

A fond farewell



Photo Credit: Ken Cole

On September 13, APS hosted a reception on Capitol Hill in honor of the retiring Chairman of the House Science Committee, Sherwood Boehlert (R-NY). The event was attended by several members of Congress, Congressional staff, members of the Administration, and numerous representatives of the Washington science policy community. In the picture, APS President John Hopfield (right) expresses his appreciation to Boehlert for years of staunch support for science. As a memento of the occasion, Hopfield presented Boehlert with a special doorstop edition of "The Physical Review: the First Hundred Years" (visible under Boehlert's left arm).

US team garners 4 gold, 1 silver at Physics Olympiad in Singapore

Twenty four high school students spent nine long, intense days at the end of May doing physics, including classes every day, seven exams, two practice labs and four mystery labs. And they had fun doing it. Members of the United States Physics team, they attended training camp at the University of Maryland.

During the nine day camp, the team took one day off from training to visit nearby Washington, DC, where they met with their Senators and Representatives, toured the National Air and Space museum, and attended a special reception

with the two physicists in Congress, Vernon Ehlers (MI-3rd) and Rush Holt (NJ-12th). Ehlers inserted a statement in the congressional record honoring the team. In a statement inserted into the Congressional Record honoring the team, Ehlers remarked "I hope their enthusiasm will be contagious to other students who will be drawn to challenging and rewarding careers in math and science."

At the end of the training camp, five students and one alternate were selected for the traveling team. These students traveled to Singapore to compete in the

Mather, Smoot share 2006 Nobel Prize in physics

APS fellow John C. Mather (NASA Goddard Space Flight Center) shared the 2006 Nobel Prize in physics with George Smoot (Lawrence Berkeley National Laboratory) for "their discovery of the black-body form and anisotropy of the cosmic microwave background radiation."

The Nobel Prize Committee cited the physicists for their work on the Cosmic Background Explorer (COBE) project. This orbiting spacecraft was the first to detect faint temperature variations in the cosmic microwave background (CMB) radiation—the microwave signals from space that are remnants of the Big Bang. The CMB was first observed experimentally in the 1960s by Arno Penzias and Robert Wilson at Bell Labs, for which they later received the 1978 Nobel Prize in Physics.

Prior to the COBE map of the International Physics Olympiad July 8-17. The team brought home four gold medals and one silver medal.

Winning gold medals were: **Menyoung Lee**, a senior at Thomas Jefferson High School for Science and Technology, Alexandria, VA (VA-11th); **William Throwe**, a senior at Shoreham-Wading River High School, Shoreham, NY (NY-1st); **Henry Tung**, a junior at Torrey Pines High School in San Diego (CA 50th); and **Otis Chodosh**, a senior at the Oklahoma School of Science and Mathematics in Oklahoma City (OK-5th). Taking home a silver

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universe, it was unclear why the universe contained stars and galaxies rather than an evenly distributed dust cloud. Theorists had predicted that a sensitive measurement of microwaves from the sky would reveal minute temperature fluctuations, which represent variations in the density of matter in the early universe. It was proposed that denser portions served as seeds for galaxies that formed later.

COBE was the first experiment sensitive enough to confirm the predicted temperature variations encoded in the map of the microwave background. COBE

was also the first to provide a very precise average temperature of the universe: 2.726 K.

It was not an easy experiment to perform. The variations in the CMB temperature had to be measured against a foreground cloud of microwave radiation coming from our solar system, our galaxy and other celestial objects. Furthermore, the motion of the earth around the sun, the sun around the Milky Way, and the Milky Way within our local cluster of galaxies also had to be taken into account.

Emitted radiation by the early universe is distributed between the various wavelengths of the electromagnetic spectrum, the shape of which depends entirely on temperature. So if scientists know the temperature of a given thing—in this case, the entire universe—they can precisely predict what the

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Photo Credit: AIP Media and Government Relations Staff
Olympian William Throwe, left, shakes hands with Representative Timothy Bishop (NY-1st). See Olympiad story on the left.

Industrialists, educators gather in DC for NAS convocation

Representatives from industry, K-12 education and higher education from almost all 50 states gathered at the National Academy of Sciences in Washington, DC, to attend a convocation marking the one-year anniversary of the release of the benchmark NAS report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*.

That report focused particularly on K-12 education in science, technology, engineering and mathematics (STEM); higher education; research; and promoting an environment that fosters innovation.

