APS physics

Capitol Hill Quarterly

www.aps.org /publications/capitolhillquarterly/index.cfm April 2009 VOLUME 4, NO. 2

Energy Secretary Chu Announces First $1.2 Billion in Recovery Act Funding for Science

UPTON, NY–The U.S. Department of Energy's Brookhaven National Laboratory will receive $184.3 million in new science funding from President Obama's American Recovery and Reinvestment Act, principally to accelerate construction of the National Synchrotron Light Source II (NSLS-II), a new $912 million project approved to start construction earlier this year by the Department of Energy (DOE).

The funds are part of $1.2 billion announced by Secretary of Energy Steven Chu, on March 23, during a visit to Brookhaven, from funding allocated under the Recovery Act to DOE's Office of Science. The funds will support an array of Office of Science-sponsored construction, laboratory infrastructure and research projects across the nation.

"Leadership in science remains vital to America's economic prosperity, energy security and global competitiveness," said Secretary Chu. "These projects not only provide critically needed short-term economic relief but also represent a strategic investment in our nation's future. They will create thousands of jobs and breathe new life into many local economies, while helping to accelerate new technology development, renew our scientific and engineering workforce, and modernize our nation's scientific infrastructure."

"This increase in federal support for basic research, the hallmark of our work at Brookhaven lab, will strengthen the country's global leadership position in science and technology," said Laboratory Director Sam Aronson. "We welcome the additional funding for Brookhaven lab,

FUNDING continued on page 3

Brookhaven's New Light Source Building Will Mean Hundreds of Jobs for Long Island

Funding Will Come from the American Recovery and Reinvestment Act

By Kay Cordtz
Brookhaven National Laboratory

UPTON, NY–The construction of the building that will house a new accelerator ring at the U.S. Department of Energy's Brookhaven National Laboratory is expected to create as many as 1,000 jobs during the next several years.

Torcon, Inc., a New Jersey-based firm with extensive experience in New York, was recently announced as the general contractor to construct the building, part of the conventional project facilities, which will house an accelerator ring at the National Synchrotron Light Source (NSLS) II.

NSLS-II will be an advanced energy storage ring that will provide new tools for science to enhance national and energy security and drive abundant, safe, and clean energy technologies. The X-ray brightness and resolution of NSLS-II will exceed any other light source existing or under construction, and it will be 10,000 times brighter than the present NSLS at Brookhaven.

Torcon Inc. is constructing

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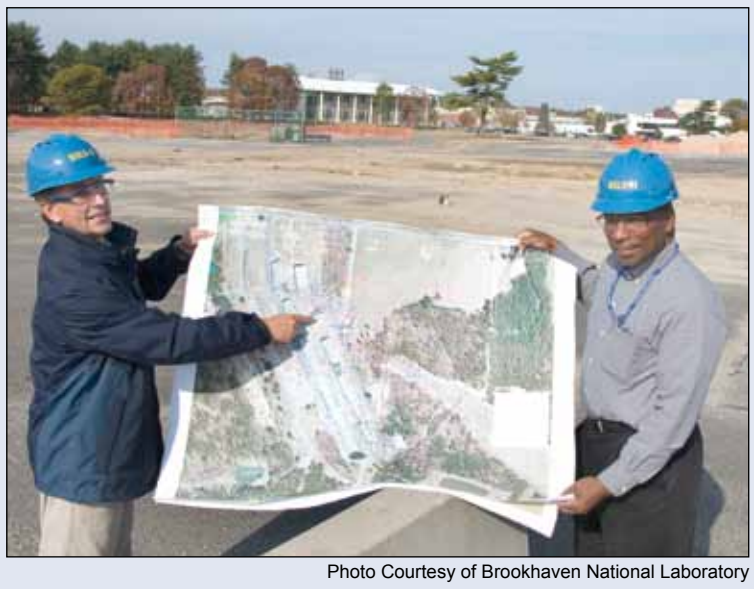

Photo Courtesy of Brookhaven National Laboratory

Stephen Sawch (left) of the Conventional Facilities Division (CFD) for the NSLS-II project and CFD's project construction engineer Mike Bromfield review plans at the site of the NSLS-II Ring Building.

