nuclear reactions (RP01.88).

Supernovae in the Universe and on Lasers. Core-collapse supernovas (SNs) represent one of nature's most dramatic events, the catastrophic explosion of a massive star. Owing to their intrinsic brightness, they are used to gauge the distances to the outermost reaches of the space, allowing the rate of expansion of the universe to be assessed, and providing the shocking recent evidence that the universal expansion is accelerating. However, the basic mechanisms and fundamental physics behind the triggering of a SN still have many open questions. In a burgeoning new subfield of plasma physics, intense lasers are being used to recreate small-scale laboratory versions of certain exploding SN plasmas for more careful scrutiny. Bruce Remington of Livermore will describe these experiments and mention numerous other examples of "laboratory astrophysics." (XB21.02)



Courtesy of Lawrence Livermore National Laboratory

To simulate a supernova explosion, energy from the powerful NOVA laser hits a central target.

Wax Tectonics. Eberhard Bodenschatz of Cornell will report on the use of wax sheets as a model for the movement of tectonic plates. Simulating in an afternoon what geologic forces took millions of years to do, Bodenschatz gets good agreement between his lab specimens and the actual patterns observed in oceanic rifts. (Session QC28.)

Physics in the Petroleum Industry. R.L. Kleinberg of Schlumberger-Doll Research in Ridgefield, CT will describe how nuclear magnetic resonance (NMR) — the basic technology used in magnetic resonance imaging (MRI) — is now being used by oil companies to characterize hydrocarbon reservoirs on-site. Daniel Rothman of MIT will discuss the complex, beautiful structures and patterns of eroding landscapes; he will also discuss efforts to model the erosion process so that physicists can, in essence, go backward in time to infer the structure of sedimentary basins before the onset of erosion. Jim Black of Landmark Graphics Corporation in Colorado will discuss the latest advances in using seismic waves to construct 3-D images of hydrocarbon reservoirs. Nicholas Cernansky will describe ideas for scientists to improve the internal combustion engine in cars. (Session JC.08)

Compiled by Philip F. Schewe and Benjamin Stein of AIP's Public Information Division

Centennial Stuff for Sale

Books, posters, CD-ROMS, and an assortment of novelty items are among the kinds of merchandise that will be available for purchase at the APS Centennial Meeting in Atlanta later this month. A few specific items include:

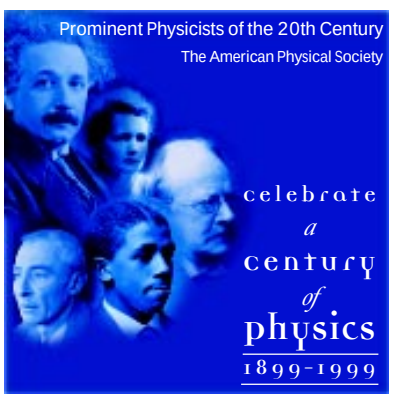
APS Timeline Wall Chart: "A Century of Physics"

A compilation of photographs and text highlighting major developments and contributions of physics throughout the 20th century, displayed on eleven 40"x 26". It will be distributed to high schools, junior colleges and universities, with a teachers guide, as a gift from the APS, and to science centers and libraries. Individuals may order copies at the Centennial and through the URL: www.aps.org/timeline.

Prominent Physicists of the 20th Century

A collection of approximately 200 portraits of late physicists available on CD-ROM, intended to provide a pictorial history of distinguished physicists throughout the last century.

Indexed alphabetically, including birth and death dates, and a short description of the subject's contribution to physics.



Physics in the 20th Century

A lavishly illustrated coffee-table book, published by Harry N. Abrams, Inc. The book is intended for the general public with text by the well-known Washington Post science writer Curt Suplee and over 200 illustrations. Physicists will enjoy sharing this with their non-physicists friends and family. It will be available at the Centennial Meeting at a 40% reduced, pre-publication price of $29.95.

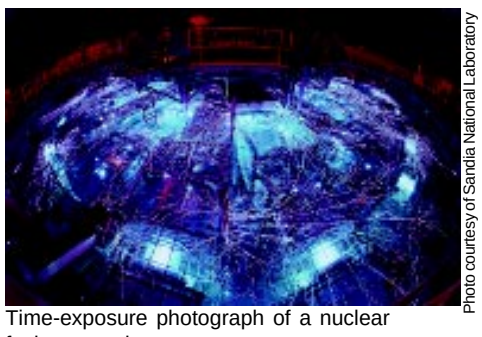


Photo courtesy of Sandia National Laboratory

Time-exposure photograph of a nuclear fusion experiment.

