

**A REVIEW OF THE PRESIDENT'S FY 2014
BUDGET REQUEST FOR SCIENCE AGENCIES**

HEARING
BEFORE THE
**COMMITTEE ON SCIENCE, SPACE, AND
TECHNOLOGY**
HOUSE OF REPRESENTATIVES
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WEDNESDAY, APRIL 17, 2013

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**A REVIEW OF THE PRESIDENT'S FY 2014
BUDGET REQUEST FOR SCIENCE AGENCIES**

WEDNESDAY, APRIL 17, 2013

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Committee met, pursuant to call, at 10:07 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Lamar Smith [Chairman of the Committee] presiding.

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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Committee on Science, Space, and Technology Hearing

***A Review of the President's FY 2014 Budget Request for Science
Agencies***

Wednesday, April 17, 2013

10:00 a.m. – 12:00 a.m.

2318 Rayburn House Office Building

Witness

Dr. John P. Holdren, Director, Office of Science and Technology Policy, Executive Office of the
President

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HEARING CHARTER

A Review of the President's FY 2014 Budget Request for Science Agencies

Wednesday, April 17, 2013
10:00 a.m. – 12:00 a.m.
2318 Rayburn House Office Building

Purpose

On Wednesday, April 17, 2013, the House Committee on Science, Space, and Technology will hold a hearing to review President Obama's proposed fiscal year 2014 (FY14) budget request for programs and science agencies under the Committee's jurisdiction.

Dr. John P. Holdren, Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy (OSTP), will review the proposed budget in the context of the President's overall priorities in science, space, and technology and will describe how the Administration determined priorities for funding across scientific disciplines and agencies. The Committee will hold separate hearings in the coming weeks to review the FY14 budget requests of science agencies within its jurisdiction.

Witness

Dr. John P. Holdren is the Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy. He also serves as Co-Chair of the President's Council of Advisors on Science and Technology (PCAST). Prior to joining OSTP, Dr. Holdren was the Teresa and John Heinz Professor of Environmental Policy and Director of the Program on Science, Technology, and Public Policy at Harvard University's Kennedy School of Government, as well as Director of Woods Hole Research Center.

The following web links are highlights of the President's FY 2014 budget request:

http://www.whitehouse.gov/sites/default/files/microsites/ostp/2014_R&Dbudget_overview.pdf

http://www.whitehouse.gov/sites/default/files/microsites/ostp/2014_R&Dbudget_agencies.pdf

The following web link provides highlights U.S. Global Change Research Program, renewable energy programs, and climate change preparedness in the President's FY 2014 budget request:

http://www.whitehouse.gov/sites/default/files/microsites/ostp/2014_R&Dbudget_climate.pdf

<http://www.whitehouse.gov/omb/budget/factsheet/building-a-clean-energy-economy-improving-energy-security-and-addressing-climate-change>

The following web link provides highlights of the Administration's proposal to consolidate STEM education programs in the President's FY 2014 budget request:

http://www.whitehouse.gov/sites/default/files/microsites/ostp/2014_R&Dbudget_STEM.pdf

The following web link provides highlights of the Administration's proposals for manufacturing R&D programs in the President's FY 2014 budget request:

<http://www.whitehouse.gov/omb/budget/factsheet/making-america-a-magnet-for-manufacturing-jobs>

Chairman SMITH. The Science, Space, and Technology Committee will come to order. I would like to welcome everyone to today's hearing, a Review of the President's Fiscal Year 2014 Budget Request for Science Agencies. I will recognize myself for an opening statement and then the Ranking Member.

The topic of today's hearing is the President's budget request for the coming year. It is the first of several hearings to examine the \$40 billion in annual federal R&D spending within the Science Committee's jurisdiction. Each Subcommittee will examine the request for the science agencies under their jurisdiction in the coming weeks.

However, at the outset of this series of hearings, I would like to say that these budget hearings are about something far more important than simply numbers on a ledger. The budget choices for federal research and development investments we choose will affect research and technology for many decades to come.

This Committee was first created in 1957 in response to the threat of the Soviet Union's launch of Sputnik. At that time, Americans were fearful of what this small spacecraft represented. The threats we face today are far more diverse and complicated. But in many ways, the same fundamental concern remains today as when this Committee was first created: Is America still a leader in science, space, and technology or are we falling behind? How does America stay ahead in the race for global competitiveness? How can we measure the benefits of such research investments when the payoff might be many years later? And how can American innovators better leverage these Federal Government investments to benefit the American people?

These questions are the prism through which the President's budget request and Congress' policy and budget decisions must be viewed. It is less a matter of dollars and cents, but more about finding common-sense solutions.

Here are some of the decisions this Committee faces with the President's budget before us.

- Today, the United States pays Russia \$63 million to take each of our astronauts to the International Space Station we built with the now-retired Space Shuttle. How best can we develop the new systems to once again launch American astronauts on American rockets? How can we better utilize the research capabilities of the International Space Station over the next decade?
- Beyond low-Earth orbit of the Station, where are the next destinations for our astronauts to explore? Is it an asteroid, as the President suggested three years ago? Or is the Earth's Moon a more compelling place for American astronauts to return rather than finding an asteroid to pull into the Moon's orbit?
- In his inaugural address last January, the President spoke briefly about climate change and the "overwhelming judgment of science." His budget proposes \$2.7 billion spread across 13 different federal agencies for climate science. How does this high level of spending affect other research priorities? Is some consolidation of research effort needed here?

- Today, China and other countries are using the very same Internet computer connections America invented and built over decades to spy on high-tech American companies and laboratories to gain our know-how and intellectual property. They might even attempt to cause physical damage using the computer systems that drive our society today. What is the best way to defend against cyber attacks and intrusions?

These are only a handful of the decisions before us as we consider the President's fiscal year 2014 budget request for federal research and development. American ingenuity and perseverance in the face of adversity is what makes our country great. We have many challenges before us—technological, scientific, and budgetary—but we will face them with the same determination Americans have in our past.

And that concludes my opening statement. And the gentlewoman from Texas, Ms. Johnson, and the Ranking Member of the Committee is recognized for her opening statement.