The October convocation centered on those key action areas. Its purpose was to bring leaders in industry, government, research and education together with representatives from the federal government to exchange ideas about initiatives at federal, state and local levels to strengthen national competitiveness.

Some progress has already been made. In his 2006 State of the Union address to the nation on January 31st, President George W Bush announced an American Competitiveness Initiative (ACI), a ten-year, \$136 billion undertaking that would double the federal commitment to basic scientific research in the physical sciences and train tens of thousands of new math and science teachers.

Just prior to the convocation, Majority Senate Leader Bill Frist (R-TN) and Democratic Leader Harry Reid (D-NV) introduced a new Senate bill (S.3936) to address most of the recommendations outlined in the NAS report. The bill will authorize \$73 billion in federal

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High school teachers conduct gravity-defying experiments

On an early morning in May, Lori DiLisi—a teacher at Beaumont High School in University Heights, Ohio—found herself savoring the novel experience of weightlessness aboard NASA's reduced gravity C-9 airplane, affectionately dubbed the "Weightless Wonder."

DiLisi was a member on one of six teams of high school teachers who conducted experiments in zero gravity aboard the aircraft this year. All six teams were selected as part of an APS-sponsored World Year of Physics 2005 project, in which high school physics teachers and their students were invited to come up with experiments that they could do in zero gravity.

In addition to DiLisi and her Beaumont High School cohorts, the other teams hailed from Circle High School, Towanda, Kansas (KS-4th); Columbus High School, Columbus, Georgia (GA-2nd); Glenbrook North High School, Northbrook,

Illinois (IL-10th); Greendale High School, Greendale, Wisconsin (WI-1st); Roosevelt High School, Seattle, Washington (WA-7th).

After a few scheduling delays,

flight, they had a medical briefing, dosed up on anti-nausea medication (just in case), zipped themselves into bright orange flight suits, and boarded the aircraft.

DiLisi's team made glycerol bridges—drops of glycerol suspended between two posts—of various lengths and widths, and measured their stability under microgravity.

The team from Circle High School in Towanda, Kansas studied the motion of objects in microgravity.

Other experiments included a free-floating robot that used a light sensor grid and student-generated soft-

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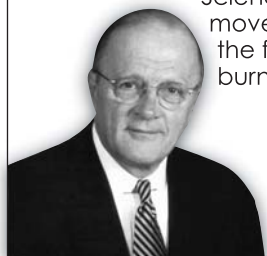
Photo credit: Vinaya Sathyasheelappa
Teacher Lori DiLisi of Beaumont High School in University Heights, Ohio flies through the air with the greatest of ease in the weightless environment aboard NASA's reduced gravity C-9 airplane.

the teams spent ten days at the Johnson Space Center in Houston, first undergoing several days of flight training and safety briefings before flying with their experiments. The day of the

On the Back Page

Congressman Sherwood Boehlert discusses.....

"Science moves to the front burner."



APS Members in the Media

“The Chinese are so smart they knock your socks off. The impression you get when you go over there is that China is going to take over the world soon.”
—**Andrew Strominger**, *Harvard University (MA-8th)*, on *China's rapid improvement in science*. (June 20, 2006)

“It has really gotten quite outrageous. These new questions that were raised are just one more example of many, in which people are scrambling to find the slightest little reason to question important scientific results, and then blow it way out of proportion.”
—**Neal Lane**, *Rice University (TX-7th)*, on *recent disputes over climate science research*. (June 23, 2006)

“The nanotubes are very, very strong—among the strongest materials known—and so the idea is that when you put the epoxy under some kind of load of some sort, if you can transfer some of that load to the nanotubes, the combined system will be stronger than the original epoxy.”
—**A.T. Charlie Johnson**, *University of Pennsylvania (PA-2nd)*, on *an epoxy made with nanotubes mixed in*. (August 28, 2006)

“The university values Fermilab as a part of our teaching and research, but even more important, we value its leadership for this nation's global role in scientific inquiry.”
—**Thomas Rosenbaum**, *University of Chicago (IL-1st)*, on *U.Chicago's bid to manage Fermilab* (August 23, 2006)

“It's a marvelous success story.”
—**David Fahey**, *NOAA (CO-2nd)*, on *the ozone hole's recovery*. (September 4, 2006)

