

**FUNDING FOR THE AMERICA COMPETES ACT
IN THE FISCAL YEAR 2009
ADMINISTRATION BUDGET REQUEST**

HEARING
BEFORE THE
**COMMITTEE ON SCIENCE AND
TECHNOLOGY**
HOUSE OF REPRESENTATIVES
ONE HUNDRED TENTH CONGRESS

SECOND SESSION

FEBRUARY 14, 2008

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**FUNDING FOR THE AMERICA COMPETES ACT
IN THE FISCAL YEAR 2009 ADMINISTRATION
BUDGET REQUEST**

THURSDAY, FEBRUARY 14, 2008

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Committee met, pursuant to call, at 12:00 p.m., in Room 2318 of the Rayburn House Office Building, Hon. Bart Gordon [Chairman of the Committee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
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***Funding for the America COMPETES Act in the FY2009
Administration Budget Request***

Thursday, February 14, 2008
10:00am – 12:00pm
2318 Rayburn House Office Building

Witness

Dr. John H. Marburger, III
Director
Office of Science and Technology Policy (OSTP).

**COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES**

**Funding for the America COMPETES Act
in the Fiscal Year 2009
Administration Budget Request**

THURSDAY, FEBRUARY 14, 2008
10:00 A.M.–12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Wednesday, February 14, 2008, the Committee on Science and Technology will hold a hearing to consider how the Administration's FY 2009 budget proposal addresses programs authorized in the *America COMPETES Act* (P.L. 110–69) within the jurisdiction of the Committee. Subcommittees will hold additional hearings regarding specific agency budgets, including for the National Science Foundation (NSF), National Institute of Standards and Technology (NIST), and Department of Energy (DOE).

2. Witness

Dr. John H. Marburger, III is Director of the Office of Science and Technology Policy (OSTP). The mission of the office is to serve as a source of scientific and technological analysis and judgment for the President with respect to major policies, plans, and programs of the Federal Government. Dr. Marburger also co-chairs the President's Committee of Advisors on Science and Technology (PCAST) and supports the President's National Science and Technology Council (NSTC).

3. Overview

H.R. 2272, the *America COMPETES Act* (COMPETES) passed the House of Representatives (367–57) and the Senate (by Unanimous Consent) on August 2, 2007 and was signed into law by the President on August 9, 2007.

A response to the 2005 National Academies' report *Rising Above the Gathering Storm*, COMPETES seeks to ensure U.S. students, teachers, businesses, and workers are prepared to continue leading the world in innovation, research, and technology. The law implements recommendations from the *Gathering Storm* report, and specifically:

- Authorizes \$33.6 billion over fiscal years 2008–2010 for science, technology, engineering, and mathematics (STEM) research and education programs across the Federal Government;
- Keeps research programs at NSF, NIST and the DOE Office of Science on a near-term doubling path;
- Helps to prepare new teachers and provide current teachers with content and teaching skills in their area of education through NSF's Noyce Teacher Scholarship Program and Math and Science Partnerships Program;
- Expands programs at NSF to enhance the undergraduate education of the future science and engineering workforce, including at two-year colleges;
- Expands early career graduate-level grant programs and provides additional support for outstanding young investigators at NSF and DOE;
- Creates the Technology Innovation Program (TIP) at NIST (replacing the existing Advanced Technology Program or ATP) to fund high-risk, high-reward, pre-competitive technology development with high potential for public benefit;
- Puts the Manufacturing Extension Partnership (MEP), which provides cost-shared technical assistance to small manufacturers to modernize their operations, on a path to doubling over 10 years;

- Establishes an Advanced Research Projects Agency for Energy (ARPA-E), a nimble and semiautonomous research agency at the Department of Energy to engage in high-risk, high reward energy research;
- Includes provisions throughout the bill to help broaden participation by women and minorities in science and engineering fields at all levels; and
- Strengthens interagency planning and coordination for research infrastructure and information technology (i.e., high-speed computing).

The President released his FY 2009 budget proposal on February 4, 2008. The budget proposes funding increases for physical sciences research programs as part of the American Competitiveness Initiative (ACI), many of which are consistent with increases authorized in COMPETES. However, the Administration's budget ignores or neglects several other areas of COMPETES, including math and science education activities at NSF, manufacturing and technology stimulus programs at NIST, and important energy programs including ARPA-E.

4. Funding for the America COMPETES Act, by Agency

National Science Foundation (NSF)

The COMPETES Act put NSF on a seven-year doubling path, authorizing \$7.326 billion in FY 2009. The Administration's FY 2009 request for the National Science Foundation is \$6.854 billion, \$822 million (13.6 percent) above the FY 2008 level of \$6.032 billion.¹ While the FY 2008 omnibus gave only a 2.5 percent increase to NSF over FY07, the Administration's FY 2009 request reflects a determination to keep NSF on a 10-year doubling path proposed under the FY07 American Competitiveness Initiative (ACI).

Research and Related Activities

The request for the Research and Related Activities (R&RA) account is \$5.594 billion, \$773 million (16 percent) over the FY 2008 estimate of \$4.821 billion and \$150 million less than authorized in COMPETES. In keeping with the Administration's emphasis on the mathematical and physical sciences, engineering and computer sciences under the ACI, those directorates, in addition to cyberinfrastructure, each see an approximately 20 percent increase over FY 2008, while the biological sciences (+10.3 percent) and social, behavioral and economic sciences (+8.5 percent) see more modest increases. Although the COMPETES Act does not assume that all fields will receive equal increases each year, the law does specifically call on NSF not to disinvest in the biological and social sciences over the long-term.

K-16 STEM Education Programs

The COMPETES Act authorized \$995 million for the Directorate for Education and Human Resources (EHR) in FY 2009. The Administration's FY 2009 request for EHR is \$790.41 million, an increase of \$64.81 million (8.9 percent) over FY 2008, but still \$205 million short of the authorized level. Most of the increases authorized in COMPETES were directed to two K-12 programs: the Math and Science Partnerships Program (MSP), which supports teacher professional development, and the Robert Noyce Teacher Scholarship Program, which educates K-12 STEM teachers, focusing on both pedagogy and content areas. In the FY 2009 request, MSP receives a \$2.5 million increase to \$51 million (\$60 million below the authorized level) and Noyce receives \$11.6 million (\$3.5 million below the FY 2008 appropriated level and \$103 million below the FY 2009 authorized level). (Note: The FY 2009 budget request indicates that NSF plans to provide only \$10.8 million for Noyce in FY 2008, despite the omnibus appropriation report's specification of \$15 million.) Two undergraduate programs, the STEM Talent Expansion Program and the Advanced Technological Education program, are flat-funded in FY 2009 despite being authorized for 10 percent increases in COMPETES. The Administration's rationale for flat-funding all of these education programs and not funding Noyce at the level of the appropriations directive is that they have not yet undergone the evaluation required under the new Academic Competitiveness Council (ACC) process. (Note: With regard to the Noyce program, the ACC is evaluating the program as it was implemented in previous years, not the significantly revised Noyce program authorized in COMPETES).

¹The expected FY 2008 funding level is \$33 million below the appropriated level due to a rescission required by the Appropriators in the FY 2008 omnibus bill.

National Institute of Standards and Technology (NIST)

COMPETES put NIST on a ten-year path to doubling, authorizing \$881.8 million in FY 2009 for research, lab construction, and the external industrial technology programs. The President's FY 2009 budget requests \$638 million for NIST, 16 percent below the FY 2008 estimated budget. While the request comes close to the authorized level for NIST internal research programs, it eliminates or severely reduces funding for the external industrial technology programs. This reflects a continued Administration opposition to the industrial technology programs.

NIST Labs and Lab construction

The NIST internal research laboratories perform research in support of measurement science and technology and technical standards development. COMPETES put the internal research laboratory account on a ten-year path to doubling, authorizing \$541.9 million in FY 2009. The budget proposal nearly matches this level (falling short by \$6.9 million or 1.3 percent), in keeping with the Administration's emphasis under ACI on supporting basic research in the physical sciences. The budget proposes \$99 million in funds for laboratory construction. In addition to COMPETES-authorized funds for basic maintenance and completing construction of high-performance laboratory space at the NIST campus in Boulder, CO, the budget proposes new funding for an expansion of office and laboratory space at JILA, a joint research institute operated by NIST and the University of Colorado.

Technology Innovation Program (TIP)

The Technology Innovation Program (TIP) was created in COMPETES to replace the Advanced Technology Program (ATP). TIP awards cost-shared grants to small companies and joint ventures for the development of high-risk, high-reward technologies that meet critical national needs, and was based in part on Administration proposals for reforming ATP. Under the provisions in COMPETES, TIP will continue to fund grants that were originally awarded by ATP in 2007, and will make its first round of new awards in 2008.

The Administration's budget proposes zero funding for TIP. The Administration justifies the elimination of the program by arguing that TIP would support activities that private industry has the means to support. The Administration has not provided documentation to support this assertion.

Manufacturing Extension Partnership (MEP)

The MEP program is a public/private partnership in all 50 states and Puerto Rico that provides technical assistance for small manufacturers to modernize their operations and adapt to foreign competition. MEP Centers are supported by equal contributions from federal funds, State funds, and client fees. In FY 2006, MEP clients reported increased or retained sales of \$6.76 billion, cost savings of over \$1.1 billion, new client investment of over \$1.6 billion, and more than 51,000 jobs created or retained.

The COMPETES Act put the MEP program on ten-year path to doubling, authorizing \$122 million in FY 2009. The budget proposes only \$4 million for MEP, to be used to close out the program. The Administration states that the MEP centers will change to a self-supporting basis, as the Administration asserts was intended in the original authorization. However, the *Technology Administration Act of 1998* (P.L. 105-309) extended the lifetime of MEP Centers indefinitely, so long as they receive a positive evaluation through an independent review. It is unclear that the Centers can operate on a self-sustaining basis, and the Administration has not provided any documents to indicate that this would be possible.

Department of Energy

The FY 2009 Administration request for the entire Department of Energy is \$25 billion. Of that, approximately \$8.6 billion is dedicated to non-defense activities in Science, Energy Efficiency and Renewable Energy, Nuclear Energy, Fossil Energy and Electricity. The remaining \$16.4 billion is divided between the nuclear weapons mission, environmental cleanup and management of radioactive waste.

Office of Science

The FY 2009 budget request for the DOE Office of Science is \$4.7 billion. This represents an increase of \$704 million, or 18 percent over the FY 2008 enacted level of funding, and \$478 million or nine percent below funding authorized in COMPETES. (Note: COMPETES includes only a top-line authorization level for the DOE Office of Science; it is silent on funding for specific research program areas.)

The request for Basic Energy Sciences (BES) is \$1.6 billion, an increase of \$298 million or 23 percent over enacted FY 2008 funding. As the largest program within

the Office of Science, BES conducts research primarily in the cross-cutting areas of materials and chemical sciences, and, based on a series of recent workshops, plans to focus more on specific research areas for energy applications.

The budget would provide \$369 million for Advanced Scientific Computing Research (ASCR), an increase of \$18 million or five percent over enacted FY 2008 funding. This includes funds to continue upgrading the Leadership Class Facilities at Oak Ridge National Laboratory and Argonne National Laboratory.

Biological and Environmental Research (BER) would receive \$569 million under the President's budget, which is \$24 million over current year funding. In addition to the role of BER in areas such as genomics, climate change research, medical applications, and environmental remediation, the FY 2009 request supports continued funding for three bioenergy centers established in 2007.

The FY 2009 funding request for High Energy Physics (HEP) is \$805 million, which is \$117 million or 17 percent more than the enacted FY 2008 level. This program conducts fundamental research in elementary particle physics and accelerator science and technology. Funding for the NOvA neutrino physics experiment and research in preparation for the International Linear Collider at the Fermi National Accelerator Laboratory and Stanford Linear Accelerator Laboratory are restored in this request.

Fusion Energy Sciences (FES) receives \$493 million, an increase of \$207 million or 72 percent over enacted FY 2008 funding. Of this amount, \$214 million is dedicated to restoring funding for the U.S. role in the International Thermonuclear Experimental Reactor (ITER). Finally, Nuclear Physics (NP) would receive \$510 million, an increase of \$77 million (18 percent) over FY 2008 funding.

Math and Science Education Programs within DOE

The DOE Office of Science's Workforce Development for Teachers and Scientists (WDTS) program funds a number of math and science education programs. The FY 2009 funding request for WDTS is \$13.6 million, an increase of \$5.6 million or 70 percent over enacted FY 2008 funding. This includes funding for the National Science Bowl, a math and science knowledge competition among high school teams across the country; the Science Undergraduate Laboratory Internship (SULI) program, which supports students working at DOE National Laboratories in individually mentored research experiences; and the DOE Academies Creating Teacher Scientists (DOE ACTS) program, which assists educators in improving their content knowledge in areas of high importance to DOE missions and in becoming contributing researchers in the scientific community.

Recognizing the importance of K-12, undergraduate, and graduate STEM education to the Nation's competitiveness and particularly workforce needs in the energy industry, COMPETES directs the DOE Office of Science, through a Director of Mathematics, Science and Engineering Education, to expand and raise the profile of STEM education activities at the Department of Energy. COMPETES directs the Department to establish a separate fund using .3 percent of all DOE R&D funds for education activities, and provide an accounting of this funding in the Administration's budget request. The budget request does provide a funding summary for education activities at the Department. However, the budget request does not clearly indicate whether a separate fund has been established or whether a Director has been named.

In addition, COMPETES authorizes several STEM education programs that are not explicitly funded in the President's budget. These include a pilot program of grants to specialty schools for science and mathematics, education programs for middle and high school students and professional development programs for teachers at National Laboratories, and programs to expand research and education at universities for nuclear and hydrocarbon (oil and gas) science.

ARPA-E

The COMPETES Act authorized the establishment of an Advanced Research Projects Agency for Energy, or ARPA-E. ARPA-E was created to fund collaborative research and development to overcome long-term or high-risk technological barriers in energy technologies that industry by itself will not undertake because of technical and financial uncertainty. The COMPETES Act authorized \$300 million for the initial year of ARPA-E's programs. Other legislative proposals establishing ARPA-E called for subsequent year's funding as high as \$1 billion to \$1.5 billion. The Administration's FY 2009 budget proposal contains no requested funds for ARPA-E. COMPETES also calls for the appointment of a Director for ARPA-E, and the legislative report further specifies that an Acting Director should be appointed to serve until a Director is confirmed by the Senate. The President has not yet appointed an Acting Director.

ARPA-E is intended to be unique not only in the type of research it conducts, but also in how it conducts that research. ARPA-E is intended to be a nimble and semi-autonomous agency within the Department of Energy, similar to the Defense Advanced Research Projects Agency at the Department of Defense (DARPA). Like DARPA, the Director of ARPA-E should establish and monitor project milestones, initiate research projects quickly, and just as quickly terminate or restructure projects if such milestones are not achieved. Projects are intended to be conducted through teams that utilize the talent, resources, and facilities found in the Nation's universities, National Laboratories and in the private sector. The Director is also given special hiring authority to quickly recruit technical staff as program managers on a short-term basis, and offer competitive salaries rivaling those of industry. The Administration has not moved towards establishing ARPA-E, nor do any current or proposed programs at the Department resemble the organizational structure or operating principles of ARPA-E as outlined in the COMPETES Act.

Chairman GORDON. This hearing will now come to order. Thank you all for your patience. Dr. Marburger, last year we had snow. This year we had a memorial service, and I suspect we will have some act up as we go through, so we want to be courteous to your time and try to move forward; and I am sure Mr. Hall will be here soon and add his presence to this good hearing.

Now, last August Congress passed and the President signed into law the *America COMPETES Act*, a response to the 2005 National Academy Report, *"Rising Above the Gathering Storm,"* and supported by a wide-range of U.S. industries, universities, and science organizations. COMPETES seeks to ensure U.S. students, teachers, businesses, and workers will continue leading the world in science innovation, research, and technology. And as we know, the global marketplace continues to become more competitive. The fact of the matter is, our country cannot and should not compete with the rest of the world on wages when half the workers in the world make less than \$2 a day. Our country needs to compete at a higher level and with better skills and higher productivity. This was the goal of the *America COMPETES Act*.

The law presents a balanced set of policies to improve our country's short-term and long-term competitiveness. COMPETES invests in long-term science and research but also short-term technology development and innovation. And just as importantly, COMPETES ensures that not only our nation will produce the world's leading scientists and engineers but also that all students will have a strong grounding in math and science and are prepared for technical jobs in every sector of the economy.

And although the Administration's budget is supportive on basic research, it is weak on several other components critical to our nation's competitiveness. Unfortunately, our students are far from measuring up compared to other industrialized countries. According to the latest OECD Program for International Students, students in America ranked 25th out of 30 developed countries in math. In science, the news is just as bad. U.S. students ranked 21st in science, down from 19th in 2003 and 14th in 2000. In fact, 25 percent of U.S. students failed to reach even a basic level where they could identify scientific concepts or apply data for a personal decision. Knowing this, I am deeply disappointed that, yet again, the President's budget does make K-12 education programs at NSF a priority.

The top recommendation of the National Academies was to ensure K-12 STEM teachers across the country have strong content knowledge and effective teaching skills. The National Academies' report cited the UTeach program which was developed 10 years ago at the University of Texas, as an example of what is working for STEM teacher education. Based on its success, UTeach has been used as a model for the State of California in an effort to reform STEM teacher education. Likewise, the private sector has pledged significant funding to expand this teacher education model nationwide.

This committee led the way in COMPETES, making this top priority and revamping the NSF's Robert Noyce scholarship. But under the Administration's budget, the Noyce program would re-

ceive only 10 percent of the funding needed to mobilize this new program.

COMPETES also seeks to ensure that U.S. companies and small businesses lead the world in innovation, creating jobs in the process. Our country has lost 3.4 million manufacturing jobs since 2000, and 217,000 jobs lost in 2007 alone; and manufacturing employment in the U.S. now stands at its lowest point since 1950.

COMPETES seeks to reverse this trend with robust funding for the Manufacturing Extension Partnership and Technology Innovation Program, both of which have a proven track record for return on investment and job creation. However, the Administration's budget phases out MEP and eliminates TIP immediately. These programs help create good American jobs that this budget would put in jeopardy.

And finally, COMPETES seeks to reduce our dependency on foreign energy and address global climate change through Advanced Research Projects Agency for Energy, or ARPA-E. Modeled after the Defense Department's successful DARPA program, ARPA-E is charged with rapidly developing and commercializing transformational clean energy technologies through collaborative research with universities, our national labs, and the private sector.

