Executive Board Passes Resolution on Office of Science Budget

Last fall, Congress passed H.R. 2419, which set the FY2006 budget for the Office of Science in the Department of Energy. This budget impacted nuclear physics particularly severely (see related story on page 5). At its November meeting the APS Executive Board passed a resolution expressing its distress and calling for a rearrangement of priorities in FY2007. The following is the text of the resolution.

The Executive Board of the American Physical Society is greatly distressed by the damaging conference action on H.R. 2419, which eliminated the small but critical increases for the Department of Energy’s scientific research programs that both houses of Congress had previously approved. The Board notes that in the face of inflationary increases in wages and energy costs, H.R. 2419 will force the Department to make significant reductions in its university programs and in operations of its national research facilities.

The Executive Board also notes that: The budget adopted by the conference rolled back funding for most Office of Science programs to levels requested by the White House last February. And at that time, in response to querries, DOE officials agreed that such budgetary levels would result in a shortfall of $300 million in university grants, amounting to a ten percent reduction in the level of scientific effort.

Finally, the Executive Board notes that: The budget Congress adopted will discourage young Americans from pursuing careers in the physical sciences at a time when the nation is losing out in the global competition for intellectual talent; and budget runs counter to calls by industrial leaders for sharp increases in federal investments in physical science basic research and education to address the alarming deficits in our high-tech balance of trade.

Funding provided by H.R. 2419 leaves virtually every Office of Science program under considerable stress. For example, Brookhaven National Laboratory in New York has already announced that it is making plans to lay off 100 members of its staff and suspend activities at the Relativistic Heavy Ion Collider, which is just now reaching the peak of its scientific productivity.

Similarly, Thomas Jefferson Laboratory in Virginia is making Executive Board continued on page 3

Dallas To Host 2006 APS April Meeting

Approximately 1500 physicists and students are expected to attend the 2006 APS April Meeting, to be held April 22-25 in Dallas, Texas. The scientific program, which focuses on astrophysics, particle physics, nuclear physics, and related fields, will consist of three plenary sessions, and poster sessions. This year the meeting will be held in conjunction with the annual Sherwood Fusion Theory Conference, devoted to disseminating the latest research results in controlled thermonuclear research.

APS units represented at the meeting include the Divisions of Astrophysics, Nuclear Physics, Materials and Fields, Physics of Beams, Plasma Physics, and Computational Physics; the Forums on Education, Physics and Society, International Affairs, History of Physics, and Graduate Student Affairs; and the Topical Groups on Few-Body Systems, Precision Measurement and Fundamental Constants, Gravitation, Plasma Astrophysics, and Hadronic Physics.

In keeping with the more generalist tone of the April meeting, nine invited plenary talks will highlight the technical program (see sidebar).

Plenary Talks at April Meeting

Voyager Data and the Terrestrial Lock Edward Stone, Caltech

Liquid Phase Quark-Gluon Plasma Barbara Jacub, SUNY, Stony Brook

Recent Results from MiniBoone Hove Tsvankin, Prcieptron

Neutrinos and Cosmology Nicole Bell, Caltech

Computational Techniques and Plasma Turbulence William Dorrland, University of Maryland

Cohesive Implants and the Physics of Hearing Jan Shipman, Purdue University

The Science of Nanotubes* Alex Zettl, UC Berkeley

Results from LIGO* Gabrielle Gonzalez, Louisiana State University

Physics Prospects and International Aspects of ILC Albrecht Wagner, DESY*

*to be confirmed

Hydrodynamics, Small-Scale Flows Highlight 2005 DFD Meeting

New research on the hydrodynamics of pectoral fins in fish and the dolphin kicks of Olympic-level swimmers were among the highlights of the 58th annual meeting of the APS Division of Fluid Dynamics (DFD), held November 20-22 in Chicago, Illinois. The meeting was jointly hosted by the Illinois Institute of Technology, Northwestern University, and the University of Illinois, Urbana-Champaign.

Last year marked the 100th anniversary of Einstein’s “miracle year” and was designated the Year of Physics. One goal was to communicate the excitement of physics to the general public, thereby inspiring a new generation of scientists. In honor of the WVP, the meeting featured a special public lecture by Nobel laureate Leon Lederman on science education’s “quiet crisis.”