[The statement of Mr. Smith follows:]

PREPARED STATEMENT OF FULL COMMITTEE CHAIRMAN LAMAR S. SMITH

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Ms. JOHNSON. Thank you very much and good morning. And welcome, Dr. Holdren. It is good to have you back before the Committee and as we begin to digest the President's fiscal year 2014 R&D budget proposals.

I am pleased that the President remains committed to prioritizing investments in research and development and STEM education in his request. Even in these fiscally challenging times, we must set priorities, and there are few more important investments that we can make for our Nation's brainpower.

The scientists, engineers, and innovators of today make discoveries and develop technologies that generate whole new industries and jobs, improve the quality of life and the security of our citizens, and keep our Nation thriving in a competitive world economy. They also help to give our children the grounding in science and technology they will need to become the innovators of the future or simply to be prepared for the highly skilled jobs of the future.

Specifically, I applaud the President's continued commitment to keeping the budgets of NSF, NIST, and DOE's Office of Science on sustained, upward trajectories initiated in the *America COMPETES Act*. These agencies, among others, help to ensure our long-term economic growth through their support for cutting-edge, basic research and STEM education.

I am also pleased with the Administration's increased support for advanced manufacturing. The last few years have proven that we cannot be just a service economy and continue to grow. We must also maintain a strong base of American manufacturing. While we will have questions about some of the specific initiatives as we proceed with the series of agency budget hearings, I firmly believe that the key to maintaining and rebuilding our manufacturing capacity is through strategic investments in advanced manufacturing R&D and workforce development.

I also support the increased funding for the U.S. Global Change Research Program. Scientists are telling us that the climate is changing, and I do not understand why some of us keep fighting that. The significant increase in extreme weather events across the globe—it snowed in Texas last week, as it was 80 degrees here in recent years and the empirical records of increased global temperatures and greenhouse gas concentration should be evidence enough. I hope we act before it is too late to direct our Nation's great brainpower to developing solutions to reduce the warming and mitigate the impacts of our most vulnerable communities.

At the same time, I am concerned that in a number of cases, agencies are being given increased responsibilities without being provided the necessary additional resources. NASA is a case in point, with some climate responsibilities previously assigned to NOAA being shifted to NASA without the out-year budget being adjusted accordingly. In addition, NASA is now being asked to carry out an ambitious asteroid retrieval mission which, while

making use of some existing projects, will clearly also require significant new development work to be undertaken.

In both of these cases, is the Administration going to provide to NASA the additional resources required to successfully carry out the mandates that have been given, or is it going to require NASA to cannibalize other important activities?

And finally, I want to address the Administration's sweeping proposal to reorganize federal STEM education programs. I support the Administration's effort to develop a coherent vision and strategy for federal investments in STEM. I firmly believe in a federal role in STEM education, but I also believe that we must hold ourselves and our agencies accountable for these investments. We need to prioritize and we need to focus on outcomes, not outputs or dollars spent. This is exactly what we asked you to do in 2010 *COMPETES Act*, and I am happy that you took the task seriously.

At the same time, the release of this proposal before we have the strategic plan in hand makes it difficult for us to understand and evaluate all of the decisions and realignments. I hope, Dr. Holdren, that you will be able to elucidate more of this for us today, and I urge you to prioritize getting us the full report. I am supportive of your process and I want to be supportive of your outcome, but the longer you wait to share your detailed plans and justifications, the greater the chance that Member and stakeholder concerns will grow and your tremendous efforts will be set back at least a year, if not longer.

That being said, we will have some concerns and disagreements about the federal R&D budget proposal, but let me be clear. This is a good budget for research, innovation, and education. I look forward to working with the President and my colleagues in the months ahead to work toward the goal of making sure that the fiscal year 2014 authorization and appropriations bill that this Congress will eventually pass will continue to reflect the need to invest in our future.

Thank you, Dr. Holdren, for being here today. And thank you for letting me go over 51 seconds. Thank you.

[The statement of Ms. Johnson follows:]

PREPARED STATEMENT OF FULL COMMITTEE RANKING MEMBER EDDIE BERNICE JOHNSON

Thank you, Chairman Smith, for holding this hearing, and welcome, Dr. Holdren. It's good to have you back before the Committee as we begin to digest the President's FY 2014 R&D budget proposals.

I am pleased that the President remains committed to prioritizing investments in research and development and STEM education in his request. Even in these fiscally challenging times, we must set priorities, and there are few more important investments we can make than in our Nation's brain power.

The scientists, engineers, and innovators of today make discoveries and develop technologies that generate whole new industries and jobs, improve the quality of life and security of our citizens, and keep our Nation thriving in a competitive world economy. They also help to give our children the grounding in science and technology they will need to become the innovators of the future, or simply to be prepared for the highly skilled jobs of the future.

Specifically, I applaud the President's continued commitment to keeping the budgets of NSF, NIST, and DOE's Office of Science on the sustained upward trajectories initiated in the *America COMPETES Act*. These agencies, among others, help to ensure our long-term economic growth through their support for cutting-edge basic research and STEM education.

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I also support the increased funding to the U.S. Global Change Research Program, including the proposed increase for NASA's climate research. Scientists are telling us that the climate is changing, and I don't understand why some of us keep fighting them. The significant increase in extreme weather events across the globe in recent years and the empirical records of increased global temperatures and greenhouse gas concentrations should be evidence enough. I hope we act before it is too late to direct our Nation's great brainpower to developing solutions to reduce the warming and mitigate the impacts in our most vulnerable communities.

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That being said, we will have some concerns and disagreements across the federal R&D budget proposal, but let me be clear. This is a good budget for research, innovation, and education. I look forward to working with the President and my colleagues in the months ahead to make sure that the FY 2014 appropriations bills that this Congress will eventually pass continue to reflect the need to invest in our future.

Thank you, Dr. Holdren, for being here today, and thank you for your contributions to ensuring continued U.S. leadership in science and technology.

Chairman SMITH. Thank you, Ms. Johnson.

Also, if other Members have opening statements, they will be made a part of the record at this point.