Nothing like this research model currently exists within the Department of Energy. A successful ARPA-E will stand on its own within the Department and have the authority and resources to quickly assemble teams to ramp up on research projects that neither industry nor the Department will do on its own. A successful ARPA-E might just cause us to rethink how we do energy research in the United States, and I hope the Administration will reconsider its lack of support for this program.

And finally, Dr. Marburger, I appreciate the report on a variety of R&D programs included in your written testimony, but I also hope that you will address the important COMPETES programs authorized by Congress and signed by the President within your testimony.

[The prepared statement of Chairman Gordon follows:]

PREPARED STATEMENT OF CHAIRMAN BART GORDON

Last August, Congress passed and the President signed into law the *America COMPETES Act*. A response to the 2005 National Academies' report *Rising Above the Gathering Storm*, and supported by a wide range of U.S. industries, universities, and science organizations, COMPETES seeks to ensure U.S. students, teachers, businesses, and workers will continue leading the world in science, innovation, research, and technology.

As we all know, the global marketplace continues to become more competitive. The fact of the matter is, our country cannot and should not compete with the rest of the world on wages when half of the world's workers earn less than \$2 a day. Our country needs to compete at a higher level—with better skills and higher productivity.

This was the goal of the *America COMPETES Act*.

The law presents a balanced set of policies to improve our country's short-term and long-term competitiveness. COMPETES invests in long-term science and research, but also short-term technology development and innovation.

Just as importantly, COMPETES ensures not only that our nation will produce the world's leading scientists and engineers, but also that all students will have a strong grounding in math and science and are prepared for technical jobs in every sector of the economy.

Unfortunately, although the Administration's budget is supportive on basic research, it is weak on several other components critical to our country's competitiveness.

Dr. Marburger, I see in your testimony that you quoted from the President's State of the Union Address. Well I would like to quote the President's speech as well. The President said that: "Last year, fourth and eighth graders achieved the highest math scores on record."

I suppose that's the good news. Unfortunately, the bad news is that our students are far from measuring up compared to other industrialized countries. According to the latest OECD Program for International Students Assessment, or PISA, students in the U.S. ranked 25th out of 30 developed countries in math.

In science, the news is just as bad—U.S. students ranked 21st in science—down from 19th in 2003 and 14th in 2000. In fact, 25 percent of U.S. students failed to reach even a basic level where they could identify scientific concepts or apply data to a personal decision.

Knowing this, I am deeply disappointed that, yet again, the President's budget does not make K–12 education programs at NSF a priority.

The top recommendation of the National Academies was to ensure K–12 STEM teachers across the country have strong content knowledge and effective teaching skills. The National Academies' report cited the UTeach program, which was developed 10 years ago at the University of Texas, as an example of what is working for STEM teacher education.

Based on its success, UTeach has been used as a model by the State of California in an effort to reform STEM teacher education. Likewise, the private sector has pledged significant funding to expand this teacher education model nationwide.

This committee led the way in COMPETES, taking this top recommendation and revamping NSF's Robert Noyce scholarship. But under the Administration's budget, the Noyce program would receive only 10 percent of the funding needed to mobilize the new program.

COMPETES also seeks to ensure that U.S. companies and small businesses lead the world in innovation, creating jobs in the process. Our country has lost 3.4 million manufacturing jobs under this Administration's watch, with 217,000 jobs lost in 2007 alone, and manufacturing employment in the U.S. now stands at its lowest point since 1950.

COMPETES seeks to reverse this trend with robust funding for the Manufacturing Extension Partnership and Technology Innovation Program—both of which have proven track records for return on investment and job creation.

However, the Administration's budget phases out MEP and eliminates TIP immediately. These programs help create good American jobs that this budget would put in jeopardy.

Finally, COMPETES seeks to reduce our dependence on foreign energy and address global climate change through an Advanced Research Projects Agency for Energy—ARPA-E. Modeled after the Defense Department's successful DARPA program, ARPA-E is charged with rapidly developing and commercializing transformational clean energy technologies through collaborative research with the university and private sector.

Nothing like this research model currently exists within the Department of Energy. A successful ARPA-E will stand on its own within the Department, and have the authority and resources to quickly assemble teams to crash on research projects that neither industry nor the Department will do on their own. A successful ARPA-E just might cause us to rethink how we do energy research in the U.S., and the Administration should reconsider its lack of support for the program.

The President is right that basic R&D funding included in his American Competitiveness Initiative is important to our economy and our future. But I believe the Administration is wrong that we don't also need to be committed to a globally competitive workforce, investments in small manufacturers that create jobs, and a new approach to cutting edge energy research.

Last year, the President threatened to veto appropriations bills that would have come much closer to fully funding COMPETES, as well as his ACI. The Administration should listen to the businesses and educators and scientists and engineers in this country and support full funding of COMPETES this year.

I look forward to hearing your testimony on these issues.

Chairman GORDON. And now the Chair recognizes just on cue Mr. Hall for his opening statement.

Mr. HALL. Thank you, Mr. Chairman. You are always on time and proper and kind to senior citizens, and I thank you, Mr. Chair-

man, and good morning, Dr. Marburger. It is good to have you before us.

I am sure that we can all agree that striking that delicate balance between adequately funding and giving proper funding to the Nation's priorities while at the same time exhibiting fiscal restraint to reduce the deficit continues to be quite a challenge. That is going in both directions at the same time. Likewise, I know we also are all in agreement that if we are to remain the world leader in competitiveness and innovation, we have to make the appropriate investments in research, appropriate investments in development, technology, and math and science education.

I am pleased to see the fiscal year 2009 budget request gets us back on path to double the funding for physical sciences and engineering at the National Science Foundation, National Institute of Standards and Technology, and the Office of Science at the Department of Energy. Building on the President's American Competitiveness Initiative and Republican-led efforts in the last Congress, we stepped up to the plate and enacted the *America COMPETES Act* last year, authorizing increased levels of funding for these agencies. So I am sure you share in my surprise and my disappointment when I realized that our friends over on the Appropriations Committee did not see fit to adequately fund these agencies for this fiscal year. The funding they provided was not only 12 percent below the level that we authorized in COMPETES, it was six percent below the President's fiscal year 2008 budget request levels. This is absolutely and just simply unacceptable. The returns that we receive from our investments in these agencies far exceeds the cost. As I have stated before, whether it is fighting the war on terror abroad or at home, ending our dependence on foreign oil or inspiring our children to enter high-tech fields so that the United States can continue to push the frontiers of innovation, these agencies have critical roles to play. The budget before us today keeps us moving forward in this regard.

Dr. Marburger, I am pleased to see boosts in funding for several science programs such as the Advanced Energy Initiative at DOE which works with solar, biomass, and hydrogen to move us toward a more secure energy future. But I do have a couple of areas of concern with this budget. There seems to be a number of places where the President has repeatedly cut other important science and technology programs. The Manufacturing Extension Program at NIST, for example, is significantly cut or canceled each year. And each year Congress fully funds the program. This year again, MEP is zeroed out in the budget.

As for NASA, while the agency has had modest budget increases, they have been insufficient to meet the goals laid out in the President's *Vision for Space Exploration* announced at the beginning of 2004. This has resulted in less ambitious development schedules for the Shuttle's replacement, and this year's budget request does not keep up with inflation. In two years' time, we will find ourselves in a situation in which the United States will be entirely reliant on other nations for access to our multi-billion dollar Space Station. I am concerned that America's preeminence in space may be jeopardized if we do not narrow the gap between retiring the

Space Shuttle and developing the Orion and the Ares launch vehicles.

Before yielding back to the Chairman, let me just say a word about STEM education in this year's request. I recognize and support the President's efforts to improve our STEM education, and all of their needs, through the Department of Education. There should be more focus there; however, I have great concern that this budget does not likewise reflect the STEM education responsibilities at the National Science Foundation, particularly an expanded Robert Noyce Scholarship program.

Mr. Chairman, I thank you for having this hearing, and I certainly thank the presence of the gentleman today who gives us his time not only on his way here, preparing to be here, and the history of success that he brings to this committee, and I look forward to hearing your testimony. Mr. Chairman, once again, I yield back my time.

[The prepared statement of Mr. Hall follows:]

PREPARED STATEMENT OF REPRESENTATIVE RALPH M. HALL

Thank you, Mr. Chairman. Good morning, Dr. Marburger. It's good to have you before us this morning.

I am sure that we can all agree that striking that delicate balance between adequately funding our nation's priorities while at the same time exhibiting fiscal restraint to reduce the deficit continues to be a challenge. Likewise, I know we also are all in agreement that if we are to remain the world leader in competitiveness and innovation, we must make the appropriate investments in research, development, technology, and math and science education.

I am pleased to see that the FY 2009 Budget Request gets us back on a path to double the funding for physical sciences and engineering at the National Science Foundation (NSF), the National Institute of Standards and Technology (NIST), and the Office of Science at the Department of Energy (DOE). Building on the President's American Competitiveness Initiative (ACI) and Republican led efforts in the last Congress, we stepped up to the plate and enacted the *America COMPETES Act* last year, authorizing increased levels of funding for these agencies. So, I am sure you shared my surprise and disappointment when I realized that our friends over on the Appropriations Committee did not see fit to adequately fund these agencies for this fiscal year. The funding they provided was not only 12 percent below the level that we authorized in *COMPETES*, it was six percent below the President's FY 2008 Budget Request levels. This is simply unacceptable. The returns that we receive from our investments in these agencies far exceed the costs. As I have stated before, whether it is fighting the war on terror abroad or at home, ending our dependence on foreign oil, or inspiring our children to enter high-tech fields so that the United States can continue to push the frontiers of innovation, these agencies have critical roles to play. The budget before us today keeps us moving forward in this regard.

Dr. Marburger, I am pleased to see boosts in funding for several science programs such as the Advanced Energy Initiative (AEI) at DOE, which works with solar, biomass and hydrogen to move us towards a more secure energy future. But, I do have a couple of areas of concern with this budget. There seem to be a number of places where the President has repeatedly cut other important science and technology programs, in effect robbing Peter to pay Paul. The Manufacturing Extension Program (MEP) at NIST, for example, is significantly cut or canceled each year. And each year, Congress fully funds the program. This year again, MEP is zeroed out in the budget.

As for NASA, while the agency has had modest budget increases, they have been insufficient to meet the goals laid out in the President's *Vision for Space Exploration* announced at the beginning of 2004. This has resulted in less ambitious development schedules for the Shuttle's replacement, and this year's budget request does not keep up with inflation. In two years time, we will find ourselves in a situation in which the United States will be entirely reliant on other nations for access to our multi-billion dollar Space Station. I am concerned that America's preeminence in space may be jeopardized if we do not narrow the gap between retiring the Space Shuttle and developing the Orion and Ares launch vehicles.

Before yielding back to the Chairman, let me say a word about STEM education in this year's request. I recognize and support the President's efforts to improve our STEM education needs through the Department of Education. There should be more focus there; however, I have great concern that this budget does not likewise reflect the STEM education responsibilities at the National Science Foundation, particularly an expanded Robert Noyce Scholarship program.

Thank you for coming up here today. I look forward to your testimony, and I yield back the balance of my time.

Chairman GORDON. Thank you, Mr. Hall. If there are other Members who wish to submit written opening statements, we will submit it for the record at this time.

[The prepared statement of Ms. Richardson follows:]

PREPARED STATEMENT OF REPRESENTATIVE LAURA RICHARDSON

Thank you Chairman Gordon for holding this important hearing today. I would also like to thank Dr. John H. Marburger III, Director of the Office of Science and Technology Policy for attending today's hearing.

In my written remarks for yesterday's hearing on NASA's FY '09 budget I mentioned how the "*America COMPETES Act*" will help us maintain our nation's role as leaders in the Science, Technology, Engineering, and Mathematics fields. The bipartisan manner in which "*America COMPETES*" passed both the House and Senate reflects the urgent need to preserve and expand the innovative spirit that makes America great.

I want to thank Chairman Gordon, and Ranking Member Hall for their leadership and hard-work in getting that bill passed. The \$33.6 billion authorized in "*America COMPETES*" is just the beginning of Congress's steadfast commitment to implementing the recommendations made in the "*Gathering Storm*" report.

However, implementing the recommendations is just the first step. Fully funding those recommendations is essential to the future performance of American students in the STEM fields. Unfortunately American students rank 25th and 21st out of 30 countries in math and science respectively.

Therefore given the current funding recommendations, I am concerned with our ability to fulfill the goals of the COMPETES Act.

Naturally that commitment begins in the classrooms of our elementary schools, middle schools, and high schools. Providing the necessary professional development to our teachers so they are not only competent but energized about their field of practice will benefit American students who will hopefully share in that teacher's enthusiasm for physics, biology, chemistry, or any other STEM field.

In addition to the educational aspects of "*America COMPETES*," the opportunity that this legislation provides for energy independence is crucial to our national security. I am confident that the "Advanced Research Projects Agency for Energy" will in due time accomplish the goals that they were tasked to achieve.

The policy behind "*America COMPETES*" is sound policy. Innovation and ingenuity made this country great, therefore any role that I can play to ensure that American students, scientist and engineers continue to compete at the highest level is a role and a responsibility that I wholeheartedly embrace.

Mr. Chairman I yield back.

[The prepared statement of Mr. Mitchell follows:]

PREPARED STATEMENT OF REPRESENTATIVE HARRY E. MITCHELL

Thank you, Mr. Chairman.

To maintain America's competitiveness in science and technology, we must do more than merely keep up. We must lead, and commit ourselves to providing the resources necessary to keep us at the forefront of this kind of cutting edge research and development.

I'm very proud of the *America COMPETES Act*, this committee's bipartisan legislation that got signed into law last August. This law ensures that our students, teachers, businesses, and workers are prepared to lead in science and technology.

However, the *America COMPETES Act* can only be successful if it's funded adequately.

While I appreciate that the President has expressed his support for America COMPETES and mentioned it as a priority in the State of the Union, I am concerned that the Administration's budget request does provide sufficient funding for all of the programs in America COMPETES.

I find the insufficient funding for math and science education particularly alarming. As a former teacher, I know first-hand how important it is to expose our children to STEM education. The future of American competitiveness in science and technology is heavily dependent on ensuring the involvement of future generations.

I look forward to hearing from our witness.

I yield back.

[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF REPRESENTATIVE VERNON J. EHLERS

I am pleased that Dr. Marburger is with us today to discuss how the Administration's FY09 budget proposal impacts the programs authorized by the 2007 COMPETES Act. Framing this hearing in the context of the COMPETES Act is appropriate, given the strong bipartisan support for the bill, and the fact that the bill is an authorizing measure and we are an authorizing committee.

There are many programs authorized in COMPETES on which the Congress and the Administration do not necessarily see eye-to-eye. One of these areas includes the Technology Innovation Program (formerly ATP) and Manufacturing Extension Partnership (MEP) program at the National Institute of Standards and Technology (NIST). I am disappointed that the FY09 request for these programs is substantively zero despite the COMPETES authorization, historically strong support from the Congress, and demonstrated results from these programs. I mention this today, although I know we will hold a separate hearing on the NIST budget, because I believe that the opposition to these programs originates with OSTP and not internal to NIST.

Nonetheless, I am overall very pleased to see that the President has been unwavering in his commitment to fulfilling the American Competitiveness Initiative. He has consistently affirmed the pathway he provided in 2006 for bolstering the funding for basic research at the National Science Foundation, NIST and the Department of Energy in his last three budgets. I am hopeful that we can find some common ground on the COMPETES programs and ultimately ensure that the actual funding reinforces the authorizations.

Chairman GORDON. Dr. Marburger, as you can see, there are some differences on this committee, but we are, I think, in unison on many, many areas. We welcome you here. Let me introduce Dr. Marburger to Laura and some of the new Members of our committee. He is the Director of the Office of Science and Technology Policy. He serves as the Science Advisor to the President and also co-chairs the President's Committee of Advisors on the Science and Technology and supports the President's National Science and Technology Council. Dr. Marburger, we welcome you here.

STATEMENT OF DR. JOHN H. MARBURGER, III, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY (OSTP); CO-CHAIR, PRESIDENT'S COMMITTEE OF ADVISORS ON SCIENCE AND TECHNOLOGY (PCAST)

Dr. MARBURGER. Thank you very much, Chairman Gordon, Ranking Member Hall, Members of the Committee. It is a pleasure for me to appear before you in this hearing once again on funding for the *America COMPETES Act* in the President's fiscal year 2009 Research and Development Budget. My written testimony has a lot of detail about the overall fiscal year 2009 research and development budget, so I will confine my oral remarks to the specific questions you asked me in the invitation.

Chairman GORDON. Thank you.

Dr. MARBURGER. First, let me express my gratitude to this committee for its support of the President's America Competitiveness Initiative and for its work on the very important COMPETES Act. This Act embraces recommendations from a wide range of scientists, businesses, and education leaders and their many organiza-

tions who believe federal actions are needed to ensure America's future leadership in science and engineering, fields which are essential to the processes of innovation that lead to long-term economic competitiveness.

[Slide]

I have on the screen a proclamation signed by almost 300 of those leaders.

I look forward to working together with this committee to achieve the goals of the ACI and the COMPETES Act.

You asked me how the President's budget addresses programs in the COMPETES Act within the jurisdiction of this committee. Because these details are spread throughout my written testimony and the Fiscal Year 2009 Budget Proposal document which is on line this year, not even available as a book, my office has prepared a one-page table that summarizes the numbers that you asked for, and I just show a picture of the table. I am not going to reference this table, but you will have copies of that that gives you a detailed accounting for how the COMPETES Act fares in his 2009 budget request.

So first of all, let me talk about the bottom line. Of the \$13.8 billion authorized for fiscal year 2009 in the Act, the President's budget funds \$12.2 billion or 85 percent of the authorized. This total compares favorably with the 82 percent level at which Congress funded the Act within the fiscal year 2008 omnibus bill.

[Slide]

And the next slide shows a chart. The blue bars are the authorized amounts, the red bar is the omnibus level of appropriation for COMPETES funding, the green bar—so the bars on the left are for '08, the bars on the right are for '09. The green bar represents the President's request as a fraction of what was authorized. It is—I think it is 85 percent of authorized compared with the 82 percent that was appropriated last year.

If the President's request is funded, COMPETES Act budgets would grow by almost 15 percent under this budget. To place this in context, the President's overall request for all non-defense R&D increases by six percent, compared with the remainder of the non-security discretionary budget which increases by less than one percent in this request. In constant dollars, growth and outlays in the non-defense R&D budget have increased by nearly a third under this Administration.

[Slide]

My slide before you shows the growth in non-defense, inflation-adjusted dollars for federal R&D. Total federal R&D in the 2009 Budget Request stands at \$147 billion, an increase of \$4 billion over last year's appropriated, which represents \$1 out of every \$7 requested by the President in the discretionary budget and the growth of 61 percent compared with 2001.