More Things in Heaven and Earth

A hard-bound book containing articles from the special issue of *Reviews of Modern Physics* commemorating the APS Centennial. Approximately 50 articles, written by distinguished physicists, with topics ranging from particle physics through applications to other areas. It will also include a section on historical perspectives, written by some of the people who helped create its history. A special pre-publication 40% off offer for APS members expires March 20, 1999.

Miscellaneous Merchandise

A wide assortment of T-shirts, coffee mugs, buttons, and bumper stickers will be available for purchase at the Centennial Meeting, featuring various APS-related logos, as well as selected entertaining slogans suggested by our own members in last year's slogan contest. [See *APS News*, October 1998]

Einstein and Franklin Brainy Babies

Photo from Brainy Baby website: www.brainybabies.com

Brainy Babies are small stuffed caricatures of famous historical figures known for their genius and/or ingenuity. A limited quantity of standard-sized Albert Einstein and Benjamin Franklin Brainy Babies will be offered for sale at the APS Centennial Meeting in Atlanta, along with smaller figures on keychains.

Brainy Babies were created by Susan Forkin and Kevin O'Donnell in the wake of the Beanie Babies craze to provide young children with better role models from many different fields. Other figures currently represented include Leonardo Da Vinci, Christopher Columbus, Harriet Tubman, Amelia Earhart, Confucious, Shakespeare, and Beethoven. [Yes, we're waiting for them to introduce a Marie Curie Brainy Baby, too.] The company maintains a colorful Web site [http://www.brainybabies.com] that is geared to children, featuring biographical information on each subject and interactive cartoons and games, as well as Web links to additional educational sites related to each figure.

Earlybird Abstract Winners

Winners were chosen at random from those submitting abstracts before the earlybird abstract deadlines for each program. Congratulations!

1st Prize (Roundtrip, domestic airfare to Atlanta, GA)
March Submission: Jess Wilcoxon, Sandia National Lab
April Submission: Z.C. Yan, Steacie Institute for Molecular Sciences

2nd Prize (2 tickets to the Gala Event at the Fernbank Museum)
March Submission: Bijan Rao, Virginia Commonwealth University
April Submission: Bernard Pope, Michigan State University

3rd Prize (a copy of Physics in the 20th Century, by Curt Suplee)
March Submission: C.A.R. Sa de Melo, Georgia Tech
April Submission: Arthur Wicklund, Argonne National Lab

Elbow Room at the APS Editorial Office

In January, conferences rooms at the newly expanded APS Editorial Offices were named and dedicated to two of Physical Review's most revered editors: Samuel Goudsmit (Managing Editor, 1951-1966; Editor-in-Chief 1967-1975) and Simon Pasternack (Assistant Editor, 1951-1976). Pasternack's wife Ruth, and his children, Irene, Eric, and Louise, were in attendance. Weather did not permit Goudsmit's wife Esther to travel, but the event was videotaped for her. Photographs and memorabilia of the two editors are displayed in the rooms, including Goudsmit's doodled notes which hung in the conference room bearing his name at the old New York APS offices. There was a time when the APS journal operations were nimble enough to relocate with each change of editor-in-chief (or equivalent thereof), but when Samuel Goudsmit took over in 1951, *Physical Review* moved for the last time. The APS editorial offices joined Goudsmit at Brookhaven and have remained in the vicinity ever since. In 1979 the journal operations relocated "across the street" from BNL to a permanent home in a modest office building known as the "Ridge Office."

In 1987, the office expanded from 12 thousand to 16.5 thousand square feet, but by 1990 space was tight again.

In 1993 the covenant restricting further expansion of the building was lifted and the need for more space was clear, but a few months later another obstacle arose when the Ridge property was included in the newly established and environmentally sensitive "Pine Barrens" area. Working with an attorney, former Director of Editorial Office Services Cindy Rice was able to negotiate a one-time-only exemption to the ban on building expansion within the Pine Barrens. Since it opened in 1979, the building had been expanded 38%, staff had increased 134%, and manuscripts by 185%. Under the circumstances, it was felt that the maximum expansion should be undertaken, even if the additional space was not finished off or occupied immediately.