I am going to introduce our witness, but Ms. Johnson just saying that she went over a few seconds reminds me to let Dr. Holdren know that if he goes beyond the usual five minutes for witnesses, that is fine, too. You are the only witness here, and so if you need to take more time, that would be perfectly fine.

Our witness today is the Honorable John Holdren. Dr. Holdren serves as the Director of the Office of Science and Technology Policy at the White House, where he is both the Assistant to the President for Science and Technology and Co-Chair of the President's Council of Advisors on Science and Technology.

Prior to his current appointment by President Obama, Dr. Holdren was a professor in both the Kennedy School of Government and the Department of Earth Science at Harvard. Previously, he was a member of the faculty at the University of California, Berkeley, where he founded and led a graduate degree program in energy and resources. Dr. Holdren graduated from MIT with degrees in aerospace engineering and theoretical plasma physics.

As our witness knows, he is normally limited to five minutes, and as I have just mentioned, please take more if you need to. And Dr. Holdren, we look forward to your testimony.

**STATEMENT OF HON. JOHN HOLDREN,
DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY,
EXECUTIVE OFFICE OF THE PRESIDENT**

Dr. HOLDREN. Well, Chairman Smith, Ranking Member Johnson, Members of the Committee, I am certainly happy to be here with you today to discuss the civilian science and technology components of the President's fiscal year 2014 budget.

The President, in his most recent State of the Union address, articulated three overarching priorities: making America a magnet for new jobs in manufacturing; unlocking the promise of American energy; and educating our citizens with the skills and training to fill the jobs of the future. The President's 2014 budget supports these three priorities by investing strategically in science and engineering research and in STEM education.

We know from decades of experience that these are the kinds of investments that will pay off for the Nation in the years ahead. They are the kinds of investments that a forward-looking nation must maintain even in economically trying times. By building and fueling America's engines of discovery, these investments promise to expand the frontiers of human knowledge, revitalize America's manufacturing sector and promote sustainable economic growth, cultivate a clean energy future for the Nation, improve health care outcomes for more people at lower cost, manage competing demands on environmental resources while addressing global climate change, and strengthen our national security.

Importantly, the President's budget does so without adding to the federal deficit, balancing increases in some areas with decreases in others and doing so strategically rather than with the blunt tool of sequestration. The numbers have been out for about a week now, so I am not going to take a lot of time going through them in detail, but as you know, the President's budget proposes \$142.8 billion for federal research and development in fiscal year 2014. That is an increase of 1.3 percent over the 2012 enacted level and proposes \$69.6 billion for nondefense R&D, which would be an increase of 9.2 percent. These increases are offset, as I mentioned, by strategic cuts.

For example, the \$71.5 billion proposed for development, the D in R&D in the 2014 budget, represents a decline of \$3.8 billion in that category. Because the final 2013 appropriations were so recently enacted, the comparisons in the budget and those I will make here today are between the 2014 proposals and the enacted 2012 appropriation. And I use current dollars, not adjusted for inflation. If you want to adjust them for inflation, the estimate for inflation between 2012 and 2014 is estimated to be 4.0 percent.

Among the particular highlights of the budget, it provides targeted support for three agencies repeatedly identified as especially important to the Nation's continued scientific and economic leadership: the National Science Foundation, the Department of Energy's Office of Science, and the National Institute of Standards and Technology laboratories. The increase there is 8.0 percent for those three combined. They total \$13.5 billion.

The budget provides \$17.7 billion to NASA, including funds for the continued development of the Space Launch System and the

Orion Multi-Purpose Crew Vehicle to enable human exploration missions to new destinations, including an exciting mission in the planning stages that would bring an asteroid within range for a human visit.

Within the Department of Energy, the budget proposes an Energy Security Trust to support research into transportation technologies to shift our cars and trucks off oil and insulate American families from volatile gasoline prices. And it provides \$379 million for the Advanced Research Projects Agency–Energy, or ARPA–E, to support transformational discoveries and accelerate development of clean energy technology.

The budget also supports several high-priority interagency science and technology initiatives, including the Networking and Information Technology R&D Program, the National Nanotechnology Initiative, and the U.S. Global Change Research Program, as mentioned by the Chairman.

Finally, the budget proposes \$3.1 billion for STEM education programs. That is a 6.7 percent increase, and it would reorganize the welter of small STEM ed programs spread across the mission agencies into about half the current number to improve focus, coordination, and evaluation.

In closing, let me emphasize the long-standing bipartisan cooperation that has characterized the Federal Government’s work to maintain America’s global leadership position in science, technology, and innovation over many administrations. My colleagues and I in the Obama Administration look forward to continuing to work with this Committee and the rest of Congress to strengthen the Nation’s science and technology portfolio in order to sustain and expand the economic and other societal benefits that that portfolio underpins.

Thank you very much. I think I am just a few seconds over.
[The statement of Mr. Holdren follows:]

Statement of Dr. John P. Holdren
Director, Office of Science and Technology Policy
Executive Office of the President of the United States
to the
Committee on Science, Space and Technology
United States House of Representatives
on
Research and Development in the President's Fiscal Year 2014 Budget
April 17, 2013

Chairman Smith, Ranking Member Johnson, and Members of the Committee, it is my distinct privilege to be here with you today to discuss the civilian science and technology (S&T) components of the President's fiscal year (FY) 2014 Budget.

A World-Leading Commitment to Science and Research

President Obama, in his most recent State of the Union address, called upon all of us to help create a growing American economy built on a solid foundation of free enterprise, individual initiative, and opportunity for everyone. He called on the American people inside and outside of government to work toward that vision, and he committed his Administration to doing its part by setting clear and ambitious priorities and investing in domains that will support broad-based and long-term growth.

He articulated in particular three priorities: making America a magnet for new jobs and manufacturing; unlocking the promise of American energy; and educating our citizens with the skills and training to fill the jobs of the future. He called upon Americans to create and sustain an economic and social environment where invention, innovation, and industry can flourish, and where a growing middle class could thrive.

The President's 2014 Budget supports that vision by investing in science and engineering research that can turn game-changing ideas into life-changing realities. And it provides support for the creation of new technologies, products, and industries that—despite barely having been imagined a few years earlier—have the potential to create some of the biggest businesses and best jobs of the future.