His lecture was followed by a reception and an exhibit of the 2005 Gallery of Fluid Motion.

Hydrodynamics. The pectoral fins of fish are designed for a great degree of control over fluid forces: they are flexible and able to change their shape, enhancing their ability to maneuver in water. However, the kinetics do not lend themselves easily to the usual analysis based on pitching or paddling kinematics, or lift-drag-based propulsion models.

In order to glean new insights into the hydrodynamics of pectoral fins, researchers at Harvard University and at George Washington University used two-camera high-resolution digital video to measure 3-D fin conformation of fish during steady swimming and while maneuvering. They also performed high-fidelity numerical simulations of the hydrodynamics and thrust performance of the pectoral fin of a bluegill sunfish. The measurements and simulations showed that the fin produces a large amount of thrust at all phases in the fin motion, and produces a distinct system of connected vortices.

Similar numerical simulations are being used to study the fluid mechanics of pectoral fins.
"Frequently, brains would win the day. You could outsmart your opponent, so it always reinforced me as a kid that being smart was a positive, that it was a superpower in a world that can be dangerous, where your superpower is intelligence." – Jim Kakalios, University of Washington, in his book on the physics of superheroes, The Star Tribune, (Minneapolis) November 1, 2005

"The morale here is abysmal. People's lives have been wreacked apart by the political games that have been played. You can't hold people's careers by the heels over the balcony without feeling threatened and cheated." – Brad Lee Holian, Los Alamos National Lab, on morale at LANL, San Francisco Chronicle, November 11, 2005

"It's craziness. What's in this?–Leon Lederman, Fermilab, on trying to understand how some- thing so complex as the universe operates.

"In today's world, you will either be a nerd or end up working for a nerd."–Vernon Ehlers, US House of Representatives, on why we should teach kids to be nerds, The Rapid City Journal, November 22, 2005

"That's got to be tough out in the field. That or some sort of forensic job would be unpleasant... Trying to find out how some- body was killed. That's yucky stuff."–Thomas Sanford, Sandra National Labs, on fossil hunting in hot weather and forensic work, which he thinks would be some of the worst jobs in science. Alaska Tribune, November 17, 2005

"There's a feeling that we could find a way to really use solar ener- gy on a large scale within 10 to 15 years. The scientists are really jazzed about that. Kapitsa is generally the one cred- ited in 1918, and stayed on as a lectur- ing professor until 1934, when he arrange for most of his apparatus to be shipped from his lab at Cambridge to be sent to him, and Kapitsa set up a new laboratory, the Institute of Physical Problems, in Moscow. In 1937, while investigating the thermal conductivity of liquid helium, Kapitsa measured the temperature at which helium flows as the fluid flows through a gap between two discs into a surrounding bath.

The results were striking: above the lambda point, there was little flow, but below the lambda tempera- ture, the liquid flowed with such great ease that Kapitsa drew an analogy with superconductors, and wrote in his paper in Nature in January 1938, "the helium below the lambda point enters a special state that might be called a 'super- fluid'." At the same time, Allen and Misener at the University of Toronto performed similar studies on liquid helium, using a slightly different setup. They measured the flow through a narrow glass tube, and also observed the extremely low viscosity. They noted that the flow was almost independent of pressure and that therefore "any known formula cannot, from our data, give a value of viscosity which would have any meaning." Their work on liquid helium and the understanding of the weird fluidity. Kapitsa was awarded the Nobel Prize for Physics for his low temperature research. He shared the 1978 prize with Leon Lederman and Robert Wilson, who won for their discovery of the cosmic microwave background radiation. Allen and Misener, though they made essentially the same discovery, did not receive a Nobel Prize, and Kapitsa is generally the one cred- ited with the discovery of super- fluids.

The work on liquid helium and the understanding of the weird fluidity of the superfluid state have been fundamental to the field of low temperature physics, which is still an exciting area of research today, as ever more exot- ic low temperature states contin- ue to be produced.