When Rice relocated and Reid Terwilliger took over, he continued the planning and permit-obtaining process. In the mean time, journal submissions continued to rise and quarters became so cramped at the Ridge office that in some of the halls it was necessary to turn sideways to pass a colleague. Staff people were seen to disappear under their desks to retrieve files. There was no conference space to speak of, and certainly no room large enough for the whole staff to meet at once. Morale suffered, but productivity did not, much to the staff's credit.

Construction finally got underway in January 1998 (to see a photo of the construction, see *APS News*, July 1998, page 5), nearly ten years after the need to expand was first felt. Half way through construction, the windows in Editor-in-Chief Martin Blume's office were bricked over. "I was uneasy working there with the door closed," Blume says, "I expected to open it and find it too bricked over and myself entombed." Nine short months later the office had doubled in size. In December, the office had a holiday party in the new cafeteria, with plenty of room for the whole staff.

Photo by Bob Kelly

Dedication ceremony for the Samuel Goudsmit and Simon Pasternack conference rooms at the APS Editorial Offices, January 15th, 1999. From left to right in foreground: Louise Pasternack-Rafferty, Eric Pasternack, Irene Pasternack, Jonothan Logan (Goudsmit's close associate), Ruth Pasternack, George Trigg, and Pasternack's brother-in-law and his wife, Kenneth and Doris Simon.

STAFF IN THE Spotlight

Halsted Returns to Roots in Ridge

APS Headquarters in College Park lost one of its most valued employees in February. Amy Halsted, staff administrator to the APS Council and Executive Board since 1993, left that position to become special assistant to APS Editor-in-Chief Martin Blume at the APS Publications Office in Ridge, New York.

A 1979 graduate of the University of Connecticut at Storrs, Halsted joined the APS 11 years ago, when the headquarters office was still located in New York City. She confesses to feeling a bit intimidated initially by the esoteric environment — not to mention the plethora of acronyms for the Society's innumerable units, publications, and committees. A turning point came during an administrative meeting, when her attention strayed down the table at a volunteer committee member. "His concentration had also lapsed, and I watched him holding a clear plastic cup half- full of water, tipping and rotating it slowly before his eyes and watching the surface remain level as the water assumed the changing shape of its container," she says. "At that moment I began to understand the nature of physicists." Halsted began as a staff liaison to five committees charged with monitoring non-technical issues in physics, and also began writing a monthly page of Society news for *Physics Today* magazine, crediting then-Senior-Editor Bill Sweet with teaching her the ropes of basic reporting. In 1991 she became administrator for the newly formed Department of International Scientific Affairs under Irving Lerch, another personal mentor, and found herself grappling with human rights and other global issues. Former APS Treasurer Harry Lustig, APS Executive Officer Judy Franz and Associate Executive Officer Barrie Ripin are among the others who have significantly influenced her during her tenure with the APS.

Amy Halsted

That same year, Halsted took advantage of the Society's tuition reimbursement program to earn her Master's degree in public administration, completed in 1993; she wrote her thesis on the APS decision to relocate to College Park, Maryland. She chose to move with the Society, and has not regretted her decision, although "I never really warmed up to Washington," she confesses, despite her job satisfaction and the opportunity to purchase her first house. "It's always reminded me of tofu: extremely nutritious and totally lacking in flavor."

Halsted's new position will enable her to return to the region she loves, and also to create many of her own job responsibilities, although she will continue to support the Publications Oversight Committee, and will assist Blume with numerous other projects.

INSIDE THE BELTWAY

A Washington Analysis

Surplus Culture Shock

by Michael S. Lubell, APS Director of Public Affairs

So dismal and dank is the typical Washington winter, that Congress hibernates every year until the ides of March. That's why Beltway denizens yawned when Democrats issued dire warnings of a government shutdown, should zealous Republicans proceed with impeachment. To the cognoscenti it was just political hype.

That's not to say that everyone in Washington takes a two-month nap beginning January 1. Hill staffers meticulously draft bills for their bosses to submit. And at the other end of Pennsylvania Avenue, moles with the green eye shades toil away at the budget due the first Monday in February.

But Congress really doesn't get down to serious business until the scent of cherry blossoms fills the air. That's why, away from the unrelenting squawking on tabloid television, you could hardly tell that the Senate was paralyzed by the trial of the century.