At the same time, the 2014 Budget recognizes today's fiscal constraints and makes tough but discriminating choices, limiting spending in many areas that in other times would likely be deemed worthy of greater support. But the Budget also focuses on and shows confidence in the future. By building and fueling America's engines of discovery, it promises to expand the frontiers of human knowledge; promote sustainable economic growth and good middle-class jobs by revitalizing America's manufacturing sector; cultivate a clean-energy future for the Nation; improve health-care outcomes for more people at lower cost; manage competing demands on environmental resources while addressing global climate-change challenges; and strengthen our national security.

As past budgets from this Administration did, the President's 2014 Budget proposes to invest intelligently in research, innovation, education, and infrastructure to lay the foundations for the industries, jobs, workforce, and environmental and national-security benefits of

tomorrow. But, of course, we need the continued support of the Congress to get it done. I say “continued support” because much of the President’s Federal research and education investment portfolio enjoyed bipartisan support during the first term of the Administration. Congress has recognized that retaining America’s global leadership position in science, technology, and innovation is not a partisan issue—and not an issue to gamble with. We hope to extend and to build on this mutual understanding and appreciation in the second term, in our interactions with both the Senate and the House, so we can continue to strengthen the Nation’s science and technology portfolio and all the economic and other societal benefits it underpins.

In the remainder of this testimony, I will elaborate on how the science and technology components of the President’s 2014 Budget support this agenda.

The Federal R&D Budget

History has shown that one of the most effective and efficient ways to invest in America—one of the best ways to assure that the Nation remains a magnet for new jobs and manufacturing and a fertile training ground for a new generation of innovators and entrepreneurs—is to invest in research and development (R&D). The President’s Fiscal Year 2014 Budget proposes \$142.8 billion for Federal research and development (R&D) to do just that—to build American innovation in manufacturing, to promote clean American energy, and to nurture a highly-skilled American workforce. To assure continued U.S. leadership in the increasingly competitive knowledge-based economy, the 2014 Budget proposes a substantial increase in non-defense R&D to \$69.6 billion, an increase of 9.2 percent over the 2012 enacted level, appropriately offset elsewhere in recognition of fiscal limits.

Specifically, the Obama Administration’s investments in research, innovation, education, and infrastructure fit within an overall discretionary budget capped at Budget Control Act of 2011 levels. The Budget reflects strategic decisions to focus resources on those areas where the payoff for the American people is likely to be highest, and allows for cuts in areas of lesser leverage. For example, the \$71.5 billion proposed for development – the “D” in “R&D” – in the 2014 Budget represents a decline of \$3.8 billion compared to 2012 enacted funding levels.¹

Budgets of Science Agencies

Three agencies have been identified as especially important to this Nation’s continued scientific and economic leadership by the President’s Plan for Science and Innovation, the America COMPETES Act of 2007, the Administration’s Innovation Strategy, and the America COMPETES Reauthorization Act of 2010: the National Science Foundation (NSF), a primary source of funding for basic curiosity-driven academic research that leads to discoveries, inventions, and job creation; the Department of Energy’s Office of Science, which leads fundamental research relevant to energy and also builds and operates much of the Nation’s major research infrastructure—advanced light sources, accelerators, supercomputers, and facilities for making nanomaterials—on which our scientists depend for research breakthroughs; and the

¹ All comparisons in the testimony are between the 2014 Budget and enacted 2012 appropriations. The testimony discusses changes in current dollars, not adjusted for inflation. The latest economic projections show inflation of 1.9 percent between 2013 and 2014 for the economy as a whole, using the GDP deflator. The inflation projections show economy-wide inflation at 4.0 percent for the two years between 2012 and 2014. All budget figures exclude the potential effects in FY 2014 of budget sequestration, as established by the Budget Control Act of 2011.

National Institute of Standards and Technology (NIST) laboratories, which support a wide range of technically and economically essential pursuits, from accelerating standards development for health information technology to conducting measurement-science research to enable net-zero-energy buildings and advanced manufacturing processes. These three agencies were authorized through FY 2013 in the America COMPETES Reauthorization Act of 2010. I look forward to working with this Committee in coming months on reauthorizing the COMPETES legislation.

In recognition of the leverage these three agencies offer and their key role in maintaining America's preeminence in the global marketplace, Congress and this Administration have worked together to increase funding for these agencies significantly over the past 4 years. The 2014 Budget maintains the commitment to increase funding for these agencies with an 8.0 percent increase between 2012 and 2014 for the three agencies' combined budgets, totaling \$13.5 billion. I want to emphasize that the proposed increases for these agencies are part of a fiscally responsible budget focused on deficit reduction, meaning these increases are fully offset by cuts in other programs.

I now turn to the budgets of individual agencies in a bit more detail. I will focus on the agencies under the jurisdiction of the Committee. Therefore, I will not provide details of the defense R&D portfolio (the Department of Defense and DOE's defense programs) or the budget of the National Institutes of Health (NIH).

National Science Foundation (NSF)

The National Science Foundation (NSF) is the primary source of support for academic research for most non-biomedical disciplines, and it is the only Federal agency dedicated to the support of basic research and education across all fields of science and engineering. NSF has always operated under the belief that optimal use of Federal funds relies on two conditions: that its research is aimed – and continuously re-aimed – at the frontiers of understanding; and that funds are best awarded through competitive, merit-review processes through time-limited awards. When these two conditions are met, the Nation gets the most intellectual and economic leverage from its research investments. In recognition of the strong connection between NSF's investments in fundamental science and engineering research and education and the technological innovation and technical workforce that fuel tomorrow's job-creating companies, the 2014 Budget request for NSF is \$7.6 billion, an increase of 8.4 percent above the 2012 funding level.