These figures express the strong priority the President places on research and development. Even a 14 percent growth in COMPETES funding is not enough to cover everything authorized under the Act. And so the President's request follows well-defined priorities. The Administration has accepted the conclusions of many studies and reports that funding for ACI basic research is most important and needs to be addressed first.

The order in which you asked about specific programs in your invitation to this hearing is exactly the order of priority with which they are treated the President's request. Research in physical sciences comes first with increases of approximately 20 percent in this area for each of the National Science Foundation, Department of Energy's Office of Science, and National Institutes of Standards and Technology. Math and science education activities at NSF, the next priority, are also scheduled to increase. The NSF Education and Human Resources budget would grow by about nine percent, and according to NSF's budget detail, education-related activities and other divisions would also grow. I should also mention that increases in COMPETES-related programs at the Department of Education are scheduled to increase by \$143 million which is a very substantial increase over the fiscal year 2008 omnibus funding.

These are the top priority areas. In view of the very serious under funding of the top category of research in the fiscal year 2008 omnibus and the urgent need to close the gap in this area, it was not possible to fund the remaining lower priorities within the constraints of this budget.

Mr. Chairman and Members of the Committee, I believe the President's budget proposal is a very strong one for science and is responsive to the goals and priorities expressed in the *America COMPETES Act*. This is the third year in which the President is proposing a budget that would substantially strengthen America's long-term competitiveness in a globalized high-technology world economy, and I hope that our joint efforts this year will lead to a Fiscal Year 2009 Budget that finally addresses the priorities that were established so long ago with such strong bipartisan support from such a wide array of constituencies. My written testimony contains much more detail, and I ask that it be made part of the record for this hearing. Thank you very much.

[The prepared statement of Dr. Marburger follows:]

PREPARED STATEMENT OF JOHN H. MARBURGER, III

Chairman Gordon, Ranking Member Hall, and Members of the Committee, I am pleased to appear before you once again to present the President's Fiscal Year 2009 research and development (R&D) budget. In the eighth and final year of this Administration, this hearing provides an opportunity to take stock of how far we have come, where we are today, and, most importantly, what remains to be done for U.S. science and technology. Exactly one year ago today, I came before this committee seeking your support for the American Competitiveness Initiative (ACI). With Congressional passage and enactment of the *America COMPETES Act*, you delivered that support.

Now I am asking for your help again. The basic research programs prioritized in the ACI and authorized in the *America COMPETES Act* remain in an under-funded state relative to their importance for the long term strength of our nation's economy. The National Science Foundation, the Department of Energy's Office of Science, and the National Institute of Standards and Technology's core lab research and facilities provide basic research infrastructure for every field of science, and produce the new knowledge that make technology breakthroughs possible. This committee has a commendable history of bipartisan support for science funding, for effective advocacy of basic scientific research, and for its technical applications that benefit every part of our society. On behalf of the Administration, I thank the Committee for the good working relationship it has established with the science agencies and with my office, and look forward to campaigning together for robust funding of our mutual innovation and competitiveness agenda.

Overall, federal R&D in the 2009 Budget is \$147 billion, \$4 billion more than FY 2008. That represents one out of every seven dollars requested by the President in

the discretionary budget. This total exceeds the Fiscal Year 2001 amount by \$56 billion and represents growth of 61 percent since then. Over these eight years, the cumulative federal R&D investment will total over \$1 trillion.

The growth in non-defense R&D is even more dramatic in the 2009 Budget. The President is seeking a six percent increase in this category. By comparison, the remainder of the non-security discretionary budget is up less than one percent. And I draw your attention to the chart of federal non-defense spending over time. (see Attachment #1) With the 2009 Budget, *real* growth in outlays for the conduct of non-defense R&D, with the effect of inflation factored out, is up 31 percent in eight years. Real non-defense R&D growth for the previous eight years was 11 percent. The President's commitment to the government's R&D enterprise is strong, and the advancement of science remains among his top budget priorities.

The most recent and dramatic evidence of this commitment can be found once again in the President's State of the Union address last month. In the President's words:

"To keep America competitive into the future, we must trust in the skill of our scientists and engineers and empower them to pursue the breakthroughs of tomorrow. Last year, Congress passed legislation supporting the American Competitiveness Initiative, but never followed through with the funding. This funding is essential to keeping our scientific edge. So I ask Congress to double federal support for critical basic research in the physical sciences and ensure America remains the most dynamic nation on Earth." (see Attachment #2)

Increased funding for critical basic research in the physical sciences is my highest budget priority. This committee has led by fully authorizing these basic research increases in the bipartisan *America COMPETES Act*. We now must succeed in implementing ACI/COMPETES with actual funding. If we fail, it will significantly impair and delay all our efforts to strengthen long-term economic competitiveness through innovation-enabling basic research in the physical sciences and engineering. Lost research time delays innovations, slows development, misses market opportunities, and costs jobs and economic growth.

America COMPETES Act: With respect to programs authorized by America COMPETES in the President's Budget, the Administration's approach is straightforward: among the many activities in the bill, establish priorities to ensure that limited resources are allocated where they are needed most. To this end, the Administration has accepted the conclusions of many studies and reports that funding for ACI basic research is most important and needs to be addressed first. This prioritization reflects a broad endorsement by the business and academic communities, most recently as part of last year's "American Innovation Proclamation," which states as its first conclusion that "Congress must act to: Renew America's commitment to discovery by doubling the basic research budgets at the National Science Foundation, the National Institute of Standards and Technology, the Department of Energy's Office of Science and the Department of Defense." (see Attachment #3)

Prioritizing within the constraints of budget realities necessarily means that some of the programs and activities authorized in America COMPETES could not be requested in this Budget. (see Attachment #4) The lack of funding in the FY 2008 Omnibus appropriations bill for the priority basic research increases authorized in the COMPETES Act makes it even more imperative to address these priorities in the forthcoming fiscal year. The President signalled this policy when he signed America COMPETES in August of last year, stating that "These new programs . . . and excessive authorizations will divert resources and focus from priority activities aimed at strengthening the basic research that has given our nation such a competitive advantage in the world economy. Accordingly, I will request funding in my 2009 Budget for those authorizations that support the focused priorities of the ACI, but will not propose excessive or duplicative funding based on authorizations in this bill." (see Attachment #5)

As just one example of this prioritization, the Budget does not request funding for the Advanced Research Projects Agency (ARPA-E) or new math and science education programs at the Department of Energy. This is because the Administration believes very strongly that the basic research programs at the DOE Office of Science are a higher leverage investment and in greater need of funding than new DOE programs, especially given the devastating impacts of last year's Omnibus appropriations bill on this agency. However, the President has requested money for programs such as Math Now, confirming the importance of improving students' access to rigorous and challenging math classes.

Earmarks: Before summarizing this year's research budget, because research earmarks returned in the 2008 appropriations, I want to express my concern about the

very serious deleterious impacts earmarks have on the science budget. I make these remarks knowing that this committee fully understands the impact of the problem and supports best practices in the allocation of research funding.

In FY 2008, DOD basic and applied research earmarks total about \$1.1 billion (about one-sixth of DOD research's total budget); \$124 million of the DOE Office of Science is earmarked; and \$83 million in earmarks and unrequested grants seriously dilute the core research and facilities proposed at the National Institute of Standards and Technology. Altogether, research earmarks are estimated at \$2 billion of the \$16.8 billion of overall appropriations earmarks government-wide in FY 2008. In nominal terms, this is more than the \$1.8 billion increase in the overall FY 2008 Federal Science & Technology budget and earmarks therefore result in an actual real cut in merit-reviewed research at the agencies that are included in the FS&T budget. As we discuss the importance of pursuing the best science to contribute to U.S. competitiveness, I hope the Congress will significantly reduce research earmarks in the FY 2009 appropriations process, as it did in fiscal year 2007. Earmarks that divert funding from a merit-based process undermine America's research productivity. The Administration commends Congress for not subjecting NSF and the National Institutes of Health to this debilitating practice. It is now time to end this practice for all research programs.

Basic Research: Turning to overall Basic Research in the 2009 Budget, \$29.3 billion is requested, an \$850 million increase. Since the effect of FY 2008 earmarks only enhance this difference and make the real programmatic increases even bigger, in my view this is a clear indication of the Administration's strong focus on fundamental research and the discovery of new knowledge as a leading mission of the Federal Government. I want to emphasize that this favorable treatment of Basic Research is occurring in a year of spending reductions for many other domestic programs, indicating the high priority this Administration places on the importance of this activity.

ACI: As described above, the centerpiece of the Administration's Basic Research agenda is the American Competitiveness Initiative. The 2009 Budget calls for a 15 percent or \$1.6 billion increase for the ACI's three priority science agencies: the National Science Foundation; DOE's Office of Science; and the laboratories of the National Institute of Standards and Technology. This level of total funding, \$12.2 billion, is necessary to restore the doubling path we all committed to last year.

I know this committee is as disappointed as I am at the current shortfall. In order not to lose yet another year of enhanced and expanded high-impact innovation research, this year Congress must complete the FY 2009 process on time.

In addition, planned basic research at the Department of Defense will grow by \$270 million over the FY 2008 request—a 19 percent increase, yielding a total of \$1.7 billion—consistent with the President's commitment to support high value research in the physical sciences. These investments are made to support national security but, due to the broad effects of basic research, also contribute to ACI innovation goals as well.

Climate Science: While long-term innovation and competitiveness are the priority drivers in the 2009 Federal R&D budget, other science areas remain very important to our nation's goals. Since FY 2001, the Administration will spend approximately \$14.6 billion on climate change science research through the multi-agency Climate Change Science Program, and the President's 2009 CCSP budget exceeds \$2 billion, a 12 percent increase over FY 2008 enacted. The U.S. leads the world in advancing climate change policy and programs, with planned expenditures of nearly \$9 billion in climate-related science, technology, international assistance, and tax incentive programs proposed in FY 2009—much more than any other country and a nine percent increase over 2008 enacted levels.

Advanced Energy Initiative: The 2009 investment of \$3.2 billion in energy-related science and technology, a 25 percent annual increase of the Advanced Energy Initiative, will keep us on track to meet the President's goal of reducing greenhouse gas intensity 18 percent by 2012 and on an achievable path to energy independence. Perhaps most critically, the 2009 AEI includes over \$788 million in basic research at DOE's Office of Science, a 55 percent increase, to overcome major technical barriers to the use of solar energy, cellulosic ethanol, energy storage, hydrogen fuel cells, and fusion energy, including critical commitment support for the ITER international fusion energy research project. Before leaving this topic I should note that ITER represents a long-term solution to an energy future without fossil fuel, and I was alarmed to learn that the FY 2008 Omnibus eliminated the U.S. contribution to this international project.

Earth Observations and Ocean Initiative: In other programs relevant to the environment, the 2009 Budget includes increased funding for a number of Earth Observations programs, most notably \$74 million for the National Oceanic and Atmospheric Administration to sustain the highest priority climate measurement capabilities that once were part of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program, and \$103 million for NASA to embark on the new series of space-based Earth observing missions recommended by the National Research Council's recent Earth Sciences Decadal Survey. A new National Land Imaging Program office to ensure long-term continuity of multi-spectral imaging of the Earth's surface is established in the U.S. Geological Survey. This year's Budget again includes the Administration's Ocean Initiative, which calls for \$84 million in 2009 funding for ocean science and research at NOAA, NSF and the USGS.

Biomedical research: The Budget sustains biomedical research at the current FY 2008 level of \$29.3 billion in the 2009 NIH Budget. The Budget includes an additional \$38 million, an eight percent increase, for the NIH Common Fund, bringing the total to \$534 million for this interdisciplinary incubator for new ideas and initiatives that will accelerate the pace of discovery across the NIH Institutes and Centers. The 2009 Budget also includes increased funding to assist young scientists as they begin their independent research careers. The Pathway to Independence program is funded at a total of \$71 million to lower the age at which young scientists get their first grant award and to encourage future generations to pursue careers in science. With the 2009 Budget, NIH discretionary budget authority is \$8.9 billion, or 44 percent, higher than eight years ago, more than the 31 percent average for all federal S&T.

Information Technology: President Bush's FY 2009 Budget of \$3.5 billion for Networking and Information Technology R&D (NITRD) represents a doubling since 2001. This brings the eight year total investment in this area to more than \$20.9 billion. The 2009 Budget emphasizes the NITRD priorities of high-end computing R&D and infrastructure, advanced networking, and cyber security and information assurance. The tools and capabilities that result from the NITRD program affect every area of science and technology and enhance the Nation's competitiveness.

Nanotechnology: This Administration's National Nanotechnology Initiative (NNI) continues strong with over \$1.5 billion in FY 2009 for this well-coordinated multi-agency, investment in fundamental research, multi-disciplinary centers of excellence, and development of focused cutting-edge research and education infrastructure. With the 2009 request, nearly \$10 billion will have been invested in nanoscale R&D in seven years. The NNI includes important research on the societal implications of nanotechnology, including human and environmental health and methods for managing potential risks.

AGENCY BUDGET HIGHLIGHTS

National Science Foundation (NSF):

Funds are requested to increase the budget for NSF to \$6.85 billion in FY 2009, 14 percent or \$822 million above 2008's \$6.03 billion. As one of the three key agencies in the American Competitiveness Initiative, NSF is the primary source of support for university and academic research in the physical sciences, funding potentially transformative basic research in areas such as nanotechnology, advanced networking and information technology, physics, chemistry, material sciences, mathematics and engineering. The NSF physical sciences directorates receive increases of about 20 percent.

NSF leads two previously mentioned Administration priority research areas that promise to strengthen the Nation's economy: the National Nanotechnology Initiative (NNI) and the Networking and Information Technology R&D program (NITRD). NSF-funded nanotechnology research, sustained at \$397 million in FY 2009, a 165 percent increase since 2001, has advanced our understanding of materials at the molecular level and has provided insights into how innovative mechanisms and tools can be built atom by atom. This emerging field holds promise for a broad range of developing technologies, including higher-performance materials, more efficient manufacturing processes, higher-capacity computer storage, and microscopic biomedical instruments and mechanisms. NSF's investments in NITRD, funded at \$1.1 billion in 2009, up \$159 million over 2008 and 71 percent since 2001, support all major areas of basic information technology (IT) research. NSF also incorporates IT advances into its scientific and engineering applications, supports using computing and networking infrastructure for research, and contributes to IT-related education for scientists, engineers, and the IT workforce. NSF will continue to support the development of a petascale computing capability widely accessible to the science and

engineering community. A new \$20 million cross-Foundation investment that is part of both the NNI and NITRD, Science and Engineering Beyond Moore's Law, is a multi-disciplinary effort to advance the fundamental science and technology of semiconductor electronics.

The 2009 NSF Education and Human Resources (EHR) budget will continue efforts to prepare U.S. students for the science and engineering workforce with a nine percent overall increase (+\$65 million) over the level in the 2008 Omnibus. Specifically, the 2009 EHR Budget provides a five percent increase for the Math and Science Partnerships program at NSF, and a seven percent increase for the Noyce Scholarship program. NSF-wide Graduate Research Fellowships are proposed for a 32 percent increase and will support an additional 700 graduate students.

NSF's investment in Cyber-enabled Discovery (CDI), begun in FY 2008, more than doubles for a total of \$100 million in FY 2009. The CDI investment promotes the advancement of science and engineering along fundamentally new pathways opened by computational thinking.

NSF will continue to fund research on cyber security foundations, network security, and systems software that supports the objectives of the *Federal Plan for Cyber Security and Information Assurance Research and Development*. Emphasis will be placed on usability, privacy, and theoretical foundations.

Department of Energy (DOE):

DOE is the lead agency for the President's Advanced Energy Initiative (AEI), highlighted above. The 2009 AEI Budget proposes:

- \$588 million for the Coal Research Initiative, R&D focused on coal gasification and carbon sequestration processes and systems, including \$156 million for the FutureGen program to demonstrate these technologies;
- \$343 million for biomass R&D to help enable cellulosic ethanol to become practical and competitive;
- \$225 million for solar R&D to accelerate development of cost-effective photovoltaic materials;
- \$221 million for R&D on hydrogen fuel cells and affordable hydrogen-powered cars;
- \$101 million for R&D of hybrid electric systems including \$48 million for high-energy, high-power batteries for hybrid-electric and "plug-in" hybrid vehicles;
- \$53 million for wind energy research to help improve the efficiency and lower the costs of wind technologies for use in low-speed wind environments;
- \$30 million for geothermal research; and
- \$544 million for the GNEP and Nuclear Power 2010 initiatives to demonstrate advanced fuel cycle technologies, to expand the domestic use of nuclear power, and to provide for safe, environmentally responsible global nuclear energy systems that support nonproliferation objectives.

Full funding of \$215 million for the U.S. contribution to the ITER international fusion energy project is imperative to meet our international commitment.

The Office of Science in DOE (DOE SC) is another of the three priority research agencies in the President's American Competitiveness Initiative, providing many of the major cutting-edge scientific facilities and labs for a wide range of basic research related to potentially significant economic innovations. The 2009 Budget provides \$4.72 billion for DOE SC, an increase of 19 percent over the FY 2008 omnibus. The Budget includes funding for priorities such as nanotechnology (\$300 million), materials science research facilities (\$719 million), basic research in support of hydrogen production, use and storage (\$75 million), the advanced energy initiative including electrical battery storage and an advanced nuclear fuel cycle (\$788 million), and advanced scientific computing facilities and research (\$368 million). The Budget also includes funding (\$93 million) to begin construction of the National Synchrotron Light Source II, a new x-ray light source that will enable the study of materials properties and functions at a level of detail and precision (nanoscale) never before possible. It continues support for construction of the Linac Coherent Light Source (\$37 million)—a materials research facility that will provide laser-like x-rays allowing an unprecedented real-time glimpse of chemical and biological processes, fully funds operations for the five nanoscale science research centers, and provides \$29 million for the upgrade of the Continuous Electron Beam Accelerator Facility.

National Institute of Standards and Technology (NIST):

The Department of Commerce's NIST "core" research and facilities receive \$635 million in 2009, an increase of 22 percent over the 2008 Omnibus after accounting for earmarks and unrequested grants. In 2009, the American Competitiveness Initiative proposes NIST funding increases of nearly \$115.2 million from the 2008 enacted level (excluding earmarks and unrequested grants) for new initiatives in research and measurements in high-leverage areas such as nanotechnology manufacturing; expanding NIST's neutron facility to aid in characterizing novel materials in high-growth research fields; and improving our understanding of complex biological systems to accelerate innovations and enable investment in biosciences, including disease diagnosis and treatment.