Still, impeachment creates an aura of surrealism in a city that places a premium on habitual behavior, however unconventional. Even by Washington standards, the House scene on January 19 was bizarre.

Here was the President delivering his State of the Union Address to a captive audience of accusers and jurors charged with determining whether he would finish out his elected term. Should they punctuate his speech with applause when it was his due or scowl perpetually for the prowling cameras? It was a tough call.

Even the $1.88 trillion Presidential budget, which landed with a thud on the steps of the Capitol on February 1, couldn't command top billing. It had to compete for prime-time coverage with conjectures about Monica Lewinsky's video-taped deposition. Nary a mention of the 4.2 percent increase for basic research.

A few weeks earlier, the White House had tacitly abandoned its support of the ABM Treaty in favor of a National Missile Defense System. No headlines!

As the Senate lurched toward its impeachment finale, no one doubted the result. But what would come afterward was anybody's guess, particularly when it involved the federal budget.

The knee-jerk GOP reaction to the President's February 1 spending plan was derision. No news there. When the Democrats held sway on Capitol Hill, that's how they responded to every Republican presidential budget.

But cut through the expected partisan rhetoric and you find politicians who are in culture shock. Weaned on decades of federal deficits, they must now confront an estimated surplus of $117 billion for FY 2000 and a staggering projection of $393 billion for FY 2009 — no error bars given.

Despite it's sturm und drang reputation, Washington is notorious for its inertia. Only six years ago the federal budget was $290 billion. Dealing with that kind of swing is tougher than turning around the QE2.

So in response to President Clinton's plan to fence off the six-percent surplus for Social Security, congressional Republicans predictably called for across-the-board tax cuts and more defense spending, while liberal Democrats just as predictably advocated more money for social programs. But except for paying down the national debt or investing in Social Security, the Balanced Budget Agreement puts the surplus off limits.

The only way around the constraint is a new agreement. Here's a possible compromise: $50 billion for Social Security, $10 billion for defense, $10 billion for civilian programs, $30 billion for tax cuts and the balance to begin paying down the debt. Pretty neat. All it requires is bipartisan action. And if the science community speaks out, research might even get a nifty boost. We'll see.

Amendment to APS Bylaws: Dues Billing Date

More efficient handling of membership information by the APS has now made it possible to bill on the anniversary date of each membership rather than on July 1 for all members. Anniversary billing spreads the work of the APS Membership Department more evenly through the year and assures new members of a full year of membership upon joining. The APS Bylaws require a minor revision to accomodate this change. The revision was considered by the Committee on Constitution and Bylaws and approved unanimously by APS Council on 15 November 1998. The revision appears below and is hereby presented to the membership for any comment, prior to its re-submission to Council in April for final ratification. Old language appears in ~~strikeout~~, new language in UPPER CASE. Comments may be addressed by regular mail or email to Danita Boonchaisri at the APS: boonchai@aps.org. Please respond by April 1.

Article X — Membership

1. Application for Membership. - Application for membership in the Society shall be made to the Executive Officer. ~~Membership shall commence on the 1st of July of the calendar year in which annual dues are received.~~ FOR NEW MEMBERS, MEMBERSHIP SHALL COMMENCE ON THE 1ST OF THE MONTH FOLLOWING RECEIPT AND PROCESSING OF THE APPLICATION AND DUES, IN ACCORDANCE WITH THE PROCEDURES SET BY THE SOCIETY.

THE BACK PAGE

Discovering Our Roots: The PhD Lineage Contest Winners

Last March, *APS News* announced a PhD lineage contest, in which entrants were asked to trace their professional "family tree" — i.e., the production of doctoral level physicists by their thesis advisors — as far back as possible. We received many entries, often containing fascinating historical details, and were impressed at the considerable effort expended by certain members to trace their academic lineage. In many cases, the submissions included substantial, detailed commentary based on exhaustive research.

The further back in time our amateur geneologists went, the more blurred the lines between the disciplines became. Chemists, mathematicians, medical doctors, and apothecaries appear regularly prior to the 19th century, along with geologists involved with mining concerns. Those APS members strongly rooted in chemistry had something of an unfair advantage, thanks to an established tradition of tracking intellectual lineage in chemistry. Many can track their ancestry back to such 18th-century luminaries as Claude-Louis Berthollet and Antoine Lavoisier. In the spirit of professional inclusion, the judges did not quibble as to whether a lineage was strictly in "physics," provided the submission was made by an APS member.