NSF puts the greatest share of its resources into the Nation's colleges and universities. Universities perform over half of all basic research in the United States. Basic research funding such as that provided by NSF is important not only because it leads to new knowledge and applications but also because it trains the researchers and the technical workforce of the future, ensuring the Nation will benefit from a new generation of makers and doers. In order to maximize this dual benefit to society and NSF's special contribution, the 2014 Budget provides \$325 million to NSF for a new, enhanced National Graduate Research Fellowship program. The Budget also proposes to consolidate a number of science, technology, engineering, and mathematics (STEM) undergraduate education activities into a new NSF program, which will promote evidence-based reforms. These proposals are part of a government-wide reorganization of STEM education programs that I discuss later in my testimony.

The NSF 2014 Budget supports job creation in advanced manufacturing and emerging technologies with \$300 million in Cyber-enabled Materials, Manufacturing, and Smart Systems (CEMSS) for multidisciplinary research targeted at new materials, smart systems, advanced manufacturing technologies, and robotics technologies. To encourage interdisciplinary research for a future bio-economy, the Budget proposes \$51 million for innovative proposals at the interface of biology, mathematics, the physical sciences, and engineering in the BioMaPS program. NSF intends to support approximately \$20 million in FY 2014 in research to advance the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) initiative announced earlier this month by the President. NSF research could involve the development of molecular-scale probes that can sense and record the activity of neural networks; advances in “Big Data” that are necessary to analyze the huge amounts of information that will be generated, and increased understanding of how thoughts, emotions, actions, and memories are represented in the brain. NSF will collaborate on this initiative with NIH, the Department of Defense’s Defense Advanced Research Projects Agency (DARPA), and private-sector partners. The Budget’s proposal for NSF also includes \$155 million for the Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21) initiative, nearly double the 2012 enacted level, to accelerate the pace of discovery in all research disciplines by advancing high performance computing, creating new research networks and data repositories, and developing new systems to visualize data. The Budget proposes \$25 million, an increase of \$17 million above the 2012 enacted level, for the public-private Innovation Corps (I-Corps) program at NSF, which is aimed at bringing together the technological, entrepreneurial, and business know-how necessary to bring discoveries ripe for innovation out of the university lab. The Budget also provides \$63 million to continue the Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) initiative that is changing the way the agency solicits and funds innovative cross-disciplinary proposals. The 2014 Budget also proposes \$372 million for fundamental research that is directly relevant to future clean energy technologies such as solar power generation and energy efficiency.

National Aeronautics and Space Administration (NASA)

The 2014 NASA Budget reaffirms the Administration’s commitment to that agency’s wide-ranging and important agenda, consistent with the bipartisan agreement reached between Congress and the Administration in the NASA Authorization Act of 2010 (the Act). NASA’s programs not only advance U.S. leadership in human and robotic space exploration, planetary science, astronomy, and cosmology, but through their contributions to aeronautical research and Earth observation they directly support U.S. economic competitiveness and the Nation’s capacity to deal with the challenges of a changing environment. Consistent with the provisions of the Act, the 2014 Budget funds continued development of the Space Launch System (SLS) and Orion Multi-Purpose Crew Vehicle (MPCV) to enable human-exploration missions to new destinations; the operation and enhanced use of the International Space Station (ISS), which has been extended through at least 2020; the development of private-sector systems to carry cargo and crew into low Earth orbit, thus re-establishing a cost-effective U.S. human spaceflight capability and shortening the duration of our sole reliance on Russian launch vehicles for access to the ISS; a balanced portfolio of space and Earth science, including a continued commitment to new satellites and programs for Earth observation; a dynamic space-technology development program; and a strong aeronautics research effort. I look forward to working with the Committee this year on reauthorizing NASA for the next several years.

Within the context of a difficult budget environment and the Budget Control Act's spending caps, NASA's 2014 budget is \$17.7 billion, a slight decrease from the 2012 enacted level. The Budget provides \$821 million in NASA funding that will be coupled with private-sector investments to develop new U.S. capabilities to transport human crews to the International Space Station. It also provides \$2.7 billion for the next-generation, deep-space crew capsule Orion MPCV and the heavy-lift SLS rocket that will send human-exploration missions to new destinations – including a bold plan to send humans to an asteroid – and it invests \$942 million for the development of innovative new technologies that can expand the potential and lower the cost of our space science and exploration efforts as well as benefit other U.S. government and commercial space activities. NASA has unique expertise in Earth observation satellite and sensor development, and the Budget makes best use of that expertise, providing \$1.8 billion to the Earth Science program, including funds to begin work on land imaging capabilities beyond the Landsat Data Continuity Mission; to study approaches to continue the long history of measurements of solar irradiance, atmospheric ozone, and Earth's radiation of energy to space; and to support other Earth-science efforts. The Budget fully funds the James Webb Space Telescope, the successor to the Hubble Space Telescope that will be 100-times more capable, at \$658 million to keep it on track for launch in 2018.

To enhance U.S. capabilities to defend our planet against near-earth objects (NEOs) such as asteroids, the subject of my testimony before the Committee last month, the Budget accelerates efforts to develop the capabilities to defend Earth from asteroid impacts by identifying potentially hazardous objects and further investigating their scientific attributes. This work will also support NASA's new asteroid mission, which itself would serve as a key stepping stone to manned missions to Mars and other destinations. The Budget provides a total of \$105 million for initial investments in the asteroid mission, \$78 million to develop needed technologies and study alternative approaches for a robotic mission to rendezvous with a small asteroid and redirect it and \$27 million to accelerate efforts to detect and characterize potentially hazardous asteroids.

Over the past year, NASA's Mars exploration program has continued to advance our understanding of Mars and engage the American people, particularly through the feats of the Mars Science Laboratory Curiosity, roaming the surface of Mars and conducting previously unimaginable scientific studies there. The \$1.2 billion 2014 budget for Planetary Science, including \$234 million for Mars exploration, reflects an integrated strategy that ensures the robotic Mars Exploration Program supports both science and long-term human exploration goals.