Kapitsa continued his research in low temperature physics for several years. During World War II he built an apparatus for pro- ducing large amounts of oxygen for the Soviet steel indus- try. In the 1940s he turned his attention to plasma physics and fusion. In 1946 he refused to work on the Soviet atomic bomb, and thus fell out of favor with Stalin. Kapitsa was awarded the Nobel Prize in Physics for his low temperature research. He shared the 1978 prize with Leon Lederman and Robert Wilson, who won for their discovery of the cosmic microwave background radiation. Allen and Misener, though they made essentially the same discovery, did not receive a Nobel Prize, and Kapitsa is generally the one cred- ited with the discovery of super- fluids.

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New APS President Highlights Research Funding, Upcoming Changes in APS Personnel

John Hopfield (Princeton University) assumed the APS president's role August 1, 2005. In the following interview with APS News, he discusses his priorities for the society during his presidential year.

Q: What do you see as some of the most important issues facing the APS today? How do you see the society addressing these issues, and how can the APS address some of these issues?
A: I think the most important challenge that the APS faces is in the area of research funding. The society is working hard to improve funding for research in the United States, both at a federal level and in industrially funded programs. The society is also working to foster education in the physical sciences and math. Both of these have bit by bit become disaster areas. That's an interesting question, as is how do you focus on this year's theme of "New APS President Highlights Research Funding, Upcoming Changes in APS Personnel".

Q: As science becomes increasingly interdisciplinary, how can APS best promote meaningful research that spans these fields? How do work in a biology department differ from work in a physics department?
A: Work in a biology department involves a different set of priorities than work in a physics department. Biologists traditionally view the world more as a system of interactions, while physicists are more concerned with the underlying fundamental laws and principles. Researchers in both fields need to communicate effectively to bridge the gap between these disciplines.

Q: What are some of the key priorities for the new president?
A: The key priorities for the new president include promoting research funding, enhancing the society's role in education, and fostering interdisciplinary collaboration. The society must continue to push for the implementation of the APS report on improving research funding.
The Year of Physics, 2005

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The Year of Physics, 2005

Dr. Atomic Offers Lessons on the Pros and Cons of Public Outreach

By Marvin L. Cohen

The Year of Physics, 2005 was marked by a series of events that highlighted the importance of physics in our lives and its role in shaping the future. It was a year of celebration and reflection, a time to reflect on the contributions of physics to society and to consider the implications of its role in our world.

The year began with the release of the movie "Dr. Atomic," a film about the development of the atomic bomb. The movie was a powerful reminder of the potential of physics to shape our world in ways that can be both beneficial and destructive.

As the year progressed, physicists were called upon to engage with the public and to explain the complex concepts of physics in a way that was accessible and understandable. This was a challenge, as many people have a fear of science and a lack of understanding of its role in our lives.

However, the Year of Physics was also a time of opportunity. It was a chance for physicists to reach out to the public and to share their knowledge and their passion for science.

One of the key events of the year was the "Dr. Atomic" opera, which was performed in many cities throughout the United States. The opera was based on the life of physicist J. Robert Oppenheimer, who was the leader of the Manhattan Project and the developer of the atomic bomb.

The opera was a powerful reminder of the impact of physics in our world and of the importance of understanding its role. It was a chance for physicists to engage with the public and to share their knowledge in a way that was both entertaining and educational.

The Year of Physics was also a time of reflection. It was a chance to consider the implications of our work and to think about the future of physics and its role in our world.

In conclusion, the Year of Physics, 2005 was a time of celebration and reflection. It was a time to consider the role of physics in our world and to think about the future of science.

Marvin L. Cohen

Albertaqun, PA
Senators Express Concern Over Layoffs and Run Times at RHIC and Jefferson Lab

Before the Senate passed the FY 2006 Energy and Water Development Appropriations Bill, members of the Senate expressed their concern over layoffs and run times at RHIC and Jefferson Lab. They expressed concern about the Nuclear Physics program at the level the final appropriations bill funded the DOE/NSF Nuclear Science Advisory Committee had recommended FY 2006 funding levels. They were concerned about proposed cuts in the budget, which would allow DOE to reprogram, or shift, money from one program to another, as confirmed in a discussion that took place on the Senate floor. Senator Hillary Rodham Clinton (D-NY) led a discussion that November 14, highlighting the severe impacts of the proposed funding cuts. She was joined by Senator John Warner (R-VA), who expressed concern about the reduced funding level, stating, “At the Jefferson Lab we need to invest in the 12GeV upgrade necessary to sustain the pace of scientific discovery.”