“The South Pole would be good too, but this is a bit more accessible. We'll need to cut some roads, though.”
—**Jacqueline Hewitt**, *MIT (MA-8th)*, on *a telescope to be built in a remote location in Australia* (September 4, 2006)

(Baltimore) “It's like trying to find 50 ants on a football field.”
—**Andrew Westphal**, *UC-Berkeley (CA-9th)*, on *analyzing data from NASA's stardust probe* (August 10, 2006)

Glad You Asked That

Ever wonder why there seem to be more home runs at Coors Field in Denver, Colorado, than at other major ball parks? The answer might be due to the air up there. Denver is known as the “Mile-High City.” Its high altitude decreases the amount of air resistance on batted balls so the balls travel farther when hit. Plus, the low air pressure means the pitches “break” less severely and are therefore easier to hit. To combat this, the baseballs used in Coors Field games are actually placed in a humidifier beforehand to increase their weight.

Earlier this year, Jay Schaffer and Erik L. Heiny, both mathematicians at the University of Northern Colorado, analyzed the effects of elevation on slugging percentages in major league baseball in 2003. They found that the slugging percentage in Coors Field is significantly different from that in any other ball park. In fact, it's

about 9.2 percentage points higher than at middle elevations (defined as between 500 and 1100 feet), and about 12.5 percentage points higher than at elevations below 500 feet.

A few years ago, US Naval Academy scientist Howard Penn determined that because of the elevation, a baseball travels roughly 10% farther at Coors Field than it does in other stadiums.

Furthermore, when Penn compared the number of home runs hit by teams playing at home versus that same team on the road, the Rockies really stood out: in 2001, 58% of their home runs occurred at Coors Field. And a full 60% of the home runs at Coors Field were made by batters from visiting teams. Over the last decade, four of the Rockies' star players have pooled their efforts to snag six national league batting titles.

Have a science question that you want to see answered here? Contact opa@aps.org.



Snapshots from Physics History

Miss Mitchell's comet

Maria Mitchell, the first female professional astronomer in the United States, was also the first to discover and chart the orbit of a new comet, which became known as “Miss Mitchell's Comet.”

As a young woman, Mitchell worked briefly as a schoolteacher, then as a librarian at the Nantucket Atheneum, while still continuing her astronomical observations. Every chance she got, if the night was clear, Mitchell would go to the roof of the house to “sweep the heavens,” using the family's 2-inch reflecting telescope.

On the evening of October 1,



NOAA Central Library

Maria Mitchell

1847, Mitchell noticed a small blurry streak, invisible to the naked eye, but clear in the telescope, and she guessed at once that it might be a comet. She

recorded the object's position, and continued to observe it to be sure it was a comet. On October 3, Mitchell's father sent off a letter to Cambridge announcing the discovery. This brought Mitchell immediate international fame, and further honors.

Mitchell made many other astronomical observations during her career, including observations of sunspots, comets, nebulae, stars, solar eclipses, and the moons of Saturn and Jupiter. She died on June 28, 1889. The Maria Mitchell Observatory on Nantucket is named after her, as is the Mitchell crater on the moon.

Millikan's oil drop experiment

Robert Millikan's famous oil drop experiment, reported in August 1913, elegantly measured the fundamental unit of electric charge. The experiment has been called one of the most beautiful in physics history.

J.J. Thomson had discovered the electron in 1897 and had made rough measurements of the particle's electrical charge using clouds of water. Millikan improved upon these measurements by trying to determine the charge on individual droplets. But the droplets of water evaporated too quickly for accurate measurement. He asked his graduate student, Harvey Fletcher, to figure out how to do the experiment using some substance that evaporated more slowly.

Fletcher quickly found that he could use droplets of oil, produced with a simple perfume atomizer. The oil droplets are injected into an air-filled chamber and pick up charge from the ionized air. The drops then fall or rise under the combined influence of gravity, viscosity of the air, and an electric field, which the experimenter can adjust. The experimenter could watch the drops through a specially designed telescope, and time how fast a drop falls or rises. After repeatedly timing the rise and fall of a drop, Millikan could calculate the charge on the drop.

In 1910 Millikan published the first results from these experiments, which clearly showed that charges on the drops were all

integer multiples of a fundamental unit of charge. Millikan then improved on his experiment to collect more data. He published the new, more accurate results in August 1913 in the *Physical Review*. Millikan won the 1923 Nobel Prize for the work, as well as for his determination of the value of Planck's constant in 1916.