Department of Commerce National Institute of Standards and Technology (NIST)

The complex web of technology that keeps this Nation's equipment and economy running smoothly depends on largely invisible but critical support in the fields of measurement science and standards. The National Institute of Standards and Technology (NIST) laboratories stand at the core of this Nation's unparalleled capacity in these areas, promoting U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology. Reflecting NIST's vital role in supporting the economy and infrastructure, the 2014 Budget of \$754 million for NIST's intramural laboratories and construction of research facilities amounts to a 21 percent increase over the 2012 enacted level. That increase will support high-performance laboratory research and facilities for a diverse portfolio of investigations in areas germane to advanced manufacturing, nanotechnology, cybersecurity, disaster resilience, and forensic science. For NIST's extramural programs, the Budget provides a \$25 million increase to

the Hollings Manufacturing Extension Partnership (MEP) to establish Manufacturing Technology Acceleration Centers to assist manufacturers in adopting new technologies to improve their competitiveness. It also includes \$21 million for the Advanced Manufacturing Technology Consortia program, a public-private partnership that supports innovative approaches to addressing common manufacturing challenges faced by American businesses.

And as stated by the President in his State of the Union address, the Administration proposes a one-time, \$1 billion investment to launch a network of up to 15 manufacturing innovation institutes across the country in a National Network for Manufacturing Innovation (NNMI). Leveraging the strengths of a particular region, each institute will bring together companies, universities and community colleges, and government to co-invest in the development of world-leading manufacturing technologies and capabilities that U.S.-based manufacturers can apply in production. At the beginning of this year, OSTP and Federal agency partners released a Preliminary Design report for the NNMI, which provides greater detail on the proposal. In the meantime, in August 2012, the Administration launched a pilot institute in Youngstown, Ohio, with a \$45 million commitment from five Federal agencies, led by the Department of Defense. In his State of the Union address, the President stated that while Congress continues to consider the broader proposal, the Administration will launch three new manufacturing innovation institutes in 2013 with appropriated funds. NIST's proposals in manufacturing are part of a Federal government-wide \$2.9 billion investment in advanced manufacturing R&D, an increase of 87 percent over the 2012 enacted level.

Department of Commerce National Oceanic and Atmospheric Administration (NOAA)

NOAA plays a vital role supporting the monitoring and stewardship of the Earth's oceans, atmosphere, and marine habitats, which directly and indirectly are enormous sources of economic activity. The NOAA budget of \$5.4 billion in appropriations, including \$733 million for R&D, strengthens support for critical weather satellite programs, Earth observations, and NOAA's other core science and stewardship responsibilities.

The 2014 Budget provides \$2.0 billion to continue the development of polar-orbiting and geostationary weather satellite systems, as well as satellite-borne measurements of sea level and potentially damaging solar storms. The Budget includes significant investments in NOAA's ocean and coastal research and observing programs, while increasing support for stock assessments and habitat and species-conservation activities that are essential to restoring and maintaining healthy, sustainable fisheries.

Department of Energy (DOE)

DOE's 2014 Budget positions the United States to compete as a world leader in clean energy and advanced manufacturing, and to respond to the threat of climate change, with the R&D portion totaling \$12.7 billion, an increase of \$1.9 billion or 18 percent over the 2012 enacted level. This excludes DOE's non-R&D cleanup, weapons, and energy demonstration and deployment programs. The 2014 Budget's priorities build on progress made over the last four years in putting the United States on the path to a cleaner and more secure energy future. Since the beginning of the Administration, responsible domestic oil and gas production has increased each year, while net oil imports have fallen to a 20-year low; renewable electricity generation from wind, solar, and geothermal sources has doubled; and U.S. greenhouse gas emissions have

fallen to their lowest level in nearly two decades. The Budget continues this approach that has been working for the economy, our energy security, and the environment.

The 2014 Budget invests in DOE's clean-energy programs to accelerate R&D and further increase the cost-competitiveness and deployment of renewable power, electric vehicles, next-generation biofuels, advanced energy-efficient manufacturing, and other energy-efficiency technologies, including \$2.8 billion for the Office of Energy Efficiency and Renewable Energy (EERE). The Budget includes a new \$25 million prize for the first natural-gas combined-cycle power plant to demonstrate carbon capture and storage. The Budget also includes \$12 million for DOE to continue a research initiative to understand and minimize the potential environmental, health, and safety impacts of natural gas development from hydraulic fracturing, in collaboration with the Environmental Protection Agency (EPA) and the U.S. Geological Survey (USGS).

As the President announced in his visit to the Argonne National Laboratory in Illinois last month, the Budget also establishes an Energy Security Trust to support research into a range of transportation technologies that would shift our cars and trucks off oil and insulate American families from volatile gas prices. The proposal, \$200 million in 2014 and \$2 billion over ten years, would set aside and redirect some of the royalty revenues generated by oil and gas development in Federal waters of the Outer Continental Shelf (OCS) to fund this research. This proposal is designed to invest in breakthrough research that will make future technologies cheaper and better through a reliable stream of funding for research focused on developing cost-effective transportation alternatives to current vehicle technologies. Funding would support research into technologies such as advanced vehicles that run on electricity, homegrown biofuels, fuel cells, and domestically produced natural gas.

The 2014 Budget provides \$379 million for the Advanced Research Projects Agency – Energy (ARPA-E) within DOE to support transformational discoveries and accelerate solutions in the development of clean energy technology. ARPA-E performs short-term, high-risk, high-reward energy research focused on creating real-world solutions in areas ranging from grid technology and power electronics to batteries and energy storage. First funded as part of the American Recovery and Reinvestment Act (ARRA), ARPA-E was first authorized in the America COMPETES Act, and was reauthorized in the America COMPETES Reauthorization Act of 2010.

The 2014 Budget also supports research through Energy Innovation Hubs first funded in 2010 to solve specific energy challenges as part of DOE's overall research and development strategy. Each of the five existing Energy Innovation Hubs focuses scientific and engineering talent on a specific problem: improving batteries and energy storage, reducing constraints from critical materials, developing fuels that can be produced directly from sunlight, improving energy-efficient building systems design, and using modeling and simulation for advanced-nuclear-reactor design and analysis. The Electricity Systems Hub proposed in the 2014 Budget would focus on the interface between transmission and distribution as the point where power and information flow intersect with markets and regulations. Each of these Hubs brings together a multidisciplinary team of researchers in an effort to speed research and shorten the path from scientific discovery to technological development and commercial deployment of highly promising energy-related technologies.