Executive Board continued from page 1

Executive Board, H.R. 2419 sets aside NIST R&D for Members' earmarks, which will do to our science programs at home and abroad.

The Fluid Mechanics of Fire.

Howard Baum of the National Institute of Standards and Technologies illustrated his latest simulation work on fire in contained environments with the latest results from the NIST investigation of the collapse of the World Trade Center towers, as a key example of the research on the fluid mechanics of fires. His talk also covered the role of fire flumes in the transport of heat and mass. Specifically, the plume provides the feedback mechanism that determine the strength of a fire, and also acts as a pump, mixing the fuel and oxidizer.

Executive Board continued from page 1

Baen Mandelbrot (left) of IBM and Yale joined other APS Fellows at a reception at the Princeton Club in New York City on November 30. The members of his set included Norton Long of IBM (center) and Braun Schwartz of the City University of New York (in the background). In the background is Donald McDonald. In addition to enjoying refreshments and the festive ambience of the Princeton Club, which was decked out for the holiday season, the assembled group of about 80 Fellows heard from APS President-elect from President John Hopfield of Princeton. Editor-in-Chief Martin Blume, Treasurer Thomas McIlrath, Director of Education Ted Hodgad, Director of International Affairs Amy Flattone, and Director of Public Affairs Michael Lubar.

Council Passes Memorial Resolution for John Bahcall

APS President-elect John Bahcall died in August (see APS News, October 2005), and at its meeting in November, Council passed a resolution to establish a memorial fund in his name. The fund is established to support travel for physicists, particularly students, to attend meetings of APS or other professional societies. To provide a memorial fund in his name, the APS Board of Trustees approved a resolution to authorize the establishment of a memorial fund in memory of Bahcall. The fund will be named the John Bahcall Memorial Fund. The Board authorized the APS President-elect to designate the initial recipients of the fund. The fund will be established with an endowment of $100,000, which will provide for the annual distribution of $20,000 for travel grants. APS News will provide updates on the fund's progress.

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The Mandelbrot Set

The Southeastern Section of the APS (SESAPS) held its annual fall meeting November 10-12, 2005. The conference was hosted by the University of Florida, Gainsville, with a technical program that ran the gamut of cutting-edge topics in physics: particle physics, dark matter and dark energy, physics history, nanophysics, Bose-Einstein condensates and atomic/molecular optics. Among the invited lecturers in particle physics were reports on the current status of particle searches at Stanford University’s factory, with the aim of gaining a better understanding of CP violation. Other talks focused on recent results from the CDF and DØ experiments at Fermilab, as well as progress on the Large Hadron Collider. In the area of astrophysics, invited speakers discussed ongoing experiments to explore the cosmic microwave background radiation, as well as the search for gravitational waves—specifically, plans for the upcoming LISA mission. As for optics, attendees were treated to the latest research involving slow-light nonlinear optics with cold atoms, as well as the use of novel light traps to study ultra-cold atoms. The World Year of Physics fig-ured prominently in the physics history session. Speakers recapitulated Einstein’s years in Switzerland, Max Planck’s early contributions to the theory of special relativity, and Sir Arthur Eddington’s historic 1919 expeditions that resulted in the verifi- cation of general relativity. Friday evening’s banquet speaker was Louis Bloomfield, a professor of physics at the University of Virginia, and the author of How Things Work: The Physics of Everyday Life.

DNP MEETING CONTINUED FROM PAGE 3

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Executive Board continued from page 1

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ISSUE: FISCAL YEAR 2006 BUDGET

Congress has completed making appropriations for most key science agencies: NSF, NIST, NASA, and the DOE Office of Science. Action on DOD and NIH is expected to be completed before the end of the calendar year. The results as of press time are summarized below. Note that there is a potential for an additional across the board rescission of 2.5% for all Federal agencies in order to pay for hurricane relief.