APS Applauds Passage of FY09 Omnibus Bill, Calls for Predictable, Sustainable Increases in FY10 and Beyond

By Tawanda W. Johnson & Brian Mosley

The American Physical Society (APS) commends the recent passage of the FY09 Omnibus Bill, which will allow scientists to continue cutting-edge research that will lead to innovation, job creation and economic growth for the United States.

Specifically, APS lauds the bill's support of research programs at the Department of Energy's Office of Science (DOE-SC), the National Science Foundation (NSF) and the National Institute of Standards and Technology (NIST). Scientists, who receive funding from these agencies, can now further their research on developing solutions to some of the country's most pressing challenges – developing clean, affordable energy, improving health care and strengthening science and math instruction in our schools.

"At a time when the nation is coping with a deep recession and striving for an economic recovery, federal investments in science and technology are more critical to America's future than ever," said Michael S. Lubell, APS director of public affairs. "Crises provide opportunities for creative outcomes. It is gratifying to see science high on Congress' priority list."

APS applauds the leadership of Congress and President Obama on the importance of funding science, the seed corn of new discoveries, job growth and economic prosperity for the nation. As policymakers seek solutions to the nation's many challenges, federal investments in science are essential to success. The research and education funds in the FY09 Omnibus spending act represent the first down payment on future discovery and innovation. For FY10, APS urges Congress to maintain the momentum and support the goals of the America COMPETES Act by providing 7 percent increases for DOE-SC, NSF and NIST core programs. Funding for these agencies will begin to fill the hole created by years of neglect and bolster our nation's scientific and technology enterprise.

On the Back Page

U.S. Rep. Judy Biggert discusses sustaining scientific leadership.

'Science, Science, Science, Science'

House Speaker Pelosi Says 'Science' is Critical to Addressing Nation's Challenges

Photo by Brian Mosley/APS Staff

House Speaker Nancy Pelosi and APS member Carlos Meriles, assistant professor of physics at The City College of CUNY, met during the Coalition for National Science Funding Exhibit and Reception, held March 24 in the Rayburn Building on Capitol Hill. Meriles displayed research in nuclear magnetic resonance – a high-resolution technique that could improve the understanding of how cancer cells are structured, thus advancing the treatment of the disease.

By Tawanda W. Johnson

Science is crucial to developing solutions to the nation's most pressing challenges, including enhancing energy security, revamping health care and improving education, said House Speaker Nancy Pelosi (CA-8th) during remarks at the 15th annual Coalition for National Science Funding (CNSF) Exhibition and Reception held March 24.

"If you want to know the agenda for this Congress, think of four words: science, science, science, science," she said to thunderous applause in the Rayburn Building on Capitol Hill.

CNSF is an alliance of more than 120 organizations that supports the goal of increasing the national investment in the National Science Foundation's research and education programs in response to unprecedented scientific, technological and economic opportunities facing the United States. The exhibit and reception involved scientists discussing research that included advances in nuclear magnetic resonance – a technique that could improve the understanding of how cancer cells are structured, thus advancing the treatment of the disease.

Before Pelosi made her remarks, Rep. Bart Gordon, chairman of the House Science and Technology Committee, praised the Speaker for outstanding leadership on science and innovation.

"She does not just talk the talk; she walks the walk," he said to a packed crowd that included Reps. Rush Holt (NJ-12th), Vernon Ehlers (MI-3rd), Bill Foster (IL-14th), Bob Filner (CA-51st) and members of the Task Force on the Future of American Innovation. They all thanked the Speaker for her long-standing support of science, including investments in the American Recovery and Reinvestment Act and the FY09 Omnibus Bill.

Pelosi said she and her congressional colleagues have fought hard for scientific investments because they are crucial to developing clean, affordable energy, improving health care and education, and developing innovations that translate into high-paying jobs and economic prosperity for the nation.