Department of Education (ED):

ED is the lead agency for academic competitiveness and the President requested the following under America COMPETES authority:

- \$95 million for the Math Now program which authorizes competitive grants to improve instruction in mathematics for students in kindergarten through 9th grade. Grantees will implement research-based mathematics programs to enable all students to reach or exceed grade-level achievement standards and prepare them to enroll in and pass algebra courses.
- \$70 million under the *America COMPETES Act* for a new vision for advanced placement, as embodied in the President's American Competitiveness Initiative, the purpose of which is to support State and local efforts to increase access to advanced placement classes and tests for low-income students in order to better prepare them for success after high school. The new authority targets federal support more specifically on the preparation of teachers to teach classes in the critical subjects of mathematics, science, and the critical foreign languages, and on encouraging more students from high-need schools to take and pass AP and IB courses and tests in those subjects.
- \$24 million for Foreign Language Partnerships, which is part of the Administration's National Security Language Initiative. These funds would support partnerships between institutions of higher education and school districts, in order to increase the number of American students who are proficient in languages that are critical foreign languages to national security.

The President's American Competitiveness Initiative also called for the creation of an Adjunct Teacher Corps to support qualified math and science professionals to become adjunct high school teachers. The President's 2009 Budget requests \$10 million for this program.

Additionally, the President's National Mathematics Panel will issue the final report within the next month. The panel's recommendations will help teachers teach all K-7 students pre-algebraic concepts so that every student can take and pass more rigorous courses in middle and high school, particularly Algebra I in middle school and Algebra II in high school.

In general, the 2009 Budget does not support significant expansion of STEM education programs that are housed outside the Department of Education. The Administration believes that the mission agencies should be focused on the R&D components of ACI.

National Aeronautics and Space Administration (NASA):

The President's 2009 Budget for NASA is \$17.6 billion, a three percent increase over FY 2008, reflecting a steady commitment by the Administration to the continued pursuit of the *Vision for Space Exploration* and to using the Shuttle to assemble the International Space Station until the Shuttle retires in 2010. Maintaining NASA budget appropriations is extremely important for the continued viability of its programs.

In 2009, NASA requests \$3.5 billion in direct costs for exploration systems including the Orion Crew Exploration Vehicle (CEV) and the Ares I launch vehicle that will carry astronauts to the Moon. 2009 will see the Ares I-X test flight, the first test flight of the Ares I launch vehicle. Ares I-X will involve a first stage with a functional four segment solid rocket booster and an inactive fifth segment, and an upper stage mass simulator. Ares I-X will test first-stage flight dynamics, controllability, and separation of the first and upper stages. Having already initiated the acquisition process for certain elements of this architecture during 2006, NASA now has all Orion CEV and Ares I elements under contract with the first crewed-flight planned to occur in 2015.

The 2009 Budget requests \$4.44 billion in direct costs to continue operating the nearly 60 spacecraft of NASA's Science Mission Directorate and to support investments in future Earth and space science missions, vital technologies, and frontier research. NASA will launch seven new Earth observing missions in the next several years, including projects such as the Landsat Data Continuity Mission and the Global Precipitation Measurement mission. In a significant new initiative, NASA also will embark upon a series of high-priority, space-based Earth observing missions, informed by the recommendations of the National Research Council's recent Decadal Survey on earth sciences. At the same time, NASA will continue its roles in the interagency Climate Change Science Program and the international initiative on the Global Earth Observing System of Systems. NASA will expand its program of scientific exploration of the Moon through a new series of low-cost robotic missions that will advance our knowledge of Earth's closest neighbor as we prepare for a human return to the Moon. Following up ongoing missions to Mars, Saturn and Mercury, NASA also will send ever-more-capable spacecraft to Mars and other outer planets. In addition, NASA will continue its vibrant astrophysics and astronomy efforts through programs such as Beyond Einstein and the Great Observatories, and will upgrade the Hubble Space Telescope in late 2008 to provide five more years of productive on-orbit life. NASA also will maintain its important heliophysics research through projects such as the Radiation Belt Storm Probes.

In December 2007, the President approved the Nation's first National Plan for Aeronautics R&D and Related Infrastructure. Consistent with this Plan, the 2009 NASA aeronautics budget prioritizes fundamental aeronautics research, the improvement of aviation safety, and research supporting the development of the Next Generation Air Transportation System. In addition, NASA will continue to address infrastructure upgrades and maintenance requirements for aeronautical test facilities across NASA centers that are of vital importance to the Nation. The 2009 budget requests \$447 million for NASA aeronautics direct costs.

National Oceanic and Atmospheric Administration (NOAA):

For NOAA in the Department of Commerce, the 2009 Budget provides \$383 million for Oceanic and Atmospheric Research (OAR), 22 percent more than in FY 2001. OAR provides for ongoing research on climate, weather, air quality, and ocean processes.

The FY 2009 NOAA budget again requests \$20 million for oceans science and research (with another \$20 million from NSF and USGS) as part of a \$40 million interagency effort to implement the Ocean Research Priorities Plan called for in the President's U.S. Ocean Action Plan. Unfortunately, the 2008 Omnibus provided about 10 percent of the \$40 million requested. Nevertheless, the President remains committed to enhancing ocean science that will make our oceans, coasts and Great Lakes cleaner, healthier and more productive and is again requesting new funding to support efforts in these areas. The \$20 million will address the four near-term ocean research priorities established by the Ocean Research Priorities Plan and Implementation Strategy, published in January 2007. The NOAA Budget also proposes \$8 million to continue extended continental shelf scientific analysis to define and map its U.S. outer limits and an additional \$21 million to develop an operational ocean monitoring network.

U.S. Geological Survey (USGS):

The FY 2009 request for the USGS in the Department of the Interior is \$969 million, 10 percent more than FY 2001. The USGS portion of the Landsat Data Continuity Mission remains steady at \$24 million, while a National Land Imaging office to assess future land imaging needs is also established. \$31 million is targeted for the new climate change activity; an \$8 million increase is proposed for the Water for America initiative, including a national water census; and for the interagency ocean science initiative referred to in NOAA, an increase of \$3 million is requested for the Ocean Research Priorities Plan and \$4 million for mapping of the extended outer continental shelf. The Minerals Resources Program is again proposed for reduction, since much of this program's research is not the responsibility of the Federal Government, and can be conducted State and local governments, industry and universities.

Environmental Protection Agency (EPA):

The FY 2009 budget for science and technology funding at EPA is \$790 million, \$4 million more than FY 2008. Research priorities include supporting the agency's nanotechnology program, funded at \$15 million, an increase of \$5 million over 2008 enacted. Additionally, to ensure EPA's ability to attract and retain the highest cal-

iber scientists, the budget proposes expanded special authority that will allow EPA to hire up to 40 scientists quickly and competitively. \$35 million is also requested to support high priority Water Security activities.

Department of Agriculture (USDA):

The USDA science and research programs total \$1.9 billion in the 2009 Budget, a \$235 million reduction from FY 2008 mostly due to the removal of earmarks and reduction of formula grants. Still at nine percent more than FY 2001, the Administration favors competitive research grants which are allocated based on an objective peer-reviewed process. This is reflected in a requested 34 percent increase for the National Research Initiative.

Department of Transportation (DOT):

The FY 2009 Budget request for highway-related research is \$430 million, the same as current funding and consistent with the level in the multi-year surface transportation research authorization. Highway research includes the Federal Highway Administration's transportation research and technology contract programs as well as some programs administered by the Research and Innovative Technology Administration. These research programs include the investigation of ways to improve safety, reduce congestion, improve mobility, reduce life cycle construction and maintenance costs, improve the durability and longevity of highway pavements and structures, enhance the cost-effectiveness of highway infrastructure investments, and minimize negative impacts on the natural and human environment.

The 2009 Budget request for Federal Aviation Administration (FAA) Research, Engineering, and Development is \$171 million, 16 percent more than current funding and includes \$56.5 million focused on the advancement of the Next Generation Air Transportation System (NextGen). FAA's Air Traffic Organization account also includes \$41.4 million for NextGen R&D. This NextGen R&D is coordinated by the interagency Joint Planning and Development Office.

In addition, the 2009 Budget requests \$12 million for the Research and Innovative Technology Administration to coordinate and advance the pursuit of transportation research that cuts across all modes of transportation, such as hydrogen fuels, global positioning and remote sensing. DOT research programs also support the National Nanotechnology Initiative, the U.S. Climate Change Technology Program, and the President's Hydrogen Fuel Initiative.

Department of Defense (DOD):

DOD's FY 2009 R&D budget (including pay for military personnel engaged in the research, development, test and evaluation enterprise) is over \$80 billion. This level of funding will support the Department's transforming commitment to reorient its capabilities and forces for greater agility, while enabling effective responses to asymmetric and uncertain challenges of future conflicts. These funds will also help address emergent threats through countermeasures to biological agents and novel technologies to detect and neutralize improvised explosive devices, mines, rockets and mortars.

The Science and Technology (S&T) component of the overall DOD R&D budget includes basic research (6.1), applied research (6.2), and advanced technology development (6.3). At \$11.5 billion in the 2009 Budget, DOD S&T exceeds the 2001 enacted level by \$2.5 billion. From 2000 to 2008, Congressional "adds"—almost all of which would be classified as earmarks according to Congress' and the Administration's definitions—to DOD S&T quadrupled. For 2008, there were 999 adds (totaling over \$2.3 billion) that must be identified and tracked down, advertised in a way specific to the Congressional mark, evaluated, negotiated and awarded, all separate from other potential awards. This means that those awards consume several times the staff and management resources of the average research award, and may not even target a military-specific research need. The large number of such additions creates impediments to the creation of effective research programs throughout the Department, and, when seen in the big picture, should be cause for concern to Congress as well as to the Administration.

A record \$1.7 billion is provided for DOD basic research (6.1) in 2009. That's \$270 million or 19 percent above the 2008 request, consistent with the ACI and the FY 2009 OSTP-OMB Federal R&D Priorities Memorandum. \$1.7 billion is also \$65 million over the nominal basic research (6.1) appropriated level in FY 2008 even with non-program earmarks included. In the 2009 Budget, DOD basic research represents 14.8 percent of the DOD S&T budget, more than last year's 13.3 percent share.

Department of Homeland Security (DHS):

The President's FY 2009 request includes \$869 million for the DHS Directorate of Science and Technology. \$564 million is also requested for the Domestic Nuclear Detection Office, \$79 million or 16 percent over FY 2008 funding. R&D continues to play a key role in securing the Nation against the terrorist threat. The President's 2009 Budget maintains an aggressive investment in scientific research, technology development, and research infrastructure aimed at continuing to enhance our nation's security. Priority research areas include: \$360 million government-wide in transformational R&D aimed at enhancing our ability to detect, identify, prevent and attribute nuclear and radiological materials; \$96 million at DHS for explosives countermeasures research; \$691 million in USDA, HHS and DHS to improve food and agriculture defense, and \$280 million government-wide to fund cyber security and information assurance R&D.

CONCLUSION

Making choices is difficult even when budgets are generous, but tight budgets require focused priorities and strong program management. This year's R&D budget proposal provides robust levels of investment that allow America to maintain its leadership position in science and move ahead in selected priority areas. The ACI and Advanced Energy Initiative properly focus R&D investments in areas that will increase our economic competitiveness, decrease our dependence on foreign oil, and accelerate development of clean energy technologies.

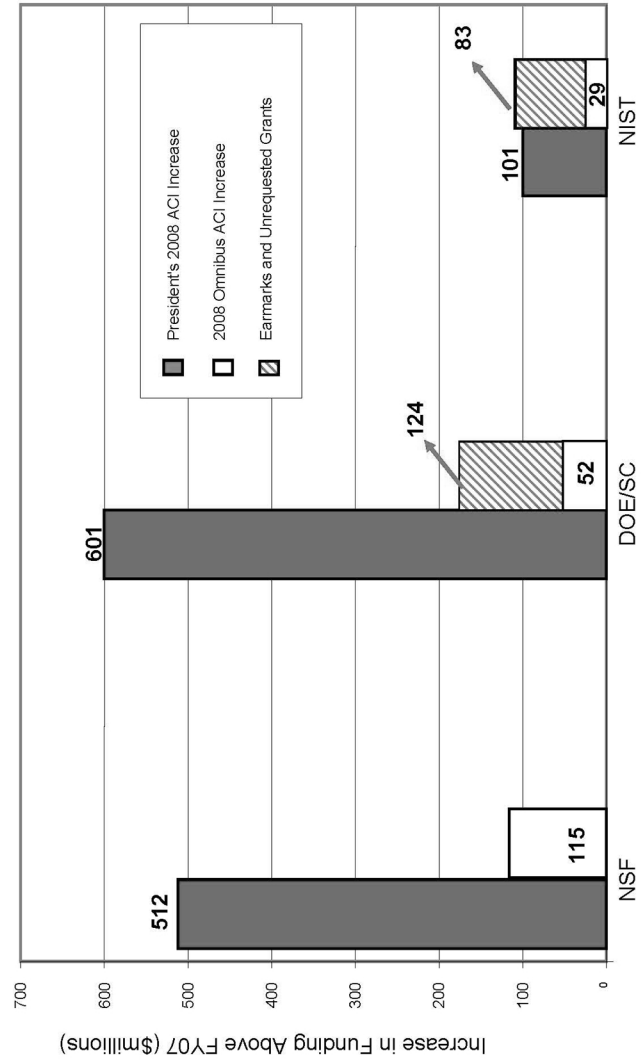
America leads all nations in research and development expenditures. In 2006 U.S. R&D investment at \$340 billion exceeded that of all the other G7 nations combined. After a worldwide slowing in R&D expenditures in the early 1990's, R&D spending rebounded in the late 90's, with the United States experiencing the most robust growth. Our scientists collectively have the best laboratories in the world, the most extensive infrastructure supporting research, the greatest opportunities to pursue novel lines of investigation, and the most freedom to turn their discoveries into profitable ventures if they are inclined to do so. Combined with the merit review process that has ensured the quality of American science in the past half century, these factors make American science the strongest in the world.

This budget will sustain this leadership and maintain science and technology capabilities that are the envy of the world. I ask that Congress fully fund the R&D initiatives advanced in the President's 2009 Budget. I would be pleased to respond to questions.

**Federal Non-Defense R&D Spending
(Outlays in billions, constant 2000 dollars)**



FY 2008 ACI Research Funding



American Innovation Proclamation

We, the leaders of American business and higher education, call on Congress to act quickly on an innovation agenda that will ensure continued U.S. competitiveness, enabling Americans to succeed in the global economy.

Innovation leadership creates high-wage jobs and rising incomes for Americans. Innovation drives productivity and economic growth, giving American workers the tools to remain the most productive in the world and creating products, processes—and even new industries—that expand employment and boost living standards.

The United States has remained the world's innovation leader through a commitment to basic research, a world-class workforce and a climate that rewards innovation. But America cannot rest on past economic success. Our competitors are investing in innovation, improving their competitive position and, in some respects, surpassing us.

Therefore, Congress must act to:

‘Renew America’s commitment to discovery

by doubling the basic research budgets at the National Science Foundation, the National Institute of Standards and Technology, the Department of Energy’s Office of Science and the Department of Defense;

Improve student achievement in math and science

through increased funding of proven programs and incentives for science and math teacher recruitment and professional development;

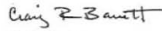
Welcome highly educated foreign professionals,

particularly those holding advanced science, technology, engineering, or mathematics degrees, especially from U.S. universities, by reforming U.S. visa policies;

Make permanent a strengthened R&D Tax Credit

to encourage continued private-sector innovation investment.

We, the signatories, hereby proclaim our support for these initiatives and stand ready to do our part.



Craig Barrett
Chairman
Intel Corporation



Richard K. Templeton
President & CEO
Texas Instruments



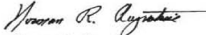
Carl F. Kofert
President & CEO
Battelle



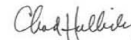
Arthur E. Ryan
Chairman & CEO
Prudential Financial, Inc.



Harold McGraw III
Chairman, President & CEO
The McGraw-Hill Companies, Inc.



Norman R. Augustine
Former Chairman & CEO
Lockheed Martin Corporation



Charles O. Holliday Jr.
Chairman & CEO
DuPont



Nicholas M. Donofrio
Executive Vice President,
Innovation & Technology
IBM Corporation



Robert C. Dynes
President, University of California

Additional Signatories on the Back.