Millikan's apparatus

Jeff Francis and the physics of baseball

The Magnus force has made Jeff Francis what he is today: a 25-year-old left-handed pitcher on the rise in his second full season with Major League Baseball's Colorado Rockies.

A former physics and astronomy major at the University of British Columbia, Francis could clarify what puts the curve in a curveball, the “hop” in a fastball, the slide in a slider, the sink in a sinker. But he won't be giving that talk any time soon.

“As much as it might seem contradictory,” Francis says, “physics knowledge does not help much on the field. So much of playing baseball is ‘feel’ that explaining to some-

one what makes a ball curve would be almost meaningless. I get asked that a lot, and sometimes I say: ‘I never met him, but I bet Einstein couldn't throw a curveball.’”

On the other hand, Einstein did toss a memorable and gigantic curve at physicists' concepts of matter, space, and time a hundred years ago. Francis is good, but he hasn't yet matched that impact.

But delivering a pitch is all about physics: the most efficient transfer of momentum from body to baseball; the maximum effectiveness of the arm as a lever; the rotational dynamics of the baseball leaving the fingertips. And within four-tenths of a second after Francis

delivers a pitch, the batter faces his own challenge of physics and mechanics.

Yale professor emeritus Robert K. Adair says a batter must react in less than one-fourth of a second. In the one thousandth of a second of bat-ball contact, a superlative hitter such as Albert Pujols of St. Louis will deliver some 8000 pounds of force, compressing the ball to about half its original diameter—that is, if Pujols meets the ball precisely on the bat's “sweet spot,” or vibrational node (point of no vibration), after analyzing and reacting to the Magnus force effects on the pitch thrown by Francis.

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The Magnus force was identified in 1852 when the German physicist Gustav Magnus demonstrated that a spinning object moving through a fluid experiences a sideways deflection in its path. A twist of the wrist, and a pitch with sideways spin will deflect in the direction of the baseball's spin.

On a pitch with backspin—the conventional fastball—the Magnus force acts upward; not sufficient to lift the ball, but sufficient to deliver a perceived “hop” on its way to the plate. The ball rising is an optical illusion. Normally, the ball drops a certain amount in the quarter-second or so that it's in the air on its



Photo credit: JamieSchwaberow/
Rich Clarkson and Associates, LLC.

regular flight towards home plate. If the right backspin is obtained, the air can hold it up just a bit longer on the way to home plate, dropping a certain fraction of the regular distance. Since the eye is so used to seeing it drop the regular amount, the ball gives the illusion of rising on the way towards the batter.

“I think all baseball players, whether they're superstars or not, are aware of certain physical aspects of the game by just being around baseball and observing,” Francis says. “For example, you'll always see hitters tapping their bat with their hand and then listening to it

like a tuning fork, knowing that a higher sound means a higher frequency, which means harder wood, which, in turn, means the ball will jump off the bat more.”

Francis says teammates knowing about his physics background often tease him good-naturedly about

being an intellectual, although “I can't get any more crossword clues than anyone else.”

Adapted from the June/July 2006 issue of Symmetry magazine (<http://symmetrymagazine.org>) with permission.

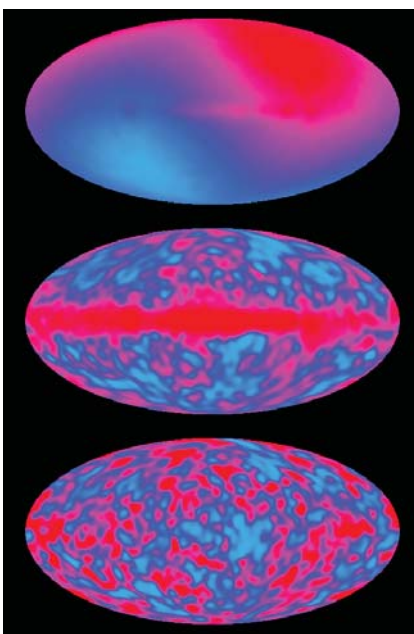
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resulting spectrum should look like. NASA launched COBE on November 18, 1989, and got the first results after a mere nine minutes of observations. The accumulated data points formed a perfect spectrum. It was such a perfect match with theory that, when the resulting curve was first shown at the 1990 American Astronomical Society meeting, there were audible gasps in the assembled scientists, followed by a standing ovation. From this, the team was able to measure the minute temperature fluctuations in the CMB, and therefore where matter in the universe began to aggregate.