"*The Rising Above the Gathering Storm* report was the wake-up call to the nation," she said, while thanking the scientific community for advocating for increased investment in scientific research and improvements in math and science education. Before the reception, she stressed those points during a meeting with various university presidents and association leaders.

Pelosi's 2005 Democratic Innovation Agenda followed recommendations of the highly acclaimed *Gathering Storm* report, which calls for an educated and skilled U.S. workforce and revitalized research at universities and national laboratories.

In 2007, the Speaker was one of the recipients of the George E. Brown Jr. Science, Engineering and Technology Leadership Award for demonstrating leadership in ensuring that the United States meets global competitiveness challenges of the 21st century.

Capitol Hill Quarterly is a publication of the American Physical Society, www.aps.org. APS is a non-partisan, professional society of physicists with more than 46,000 members.

APS Members in the Media

Politico

"They could turn it into a gigantic Tunnel of Love. When I was a kid, you could take your girlfriend floating down the Tunnel of Love and do some necking, as we called it. Yucca would give you five miles of tunnel – that's some serious necking."

***Burton Richter*, (CA-14th)** *joking about what to do with the Yucca Mountain tunnel following the release of President Obama's FY10 budget, which cuts funding for the proposed nuclear waste facility,* Politico*, March 11, 2009*

Calgary Herald

"Roughly speaking, we predict there could be a 1,000-time reduction in power consumption with electronic computers built in this new way, and they could be something like 1,000 times smaller in size."

***Robert Wolkow**, University of Alberta, on making the world's smallest quantum dots, which could be used in making smaller computers,* Calgary Herald*, February 3, 2009*

The Financial Times

"We look at the economic sensibility of an idea and why the market doesn't understand it and we do."

***Ronald Kahn*, (CA-8th)** *Barclays Global Investors, on his approach to quantitative finance,* The Financial Times*, January 26, 2009*

The New York Times

"Jack Tatum was vicious – that helps – but he had a way of popping with the perfect angle and timing."

***Timothy Gay*, (NE-1st)** *University of Nebraska, on the physics of the hit in football,* The New York Times*, January 30, 2009*

The New York Times

"The one thing that has always intrigued me is, can we take the same idea and do it in three dimensions?"

***Daniel Rugar*, (CA-16th)** *IBM, on using a magnetic resonance force microscope to get a 3-d image of a virus,* The New York Times*, January 12, 2009*

Christian Science Monitor

"What we've done is to create a situation with a lot of people who smell big money and they're working very hard. I'm optimistic that in a few years, they're going to lick the problem."

***John Goodenough*, (TX-21st)** *the University of Texas at Austin, on battery research,* Christian Science Monitor*, January 22, 2009*

The Houston Chronicle

"I view it as a recognition of many hundreds of scientists who have gotten seriously involved in policy one way or another, either advising the government, writing for the public, getting involved in schools or working with federal, state and local government on any number of policy issues. It's a concept I call the civic scientist."

***Neal Lane*, (TX-7th)** *Rice University, on receiving the National Academy of Sciences' Public Welfare Medal,* The Houston Chronicle*, January 31, 2009*

Cleveland Plain Dealer

"It is considered a holy text, the Citizen Kane of comic books. When I was done vibrating like a gong, I said I'd be happy to do something."

***James Kakalios*, (MN-5th)** *University of Minnesota, on being asked to be a science advisor to the upcoming Watchmen movie,* Cleveland Plain Dealer*, December 14, 2008*

Snapshots from Physics History

April 25, 1954: Bell Labs demonstrates the first practical silicon solar cell

Solar cells, which convert sunlight into electrical current, had their beginnings more than 100 years ago, but early ones were too inefficient to be of much use. In April, 1954, researchers at Bell Laboratories demonstrated the first practical silicon solar cell.

The story of solar cells dates back to an observation of the photovoltaic effect in 1839. French physicist Alexandre-Edmond Becquerel, son of physicist Antoine Cesar Becquerel and father of physicist Henri Becquerel, was working with metal electrodes in an electrolyte solution when he noticed that small electric currents were being produced when the metals were exposed to light, but he couldn't explain the effect.