Comparison of America COMPETES Act of 2007 with the 2008 Omnibus and the 2009 President's Budget

	FY 2008				FY 2009			
	FY08 COMPETES	FY08 OMNIBUS	Omnibus vs. COMPETES	% of COMPETES funded in Omnibus ¹	FY09 COMPETES	FY09 Budget	Budget vs. COMPETES	% of COMPETES funded in Budget ¹
Title 1, Sec 1002, Study on Barriers to Innovation	1	0	-1		0	0	0	
Title 3, Sec 3001-A-1, Laboratory Activities, NIST	902	4,461	-3,559	50	643	638	-5	98
Title 3, Sec 3001-A-2, Construction and Related Topics, NIST	191	160	-31	84	96	84	-12	86
Title 3, Sec 3001-B-1, Industrial Technology Services, MSP	110	90	-20	82	122	4	-12	8
Title 3, Sec 3001-B-1, Industrial Technology Services, TTP	100	40	-60	40	132	32	-12	0
MST Review ²	800	742	-58	93	863	63	-80	73
Title 5, Sec 5174, DOE MSE Pilot Program	14	0	-14	0	23	0	-23	0
Title 5, Sec 5175-F, DOE Experimental Based Learning Ops	0	0	-0	0	0	0	-0	0
Title 5, Sec 5185-F, DOE Summer Institute ³	15	2	-13	13	20	0	-20	0
Title 5, Sec 5181, National Energy Education Development	1	0	-1	0	"each sum"	0	-1	0
Title 5, Sec 5004-F-1, Nuclear Sci Program: Specialized Grants	4	0	-4	0	0	0	-4	0
Title 5, Sec 5004-F-2, Nuclear Sci Competitiveness Grants	3	0	-3	0	0	0	-3	0
Title 5, Sec 5005-F-1, Hydrocarbon Systems Sci Prog Grants	4	0	-4	0	0	0	-4	0
Title 5, Sec 5005-F-2, Hydrocarbon Systems Sci Competitiveness Grants	3	0	-3	0	0	0	-3	0
Title 5, Sec 5004-F-1, DOE Early Career Awards	20	8	-12	39	25	10	-15	40
Title 5, Sec 5007, DOE Basic Research Division to 2010	4,098	3873	-225	95	5,203	4,722	-481	91
Title 5, Sec 5008, Discovery Sci and Engineering Innov. Inst ⁴	10	0	-10	0	10	0	-10	0
Title 5, Sec 5009, NSEC, Nanoscience	8	16	8	244	12	18	6	150
Title 5, Sec 5011, Outstanding Research Program	10	0	-10	0	2	0	-2	0
Title 5, Sec 5012, APJSL ⁴	300	0	-300	0	"each sum"	0	-300	0
DOE Subtotal	4,984	4,002	-982	80	5,661	4,787	-874	84
Title 6, Sec 6113, Programs for Specialized and Sci/Tech	121	113	-8	93	13	0	-13	0
Title 6, Sec 6114, Programs for Nuclear Sci/Tech	125	1	-124	1	124	0	-124	0
Title 6, Sec 6113, AP and IS programs ⁴	75	44	-31	59	"each sum"	73	-2	
Title 6, Sec 6121, Math Wars for Secondary Schools Program ⁴	1	0	-1	0	0	0	-1	0
Title 6, Sec 6121, Math Wars for Secondary Schools Program ⁴	95	0	-95	0	"each sum"	92	-3	
Title 6, Sec 6122, Summer Term Education Works	"each sum"	0	-95	0	"each sum"	0	-95	0
Title 6, Sec 6123, Math skills for secondary school students	95	0	-95	0	95	0	-95	0
Title 6, Sec 6124, Foreign Language Partnership Program	29	0	-29	0	"each sum"	24	-5	
Title 6, Sec 6121, Alignment of education programs	50	0	-50	0	"each sum"	0	-50	0
Title 6, Sec 6122, Math and Science Partnership Demon Grants	"each sum"	0	-95	0	"each sum"	0	-95	0
EO Subtotal	600	49	-551	8	489	189	-400	27
Title 7, Sec 7002, National Science Foundation	6,000	6,032	32	101	7,326	6,954	-372	94
Research and Related Activities	5,199	4,021	-1,178	77	5,743	5,694	-49	99
NSF Research Enhancement Program	110	94	-16	85	122	112	-10	92
Faculty Early Career Development Program	165	168	3	101	184	182	-2	99
Research Experiences for Undergraduates Prog	62	59	-3	95	68	62	-6	90
Experimental Program to Stimulate Competitive Research	120	111	-9	92	133	114	-19	86
Integrative Graduate Education and Research Training program	47	33	-14	70	53	36	-17	68
Graduate Research Fellowship Program	9	8	-1	89	10	8	-2	81
Professional Sci Masters degree program (Sec 7034)	10	0	-10	0	12	0	-12	0
Education and Human Resources	599	720	121	120	892	784	-108	88
MathSci partnerships under Sec 8 NSF Auth Act 2002	100	49	-51	49	111	81	-30	73
Robert H. Noyce Scholarship, NSF Act Sec 10	90	11	-79	12	116	12	-104	10
SciMath-EngTech Talent expansion program, NSF Act	40	30	-10	75	40	30	-10	75
Advanced Techn. Education Program (Sci Math Tech Act of 1992)	62	62	0	100	65	62	-3	97
Integrative Graduate Education and Research Training program	27	20	-7	74	30	28	-2	83
Graduate Research Fellowship Program	97	88	-9	91	103	103	0	100
Research Equipment and Facilities Consortium	240	221	-19	92	262	148	-114	56
Agency Operations and Award Management	209	202	-7	96	314	300	-14	96
Office of the National Science Board	4	4	0	100	4	4	0	100
Office of the Inspector General	12	11	-1	92	12	12	0	100
Title 7, Sec 7005, Laboratory Science Pilot Program ⁴	8	0	-8	0	"each sum"	0	-8	0
NSF Subtotal	6,003	6,032	29	101	7,331	6,954	-377	93
Title 8, Sec 8005, Study of the Provision of Online Degree Programs	"each sum"	0	-1	0	0	0	0	0
TOTAL	15,192	10,622	-4,570	69	18,548	15,428	-3,120	83
TOTAL (without Dept. of Ed.)	12,484	10,776	-1,708	86	13,857	12,543	-1,314	91

¹ Denotes American Competitiveness Initiative programs. Omnibus funding of ACL activities includes \$124 million and \$85 million of earmarks and unrequested grants at DOE and NIST, respectively.

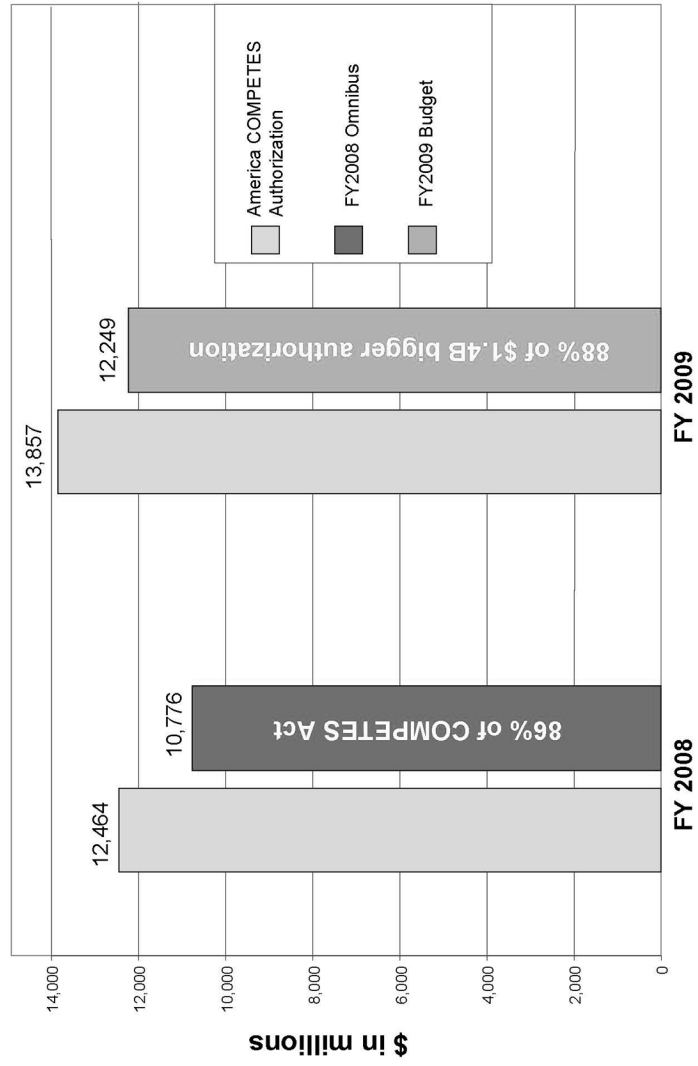
² Percentages exclude amounts in excess of authorized levels for individual programs.

³ Funded through DOE Academics Creating Teacher Scientists Program.

⁴ Though not included in table, total Budget funding for DOE research center partnerships similar to those in Section 5008—Energy Frontier Research Centers, Bioenergy Research Centers, and SciDAC Institutes—is \$163 million.

⁵ When applicable, authorized levels of "each sum" are assumed to be equal to the prior year amount.

America COMPETES Act Funding*



*Totals do not include the Department of Education

BIOGRAPHY FOR JOHN H. MARBURGER, III

John H. Marburger, III, Science Adviser to the President and Director of the Office of Science and Technology Policy, was born on Staten Island, N.Y., grew up in Maryland near Washington D.C. and attended Princeton University (B.A., Physics 1962) and Stanford University (Ph.D. Applied Physics 1967). Before his appointment in the Executive Office of the President, he served as Director of Brookhaven National Laboratory from 1998, and as the third President of the State University of New York at Stony Brook (1980–1994). He came to Long Island in 1980 from the University of Southern California where he had been a Professor of Physics and Electrical Engineering, serving as Physics Department Chairman and Dean of the College of Letters, Arts and Sciences in the 1970's. In the fall of 1994 he returned to the faculty at Stony Brook, teaching and doing research in optical science as a University Professor. Three years later he became President of Brookhaven Science Associates, a partnership between the university and Battelle Memorial Institute that competed for and won the contract to operate Brookhaven National Laboratory.

While at the University of Southern California, Marburger contributed to the rapidly growing field of nonlinear optics, a subject created by the invention of the laser in 1960. He developed theory for various laser phenomena and was a co-founder of the University of Southern California's Center for Laser Studies. His teaching activities included "Frontiers of Electronics," a series of educational programs on CBS television.

Marburger's presidency at Stony Brook coincided with the opening and growth of University Hospital and the development of the biological sciences as a major strength of the university. During the 1980's federally sponsored scientific research at Stony Brook grew to exceed that of any other public university in the north-eastern United States.

During his presidency, Marburger served on numerous boards and committees, including chairmanship of the governor's commission on the Shoreham Nuclear Power facility, and chairmanship of the 80 campus "Universities Research Association" which operates Fermi National Accelerator Laboratory near Chicago. He served as a trustee of Princeton University and many other organizations. He also chaired the highly successful 1991/92 Long Island United Way campaign.

As a public spirited scientist-administrator, Marburger has served local, State and Federal governments in a variety of capacities. He is credited with bringing an open, reasoned approach to contentious issues where science intersects with the needs and concerns of society. His strong leadership of Brookhaven National Laboratory following a series of environmental and management crises is widely acknowledged to have won back the confidence and support of the community while preserving the Laboratory's record of outstanding science.

DISCUSSION

Chairman GORDON. Thank you, Dr. Marburger, and thank you for addressing our questions. We will now proceed to questions from this committee, and the Chairman will recognize himself for five minutes.

We have now seen seven budget requests in a row that propose a range of funding for MEP that most of us agree are woefully inadequate, and each year there is a different justification for the cuts and each year the Committee has heard experts that will come in and testify to refute those justifications. This year the justification is I think the weakest of all. The Administration says that the Congressional intent was for MEP centers to stop receiving federal funding after six years. Can you explain that to me, Dr. Marburger?

Dr. MARBURGER. The MEP program is a successful program that assists private sector in their efforts to develop technologies that will help the United States economy. This Administration believes that programs that help the private sector should be funded by the private sector, and that explains the pattern of budget requests by this Administration over the years.

Chairman GORDON. Well, many of us feel that by creating additional jobs and small businesses, we are going to be benefiting our country; but the justification in the budget was that the Congressional intent was for MEP centers to stop receiving federal funding after six years. Could you explain that?

Dr. MARBURGER. I do not—

Chairman GORDON. Well, let me help you. Let me help you.

Dr. MARBURGER.—know what the explanation for the six-year period was but there is no question—

Chairman GORDON. I am not trying to trick you here. Let me just get the information on the table here. When the original *Omnibus Trade Act* was passed in 1988, it did have a six-year sunset.

Dr. MARBURGER. I see.

Chairman GORDON. Yet, in 1998 the bill was reauthorized saying that it would continue, it needed to be reviewed unless there was a review that said it should stop, and no review has said that. And this authorization was continued with the COMPETES Act. So once again, we are looking for a reason. I think that the reason that you gave orally is what you believe and what many of us do not concur with and the reason that this committee has, time after time on a bipartisan basis, made that clear.

Also, Dr. Marburger, Section 1009 of the COMPETES Act required your office to work with all federal science agencies to develop and issue principles to ensure that the federal scientists can communicate the findings of their research openly to the public and that their research will not be suppressed or distorted. These principles were to be developed within three months after the law was passed. Within six months after the law was passed, your office was to ensure that each federal agency developed and implemented policies and procedures consistent with these principles. I would like to ask, what have you done to fill the requirements in Section 1009 of the COMPETES Act and have you developed the principles? Have they been issued by your office? Have all federal science agencies developed and implemented policies based on these principles?

Dr. MARBURGER. My office has developed principles. In fact, I saw the final draft of those principles within the last few weeks. They have been submitted to the Office of Management and Budget for distribution to the departments for the kind of review that is specified in the Act. That will take some time, but we do want the agencies and offices to have buy-in to these principles so that we can be assured that they will be followed. Sorry that it has taken this long. It is a process that involves consultation with the agencies, but I do believe that we are on a good track to get this out. You will receive the information as soon as it is possible to get it to you in the form in which it is likely to be approved.

Chairman GORDON. Better late than never. We do hope that you will try to move this forward. I think it is important. Let me ask you, did you take any type of public comment or seek public comment on these principles as you were developing them?

Dr. MARBURGER. We did not take public comment as far as I know on these principles, but they will go through an inner-agency vetting process that will expose them to public view that will inform the final version of them. I believe that several agencies have

good models for a set of principles, and we drew heavily on those. NASA is one that I can name in preparing our document that we are now circulating to the agencies.

Chairman GORDON. Well, we would certainly welcome to see that at the earliest convenience, Dr. Marburger.

I want to lead by example. My time is up.

Mr. HALL. Thank you, Mr. Chairman. Dr. Marburger, what are the consequences of the fiscal year 2008 omnibus appropriations on the agencies that were targeted for increases in the American Competitiveness Initiative and the *America COMPETES Act*; and to follow up, how does the fiscal year 2009 budget rectify this, what we call a funding dilemma?

Dr. MARBURGER. Congressman, the agencies that were targeted for increases under the COMPETES Act and the ACI last year did receive some increases but nowhere near the amount that were proposed by the President. In fact, I believe I have the slide, if it is still available at the end, that shows the impact of COMPETES Act funding, of the omnibus funding.

[Slide]

The green bars represent the Presidential requests for the three priority agencies, National Science Foundation is the first, the Department of Energy, Office of Science is the second, and the NIST is the third. And on the right, the bars, some of the white and the red bars, are the amounts that were actually appropriated in the omnibus bill. The red hatched bars indicate the amount of unrequested funds or earmarks associated with that funding which I will not comment on, but you can see the difference is very great. And I believe that there has been some very significant adjustment required, particularly in the High Energy Physics Program and the Department of Energy, Office of Science, and in the International Fusion Initiative called ITER. The omnibus bill specifically cut funding for these areas that has precipitated loss of jobs in some key national laboratories, layoffs on the order of hundreds of trained scientists and engineers at SLAC, Stanford Linear Accelerator Center, in California, and at Fermi Lab in Illinois. This represents a serious problem for those laboratories. They are coping with it and adjusting their priorities, and it also causes a great deal of embarrassment for the Nation because we have international commitments to the ITER program that just have to be fulfilled.

So there are these specific consequences that have a more or less immediate impact. In the longer run, of course, failure to fund these I think visionary increases causes us to lose opportunity. Other countries are investing in infrastructure for basic research in precisely these areas. These are the areas that support nanotechnology and energy technology and so forth, and we just need to catch up. This fiscal year 2009 proposal from President Bush aims to catch up. He did not shrink from asking for large increases in the research budgets for these areas and, in addition, increases in other areas as well, including education and to the extent possible in more targeted technology areas.

So I hope that answers your question.

Mr. HALL. I think it does. Let me get more up to date on another issue, and you may not—can comment on this but I will ask it any-

way and at a later time when you can comment on it, I would ask you to give us something in writing on it. I think you are going to allow us to do that, aren't you, Mr. Chairman, to ask for a follow-up?

Chairman GORDON. If you want, Mr. Hall.

Mr. HALL. Just last night the Committee received a copy of the National Nanotechnology Initiative called "*Strategy for Nanotechnology-Related Environmental, Health, and Safety Research*." I just got that last night. I think staff did, ours did. I don't really know when the Chairman got it. He is entitled to get it first, and I understand that. But our staff is still reviewing it. Tell us how the fiscal year 2009 budget addresses the recommendations in this report, if you know, and it may be an unfair question with this recent development.

Dr. MARBURGER. I also just received this this morning, and I do note that it includes the supplemental that is published annually, usually shortly after the President's Budget Request comes out. It is called "*National Nanotechnology Initiative 2009 Budget and Highlights*," and there are tables in this document, this very brief document, that shows how each agency has a share of the mission under the National Nanotechnology Initiative. This is a robust initiative. The 2009 budget provides increased support for this initiative. It increases from \$481 million in 2007 to \$551 million in 2009, and that is a substantial increase, and we think that the program is focused and agencies are appropriately coordinating their work and participating in it very strongly.

Mr. HALL. I thank you for that. I have led you over and gone over my time. I yield back my time.

Chairman GORDON. Thank you, Mr. Hall. That is an important document. I think it has just come to our office the same as yours. We look forward to looking that over. Dr. Marburger, I think you will find that this committee will agree on much more than we disagree on, but just to set the record straight, let me concur that we all are disappointed with the funding within an omnibus of the COMPETES bill. However, early last year, the House of Representatives passed by a large bipartisan margin, 281 to 142, Commerce, Justice, Science Appropriation Bill that came very close to fully funding NSF and NIST programs under the COMPETES, as well as the President's ACI. The Senate passed a similar bill by a margin of 75 to 19. However, the White House issued a statement of administration policy on the bill, stated that the Administration strongly opposed the House and Senate bills and if the bills were presented to the President, they would be vetoed. The White House issued an almost identical statement on the House, Energy, and Water appropriations bill which came close to fully funding COMPETES and the ACI programs at the DOE Office of Science, just again, for everybody's information. Now, Dr. Baird, the Chairman of the Committee that oversees NSF.

Mr. BAIRD. Dr. Marburger, thank you for joining us. Thank you, Mr. Chairman. I share the disappointment expressed by my colleagues on what happened at the end of the year last year, a bit of a self-inflicted wound by the White House to some extent, but unfortunately it wasn't self-inflicted, it was inflicted on the scientific community with I think unfortunate consequences. I want

to just raise two general issues that are of concern to myself and my committee in particular this year. One has to do with the role of social sciences, and just briefly, you have probably followed the stories for example about DOD embedding anthropologists with its units in the field and the units finding them incredibly valuable to address cultural issues in Afghanistan and Iraq. We have had testimony before our hearing on Energy for example, just changing the way one messages conservation efforts can increase efficiency by 34 percent in terms of re-using towels and other things. They sound like small things, but on a nationwide scale it is large.

In the health care front, if you look at the rising cost of health care in this society, many of the illnesses that are driving health care costs up are behaviorally related, and if you look at transportation sector, highway safety, et cetera, which is a long introduction into the question of how you and the Administration see the role of social sciences in solving some of this nation's priorities and within your budget.

The second question I will give you and then you can answer both if you like, another issue of concern to our committee, and to myself, has to do with science diplomacy. For many years, the United States led the world in a number of ways. This committee, I understand, had a subcommittee dealing with international science exchanges. I think actually prior to 9/11, those were actually declining, and I think we have lost our leadership role in that. What are your thoughts about the Administration priorities and where this country should go to regain our international standing as a leader in scientific dialogue and exchange? Those two questions would be much appreciated.