Mather and Smoot, together with other members of the COBE

project collaboration, first announced their results in 1992. APS Executive Officer Judy Franz was at the APS meeting fourteen years ago. “I remember attending the COBE talk in '92,” says Franz. “We all knew it was exciting at the time. In recent years, people tended to ask not whether it was worthy of a Nobel Prize, but when the Nobel Committee would get around to presenting them with the award. I'm glad they finally ended the suspense.”

On the right, different contributions to the Cosmic Microwave Background Radiation based on two years of COBE Observation.



Credit: COBE/DMR Science Team

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spending for science and technology over five years, comparable to the ACI.

The morning session featured comments from representatives from Congress, the respective presidents of the NAS and National Academy of Engineering, US Secretary of Labor Elaine Chao, and Norman Augustine, who chaired the NAS committee that produced the *Gathering Storm* report.

Several speakers urged the attendees to not rely solely on national federal efforts, but also to take local action, especially when it comes to education. Sen. Jeff Bingaman (D-NM) emphasized that the Senate

legislation is an authorization bill, not an appropriations bill. “This legislation only provides incentives to strengthen math and science education,” he said. “It's up to the states, universities and local school districts to step up to the plate and translate those incentives into real opportunities for students, and for change.”

He continued, “The task of securing our economic future will require sustained effort at every level of society: local, state and federal,” said. “Without such an effort, at all levels, we will fail to capitalize on the exceptional intellectual strength of our top scientists and engineers.”

Among the featured morning speakers was Dean Kamen, president of DEKA Research & Development Corporation and inventor of the Segway transporter and the wearable insulin pump. A strong proponent of STEM education, Kamen also founded FIRST (For Inspiration and Recognition of Science and Technology), which sponsors such events as high-school robotics competitions and middle-school Lego competitions. He closed by quoting William Butler Yeats: “Education is not the filling of a pail but the lighting of a fire.”

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medal was **Sherry Gong**, a junior at Phillips Exeter Academy in Exeter, NH(NH-1st).

In an unofficial ranking of countries based on total team score, the US team placed second, outscored only by the Chinese team.

From 1986 to 2006 the United

States teams have brought home 30 gold medals, 21 silver medals, 26 bronze medals, and 11 honorable mentions.

The Olympiad is an international competition among pre-university students from more than 80 nations. The goals of the Olympiad

are to encourage excellence in physics education and to reward outstanding physics students.

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were to control the robot's orientation; three separate experiments on magnetism in zero-gravity; a study of granular materials in an electric field; an investigation of how paints interact with themselves, each other, and different surfaces while producing unique artwork in zero-g; and an experiment to measure the tumble rate of a two pound picosatellite.

The flights were successful, and all groups got some good data to take back for their students to analyze. The teachers and participating students then returned to their schools to share what they've learned by giving presentations about their experiments and developing activities for use in their schools and communities.



Photo Credit: AIP Media and Government Relations Staff

Representative Jim Moran (D, VA-8th) meets with Olympian Meyoung Lee in the halls of Rayburn.

TALKING POINTS: Containing nuclear proliferation

Editor's Note: The following is an edited excerpt from an extended Q&A interview with Sidney Drell and Richard Garwin. Garwin contributed to the design of the first thermonuclear weapon in 1952 and Drell worked on a JASON study in 1960 that examined national security issues; both went on to serve in prominent federal advisory positions. The full interview, which took place before the North Korean nuclear test, can be found online at www.aps.org/apsnews/0806/080620.cfm

Q: What do you think is the right size nuclear arsenal?

GARWIN: There's no security in having vast numbers of nuclear weapons. There's insecurity in our having vast numbers, and especially having vast numbers of not very well protected nuclear weapons in Russia. The US could immediately reduce its arsenal to two thousand nuclear weapons and within a couple of years to one thousand nuclear weapons total, including reserves. And that would be on the way to having a few hundred nuclear weapons in the world all together.

DRELL: I can't think of any value to having more than a few hundred. If I had infinite confidence that I knew all scenarios coming I might say we should get rid of all nuclear weapons, along with other countries. But I can't envisage every possible scenario. ... But if a dictator knows that we have five, or ten, or a hundred nuclear weapons then he also knows it would be total suicide for him to act crazy. So nuclear weapons might have value while we're sorting out this new world with terrorists. I'm not quite arrogant enough to say “I know they have zero purpose, get rid of them.”