Calvin S. Fuller is shown diffusing boron into silicon to create the world's first practical solar cell.

Several decades later, in 1873, Willoughby Smith, an English engineer, discovered the photoconductivity of selenium while testing materials for underwater telegraph cables. In 1883, American inventor Charles Fritts made the first solar cells from selenium. Though Fritts had hoped his solar cells might compete with Edison's coal-fired power plants, they were less than 1 percent efficient at converting sunlight to electricity, and thus not very practical. Some research on selenium photovoltaics continued for the next several decades, and a few applications were found, but they were not put to widespread use.

The next major advance in solar cell technology was developed in 1940 by Russell Shoemaker Ohl, a semiconductor researcher at Bell Labs. He investigated some silicon samples, one of which had a crack in the middle. He noticed that current flowed through this particular sample when it was exposed to light. This crack, which had probably formed when the sample was made, actually marked the boundary between regions containing different levels of impurities, so one side was positively doped and the other side negatively doped. Ohl had inadvertently made a p-n junction, the basis of a solar cell. Excess positive charge builds up on one side of the p-n barrier, and excess negative charge builds up on the other side, creating an electric field. When the cell is hooked up in a circuit, an incoming photon that hits the cell can then give an electron a kick and start current flowing. Ohl patented his solar cell, which was about 1 percent efficient.

The first practical silicon solar cell was created 13 years later by a team of scientists working at Bell Labs.

In 1953, engineer Daryl Chapin, who had previously worked on magnetic materials at Bell Labs, tried to develop a source of power for telephone systems in remote, humid locations, where dry cell batteries degraded too quickly. Chapin investigated several alternative energy sources and decided that solar power was one of the most promising. He tried selenium solar cells, but found them too inefficient.

Meanwhile, Calvin Fuller, a chemist, and Gerald Pearson, a physicist, worked on controlling the properties of semiconductors by introducing impurities. Fuller gave Pearson a piece of silicon containing gallium impurities. Pearson dipped it in lithium, creating a p-n junction. Pearson then hooked up an ammeter to the piece of silicon and shined a light on it. The ammeter jumped significantly, to their surprise.

Pearson, who was aware of Chapin's work, told his friend not to waste any more time on selenium solar cells, and Chapin immediately switched to silicon.

The three then worked for several months on improving the properties of their silicon solar cells. One problem was the difficulty in making good electrical contacts with the silicon cells. Another problem was that, at room temperature, lithium migrated through the silicon over time, moving the p-n junction farther away from the incoming sunlight. To solve that problem, they tried different impurities, and eventually settled on arsenic and boron, which created a p-n junction that stayed near the surface. They also found they were able to make good electrical contacts with the boron-arsenic silicon sells. After making some other improvements to the design, they linked together several solar cells to create what they called a "solar battery."

Bell Labs announced the invention on April 25, 1954, in Murray Hill, New Jersey. They demonstrated their solar panel by using it to power a small toy Ferris wheel and a radio transmitter.

Those first silicon solar cells were about 6 percent efficient at converting the energy in sunlight into electricity, a huge improvement over any previous solar cells.

The New York Times wrote that the silicon solar cell "may mark the beginning of a new era, leading eventually to the realization of one of mankind's most cherished dreams–the harnessing of the almost limitless energy of the sun for the uses of civilization."

The first silicon solar cells were expensive to produce, and early efforts at commercialization were not very successful. But within a few years, solar cells were commonly used to power satellites, and other applications followed.

Chapin simplified the process of making silicon solar cells and even developed a solar cell science experiment for high school students. Chapin, Fuller and Pearson were inducted into the National Inventors Hall of Fame in 2008.

Today, solar cells are used in many devices, from handheld calculators to rooftop solar panels. Improved designs and advanced materials have made it possible to build solar cells that reach over 40 percent efficiency. Research and development continues with the goal of decreasing the solar cells' cost and improving their efficiency to make solar power more competitive with fossil fuels.