Dr. MARBURGER. Thank you, Congressman. First, in the social sciences, I want to declare here that I am a strong advocate for social sciences. I believe that social sciences have a great deal more to contribute to solving the difficult problems of society than they are now, and I hope that the increases that have been requested for the National Science Foundation will help those budgets and move us forward in that area.

Mr. BAIRD. Thank you. That is great to hear.

Dr. MARBURGER. So I completely agree on a priority for the social sciences. I can talk much more about that if—

Mr. BAIRD. We should get together and do that. We would love to have you do that.

Dr. MARBURGER. I would like to do that. On science diplomacy, by coincidence after this hearing, I will be meeting with the European Science Commissioner, Dr. Potocnik, to discuss important large-scale science interactions that we have with the European Union; and next week, starting on Monday evening and extending for a day-and-a-half beyond that, I will be leading a joint commission meeting with Russia, and the Minister for Science in Russia will be leading the delegation on the Russian side. So we have all the major agencies that are under the purview of this committee represented in our team on that joint commission. I mention these activities to indicate that there is a continuing, ongoing relationship with other countries and that the President himself and the Secretary of State both support the use of science in their diplomatic endeavors. It is important for us to maintain the funding

that we have committed for these efforts. That is why I am so disappointed in the ITER treatment in the omnibus bill, but we are going to just do this somehow; and of course, we have major cooperative initiatives in space and basic science, large machines, as the Large Hadron Collider comes on line in Geneva later this year. Americans will probably dominate the team that is working there.

So we think this is important, and we continually look to the State Department to support the efforts of all the agencies.

Mr. BAIRD. I am pleased by both responses. I just want to thank you for that, and I would like to follow up with you on both areas. And finally, I just would acknowledge that I had the privilege of leading many Members of this subcommittee to Antarctica, and I just want to commend the research that this country is conducting down there, the NSF people, and all the folks who make that possible. I know you have a passion for that as well. It is really remarkable what they do there. Thank you, Dr. Marburger, for your service and your testimony today.

Chairman GORDON. Right on time, Dr. Baird. And Ms. Biggert is recognized for five minutes.

Ms. BIGGERT. Thank you, Mr. Chairman. Before I ask my question, if I could ask unanimous consent that an op-ed by Craig Barrett, the Chairman of Intel Corporation that was in the *San Francisco Chronicle* on January 20, 2008 be included in the record for today's hearing?

Chairman GORDON. Without objection.

[The information follows:]

Flagging economy needs science investments

CRAIG BARRETT

SUNDAY, JANUARY 20, 2008

Two years ago, the National Academies published the seminal study on U.S. competitiveness entitled "*Rising Above the Gathering Storm*." The study identified major shortcomings in U.S. investments in basic scientific research as well as in math and science education for our youngsters. The suggestions contained in this study were immediately picked up by the Democratic House Leadership as their competitiveness strategy and later by President Bush in his State of the Union message under his American Competitiveness Initiative. Legislation in the form of the *America COMPETES Act* was passed in the House and Senate in 2007, and it appeared the United States was finally going to move forward after years of neglect to increase investment in math, science and basic research. All parties agreed that our competitiveness in the 21st century was at stake and we needed to act.

So much for political will.

The recent budget deal between Republicans and Democrats effectively flat-funds or cuts funding for key science agencies. Excluding "earmarks," the Department of Energy funding for fiscal year 2008 is up only 2.6 percent, thus losing ground to inflation. The National Science Foundation is up 2.5 percent, with the same result. The National Institute of Standards and Technology is up 11 percent, however the labs where research happens only get 2.3 percent, again losing ground to inflation. Key national laboratories, such as the Fermilab, which focuses on high-energy particle physics research, face the likelihood of hundreds of jobs being lost and the closing of some facilities, helping to shortchange defense research. Predicting the impact of such funding cuts in basic research on future job creation is difficult. Who could have predicted a \$300 billion semiconductor industry from the invention of a transistor? But our kids who are heading to college are very smart. They will make their career decisions based on where they see the priorities of our government and economy.

The funding decisions on the *America COMPETES Act* took place a few days after Congress passed a \$250 billion farm bill. In the eyes of our political leaders, apparently, corn subsidies to Iowa farmers are more important for our competitiveness

in the next century than investing a few billion in our major research universities. The President expressed his happiness with the budget and Sen. Harry Reid, the Senate Majority Leader, said, “The President didn’t get his priorities, we got ours.”

At a time when the rest of the world is increasing its emphasis on math and science education (the most recent international tests—NAEP and PISA—show U.S. kids to be below average) and increasing their budgets for basic engineering and physical science research, Congress is telling the world these areas are not important to our future. At a time when we are failing our next generation of students, politically charged topics such as steroids in Major League Baseball and the destruction of CIA interrogation tapes command instantaneous congressional hearings while the seed corn (no pun intended) of our future is ignored and placed lower in priority than billions of dollars of earmarks.

Perhaps this would all be a moot discussion if we could continue to import the best and brightest minds from around the world to start and staff our next generation of high tech startups. But Washington can’t even get that strategy straight, as legal immigration—the process by which bright, highly educated workers immigrate to the United States—is being choked by our inability to control illegal immigration. While the EU has proposed a simplified and expanded program for importing highly educated talent from the rest of the world, we continue to make it more difficult for the same talent to work in the United States, even when some of these knowledge workers have received their education in the United States at partial taxpayer expense.

Where are the voices in Washington to bring reasoned debate and action to these topics? Where are the voices among the presidential candidates to propose solutions to these challenges? What do we elect our political leaders for if not to protect our long-term future?

The United States stands at a pivotal point in our history. Competition is heating up around the world with millions of industrious, highly educated workers who are willing to compete at salaries far below those paid here. The only way we can hope to compete is with brains and ideas that set us above the competition—and that only comes from investments in education and R&D. Practically everyone who has traveled outside the United States in the last decade has seen this dynamic at work. The only place where it is apparently still a deep, dark secret is in Washington, D.C.

What are they thinking? When will they wake up? It may already be too late; but I genuinely think the citizenry of this country wants the United States to compete. If only our elected leaders weren’t holding us back.

Craig Barrett is the Chairman of Intel.

<http://sfgate.com/cgi-bin/article.cgi?f=/c/a/2008/01/20/EDFDUHP11.DTL>

This article appeared on page G-5 of the *San Francisco Chronicle*.

Ms. BIGGERT. Let me just say that this article does have a quote in talking about the funding decisions and the loss of funding in the omnibus bill. He says, “The President expresses happiness with the budget, and Senator Harry Reid, the Senate Majority Leader, said, ‘The President didn’t get his priorities, we got ours.’” And I don’t want to point fingers at anyone, but I really just want to say how serious this problem is and how important it is that, you know, hopefully we can do something.

So with that, Dr. Marburger, I would like to start by commending you and President Bush for remaining committed to the American Competitive Initiative and the spirit of the *America COMPETES Act* in Fiscal Year 2009 Budget Request. I think, you know, despite the failure by this Congress to fully fund related R&D programs in each of the last two years, I know that you are talking about the fiscal year 2009 budget request, but I would just like to ask you if you could share with this committee what would be the consequences if Congress fails to restore the funding that was lost in the fiscal year 2008 budget, if we fail to fund that in a supplemental appropriation bill? Could you give us a damage report?

Dr. MARBURGER. Congresswoman, I can't really speak to what happens in fiscal year 2008. I don't have any information on that. I do think that the best possible thing that could happen for those programs which are impacted by the results of the 2008 omnibus bill would be a timely appropriation for the current request and swift action on appropriations during this session of Congress. I think that would send the right signal to the agencies whose hopes had been dashed, and I think it would send the right signal to the international community. But I can't speak to the fiscal year 2008 process. I am sorry.

Ms. BIGGERT. Well, what I was more concerned about was, and maybe you can speak to this, what happens with the personnel, you know, the scientists, the engineers, and support staff for these programs? My concern is that already we are seeing layoffs in some of the labs and furloughs and scientists already saying I am going back to France.

Dr. MARBURGER. We have heard some stories like that. I know that the Department of Energy is doing everything they can to help those people whose jobs are impacted by the consequences of that bill. I have spoken directly with the Secretary of Energy and with the Under Secretary for Science, Dr. Orbach, and I know that they are working as hard as they can to make arrangements to deal appropriately with that. But I can't put a bright face on it. These are things that happen, and they are happening. There are impact reports available from the Department of Energy that I have seen, and it is possible to give more detail on the actual reductions in force that are required. I don't have the current numbers with me, but I know they have been reported in the newspapers as well.

Ms. BIGGERT. Another consequence seems to be from American businesses who use their facilities where they are going to be cut the usage of the research that they need to do to be innovative and creative.

Dr. MARBURGER. Well, this is true. I focused on the most acute impacts which were actual furloughs and layoffs, but the reason that these agencies are prioritized in the first place is that their budgets have lagged for decades, literally, and the facilities that they operate for the rest of the science community, which are very heavily used, are operated on very thin budgets. And so this year it has been necessary to curtail the running time of some of these important facilities which are used by biomedical investigators and people working on energy technology, nanotechnology, and so forth. So there is no question that there has been a fairly broad impact on the ability of our nation to compete in these fundamental areas.

Ms. BIGGERT. Have you talked at all to Secretary of State Rice about the international reaction to our failure to fund ITER?

Dr. MARBURGER. I have not talked directly with the Secretary, but I have had discussions with her science advisor, Dr. Nina Federoff, and I have been in touch with her regarding correspondence with the Secretary and others on this issue. So we are in very close contact with the State Department.

Ms. BIGGERT. Now, I just hope that the President—and I am sure that he does because he has heard from a lot of us, about the importance of this issue and to every Member in this committee and the consequences if we fail to restore the funding. Thank you.

Chairman GORDON. Thank you, Ms. Biggert. Ms. Richardson is recognized.

Ms. RICHARDSON. Yes, thank you, Mr. Chairman. Thank you for being here today, and it is a pleasure meeting with you, and I look forward to working with you.

A couple questions. Number one, since I am a newer Member, if you wouldn't mind supplying to the Committee, you mentioned in your testimony what are some of the levels of how other countries are contributing and investing in this area. If you wouldn't mind giving us a more updated report of what some of those countries are doing, that would be of great help to me. And then as I go into my second question, I would like to build upon what Chairman Gordon was saying in his initial questions and that was that you put up in your slide of the earmarks and requests and all of that. The bottom line is within your particular department, there have been significant cuts, and our concern is as a matter of this committee, we want to see not only—we don't want to see a reduction in terms of programs and services, we would like to see an increase. Specifically the National Nanotechnology Initiative had a barely increase of two percent which doesn't even meet with the normal cost-of-living increases, and in particular, I would like to point out to you the Manufacturing Extension Partnership. Since 2000 and the current Administration, we have lost 3.4 million manufacturing jobs. These are high skilled, high wage jobs that are the backbone of many communities such as mine. NIST recently reported the results of a survey where manufacturers who used your program, MEP in 2006, after one year you had 52,000 jobs that were created or retained, \$6.8 billion in new or retained sales, \$1.1 billion in cost savings, and over \$1.7 billion of private investment leverage. So my question to you, sir, is did you request an increase for this program and also the NNI program, and if so, what did you request?

Dr. MARBURGER. The two programs are quite different in how they are funded. To start with the NNI program, the NNI program is funded through the agency budgets primarily of the agencies that are targeted under the COMPETES Act, and we roll up their expenditures on nanotechnology at the end of each year, and we also ask them to indicate how much they are spending in subsequent years. And I believe that is part of what this very recently issued document describes. I was just trying to identify the increases. So on nanotechnology, we do not ask for specific increases for that program. We ask for increases for the agencies that fund that program. The Department of Defense and the National Science Foundation have the largest share of that program, and I believe that the funding will go up in those agencies in this year.

With respect to the Manufacturing Extension Program, our argument is not about the effectiveness of the program but with how it is funded; and in my response to Chairman Gordon's question, I tried to give a succinct explanation for that which is primarily is that there is a difference of opinion about how that program should be funded.

Ms. RICHARDSON. So given the comments of this committee and if we are saying that we are supportive of that program and we see the results of that, what could we anticipate from you of taking

that back to the Administration and reconsidering because clearly to have the budget, you know, zeroing out for a program that is working and we are losing manufacturing jobs across this country, it is a very key priority for me.

Dr. MARBURGER. I don't believe that there is any chance that the President will change his request to Congress that is now before Congress in response to your question.

Ms. RICHARDSON. I look forward to you taking back this committee's comments to the Administration.

Dr. MARBURGER. Thank you.

Ms. RICHARDSON. Thank you, Mr. Chairman.

Chairman GORDON. Just for your information, Ms. Richardson, I think year after year on a bipartisan basis this committee has supported the MEP program and felt that it is very worthwhile. But unfortunately, much of the funding has been replaced, although it is very tight there.

Dr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman. First of all, thank you, Dr. Marburger, for being here. Thank you for the hard work you are doing to try to straighten out what is a very unfortunate situation which a good deal of the blame belongs in the Congress for passing an omnibus bill which is totally inadequate in funding science and research, and we will have to continue to work together to try to correct that. But I appreciate your efforts on that score. I also thank the President for his strong support of ACI and the authorization bill and also attempting in fiscal year 2008 to institute the ACI authorizations with full funding. Unfortunately, we find ourselves in a bad situation, and I will get back to that in just a moment. But I do want to mention, MEP always comes up every year, and I have fought assiduously for it. I have talked to Director of OMB and the Chief of Staff of the President about this at times and complained about the little man in the basement of the White House who doesn't like MEP and tries to kill it every year. Now, I know that little man is a big man, and he is not in the White House, and I do know where he is. But that is in your shop and the President's shop and not in ours, but so be it.

I do want to point out, however, that we have a forerunner for the MEP. It is called the Cooperative Extension Service in the Department of Agriculture. That has been in place for many years. I don't know how many, but it basically grew out of the land grant system which the Congress developed in the 1860s or thereabouts. It has been around a long time. It has been very, very useful in making American farms the most efficient farms in the world. It works extremely well, and we as a nation spend \$400 million a year to fund the Cooperative Extension Service which is for agriculture. Agriculture today in this country employs about one and one-half percent, at most two percent, of the population. Manufacturing on the other hand employs 14 percent of the workers in this nation. Now, I fail to understand the logic of the Administration in saying, yeah, it is okay to spend \$400 million a year on agriculture extension programs which meets the needs, the training needs and so forth, of one and one-half percent of the population, but it is totally wrong to support for manufacturing which has 14 percent of the workers in the Nation. And there is a strong philo-

sophical disagreement here. And I am not castigating you. I know what the situation is. But I simply do not understand an Administration position which he held onto for years. We continue to fight the battle, we continue to appropriate the money. It is just a silly conundrum to have to deal with.

Having vented myself on that, let us get back to the real issue which is the funding of research. We all heard the stories about China, India, and so forth. They are where they are for two reasons because in approximately 20 years both countries, China and India, made major changes in their political structure and basically adopted the free enterprise system, a limited free enterprise system. Secondly, they strongly emphasized math and science education for their students. The result of those two major decisions of those countries is that they are beating us in manufacturing and production in ways we never anticipated. We already have the free enterprise system. That is how we grew what we did and how we became so strong. But we have not beefed up the math and science education programs in our nation, and as a result, we are losing ground dramatically. And we also are faltering in our research efforts, whereas those countries are substantially improving them as are almost every country in the world. We are in danger of losing our status. Right now South Korea is becoming very close to us in the dollars spent per year on basic research compared to GDP, and other nations are approaching us or exceeding us. Our country simply has to come to grips with that. The omnibus error was our fault as a Congress, and the President had little choice but to sign it. So the Administration saved money because less money was spent on science and R&D. Why in the 2009 proposal didn't the Administration fund or propose funding all the ACI entities, whether an NSF, DOE, NIST, at the fiscal year 2009 authorization? In other words, continue what they would have done had we passed the 2008 authorization that was requested by the President. The omnibus bill, like it or not, it cut science funding substantially, but that did save the Administration some money. Now why base next year's fiscal year 2009 proposal on a faulty 2008 fiscal year result? And I have never understood that method of budgeting. I happen to be a fan of zero-based budgeting, but be that as it may, it just doesn't make sense to me. If we set ourselves on a path to double the funding for research in DOE, NSF, and NIST to double in a certain number of years, just because we fall back in one year, why do we have to fall back next year as well? Why not restore that? Do you have an answer for that?

Dr. MARBURGER. I am not sure I can answer all of those questions.

Mr. EHLERS. You don't have to answer all of them.

Dr. MARBURGER. Well, certainly, in my view, the 20 percent increases for these agencies, and two of them are quite large agencies, those represent a very powerful commitment by the Administration—

Mr. EHLERS. No question. No question.

Dr. MARBURGER.—in a time when the President is holding the rest of the discretionary budget to less than one percent growth, I mean, below inflation. These priority areas are getting huge increases, even in the area where people are concerned about, the

education sections of NSF and other agencies, the increases are on the order of nine percent. These are big increases at a time when the Nation is facing budget deficits and difficult economic times, and I think that the prioritization within this budget request reflects the needs of these agencies. I mean, I think these are healthy requests.

Mr. EHLERS. I don't argue with that. My argument is very simple. If we had in fact passed the President's request this past year, which both Appropriations Committees had decided to do, he would have put more money in this. In other words, we went on the NIH doubling path a decade ago. We had an agreement, and every year we took the steps to double in a certain amount of time, and we fulfilled our commitment to do it. After one year, we are falling back.

Dr. MARBURGER. I am not sure of that. I would like to get back to you on that because I think the increases that the President is requesting for this year actually get us back up on the original ACI schedule. The difference between the omnibus bill and the President's request this year is much greater than the difference that he would have had to ask for had the omnibus bill funded—

Mr. EHLERS. No, I understand that—

Dr. MARBURGER.—full request.

Mr. EHLERS.—and we will discuss that privately. We don't have to hash that out here.

Dr. MARBURGER. Okay. But let me just state finally, I believe the fiscal year 2009 request for the ACI agencies was not based on the fiscal year 2008 request but was an independent judgment of what needed to be done to meet the President's targets, and I will be glad to say that in writing.

Mr. EHLERS. Okay. Thank you very much. I yield back.

Chairman GORDON. Ms. Woolsey is recognized.

Ms. WOOLSEY. Thank you, Mr. Chairman, and I was here for your testimony, sir. I had to leave and then come back, and you know how we are. But your answer to my colleagues, Congresswoman Richardson and then to Congressman Ehlers, still makes me confused. Why are you asking us for support if you think what the President's budget does is adequate? That is confusing to me.

Dr. MARBURGER. Congress appropriates the money—

Ms. WOOLSEY. Right.

Dr. MARBURGER.—and this is my opportunity to speak to Congress.