Similarly, the further one moved from the 19th century, the more fuzzy became the definition of what constitutes a "PhD thesis advisor." [One entrant listed his ultimate ancestor as "God," but this was deemed inadmissible since everyone knows that God does not even have tenure, never mind a PhD.] Many entrants surmounted these obstacles by counting personages more aptly described as mentors or major influences as part of their intellectual family tree. And who are we to discount their claims, provided they can supply sufficient evidence to support their argument?

Earliest Ancestry

The geneology dating back the furthest was submitted by Steven Sibener of the University of Chicago. The chart spans as many as 22 "generations" (depending on the "fork" one follows) and eventually dates to back to Pelope who taught in Padua in 1453. It was created as a 60th birthday present to Sibener's advisor, Yuan T. Lee, and includes several as forks from the primary lineage. In fact, the oldest fork dating back to Pelope leads not to Lee, but directly to Dudley Herschbach of Harvard University, with whom Lee shared the 1986 Nobel Prize, along with John Polanyi. [See http://www.scs.uiuc.edu/~mainzv/Web_Geneology]

Michael Gerver of MIT placed a close second, tracing his academic lineage back to Johann Georg Magnus, a medical doctor in Germany in the early 1500s. A secondary lineage reaches back to Adam Spencer, who lectured regularly on science in Boston in the early 1720s and was a primary influence on the (largely informal) scientific development of Benjamin Franklin. Robert Lanier, a chemical engineer at Livermore National Laboratory, traced his lineage back to Paracelsus (early 1500s), tying for second place, while Richard Register of Princeton University traced his roots back to the 1640s. However, Gerver certainly wins for tracing his lineage back the furthest within the U.S.

David Lockwood of Canada's National Research Council had the earliest date (1719) with the fewest generations (8). His lineage dates back to a German mathematician/astronomer named Abraham Kastner who taught at universities in Leipzig and Gottingen. Michael Hilke of Princeton University placed a close second, tracing his lineage back to the 1770s within 9 generations.

Most "Generations"

The clear winner in this category is Lanier, whose chemist ancestors go back 24 generations, but Sibener's 22 generations qualified him for a close second. Gerver, with 19 generations in his primary lineage, placed third. Among the runners-up, Register and Rick Strickert of Radian International in Austin, Texas, each had 15 generations dating back to Christolphe Glaser, an MD in Basel, Switzerland, who is generally credited with the education of N. Lemery, a Paris apothecary in the late 1600s. Louis Grace of Livermore National Laboratory had 14 generations dating back to Lavoisier. George Snow of the University of Maryland deserves special mention for submitting the shortest possible lineage: his thesis advisor was Eugene Wigner — who won the 1963 Nobel Prize for mapping the structure of the atom and its nucleus — and Snow apparently felt no need to trace his heritage further.

Most "Nobel" Lineage

Several of those who submitted geneologies had three Nobel Laureates among their direct intellectual ancestry, making it difficult to choose a clear-cut winner, but we eventually decided on a tie. Martin Perl of Stanford University had a mere three generations in his lineage, but every one is a Nobel laureate: Isidor Rabi, Perl himself, and Perl's student, Samuel Ting. [This no doubt places considerable pressure on the generation of students under Ting.] E. Raymond Andrew of the University of Florida, Gainesville, also counts three successive Nobelists among his five generations of ancestors: Joseph J. Thomson (who discovered the electron), Ernest B. Rutherford, and Pyotr Kapitza. In addition, he was mentored as a postdoctoral fellow by another Nobelist, Edward Purcell.

Others who can claim three "Nobel" ancestors certainly deserve honorable mention. Charles Slichter of the University of Illinois is another descendent of Thomson and Purcell, as well as Nobelist Owen Richardson. Matthew Walhout of Calvin College descends from Rabi, Norman Ramsey, and William D. Phillips.

Rigoberto Hernandez's Nobel Trinity includes Linus Pauling, honored once in chemistry in 1954 and again in 1962, when he won the Nobel Peace Prize. The third is 1909 Nobelist Friedrich Ostwald, widely considered to be the father of American physical chemists. Grace also descends from Pauling, as well as Herschbach. Hilke can lay claim to two Nobel laureates among his academic ancestry: Wolfgang Pauli, who won in 1945, and Wilhelm Roentgen, who won the very first Nobel physics prize awarded in 1901. Carlo W.J. Beenakker of Leiden University, The Netherlands, descends from 1913 Nobelist Heike Onnes, while a secondary fork links him to 1902 Nobelist Pieter Zeeman.