The National Science Foundation received a 13 percent increase for its Fiscal Year (FY06) budget, for a total budget of $5.65 billion. However, the majority of the increase included the transfer of the costly polar icebreaker ships from the Coast Guard.

• The DOE Office of Science suffered a major and unexpected setback during last minute negotiations in the House-Senate Conference. The overall budget increased 1% to $3.63 billion, but virtually all of the increase went to earmarks. Excluding the $130 million in special earmarks, the Administration has moved a step closer to making final its pres- sure to keep physics in the public view, and to keep the public informed and engaged in supporting us, we’ve got to do something to make physics more accessible. We believe that it is not something that only some- body with the genius of Einstein can do well. We need to publi- zers, because those physicists find significant problems. We have to do something that emphasizes that physics is behind the vast bulk of the technologies that make the world what it is today. We have to emphasize that understanding physics better and more deeply is very important to maintaining the United States position in a technological world, and that an increased popular understanding of physics is important to making political decisions about technology.

Q: How did you become inter- ested in physics?
A: My mother was a physicist and my father was a physicist. I thought that was perfectly ordi- narily. Interestingly, I didn’t learn much about physics from them. What got particular attention from my father was the attitude that you ought to be able to look at the world and understand how it works. If something was broken you should be able to fix it. You ought to be able to make measure- ments, and take it apart into compo- nents, and eventually under- stand how it ‘works’. (I of course tried this myself when I was young, shooting at my mother and with results which were later repaired by one parent or the other). But it didn’t matter to my father whether it was the voltage regulator of the car generator or the spectrum of a molecule, the general view about what a physi- cist ought to be able to do was to me. To that atti- tude became the essence of physics. It’s not the specific sys- tem you are working on, but the attitude you bring, that defines a physicist. I used to ask my father what do you do in physics whether you’re studying quarks or the water drops coming from a faucet. The attitude about what kinds of questions should be asked, and what is meant by an—answer—what’s characteristics physics to me. Nothing is a pri- ory out of bounds. There are many significant questions outside of the bounds of physics, but when you run across one, you know it because you are unable to find the kind of answers that are sat- isfactory to you. For instance, I’ve given considerable thought to it over the years, and decided that because I couldn’t conceive of how to do objective experiments of relevance to the central issues of consciousness. He had given considerable thought to it over the years, and decided that because he couldn’t conceive of how to do objective experiments of relevance to the central issues of consciousness, it lay outside of physics.

Pay Attention or I’ll Collapse Your Wavefunction

Jennifer Ouellette reads to a stuffed quantum cat.

A new book by APS News Associate Editor Jennifer Ouellette has turned the “This Month in Physics History” col- umn into a fun and accessible collection of essays for a genera- al audience. Ouellette’s book, Black Bodies and Quantum Cats, was released on December 27, published by Penguin Books.

The book began when Ouellette was asked to write the hist- ory columns written by Ouellette for APS News, but the essays in the book have been significant- ly expanded and written to appeal to a wider readership. Each chap- ter in Black Bodies and Quantum Cuts deals with a single theme in science history, from Leonardo da Vinci to string theory. Among the supporting cast of scientifically interesting objects are roller coasters, IBM’s chess playing computer, Reddi-whip and Velcro.

The short, self-contained essays explain physics through references to movies, television, literature, and art. Each chapter shows the quirky personalities and amusing stories behind the science. For instance, Elmer of Malmesbury, a medieval monk who jumped off a roof with a crude pair of wings in 1010, appears in the chapter on flight. Building in Zimbabwe was designed to mimic the tempera- ture regulation found in termite mounds illustrates the principle of biomimicry. A chapter on the discovery of the top quark compares the subatomic zoo to the huge and eccentric Greek family, hil in the hit movie My Big Fat Greek Wedding.

Black Bodies and Quantum Cuts will appeal to anyone who wants to learn more about how some of the most amazing dis- coveries in science came about. Even physicists should enjoy it. Ouellette, a big fan of the TV show Buffy the Vampire Slayer, has also just completed a book on the Physics of the Buffyverse, which will be published in January 2007.