The Department of Energy's Office of Science pursues fundamental discoveries and supports major scientific user facilities—including large-scale x-ray and neutron sources, particle

colliders, supercomputers, fusion devices, and sophisticated facilities for nanoscience and genomic sequencing— that are key to maintaining U.S. leadership in many areas of research, especially those related to energy, the environment, and climate change. The Office of Science's portfolio includes the Energy Frontier Research Centers (EFRCs) which support multi-year, multi-investigator scientific collaborations focused on overcoming hurdles in basic science that block transformational discoveries in energy science. The 2014 Budget includes funding for new EFRCs to replace some of the Recovery Act awards that will be completed. The Office of Science stewards 10 DOE National Laboratories and supports the research of about 25,000 Ph.D. scientists, graduate students, and postdoctoral associates, and engineers at over 300 universities and national laboratories nationwide. Nearly 29,000 researchers from academe, national laboratories, and industry make use of its advanced scientific user facilities each year, pursuing discoveries at the frontiers of science that enhance the Nation's energy security and economic competitiveness. The 2014 Office of Science Budget of \$5.2 billion, an increase of 5.7 percent above the 2012 enacted funding level, increases funding for both research and cutting-edge facilities and maintains the President's commitment to increase funding for three key science agencies.

Environmental Protection Agency (EPA)

EPA R&D funding totals \$560 million in the 2014 Budget, a slight decrease from the 2012 funding level. With this investment, EPA will focus on enhancing and strengthening the planning and delivery of science in its restructured research and science programs, making these efforts more integrated and cross-disciplinary. The 2014 Budget supports high-priority research of national importance in such areas as potential endocrine disrupting chemicals, green chemistry, green infrastructure, computational toxicology, and drinking water. The 2014 Budget proposes a total of \$14 million for EPA's research collaboration with USGS and DOE to reduce the potential health and environmental impacts of natural gas development using hydraulic fracturing.

Department of the Interior and United States Geological Survey (USGS)

The 2014 Budget for the Department of the Interior provides \$963 million for R&D, an increase of 17 percent or \$143 million over the 2012 enacted level, to invest in science to support decision-making in the Department's resource management and trust responsibilities and to support other Federal, state, local, and tribal entities in making sound, science-based decisions that affect environmental and human health and safety. This funding supports scientific monitoring, research, and analysis to assist decision-making in resource management and the special trust responsibilities of Interior and other federally mandated and nationally significant programs. Specific science activities include energy permitting, ecosystem management, rapid response to natural disasters, climate change adaptation, oil-spill restoration, water and wildlife monitoring, and tribal natural resource management. The total budget of Interior's United States Geological Survey (USGS) is \$1.2 billion, or a \$99 million increase from the 2012 enacted level. The 2014 Budget proposes \$19 million for USGS to continue its collaboration with EPA and DOE to conduct a research initiative to understand and minimize the potential environmental, health, and safety impacts of natural gas development from hydraulic fracturing.

Department of Homeland Security (DHS)

DHS R&D totals \$1.4 billion in the 2014 Budget, up \$893 million from the 2012 enacted level in order to restore steep cuts enacted in 2011 and 2012 appropriations and to fully fund construction of a state-of-the-art biomedical-countermeasures facility. The 2014 Budget funds important R&D on cybersecurity, nuclear materials and explosives detection, and chemical/biological response systems. The Budget increases investments to develop state-of-the-art technologies and solutions for Federal, State, and local homeland security operators. The Budget also proposes \$714 million to construct the National Bio- and Agro-Defense Facility (NBAF), a state-of-the-art laboratory to study and develop countermeasures for foreign animal, emerging, and zoonotic diseases that threaten human health and our agricultural industry.

Department of Transportation (DOT)

The 2014 Budget provides \$942 million for DOT R&D, an increase compared to the 2012 funding level. The Budget request includes funding for several R&D activities in the Federal Aviation Administration's (FAA) Next Generation Air Transportation System, known as NextGen. The Joint Planning and Development Office coordinates this important effort with NASA and other participating agencies. The Federal Highway Administration (FHWA) manages a comprehensive, nationally coordinated highway research and technology program, engaging and cooperating with other highway- research stakeholders. FHWA performs research activities associated with safety, infrastructure preservation and improvements, operations, and environmental mitigation and streamlining. Other DOT agencies conduct critical targeted research in support of transportation safety goals.

White House Office of Science and Technology Policy (OSTP)

The 2014 Budget requests \$5.65 million for operation of the White House Office of Science and Technology Policy (OSTP). This request is above the FY 2012 enacted level of \$4.50 million but well below the \$6.65 million amount enacted in FY 2011. OSTP's budget supports the Office's mission of coordinating science and technology efforts across the Executive Branch. OSTP works with the Office of Management and Budget (OMB) to set S&T priorities for all those executive branch departments and agencies with S&T and STEM-education missions and provides science and technology advice and analysis in support of the activities of the other offices in the Executive Office of the President. OSTP staff also supports me in my role as the Assistant to the President for Science and Technology in providing the President with such information about science and technology issues as he may request in connection with the policy matters before him. Through the National Science and Technology Council (NSTC), OSTP works closely with departments and agencies to coordinate a wide array of interagency science and technology initiatives to ensure that efforts are complementary, that data and facilities are appropriately shared, and that the maximum utility is gained from every research dollar. In addition, OSTP serves as the lead White House office in a range of international S&T activities. This work is accomplished with approximately 27 full-time equivalent staff supported by the OSTP appropriation, which includes the OSTP Director, four Associate Directors (for Science, Technology, Environment and Energy, and National Security and International Affairs), and a small administrative staff; approximately 50 scientific and technical experts detailed to OSTP from all across the executive branch; approximately a dozen other experts brought in under the Intergovernmental Personnel Act or various fellowship arrangements; and a handful of interns. This mix of personnel provides OSTP with a wide range

of expertise and leverages a multitude of resources to ensure that the science and technology work of the Federal government is appropriately supported, coordinated, and amplified.

Interagency Initiatives

A number of high-priority interagency S&T initiatives are highlighted in the President's 2014 Budget. These initiatives are coordinated through the NSTC, which as noted above is administered by OSTP.