Q: Some analysts warn that the US lacks the weapon to hold certain hard and deeply buried targets at risk and they proposed developing a Robust Nuclear Earth Penetrator—the “bunker buster.” What do you think of that weapon concept?

GARWIN: The typical justification for a program is to say: “Our current things are inadequate and we need this new one.” And so, you show that there is something that cannot be achieved with existing systems and could be achieved with a future system. Regarding the bunker buster in particular, General Cartwright, the head of STRATCOM, says he doesn't need it. He can have functional defeat of these underground facilities by controlling what goes in, what comes out, their communications, and so on. More generally, we need to recognize that in order to limit what other countries do, we have to accept limitations ourselves.

Q: Do you think the fact that North Korea and Iran are pursu-

ing nuclear weapons means that our nonproliferation policies are failing? Is it inevitable that more countries will develop nuclear weapons?

DRELL: Only eight countries have nuclear weapons—that's an extraordinarily successful achievement over 61 years. With the spread of nuclear technology, it's become clear that the NPT needs to be supplemented by further restrictions in order to keep countries from becoming latent or virtual nuclear powers. Additional restrictions to the NPT are necessary, such as allowing challenge inspections to all suspect facilities, not just to declared facilities. There's a Proliferation Security Initiative that has countries working together to prevent the shipment of equipment that facilitates uranium enrichment. And the President has a proposal, and so does Mohamed El Baradei at the IAEA, that restricts development of new national enrichment and reprocessing facilities and in exchange provides fuel service guarantees. I think we also need restrictions that say we're not going to build arsenals larger and that we're not going to test nuclear weapons. I think some of these things should be put in the legislation by Congress.

Q: You have been working on these issues for more than four decades; how would you characterize this moment?

DRELL: We are now, I think, facing a very different and more difficult problem. That is keeping the most dangerous material and weapons out of the hands of very dangerous people for whom the conventional notion of deterrence doesn't work. Nations have to work together, cooperatively, to prevent proliferation. And I think that at the moment we're really at a crossroads. ... With more nuclear-armed countries and more confrontations, nuclear weapons will gain increasing relevance around the world and the likelihood of crossing the nuclear threshold, even at a low level, I think, will grow. So, I think we're at a very dangerous point and I just urge the leaders of countries to continue to use diplomacy as creatively as possible, balancing carrots and sticks. I see no other course.

The Back PAGE

Science moves to the front burner

by Congressman Sherwood Boehlert (R-NY, 24th)

Science and technology can give us tools to address some of the most important and difficult challenges facing our nation. We won't be able to eliminate our addiction to oil, reduce our vulnerability to terrorism, or remain economically competitive if we don't have the world's best minds in this and future generations working to make new scientific discoveries and develop new technologies.

For the first time in years, science and technology—and the vital role they play in ensuring America's future economic competitiveness—are receiving the attention they deserve, and they are on the brink of receiving commensurate funding.

The dramatically improved policy landscape can be attributed, in part, to the National Academy of Sciences report, *Rising Above the Gathering Storm*, which took Washington by storm. Prior to the release of that report, the competitiveness issue was frankly not on the front burner. Now it is.

Even in the highly divisive atmosphere that now prevails in Washington, there is unity on the fundamentals about competitiveness, and the President as well as Congress, and both political parties are touting their efforts to increase

spending on physical science research and to increase the focus on science, technology, engineering and mathematics, or STEM, education.

Most important, Congress is likely to approve substantial increases in funding for three key physical science agencies—the National Science Foundation (NSF), the Department of Energy's (DOE) Office of

Science, and the National Institute of Standards and Technology (NIST).

These three agencies are especially critical because they're not focused on advancing any single government mission, but rather on strengthening the nation's overall capacity in science and engineering through the support of basic research and, in the case of NSF, education. They are the right agencies to concentrate on.

They are the agencies for which the President requested significant spending increases in his fiscal 2007 budget as part of the American Competitiveness Initiative he announced in his State of the Union message.

The conspicuous request for those increases in a very tight budget that was not kind to any other non-security, non-military spending was pretty remarkable. But perhaps even more amazing has been the Congressional response—namely, we've gone along with it.