Ms. WOOLSEY. Okay. So in asking us to help, will one of the pieces of legislation that then we can do more about in the COMPETES Act, advanced research projects, ARPA-E, I mean, if we can do more for you, will the White House support more for our move to replace fossil fuels with more energy efficient technologies? Is it going to work both ways or do we help and then we put more money into old-fashioned energy systems?

Dr. MARBURGER. The failure of the President to designate and create an ARPA-E within his budget request does not mean that this request falls short for what is needed for investments in energy-related research. Under the Advanced Energy Initiative, which funds parts of the Department of Energy that do the same things that the ARPA-E would do, or similar things, there is a

very large increase. I think there is about a 25 percent increase in the budget for energy-related research and development and technology, a very large increase. The base is about \$3 billion I think now, and the President is requesting an additional \$600 million for that area. So there isn't any failure to rise to the occasion as it were for energy-related research.

Ms. WOOLSEY. But remember, my question to you was, is it energy that will take us to the future so that it is getting beyond fossil fuels or is it staying with the same energy programs that we have had in the past?

Dr. MARBURGER. Absolutely. I believe there is some detail in my written testimony. I apologize for not having time to go through all of that in my oral, but there are large requests for biomass, solar, hydrogen fuel cells, hybrid electric systems, wind energy, geothermal, and nuclear power, all receiving increases under that title. So I believe that this proposal does in fact address the important national needs in the energy technology area.

Ms. WOOLSEY. Well, I am probably going to ask you something that is unfair because I have a couple of seconds left I am sure. Do you have any idea why the President feels that it is okay to increase the Pentagon's budget by 8 percent and leave projects like ARPA-E without any funding at all?

Dr. MARBURGER. As I explained, the objectives of ARPA-E as I understand them are in fact funded through other programs within the Department of Energy. When it comes to the Department of Defense, the major increases in basic research in this budget proposal for the Department of Defense, which is a major funder of things like nanotechnology and other things that are important for our competitiveness, so that the President's increases to the Department of Defense do not ignore or shortchange in any way other areas of the science budget. We think that the science budget proposal in this document is healthy, it addresses the needs of the Nation, and I don't think there is any need to feel that the Defense budget is somehow causing the science programs to be short-funded.

Ms. WOOLSEY. Do you think that that would make any kind of sense to remove these programs from the Department of Defense and bring them over to the other side of the fence so that we don't have to have this huge Defense budget to get something done?

Dr. MARBURGER. Well, the Defense Department has traditionally been the major supporter of research in engineering particularly and in material science and lasers and other things. They have a strong track record of success in these areas. And furthermore, research in these priority areas is important for the Department of Defense missions. So I think it is appropriate to see the robust research budget in the Department of Defense.

Chairman GORDON. Thank you, Ms. Woolsey, and Dr. Gingrey is recognized.

Mr. GINGREY. Mr. Chairman, Thank you. Dr. Marburger, thank you for your testimony, and you know, relating back to what the gentlelady from California just said, Ms. Woolsey, we are not often necessarily on the same page on every issue, but I think she does bring up a pretty good point; and it makes me wonder sometimes if when we get reports like we did with *The Gathering Storm* and

the fact that we all realize that we are so far behind other developed countries in math and science and the push by this committee to pass the *America COMPETES Act* and to try to address that problem with more funding for STEM research and education, it makes me wonder sometimes if we are fighting hard enough. And when I say we, I am talking about these agencies to which these budgets apply, and maybe even Dr. Marburger yourself and your committee and the great scientists that you and others are that advise the President and advise the Administration. I also sit on the House Armed Services Committee, so I am a strong proponent for continued funding for our national defense and growing that; and I think it is important what we do in Darfur as you pointed out. But I think as she pointed out in regard to ARPA-E, we are talking about alternative energy sources and if that is not a threat to us both economically and security-wise, I mean, I don't know what else is. I mean, certainly it is a threat. So it makes me wonder if you guys, if I can use that expression, are fighting hard enough to get your share of the pie. And of course, we want to keep the pie small. I do as a fiscally conservative Republican, and I will continue to take that posture but here again, I mean, Dr. Ehlers pointed out in regard to Agriculture Extension Programs and the number of people today in this country involved in agriculture as their means of income versus those that are involved in manufacturing, and we have no money in here for MEP which is so important in every district of 435 Members of this House of Representatives and 100 Senators, I just don't get that part. I better finish up quickly or you will have no time to respond. But in regard to the math education as an example, you have got funding. Your testimony says that your budget does not support significant expansion of STEM education programs that are housed outside the Department of Education. Why not? So at this point, I will turn it over to you and let you respond to my diatribe.

Dr. MARBURGER. Thank you, Congressman. I will try to spend a minute on each. First of all, with respect to energy technology, I think a 25 percent increase in a \$3.2 billion base for advanced energy technology really is responding to the need in this area. And so the fact that the President did not fund those activities through ARPA-E does not mean that we are not funding them. ARPA-E was authorized at \$300 million this year, but the President's request for research in these precise areas was \$600 million so we can't say that this budget represents a pull-back from the need to fund energy technology. With respect to the remark in my testimony that indicated that the significant expansion of education programs took place only in the Department of Education, I think that is an artifact of a way of counting these things that perhaps OMB, from whom I got those talking points, expresses it. The fact is that the budgets for education in the National Science Foundation are approximately equal to the budgets for math and science education in the Education Department. There were certain increases in ACI categories that were quite substantial this year in the Education Department. There was a nine percent increase in education in the National Science Foundation on a pretty big base. So I am not sure that we are comparing apples and oranges here, but I know that the President is asking for increased money, both

in the National Science Foundation and in the Department of Education. The Education Department is designed to address large-scale education programs, implementation, if you wish, of education, whereas the National Science Foundation's role here is to develop materials and learning techniques and so forth doing education and science research. And they both do a good job at their respective missions.

Chairman GORDON. The gentleman's time has expired.

Dr. MARBURGER. I will just stop there. Thank you.

Chairman GORDON. So I guess, Dr. Marburger, since the Department of Education has been doing such a good job you are satisfied with our international rankings?

Dr. MARBURGER. I think the international rankings are difficult to interpret. The——

Chairman GORDON. Okay. Well, since we are close, we will let Congresswoman Eddie Bernice Johnson is recognized for five minutes.

Ms. JOHNSON. Thank you very much, Mr. Chairman. I will simply ask, and you might not have time to answer my question in completion. I got here a little late, so maybe you addressed this but to me, the most important thing about any future in research or anything else is finding the students interested. And what I would like you to do is describe to me the activities that you are involved with or that you know education is involved with in seeking that preparation for our nation for the future. If we can't have basically prepared people to do this, the rest of it is for naught. Thank you. I look forward to seeing your response.

Dr. MARBURGER. Thank you. I would like to respond to that in writing because there is such a large number of programs that are funded and increased in this budget proposal.

Ms. JOHNSON. I would like also your recruitment activity.

Dr. MARBURGER. And recruitment. I will look into that. I can't respond to that immediately.

Ms. JOHNSON. I really can read what is in here for funding, I just want to know some activities that are encouraged, that is supported by the Administration, or that is going on to get the attention of young people to participate in these programs.

Dr. MARBURGER. I think I understand. And I do believe information exists on that that I will send to you.

Chairman GORDON. Thank you, Ms. Johnson. And because of Ms. Johnson's courtesy, Dr. Bartlett, you can close us out here as we have 10 minutes to a vote.

Mr. BARTLETT. Thank you very much. Thank you for your testimony, sir. The same gentleman that predicted that the United States would reach its maximum oil production in 1970, M. King Hubbard predicted that the world would be reaching its maximum oil production about now; and as you know, the IEA, International Energy Agency, and the EIA, the Energy Information Agency, have both been tracking the production and consumption of oil, and they have shown that to be flat for the last 30 months. With a flat production and an increasing demand, oil has increased from \$40 a barrel to I think it is about \$95 a barrel today. A couple of weeks ago Shell Oil Company issued a statement saying that not later than 2015, just around the corner, that the world would not be able

to meet the demands of our industry with oil and gas. The Hirsch Report, the first of four reports paid for by our government and ignored by our government, published in 2005, said that if you didn't anticipate this maximum production of oil, peak oil by two decades, that you would have meaningful economic consequences of that. Considering, sir, that most of the monies that we are spending are business as usual, wind, solar, nuclear, biomass, and ethanol, I would submit that we really do need an ARPA-E. None of these things that you mentioned on that list, and they are all very admirable, but they are not the cutting edge kinds of things that we are going to absolutely have to do if we are going to avoid a big train wreck. I see little indication on the part of the Administration that they understand the seriousness of the challenge that we face. My wife, by the way, says that I shouldn't be talking about this. Don't I remember in ancient Greece they killed the messenger that brought bad news, and I tell her this is a good news story because if we start today, the ride will be less bumpy than if we start tomorrow. I find this exceedingly challenging. There is no exhilaration like the challenge of meeting and overcoming a big threat, and that is what this is. Shouldn't we start having a really aggressive program in ARPA-E considering the real challenge of energy in the world?

Dr. MARBURGER. I certainly agree that we need to be working very hard and doing everything that we can do to address the energy challenges. Whether it is spent through ARPA-E or through the Advanced Energy Initiative or something else, I'm not as concerned as long as it is being spent; and I do think that there is a substantial commitment by this Administration to addressing the issue of energy security, which means that we should be able to use the energy resources that we have available to us, including nuclear and coal, without contaminating the environment. And that is why the President is seeking funding for demonstration projects and programs to produce electricity from coal without adding to the CO₂ in the atmosphere. I think that there is in fact a very compelling set of initiatives that have been defined by the Department of Energy in their energy technology plans that if funded would in fact help us to meet this very grave and very serious challenge. I agree the challenge exists and we ought to be doing something for it. I think the President is asking for the funds to do that.

Mr. BARTLETT. Yes, sir. Most of the things that we are doing are to produce more electricity. I am fairly sanguine about the future of electricity production. I think with more microhydro which has a huge potential, I think with a lot more nuclear, with wind and solar we can get around the huge storage challenges there, we can probably produce about as much electricity as we would like to use. I am not at all sanguine about liquid fuels. I see almost nothing out there that can take up that slack. I spent a week in South America with the Chairman of our Committee on Agriculture. He believes that at the end of the day when we have exploited every potential we can for fossil fuels, renewables, for fossil fuels, that we will be producing about a third as much equivalent as we are today. We can live very happily with that, sir, but that is going to require a huge investment, don't you think?

Dr. MARBURGER. Absolutely.

Mr. BARTLETT. Thank you very much, Mr. Chairman.

Chairman GORDON. In summary, Dr. Marburger, I think what you have heard on a bipartisan basis is more of the same in education, more of the same in our energy research is not getting the job done. We have to look at a different way to approach these, or we are going to continue to be, you know, 21st with our students, we are going to be, you know, running out of energy. But let me say to paraphrase Dr. Bartlett, you are the messenger, and we respect that. We respect you, and we thank you for coming here and I am glad that we could get you out before we had to hold you up on this vote. This committee will receive any additional statements from Members and questions if they would like to have his follow-up answers from the witnesses, and the witness is excused and the meeting is adjourned. Thank you.

[Whereupon, at 1:25 p.m., the Subcommittee was adjourned.]

Appendix:

ANSWERS TO POST-HEARING QUESTIONS

ANSWERS TO POST-HEARING QUESTIONS

Responses by John H. Marburger, III, Director, Office of Science and Technology Policy (OSTP); Co-Chair, President's Committee of Advisors on Science and Technology (PCAST)

Questions submitted by Chairman Bart Gordon**Department of Energy, Office of Science**

Q1. A large fraction of the workforce at federal research agencies like DOE and NASA has been there for decades. Yet, there does not appear to be a significant effort to make it easier to bring in top talent and pass on institutional knowledge before these employees retire in the next few years.

- *Does the Administration have any plans to address this issue? Is the Administration conducting a wholesale review of recruiting and hiring practices to ensure a free-flowing pipeline of top talent into federal research agencies?*

A1. Agencies were tasked by the Office of Management Budget (OMB) as part of the Human Capital Initiative (part of the President's Management Agenda) to identify potential skill gaps and create plans to address those gaps. More information on this initiative can be found at: <http://www.whitehouse.gov/omb/budget/fy2002/mgmt.pdf>

At the agency level, workforce planning activities occur on an ongoing basis consistent with specific agency and mission needs. For example, the Office of Science (SC) has sought and received delegated hiring authority from the DOE Human Capital Office. Once the approval was received, SC instituted the following processes to attract and expedite the hiring process within overall DOE guidelines:

1. Developed templates for our scientific program manager position descriptions, crediting plans, and hiring management questions to speed the process.
2. Utilized available recruitment incentives such as superior qualifications in order to be able to set salaries higher than the normal entry level of step 1.
3. Paid relocation and/or moving expenses.
4. Offered recruitment incentives as a percentage of salary.
5. Aggressively advertised outside of the normal human resource mechanisms in scientific journals to attract interest.

Q2. For several years NSF has been tasked to fund the operations and maintenance costs of Coast Guard icebreakers under the rationale that the only use of Coast Guard icebreakers is to support NSF's polar research activities. In 2006 the National Academy of Sciences completed a review of national needs and requirements for icebreaking capabilities in polar regions and concluded that "polar icebreakers are essential instruments of U.S. national policy." Furthermore, the Academy recommended that the Coast Guard have the responsibility, and the budget, to construct new icebreakers and provide for the operations and maintenance costs of existing icebreakers. Finally, the Academy stressed the need for a Presidential Decision Directive to clearly align agency responsibilities and budgetary authorities.

Q2a. Has the Administration made a determination, through a Presidential Decision Directive or otherwise, on whether there is a national need for icebreakers, and if so, whether the Coast Guard should have the budget and responsibility for icebreaker construction, operation and maintenance?

A2a. The Office of Science and Technology Policy (OSTP) recognizes there are national needs for icebreaking capability not directly related to science, however, OSTP cannot speak authoritatively to individual agency needs beyond science unless they are spelled out in existing policy documents or agreements.

There are two ongoing interagency discussions. The first interagency discussion includes the Department of State, Department of Defense, Department of Homeland Security, Department of Commerce, Department of Transportation, Department of the Interior, and the National Science Foundation. These discussions include broad reviews of previous executive branch policy documents, and evaluations of possible policy changes that recognize likely future increases in human activity that will accompany climatically driven environmental change anticipated in the Arctic region.

Once the interagency policy discussions are completed, agencies can use the results to identify and develop capability and resource requirements.

There is a second separate but parallel interagency discussion, to include broad reviews of operational requirements for polar icebreakers, which has just begun and also includes the aforementioned agencies. A number of agencies are involved because the Coast Guard icebreakers are used by multiple agencies, including NOAA to map the Extended Continental Shelf.

Q2b. If the Administration has concluded that there is no national requirement for icebreakers, will NSF be released from the responsibility for funding all of the costs of the Coast Guard's active icebreakers and be allowed to pursue other options, which may be less costly, to support its requirements for access to and support of research in polar regions?

A2b. The Administration has made no conclusion yet regarding national requirements for icebreakers. It is necessary to first complete the ongoing Arctic policy review.

National Academy of Sciences Study on Service Science

Q3. Section 1005 of the America COMPETES statute requires the Director of OSTP, through the National Academy of Sciences, to conduct a study on service science and report to Congress on how the Federal Government should support this discipline. What is the status of this study?

A3. OSTP is reviewing the proposal from the National Academy of Sciences and is currently exploring options to fund the study. Additionally, OSTP is in the process of reaching out to relevant stakeholders in order to define the scope of the study.

Questions submitted by Representative Ralph M. Hall

Q1. In the President's budget request of \$74 million for NOAA in FY09, what will be the practical affect of this cut? How will the cut affect NOAA's ability to leverage the \$74 million in the FY09 request? Will there be further delays in the NPOESS satellite due to this cut?

A1. The \$74 million in new funding included in the FY 2009 President's Budget request for the National Oceanic and Atmospheric Administration (NOAA) is intended to support the reinstatement of several key climate measurement capabilities that once were part of the tri-agency National Polar-Orbiting Operational Environmental Satellite System (NPOESS) effort, but were removed from the planned NPOESS satellites during the 2006 restructuring of the program. In particular, this funding will be used to sustain the data sets for three high-priority climate-related measurements: total solar irradiance (measured by the Total Solar Irradiance Sensor, or TSIS); Earth radiation budget data (from the Clouds and Earth Radiant Energy System sensor, or CERES); and ozone vertical profile data (from the Ozone Mapping and Profiler Suite Limb sensor, or OMPS-Limb). The TSIS and CERES measurements contribute to long-term climate records that are vital to discriminating between natural and human causes of climate change and to monitoring long-term shifts in the energy budget that forces climate change. The OMPS-Limb data are important for monitoring ozone structure and depletion vertically in the atmosphere and thus to our understanding of the ozone recovery process and related phenomena.

The \$74 million in funding allocated for this climate sensor package does not represent a budgetary cut, but rather represents funding that has been added to NOAA's request specifically for this purpose. The Administration believes that NOAA is well-positioned to use these funds in programmatic actions for sustaining these valuable data sets. No delays for the NPOESS satellites themselves are anticipated as a result of this action.

Q2. In your written testimony, you state that the FY09 budget request for the Climate Change Science Program (CCSP) is \$2 billion, but that the overall spending on climate change policies, science, technology, international assistance and tax incentives is almost \$9 billion. Subtracting the \$2 billion for CCSP—half of which goes to NASA for the satellites—can you please provide a detailed accounting of how the other \$7 billion is being spent? Please also provide a detailed accounting of how the \$4 billion for the CCSP program is to be distributed.

A2. The distribution of the \$2.08 billion requested for the Climate Change Science Program is shown in this table. Details for each agency are not available and may be obtained from the agency.

CLIMATE CHANGE SCIENCE PROGRAM: FY 2008-2009 BUDGET BY AGENCY [DISCRETIONARY BUDGET AUTHORITY IN \$M]						
Agency	FY08 Enacted			FY09 Requested		
	USGCRP	CCRI	CCSP	USGCRP	CCRI	CCSP
USDA	57	8	65	54	8	62
DOC	222	44	266	281	44	325
DOE	103	25	128	121	25	146
HHS	47	0	47	47	0	47
DOI	34	0	34	31	0	31
DOT	0	1	1	0	2	2
EPA	20	0	20	16	0	16
NASA	1,004	74	1,078	1,134	70	1,204
NSF	180	25	205	196	25	221
SI	6	0	6	6	0	6
USAID	0	14	14	6	14	20
Total Research	1,673	191	1,864	1,892	188	2,080
CCSP TOTAL	1,673	191	1,864			
President's Request				1,892	188	2,080

The summary of distributions for the climate change expenditures is shown in this figure:

Fiscal Year 2009 Federal Climate Change Expenditures Summary

Summary of Climate Expenditures ¹	FY 2007 Actual Budget Authority	FY 2008 Enacted Budget Authority	FY 2009 Proposed Budget Authority	Change in Budget Authority 2008-2009
Climate Change Science Program (CCSP)	1,825	1,864	2,080	216
Climate Change Technology Program (CCTP)	3,485	4,302	4,416	114
International Assistance ²	188	202	657	455
Energy Tax Provisions That May Reduce Greenhouse Gases ^{3,4}	1,520	1,520	1,440	-80
Total^{1,5}	7,004	7,874	8,573	699

¹Data supersede numbers released with the President's 2009 Budget. Discrepancies resulted from rounding and improved estimates.