APS physics Capitol Hill Quarterly

APS Physics Capitol Hill Quarterly is published four times yearly by the Washington Office of the American Physical Society (APS). It contains news of the Society and of physics relevant to Capitol Hill as well as opinions. The APS Headquarters is located at One Physics Ellipse, College Park, MD 20740-3844. Phone: (301) 209-3200.

April 2009 • Series 2, Vol. 4, No. 2 • **© 2009 The American Physical Society**

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APS President Murray States Long-Range Federal Plan is Key to Addressing Critical Research & Development Issues

Cherry A. Murray, Deputy Director for Science and Technology at Lawrence Livermore National Laboratory, assumed the APS presidency on Jan. 1, 2009. In July, she will become Dean of Engineering and Applied Sciences at Harvard University.

Q: What do you see as the most pressing issues facing the physics community right now?

A: First, let me start with the challenges facing the nation and also the globe: national security, energy security, environmental security and human health are all critical issues. On top of that, the global financial crisis and U.S. economic security are also important challenges. The challenges facing the globe require the underpinning of an incredibly strong and vital science and engineering enterprise. The Rising Above the Gathering Storm Committee at the National Academies, on which I served, identified several areas of concern where I believe APS can play a role. The gathering storm that we see in this country is a lack of a future science and engineering work force, the stagnation of support for basic and long-term applied research and a plan for retaining our high-tech economic sector that drives the economy. We have fallen down considerably. The U.S. has become much too complacent.

Q: What will be your focus during your presidential year?

A: The federal government needs a long-range plan for how the nation is going to address these challenges, including a strategy for maintaining the vitality of the science and engineering enterprise across academia and the national labs in partnership with industry. Federal funding for science and technology needs to be predictable and sustained. Physics can play a huge role. I would like to see APS work with the National Academies and other professional societies to provide a unified message from the scientific community in support of a long-range plan for federal support of basic and long-term applied scientific research balanced across disciplines. I am also the chair of the Division of Engineering and Physical Sciences at the National Research Council, and I'm on the board of the American Association for the Advancement of Science. I think APS can be a leader in bringing the societies together.

Cherry A. Murray

Confirmation of Renowned Scientists Holdren and Lubchenco to Top Administrative Posts Heartens APS

By Tawanda W. Johnson

The American Physical Society (APS) is elated that APS Fellow John P. Holdren, an international expert on energy and climate change, has finally been confirmed as President Obama's director of the Office of Science and Technology Policy (OSTP). The Society also applauds the confirmation of Jane Lubchenco, a renowned marine ecologist, who will lead the National Oceanic and Atmospheric Administration (NOAA).

"The confirmation of John Holdren as science adviser and director of OSTP, and Jane Lubchenco as NOAA administrator, sends a powerful message to the nation that science will play an integral role in the Administration's energy, environment and economic policies," said APS President Cherry A. Murray.

Holdren, who served as a top adviser to the Obama presidential campaign, is the Teresa and John Heinz Professor of Environmental Policy and director of the Program on Science, Technology and Public Policy at the Harvard's Kennedy School of Government. He is also professor of environmental science and policy in Harvard's Department of Earth and Planetary Sciences.

From 2005-2008, he served as president-elect, president and chair of the board of the American Association for the Advancement of Science. In 1995, Holdren received the APS Burton Forum Award, "for his many insightful contributions to the analysis of global energy issues, for his unstinting leadership in arms control and for the clear and lucid presentation of these ideas to scientists and to the general public."

John P. Holdren

Jane Lubchenco

Photo Courtesy of NOAA

Trained in fluid dynamics and plasma physics, Holdren has devoted much of his career to energy and climate change research. He is the second physicist to join President Obama's Administration. His selection follows that of U.S. Energy Secretary Steve Chu, Nobel Laureate, APS Fellow and lifetime member of APS.

Lubchenco, a lauded marine ecologist, is a graduate of Colorado College. She received her master's degree from the University of Washington and a Ph.D. from Harvard University in marine ecology. She previously taught at Harvard and has been on the faculty of Oregon State University since 1977. Additionally, Lubchenco has been the recipient of numerous accolades, including a MacArthur Fellowship, nine honorary degrees and the 2002 Heinz Award in the Environment. She was also a presidential appointee for two terms on the National Science Board, which advises the President and Congress and oversees the National Science Foundation.