NEW APS PRESIDENT CONTINUED FROM PAGE 3

Ridiculously Short History of Time

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Global competition has placed a premium on growth in science and technology, a point quite particular-ly true in Central and Eastern Europe (CEE), where the 10 lead-ing countries* are growing at an average rate of 5.2% per year, as opposed to a 1.8% rate for the 15 West European countries, called the 15, which have a tradition of industrial growth rather than simply relying on cheap labor. High technology growth has become a priority for these 10 CEE countries, and a benefit for their increasing economic cooperation across the Euro-Atlantic community.

In order to capitalize on the fact that the vast majority of all science and technology (S&T) activity in these countries is targeted toward industrial growth, an Action Commission for Science in the Service of Industrial Growth has been established. This commission, comprising representatives from business, government, institutes and universities from CEE and other countries, is presently completing its first year of work.

Central and Eastern European countries are particularly aware of American excellence in high technology and areracing to catch up. The number of current initiatives have been organized with an emphasis on sharing American success in innovation, commercial-ization and investment. These initiatives are directed toward increased CEE investments in industrial growth, and are aimed at creating an environment for increased cooperation in business and investment.

The following steps offer a framework for action:

- **Awareness of risks**: Many US institutions are still considering the global impact of the Chinese government's declining economic status on the US economy. The unhappy fact that the US government is not prepared to act on this issue is that the Chinese government is making a major commitment to the future of high technology industry.
- **Understanding the role**: Each nation is working on its own strategy for increasing its economic status. The Chinese government is providing a significant amount of funding for the development of new technologies. The Chinese government is also making a significant investment in the development of new technologies.
- **Identifying the need**: Many US institutions are considering the global impact of the Chinese government's declining economic status on the US economy. The unhappy fact that the US government is not prepared to act on this issue is that the Chinese government is making a major commitment to the future of high technology industry.
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There are other benefits of this cooperation, including the following:

- **Increased competitiveness**: The CEE countries can increase their competitiveness in the global economy by working together to develop new technologies.
- **Increased innovation**: The CEE countries can increase their innovation by working together to develop new technologies.
- **Increased investment**: The CEE countries can increase their investment by working together to develop new technologies.
- **Increased jobs**: The CEE countries can increase their jobs by working together to develop new technologies.
- **Increased research**: The CEE countries can increase their research by working together to develop new technologies.

**High-Tech Growth Priority in Central and Eastern Europe**

George W. Handy

*These are: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia.

**Priorities and the Associated Action Commission**

The priorities of the Action Commission focus on the development of high technology projects in Central and Eastern Europe. The most recent of these is the project on high technology growth in the Czech Republic, Hungary, Poland, Romania, and Slovenia. This project is directed toward the development of high technology projects in Central and Eastern Europe. The most recent of these is the project on high technology growth in the Czech Republic, Hungary, Poland, Romania, and Slovenia. This project is directed toward the development of high technology projects in Central and Eastern Europe.

The following action steps offer a framework for action:

- **Making contact at workbench level**: The Czech Republic has undertaken projects on high technology growth initiatives in this region. These projects have been designed to increase the competitiveness of high technology industry in this region.
- **Capitalizing on the fact that US scientists are working on select topics in cutting-edge technologies**: The Czech Republic has undertaken projects on high technology growth initiatives in this region. These projects have been designed to increase the competitiveness of high technology industry in this region.
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**High Technology Growth**

George W. Handy

High-Tech Growth a Priority in Central and Eastern Europe

**Priorities and the Associated Action Commission**

The priorities of the Action Commission focus on the development of high technology projects in Central and Eastern Europe. The most recent of these is the project on high technology growth in the Czech Republic, Hungary, Poland, Romania, and Slovenia. This project is directed toward the development of high technology projects in Central and Eastern Europe. The most recent of these is the project on high technology growth in the Czech Republic, Hungary, Poland, Romania, and Slovenia. This project is directed toward the development of high technology projects in Central and Eastern Europe.

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