Most Cited Forebears

Many of our amateur geneologists with roots in England counted Rutherford and/or Thomson among their intellectual ancestors. In fact, the two might be considered the founding fathers of modern physics PhDs in England. As such, we honor them posthumously for being the forebears most frequently mentioned in our geneological contest submissions. Significantly lacking among the various submitted lineages were such giants as Isaac Newton, Albert Einstein, Werner Heisenberg, Niels Bohr, or Richard Feynman. We're not sure if this is because they mentored fewer students, or because their intellectual descendents simply don't have the time or inclination to enter geneological contests.

Photo by D. Schoenberg/AIP Niels Bohr Library: Bainbridge Collection

Most frequently cited forbears: J. J. Thomson and Ernest B. Rutherford

Other Notable Ancestry

Of course, ancestors don't have to be Nobel laureates in order to be distinguished. Gerver's lineage includes such illustrious figures as Percy Bridgman, Gustav Kirchhoff, Joseph Priestley, and Franklin. Brian Garris and Nikolaos Kidonakis traced their line back 11 generations to William Hopkins, a Cambridge professor in the 1820s, and count James Clerk Maxwell, George Stokes, and William Thomson (Lord Kelvin) among their ancestors.

Even so-called "rank and file" names are rendered illustrious with the passage of time. Gerver found that the earliest names in his lineage had much more extensive entries in *The Dictionary of Scientific Biography* (DSB). "They made important contributions, not so much in scientific discoveries, but in organization and institution building," he wrote, which no doubt accounted for their more numerous descendents. "And many of the discoveries that they did make, although not as dramatic as the discoveries of Newton, Maxwell, Einstein or Bohr, were necessary in order for the 'big' discoveries to be made."

One of Gerver's more fascinating forebears was Guener Rolfincke, who received his MD from the University of Padua in 1625 and became a professor of anatomy, surgery and botany at the University of Jena. He is best known for building the first anatomical theatre there, giving controversial lectures on dissection using the bodies of recently executed criminals (a practice known locally as "Rolfincking" for a time). He was the first German to teach Harvey's theory of blood circulation, and the first to demonstrate that cataracts were located in the lens of the eye; he also trained 104 doctoral candidates.

Rolfincke's student, Georg Wedel, was an MD whose views hovered curiously between the medieval and modern worlds. Unlike his mentor, Wedel defended astrology, alchemy, and iatrochemistry (the application of chemistry to medicine, based on medieval concepts), influencing an entire generation of physicians in the late 1600s. Priestley was the first to give a detailed published account of Franklin's kite and lightning experiment in 1767, and was an ardent supporter of the colonists during the American Revolution, emigrating to the U.S. in 1794 after an angry Tory mob destroyed his house and laboratory.

Ralph H. Fowler, who taught at Cambridge in the 1930s, married Rutherford's only daughter, and first introduced Dirac to quantum theory by providing him with the galley proofs of Heinsenberg's famous "matrix article" of 1925, which led to Dirac's discovery of Poisson-bracket relations. Fowler's student, John E. Lennard-Jones was actually born Jones, but changed his name after marrying Kathleen Mary Lennard in 1925. Originally from Germany, Edward L. Nichols was a postdoc at Johns Hopkins under the first APS president, Henry Rowland, and served as an assistant to Thomas Edison in his work on electric lighting.

APS News thanks everyone who submitted geneologies for this contest. Without the diligent efforts of the APS members who took the time to rummage in the musty, disorganized files of history, our readership might never have heard such colorful details, which only serve to enhance our sense of physics history.

The Winner's Circle

Earliest Ancestry:
Steven Sibener, University of Chicago

Earliest U.S. Ancestry:
Michael Gerver, MIT

Most Generations:
Robert Lanier, Livermore National Lab

Earliest Date/Fewest Generations:
David Lockwood, National Research Council of Canada

Shortest Lineage:
George Snow, University of Maryland

Most "Nobel" Lineage (tie):
Martin Perl, Stanford University E. Raymond Andrew, University of Florida, Gainesville

Most Frequently Cited Forebears (tie):
J.J. Thomson and Ernest B. Rutherford

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. Responses may be sent to: letters@aps.org.*