A number of Members of Congress, including me, have been calling for these increases for years (as have science groups, such as the American Physical Society). And we have had some important allies, most notably Rep. Frank Wolf of Virginia, who chairs the House panel that funds NSF and NIST. But all of us were voices in the wilderness. Now we've got company.

While final spending bills for these key agencies have yet to be hammered out, both the House and Senate have passed bills that include the money to fully fund the President's request, and at some point we will send to the President fiscal 2007 spending bills that will include major increases for the three agencies as part of a planned 10-year doubling of their budgets.

So there has been tremendous progress, and it will mean that American colleges and universities will have more money for research and higher education. And that will mean

number of teachers called for in the *Gathering Storm* report.

Back in June, the House Science Committee passed a bill, H.R. 5358, the Science and Mathematics for Competitiveness Act, that authorizes the needed increases for the Noyce program.

The bill also includes funding authorization and language for some other key programs including the Math and Science Partnerships, which bring together universities and school districts to improve K-12 education; and a program to create centers at universities to improve undergraduate STEM education. The experts point out that undergraduate education is really the linchpin of the system because it's where we get our next generation of teachers.

Also back in June, the Science Committee passed a bill, H.R. 5356, the Research for Competitiveness Act, that addresses some of the *Gathering Storm* report's recommendations on accelerating innovative science and engineering research. The bill expands NSF's early career research grants program and authorizes new early career research grants programs at NSF and DOE, modeled on the former President's Young Investigator Awards program, that encourages industry to support promising young research faculty conducting basic research by providing federal matching funds.

Our Science Committee bills are bipartisan, and they are targeted—they focus on improving existing programs, and the funding included in the bills is restrained and based on thoughtful calculations of how much is needed.

Unfortunately, the Science Committee bills have been stalled by a handful of conservative House Members who are unwilling to see us increase spending on almost any domestic program and by some of the more ideological elements within the White House. In the face of their opposition, the House leadership has not been willing to move the bills forward. That's a missed opportunity.

We have not given up, though. The Science Committee will keep pushing on science and engineering research, and on math and science education, until the very end of this Congress. The elements in the White House who are more kindly disposed to the legislation are working on their colleagues; House and Committee leaders are still talking, and no one knows what will happen when Congress returns in November.

In the meantime, the Senate introduced its bipartisan competitiveness package in September after months of negotiation. The introduction of that package is good news because it demonstrates the Senate's commitment to this issue, but I'd like to see a more streamlined, targeted approach than the 209-page Senate bill. Unless we set priorities, the legislation won't have any impact. And the Senate package could not possibly get through the House.

So while I can't say I'm optimistic that we'll get authorizing legislation enacted this year, all the pieces we need to do so are on the board, and we could negotiate a good bill if we were given the green light to do so. And regardless of the authorizing legislation, Congress is likely to increase spending on research significantly this year.

So my colleagues who will be around for the 110th Congress in January, will be in a good position to start right in again on STEM issues when Congress convenes. And now that the issue is on the front burner, it's not going to go away.

Congressman Sherwood Boehlert (R, NY-24th) is the Chair of the House Science Committee. He is currently serving in his 12th term. Congressman Boehlert will be retiring at the close of the 109th Congress.



that the nation is taking some important steps to preparing for the future.

On the education side, frankly, the picture isn't quite as rosy. While Congress has increased spending for education in recent years, we need to be doing more to focus specifically on improving STEM education at the K-12 and undergraduate levels. And NSF needs to play an important role in that, as it has historically.

My one disappointment with the President's proposals was that they did not include substantial increases for NSF's education programs. NSF has unparalleled expertise in STEM education, it awards funds competitively, and it is uniquely placed to bring universities, community colleges and school districts together. Its summer institutes back in the 1960s are still viewed as a high water mark in federal efforts to improve

what we now call STEM education. So we ought to be making greater use of NSF.

The NSF education program that I'm most enthusiastic about is, not surprisingly, one I created along with Senator Jay Rockefeller. The reason

we created it is that we believe—and research has now borne out this belief—that the key to improving STEM education is improving the quality of the classroom teacher.

The program, the Robert Noyce Scholarship Program, provides grants to colleges and universities to award scholarships to top science, math and engineering majors who agree to teach at the K-12 level two years for each year they receive aid.

The Noyce program, which has only been funded for a few years, is beginning to show results. But the funding is small—less than \$10 million. I want to see the program increase over the next several years, as the NSF budget increases, to around the \$40 million level to create the

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