BROOKHAVEN continued from page 1

the largest component of the machine and estimates that 90 percent of the total construction cost of more than $170 million will be spent directly with Long Island contractors and suppliers. The construction of the conventional facilities is expected to last through 2012.

Funding for the project will come from the American Recovery and Reinvestment Act, which was recently signed into law by President Obama to revive the ailing economy by investing in scientific infrastructure and instrumentation, among other projects.

The construction of the NSLS-II will not only enhance Brookhaven's standing as a world-leading research facility, but it will also yield a direct economic benefit to Long Island and New York State. The lab's project team estimates that about $91 million in materials will be bought from Long Island and other New York suppliers. Approximately $63 million in labor, most of it supplied by local labor unions, will be needed to complete the construction of the building. The average manpower level will be about 125 workers, with a peak of approximately 300.

"A great deal of work on the part of many talented and dedicated people has led us to where we can begin construction of this state-of-the-art machine," said Steven Dierker, associate laboratory director for light sources and NSLS-II project director at Brookhaven.

The machine will be the newest member of a suite of advanced light sources and neutron facilities operated by DOE's Office of Science and used by more than 9,000 researchers annually from all disciplines. By providing a wide range of high-resolution probes for nanoscience, NSLS-II will enable scientists to focus on some of the nation's most important scientific challenges at the nanoscale level, including clean, affordable energy, molecular electronics and high-temperature superconductors. NSLS-II will also enable structural studies of the smallest crystals in structural biology. DOE has approved a total project cost of $912 million.

The conventional facilities contract is the first and largest of several in a construction process that will culminate in the launch of the new facility in 2015.

For more information about the NSLS-II project, visit www.bnl.gov/nsls2.

FUNDING continued from page 1

which is part of DOE's family of national laboratories, key to the nation's scientific enterprise."

"Secretary Chu's visit to Brookhaven is a clear sign of how important the lab is to the scientific and competitive research future of Long Island and the entire nation," commented the senior senator from New York, Charles Schumer. "We look forward to a long and productive relationship with the new secretary to ensure the lab – as a critical scientific and economic engine–continues to thrive and grow."

"These recovery funds will create jobs on Long Island, strengthen the economy and spur the innovations we need to make America strong in the future," Rep. Timothy Bishop (NY-1st) said. "What's good for Brookhaven is good for Long Island and the nation. This recovery funding will put hundreds of Long Island construction workers, electricians ,and plumbers to work and allow the lab's highly skilled and dedicated scientists to continue their cutting-edge energy research."

"Secretary Chu's visit to Brookhaven is a clear sign of how important the (Brookhaven) lab is to the scientific and competitive research future of Long Island and the entire nation."
-Sen. Charles Schumer (NY)

New York Sen. Kirsten Gillibrand said, "This is great news for Brookhaven National Laboratory and for all of Long Island. Brookhaven is a major economic engine for Long Island. This funding will help create jobs and keep Long Island at the forefront of scientific research."

The $1.2 billion that Secretary Chu announced at Brookhaven is the first installment of a total of $1.6 billion allocated to the DOE Office of Science by Congress under the Recovery Act legislation. Officials are working on details remaining to enable approval and release of the balance of $371 million.

"This recovery funding will put hundreds of Long Island construction workers, electricians and plumbers to work and allow the lab's highly skilled and dedicated scientists to continue their cutting-edge energy research."
-Rep. Timothy Bishop (NY-1st)

Other approved projects include:

- $123 million for major construction, modernization and needed decommissioning of laboratory facilities at Oak Ridge National Laboratory (ORNL), in Oak Ridge Tenn.; Lawrence Berkeley National Laboratory (LBNL), in Berkeley, Calif.; and Brookhaven National Laboratory.