² Includes funds that are also counted in the Climate Change Science Program total. Table total line excludes this double-count.

³ Tax incentives related to climate change included in this report are currently projected at about \$6.0 billion over five years (2009-2013).

⁴ Tax expenditures are estimates of the revenue losses due to a tax preference. While not exactly equivalent to budget authority, tax expenditure estimates have been included for completeness.

⁵Table total may not add due to rounding.

By the end of this Administration, the President will have spent almost \$45 billion on climate change programs. In addition, the 2009 Budget requests a record additional \$8.6 billion—a +9 percent increase over 2008 enacted spending levels—to support climate change-related research, development, and deployment programs, voluntary partnerships, and international aid efforts.

- **Climate Change Science.** The FY 2009 Budget proposes \$2.1 billion for the Climate Change Science Program, an increase of +12 percent over 2008 enacted, including a +12 percent increase for NASA's Science Program.

- **Climate Change Technology.** The Climate Change Technology Program (CCTP) is coordinated by the Department of Energy. The 2009 Budget proposes \$4.4 billion for CCTP activities, an increase of +3 percent over 2008 enacted spending. This includes a +67 percent increase for DOE research on fusion, carbon sequestration, and hydrogen, and a +22 percent increase for energy efficiency and sequestration pilot projects.
- **International Assistance.** These programs support developing countries' efforts to address climate change through improved energy efficiency and renewable energy, land use, and forestry practices. Proposed spending in the 2009 Budget increased +225 percent from 2008 to \$657 million, due largely to a new international Clean Technology Fund to provide financing to the developing world for investments in cleaner technologies.
- **Energy Tax Provisions.** This category includes tax incentives for investments in certain energy technologies. These incentives promote deployment of energy efficient or alternative energy technologies. The value of these tax incentives in the 2009 President's Budget total \$6.0 billion over the years 2009–2013, a +19 percent increase from 2008 enacted levels.

Q3. *Since the President's Vision for Space Exploration was announced in January 2004, the cumulative effects of subsequent NASA budget requests and a continuing resolution have caused the operational date of the Constellation system to slip to March of 2015. The FY09 budget request seeks funding that only maintains an initial operational capability by March 2015. Hence, the Administration does not endeavor to accelerate development of Ares/Orion, and as a result, the United States will be reliant on the Russians for access to ISS for at least five years. Why is the Administration reluctant to propose additional funding to close the gap?*

A3. While NASA has committed to an Initial Operational Capability (IOC) of the Orion Crew Exploration Vehicle and its associated Ares I Crew Launch Vehicle by March 2015, it is our understanding that NASA is targeting an aggressive schedule with an IOC potentially as early as September 2013 albeit at a reduced cost confidence level. The President's FY 2009 Budget request for NASA, which increases exploration funding by 11 percent, supports NASA's current Orion/Ares program development plans in terms of achieving IOC by the March 2015 date with a 65 percent cost confidence.

With regard to budgetary resources, it is important to note that the *Vision for Space Exploration* calls for a "sustained and affordable" program of space exploration, and the Administration's approach has been for NASA to proceed with exploration activities and missions as it can afford to pay for them. At the same time, an over-arching Administration goal with respect to NASA is to maintain sufficiently robust programs (in the context of program requirements and Presidential priorities) across the range of NASA mission areas and activities, including not only human space flight activities but also areas such as Earth and space science and aeronautics. The President's FY 2009 Budget request is consistent with this objective, calling for a total of \$17.61 billion (a 2.9 percent increase over the FY 2008 enacted level), with almost a third of this amount allocated to science activities. Our view is that this request reflects a strong commitment by the Administration both to the exploration vision and a vigorous NASA science program, while also seeking to reinforce the foundational R&D capabilities necessary for long-term technical excellence and success in aeronautics. In light of this over-arching budgetary objective and other non-NASA fiscal demands, the Administration considers the amount requested for NASA exploration activities, as well as for NASA overall, to be appropriate and reasonable.

Q4. *The Administration is aware that the Iran, North Korea, Syria Non-proliferation Act (INKSNA) prohibits NASA from making cash purchases from Russia after 2011. NASA's FY09 budget request includes \$2.6 billion to purchase ISS transportation services through 2013. In order for NASA to purchase Soyuz flights after 2011, Congress must amend the INKSNA. Does the Administration plan to seek an amendment for INKSNA? If so, when should Congress expect to receive the request?*

A4. This is an important issue, and OSTP is working closely with NASA and other appropriate offices and agencies to coordinate the Administration's views and next steps on this subject. We expect this coordination process to be completed soon.

Questions submitted by Representative David Wu

Q1. Does the Administration think our small and medium manufacturing base is important? The MEP is the only federal program to assist our small and medium-sized manufacturers. In my district, and I believe in every Congressional district, we hear from this community that their #1 priority is to maintain full funding for MEP.

- *Dr. Marburger, what should I tell these groups? Why do their priorities fall on deaf ears in this Administration? What priority do you give to our small manufacturing base?*

A1. Certainly the prosperity and health of the small and medium manufacturing base is important for U.S. competitiveness. However, programs that provide direct support for the private sector should be funded, when possible, by the private sector and not by the government. In the case of MEP, the government is providing consulting services that are available concurrently from commercial entities. Originally targeted at small firms, MEP centers now also serve many larger firms that do not need federally-subsidized consulting advice. Given the substantial benefits that MEP clients receive from the program, these clients have both a profit incentive and the means to obtain these services from the private sector. In an environment of limited resources, choices such as this help ensure the taxpayers' money is used optimally to achieve the maximum positive impact. It is the Administration's judgment that the NIST core budget is a higher priority than NIST extramural programs like MEP.

Questions submitted by Representative Daniel Lipinski

Fermilab

Q1. The President's budget request for the federal agencies encompassed in the American Competitiveness Initiative (ACI) appears to place a high priority on investment in the Nation's scientific enterprise. However, a close reading of the budget shows that this funding comes at the expense of some 151 federal programs that the President proposes on paper to reduce or eliminate for savings of \$18 billion that can be invested in Administration priorities.

- *Illinois is home to two DOE national laboratories—the Fermi National Accelerator Laboratory (Fermilab) and Argonne National Laboratory.*
- *Fermilab is the Nation's only national laboratory devoted to studying particle physics. When Congress restored funding to many programs the President proposed to cut or eliminate in the FY 2008 omnibus appropriations bill, there was not enough money to fund the ACI. DOE's High Energy Physics program, which funds Fermilab, was cut by eight percent below the FY 2007 level—a real cut with real consequences.*
- *On February 1st, Fermilab began unpaid rolling furloughs of its 1900 scientists, engineers, technicians and support staff. On February 5th, Fermilab began the process of laying off 200 people from the lab given the budget for FY 2008 and outlook into FY 2009. We are losing the best and brightest scientists and sending a chilling message to our university students choosing a career path when we need more scientists.*
- *This is a repeat of the FY 2008 budget all over again. Are the President and the Administration serious about investing in the Nation's scientific enterprise and making the ACI a reality?*

A1. The President and the Administration are absolutely committed to making the ACI a reality. In his 2008 State of the Union speech, President Bush renewed his call to implement the American Competitiveness Initiative now, stating:

"To keep America competitive into the future, we must trust in the skill of our scientists and engineers and empower them to pursue the breakthroughs of tomorrow. Last year, Congress passed legislation supporting the American Competitiveness Initiative, but never followed through with the funding. This funding is essential to keeping our scientific edge. So I ask Congress to double federal support for critical basic research in the physical sciences and ensure America remains the most dynamic Nation on Earth."

Unfortunately, the 2008 omnibus appropriations bill drastically cut proposed ACI civilian research, funding only one-third of the President's requested increase. In ad-

dition, Congress directed over half of the enacted increase (\$207 million of a total \$403 million increase) to earmarks and an unrequested new grants program. This significantly impairs and delays the Administration's efforts to strengthen long-term U.S. economic growth and competitiveness. The increased funding would enable scientists to further explore promising and critical areas such as nanotechnology, supercomputing, and alternative energy sources. President Bush's call for doubling these basic research levels has been endorsed by Congress, which fully authorized his ACI research increases in the bipartisan *America COMPETES Act* (Public Law 110-69), and is supported by a broad coalition of business and academic leaders in the "American Innovation Proclamation" (<http://futureofinnovation.org/media/Proclamation-FINAL.pdf>). The President's FY 2009 Budget returns ACI civilian research to a doubling path to ensure this consensus national priority objective is realized.

Q2. *High Energy Physics is an international field with great collaboration. The field will soon be focused on the Large Hadron Collider coming into operation in Switzerland and operations at the Tevatron at Fermilab will wind down by the end of the decade.*

What is the Administration doing to help minimize the impacts of the final FY 2008 budget for Fermilab? What can we do together to reduce the serious impacts on Fermilab and our other research laboratories and facilities?

A2. The Administration is very concerned about the impacts of the FY 2008 budget on Fermilab and on other research laboratories and facilities. The impacts of the FY 2008 budget have been severe, particularly for Fermilab and the High Energy Physics community. The FY 2008 budget allocates \$688 million for the DOE/HEP, which supports Fermilab. This represents a funding cut of six percent compared to FY 2007. Representative Lipinski has already described the impacts of these cuts, including a large number of layoffs and unpaid rolling furloughs for all employees. The President's FY 2009 Budget includes \$805 million for DOE/HEP, an increase of 17 percent over FY 2008. This proposal focuses on supporting operations and facility improvements at Fermilab, preserving the U.S. leadership roll in the Large Hadron Collider collaboration, fulfilling our commitments on international collaborations, and investing in research and technology that will position the U.S. to regain and preserve leadership in the field of High Energy Physics for the future. The serious impacts of the FY 2008 budget can be reduced by passage of the President's FY 2009 Budget.

Q3. *The future for Fermilab belongs in new projects, which must be accelerated, including the NOvA neutrino program done jointly with Fermilab and the State of Minnesota and a new project (Project X) which will pave the way to develop the technology for the proposed International Linear Collider. What is the Administration's commitment to these future programs for Fermilab in the FY 2009 budget?*

A3. The Administration is committed to investing in a program that is scientifically productive and in technology development that will enable the U.S. to maintain a High Energy Physics program that is internationally vital. The DOE has charged its Particle Physics Project Prioritization Panel (P5) with developing a 10-year strategic plan for an optimum science program within the constraints of a limited budget. Since Fermilab is the only dedicated national facility for DOE Office of High Energy Physics (HEP), this strategic plan is particularly important for defining its role in the national and international context.

The President's FY 2009 Budget includes \$65 million for the NuMI Off-axis Neutrino Appearance Detector (NOvA). There is no funding explicitly requested for Project X since it is still being defined. The FY 2009 budget restores funding for International Linear Collider (ILC) R&D. Funding designated for technology development in support of the ILC and funding for superconducting radio frequency (RF) technology are both investments in the U.S. capabilities. These help preserve U.S. leadership in the field and the *option* for a future the next administration to host the next collider. This request fully supports Fermilab's ability to plan for the future even though that future is strongly tied to the strategic planning efforts of the HEP community via P5.

Nanotechnology

Q4. *Although the FY09 budget request provides funding increases for some R&D agencies, it has curious inconsistencies. One significant inconsistency is the funding proposal for the National Nanotechnology Initiative (NNI), which arguably involves the most cutting edge science and technology and is critical for our*

future technological strength. Under this budget proposal, NNI funding would stagnate, receiving an increase of only two percent above FY08.

This budget proposal, which provides an increase below inflation, would effectively result in a reduction in the level of effort for nanotechnology research. How is this consistent with the goal of strengthening U.S. innovation and competitiveness, and how do you justify it in a year in which the Administration is trumpeting its support for research in the physical sciences and engineering?

A4. The President's FY 2009 Budget provides over \$1.5 billion for the National Nanotechnology Initiative (NNI), over three times the level of investment at the beginning of this Administration, bringing the total since the NNI was established in 2001 to nearly \$10 billion. This sustained investment is advancing our understanding of the unique phenomena and processes that occur at the nanometer scale and expediting the responsible use of this knowledge to achieve advances in medicine, manufacturing, information technology, and energy and environmental technologies.

This budget request for nanotechnology reflects its high priority among interagency R&D areas, and includes increases for nanotechnology R&D within the National Science Foundation, Department of Energy, National Institute of Standards and Technology (in the Department of Commerce), the National Aeronautics and Space Administration and Environmental Protection Agency. The budget request for the Department of Defense declines by \$112 million relative to 2008 primarily because the Administration does not request funding for the numerous earmarks that Congress added in this area.¹ (The Administration prefers instead to award research funds based on merit review through a competitive process refereed by scientists themselves. Such a system has the best prospects for ensuring that the highest quality research is supported.)

While the total NNI budget increase over FY 2008 is about 2.4 percent, the increase targeted for physical sciences at NSF, NIST, and DOE is a substantial 11 percent, and seeks to restore funding in FY 2008 that was expected to be much higher (\$80 million more for DOE alone) as part of the American Competitiveness Initiative (ACI). This increased support for basic research in the physical sciences is essential to progress across the National Nanotechnology Initiative.

Ultimately both Congress and the Administration must fit funding within a discretionary budget that has limits. Looking at overall funding for the NNI relative to other areas, it is clear that the direction of the requests for the NNI over the course of this Administration has been consistent with the President's commitment and congressional intent to support American competitiveness.

Q5. *The National Science and Technology Council, which you chair, is charged with setting overall goals and priorities for interagency R&D initiatives, such as the NNI. Does the FY09 budget request for the NNI result from a conscious decision by the agencies represented on the NSTC to reduce the level of effort in this area of research? If so, what are the reasons for the de-emphasis, and if not, how did this budget request come about?*

A5. See answer to question one above regard funding levels—the level of effort in nano research is not being reduced—it is being increased government-wide and particularly within the priority ACI agencies. The process associated with developing R&D budgets is a collaborative one involving agencies working with the OMB and OSTP.

DOE Office of Science Labs

Q6. *The DOE Office of Science is the steward for several very large-scale experimental and scientific facilities around the country, some of which can cost hundreds of millions or more to build, and tens of millions in annual operational costs. Argonne and Fermilabs are two such examples, both of which help to greatly stimulate the economy of Illinois and the Midwest. But, these facilities are often used for non-energy research by other agencies such as NIH, DOD, NSF, and private industry for what amounts to nominal compensation.*

Given your call to diversify funding sources for research, is the current scheme adequate for the dual goals of encouraging diverse, productive use of these facilities?

¹In addition, because "nanotechnology" is not a separate budget item, DOD programs are driven by performance goals, not the means by which those are achieved. As a result, the amount within DOD programs that will be spent on nanotechnology-related R&D in the future can only be roughly estimated. In fact, DOD is generally conservative in its estimate and in the past has spent more than it proposed for a given year.

ties and recovering significant operational costs? Or should DOE continue to bear the brunt of responsibility for others' research?

A6. One of the most important missions the Office of Science carries out on behalf of the entire U.S. research community is designing, building and operating many of this country's largest scientific user facilities. Scientists are awarded time on these facilities based on the strength of the science they propose to do—regardless of whether they come from government labs, academia or industry and regardless of whether they are directly supported by DOE or other agencies. Argonne and Fermilab, alone, support approximately 6,000 visiting researchers per year who use those labs' particle beams and colliders, nuclear physics accelerators, x-ray synchrotron light sources, nanoscience centers and supercomputers.

In cases where the Office of Science is the source of 90 percent or more of total federal funding for a discovery-oriented field, such as nuclear physics and particle physics, recovery of operational costs would not result in more efficient or effective use of taxpayer resources. Support of these two fields is a shared responsibility of NSF and the Office of Science. The federal investments in these fields are coordinated through two committees that advise both agencies: the High Energy Physics Advisory Panel and the Nuclear Sciences Advisory Panel. About 40 percent of the 6,000 users at Argonne and Fermilab are using high energy or nuclear physics machines. There are two distinct areas in which foreign collaborators have contributed (cash or in-kind) to the Tevatron Collider program: detector and upgrade construction, and ongoing support of detector operations and software and computing for data storage and analysis. Foreign collaborators have contributed over \$100 million in capital equipment for detector fabrication and upgrades and about \$8 million per year in ongoing support for operations and computing.

In other fields, the Office of Science may not be the dominate source of research funding as it is in particle or nuclear physics, but it does have a mission to operate the majority of large national facilities. X-ray synchrotron light sources are one example. The Office of Science operates four of the Nation's six synchrotrons operating as user facilities, and DOE facilities are the site of 178 of the 212 beamlines in the Nation. Of those 178 beamlines, 96 receive full operational support from the Office of Science. The other major operational support is provided by NIH (21 beamlines), universities (22 beamlines), and industry (21 beamlines). Research institutes, NSF, Department of Commerce, and DOE EE/EM also support three to five beamlines each. When researchers use these beamlines to conduct proprietary research not published in the open literature, DOE charges full cost recovery. In most cases, that is a very small proportion of any facility's budget. As an example, revenue recovered for proprietary research at Argonne's Advanced Photon Source in FY 2007 represents two percent of the total facility budget.

A 1999 National Academies report entitled, *"Cooperative Stewardship: Managing the Nation's Multi-disciplinary User Facilities for Research with Synchrotron Radiation, Neutrons, and High Magnetic Fields,"* describes this most efficient and effective model for operating these national resources—that is the funding of the core operations under the stewardship of one agency. Scientific user facilities are generally characterized by large fixed costs and their operations become unstable when those fixed costs are spread over a diverse base of uses. The cooperative stewardship model does allow for shared investment by partner agencies, and DOE's partners have a successful track record of making those shared investments.

The recovery of operational costs from users is not a goal of this Administration. Rather, the Administration believes that maximizing the scientific and technological return on the Nation's existing scientific infrastructure should be one of the highest priorities for our R&D investment to protect our global scientific and economic leadership. That is why the President proposed the ACI and wants to see it fully funded.