"Brookhaven is a major economic engine for Long Island. This funding will help create jobs and keep Long Island at the forefront of scientific research."
-Sen. Kirsten Gillibrand (NY)

- $65 million to accelerate construction of the 12-Billion Electron Volt Upgrade of the Continuous Electron Beam Accelerator Facility (CEBAF) at Thomas Jefferson National Accelerator Facility (TJNAF) in Newport News, Va.
- $277 million for Energy Frontier Research Centers, to be awarded on a competitive basis to universities and DOE national laboratories across the country.
- $90 million for other core research, providing support for graduate students, post-doc students, and Ph.D. scientists.
- $69 million to create a national scale, prototype 100-gigabit per second data network linking research centers across the nation.
- $330 million for operations and equipment at Office of Science major scientific user facilities, used annually by more than 20,000 researchers.
- $125 million for needed infrastructure improvements across nine DOE national laboratories: Ames Laboratory in Ames, Iowa; Argonne National Laboratory, in Argonne, Ill.; Brookhaven National Laboratory; Fermi National Accelerator Laboratory in Batavia, Ill.; LBNL; ORNL; Pacific Northwest National Laboratory in Richland, Wash.; SLAC National Accelerator Laboratory in Menlo Park, Calif; and TJNAF.

News release Courtesy of DOE: http://www.energy.gov/news/7083.htm.

The Back PAGE

Sustaining Scientific Leadership

By U.S. Rep. Judy Biggert (R-IL-13th)

As Congress begins to debate its budget plans for fiscal year 2010, a look at past mistakes can instruct and lead to future success when it comes to sustaining America's scientific leadership and economic competitiveness.

In December of 2007, Congress had yet to agree to several major appropriations bills and decided instead to pass an Omnibus spending package that left a number of key agencies and programs dramatically underfunded, including physics research.

Particularly troubling to me were cuts to the Department of Energy's (DOE) Office of Science, which supports over 40 percent of all federally sponsored research in the basic physical sciences. It also is the principal source of funding for Argonne National Laboratory, and the sole source of funding for Fermi National Accelerator Laboratory, both in my home state of Illinois. These are places where critical research is being done in areas like alternative energies, biotechnology, nanotechnology, material and chemical sciences, and supercomputing, and are home to unique facilities used by thousands of scientists from U.S. industry, academia, and the government.

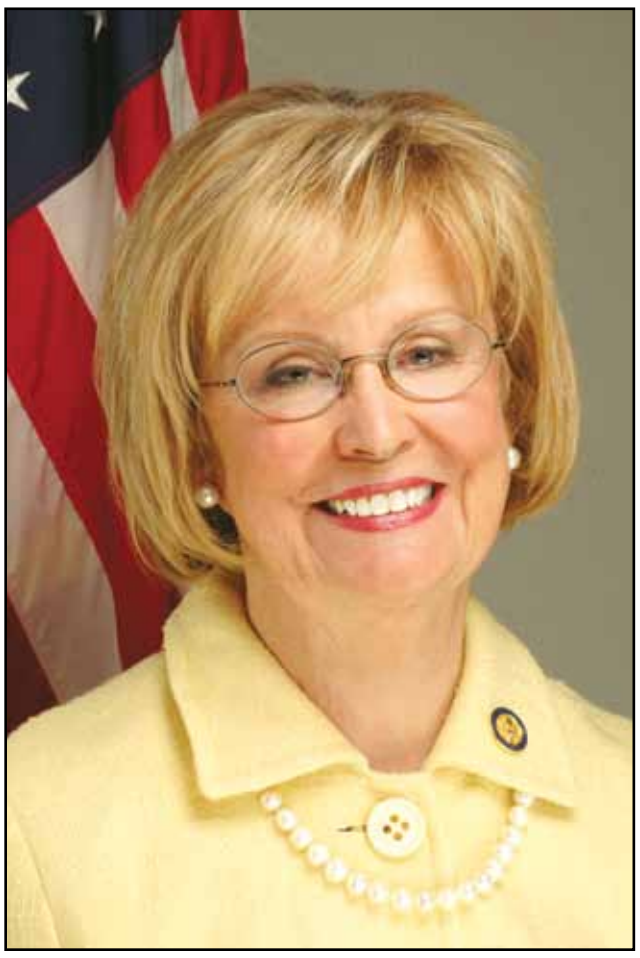
Again in 2008, the Office of Science's budget – excluding earmarks – increased at a rate less than inflation. Significantly reduced or cut altogether were High Energy Physics, Basic Energy Science user facilities, and the U.S. contribution to the international fusion experiment ITER.

"Over half of the growth in the Gross Domestic Product of the U.S. over the last fifty years is attributable to past investments in science and technology development."

To make matters worse, $124 million was earmarked from the DOE Office of Science's budget, the bulk of which was largely for items totally unrelated to DOE's mission, such as MRI machines for hospitals.

In the end, through a year-long campaign, we were able to secure funding in a later supplemental appropriations package to help avert more shutdowns and layoffs at many of our national laboratories. But for those in the scientific community, it was a wake-up call to the need for action to prevent America from losing its brightest young talent and surrendering scientific leadership to competitors in Europe or Asia.

As a Senior member of the House Science and Technology Committee and Co-Chair of the House Research and Development Caucus, I work hard to educate Members of Congress about the importance of basic scientific research. There are many reasons to support the work being done at America's laboratories and research universities, but here are five that I find particularly compelling and that I would encourage you to share with your Representatives in Washington.



First, over half of the growth in the Gross Domestic Product of the U.S. over the last fifty years is attributable to past investments in science and technology development. That's why we must make investing in basic research a priority to ensure that U.S. businesses large and small remain competitive and create good American jobs in an increasingly global marketplace. In an environment where we are striving to stimulate this economy, research and development can and should play a central role.

Second, basic research is often the key to overcoming technical obstacles to the development and deployment of advanced technologies, whether we are talking about energy, healthcare, environmental protection, or military technologies. It is critical to the competitiveness of American industry and to enhancing national security, improving our health, preserving our environment, and reducing our dependence on Middle Eastern oil and gas.

"Investing in basic science is an investment in the education and training of the next generation of scientists and engineers."

Third, strong federal support for research also ensures that American scientists and engineers have access to unique tools and facilities that will keep the U.S. at the forefront of scientific discovery. By building and maintaining such tools and facilities, we are investing in the nation's capacity to innovate and effectively use science to confront national challenges in the future.

Fourth, investing in basic science is an investment in the education and training of the next generation of scientists and engineers. By actively participating in the planning and execution of just about every basic research project, graduate fellows and doctoral candidates learn how to effectively conduct research and expand their own knowledge in a given field – invaluable experience and insight that make them the hope for our future.

Finally, the private sector no longer conducts much basic research, which by its very nature is high-risk and longer-term. As a result, the funding of basic research is an appropriate governmental responsibility, which is why it should be among the highest of priorities for future budgets.

These are all reasons it's more important than ever that we stay on a path that will fulfill the commitments made in the 2007 America COMPETES Act, which aims to double Office of Science funding within a 10-year period.

As you are probably aware, Congress did provide significant increases for the DOE Office of Science, National Institute of Standards and Technology (NIST), and the National Science Foundation (NSF) within the recently passed stimulus measure and fiscal year 2009 Omnibus appropriations package. However, with tight budgetary pressures amid the current economic recession, these important priorities will have to compete vigorously for funding during future years. And as Congress takes up the President's budget proposal for fiscal year 2010, that's when input from members of the American Physical Society and other scientific institutions will be crucial.

"The funding of basic research is an appropriate governmental responsibility, which is why it should be among the highest of priorities for future budgets."

So please, join with your fellow scientists, contact your Members of Congress, and let the American public know how important physical research is to America's long-term economic health and competitiveness.

U.S Rep. Judy Biggert (R-IL-13th) is Co-Chair of the House Research and Development Caucus and a Senior Member of the House Science and Technology Committee.

The views expressed on "The Back Page" are that of the author and do not necessarily reflect the views held by the American Physical Society.