Networking and Information Technology R&D

The multi-agency Networking and Information Technology Research and Development (NITRD) provides strategic planning for and coordination of agency research efforts in cyber security, high-end computing systems, advanced networking, software development, high-confidence systems, information management, and other information technologies. The 2014 Budget proposes \$4.0 billion for the NITRD Program, an increase of 4.2 percent over the 2012 enacted level. The 2014 Budget includes a focus on research to improve the ability to derive value and scientific inferences from unprecedented quantities of data ("big data") and continues to emphasize foundations for assured computing and secure hardware, software, and network design and engineering to address the goal of making Internet communications more secure and reliable.

National Nanotechnology Initiative

The 2014 Budget proposes \$1.7 billion for the multi-agency National Nanotechnology Initiative (NNI)—a \$159 million reduction from the 2012 enacted level. To accelerate nanotechnology development in support of the President's priorities and innovation strategy, the NNI member agencies focus on R&D of materials, devices, and systems that exploit the unique physical, chemical, and biological properties that emerge in materials at the nanoscale (approximately 1 to 100 nanometers). Participating agencies continue to support fundamental research for nanotechnology-based innovation, technology transfer, and nanomanufacturing through individual investigator awards; multidisciplinary centers of excellence; education and training; and infrastructure and standards development, including openly-accessible user facilities and networks. Furthermore, agencies have identified and are pursuing Nanotechnology Signature Initiatives in the national-priority areas of nanomanufacturing, solar energy, sustainable design of nanoengineered materials, nanoscale sensors, and nanoelectronics, through close alignment of existing and planned research programs, public-private partnerships, and research roadmaps.

U.S. Global Change Research Program

The Budget continues the commitment to global-change research, with the understanding that insights derived today will pay off with interest in the years and decades ahead as the Nation works to limit and adapt to shifting environmental conditions. Investments in climate science over the past several decades have contributed enormously to understanding of global climate. The trends in global climate are clear, as are their primary causes, and the investments in this research arena in the 2014 Budget are a critical part of the President's overall strategy to mitigate U.S. greenhouse-gas emissions and move toward a clean-energy economy even as the Nation adapts to those changes that are inevitable. The 2014 Budget provides \$2.7 billion for the multi-

agency U.S. Global Change Research Program (USGCRP), an increase of 6.0 percent over the 2012 enacted level.

The USGCRP was mandated by Congress in the Global Change Research Act of 1990 (P.L. 101-606) to improve understanding of uncertainties in climate science, expand global observing systems, develop science-based resources to support policymaking and resource management, and communicate findings broadly among scientific and stakeholder communities. Thirteen departments and agencies participate in the USGCRP. OSTP and the Office of Management and Budget (OMB) work closely with the USGCRP to establish research priorities and plans to maximize research-dollar efficiencies and ensure that the program is aligned with the Administration's priorities and reflects agency planning.

The 2014 Budget supports the four objectives set forth in USGCRP's 2012-2021 strategic plan, which are to (1) Advance Science: advance scientific knowledge of the integrated natural and human components of the Earth system; (2) Inform Decisions: provide the scientific basis to inform and enable timely decisions on mitigation of and adaptation to global environmental change; (3) Conduct Sustained Assessments: build sustained assessment capacity that improves the United States' ability to understand, anticipate, and respond to global-change impacts and vulnerabilities; and (4) Communicate and Educate: advance communications and education to broaden public understanding of global change.

Funding in the 2014 Budget will support an integrated and continuing National Climate Assessment of climate-change science, impacts, vulnerabilities, and response strategies, as mandated by Congress. In FY 2014, USGCRP agencies will give emphasis to research that advances our understanding of vulnerabilities in human and natural systems and their relationships to climate extremes, thresholds, and tipping points. Specific areas where progress will be needed include promoting new and maintaining existing observations to detect trends in extremes; integration of observation into models for prediction and climate simulation at spatial and temporal scales conducive to decision making, including enhancing and making more effective use of supercomputing capabilities; research to better understand attribution of change to human or natural causes; and deploying research findings and National Climate Assessment outputs in a Global Change Information System in support of adaptation responses to changing frequency and intensity of extreme events.

Science, Technology, Engineering, and Mathematics (STEM) Education

President Obama strongly believes that the United States must equip many more students to excel in STEM fields. That's why the President's 2014 Budget invests \$3.1 billion in programs across the Federal government on STEM education, a 6.7 percent increase over the 2012 enacted funding level. The 2014 Budget includes critical investments in several key areas that will benefit aspiring students: preparing and supporting excellent STEM teachers; supporting more STEM-focused high schools and districts; improving undergraduate STEM education; improving the reach of informal STEM-learning efforts; and investing in breakthrough research on STEM teaching and learning.

In addition, the 2014 Budget makes disciplined choices to consolidate and cut back lower-priority programs to make room for targeted increases. This includes the proposed elimination or consolidation of 114 programs, with approximately \$180 million in savings reinvested in new or existing STEM programs. This reorganization will substantially decrease

the fragmentation of STEM programs across agencies, allowing potential for easier coordination and strong evaluations of what's working. The reorganization also includes increasing capacity at key agencies, including \$5 million for a new Office of STEM at the Department of Education. The Administration is proposing to reorganize STEM-education programs into four key areas: K-12 instruction; undergraduate education; graduate fellowships; and informal education activities that typically take place outside the classroom. Each key area would have a lead agency. The Department of Education's role in K-12 education would be to develop STEM innovation networks, support STEM Teacher Pathways to help reach the President's goal of preparing 100,000 effective STEM teachers over the next decade, and create a STEM Master Teacher Corps to build the STEM instructional skills of others. NSF would promote reform of STEM undergraduate education and enhance graduate fellowships to reach more students and address national needs. The Smithsonian Institution would improve the reach of classroom and informal education materials and activities by ensuring they are aligned with State standards and are relevant to what is being taught in school. Efforts within the Department of Education, NSF, and the Smithsonian Institution will be closely coordinated with the activities and assets of other Federal science agencies.

In his 2011 State of the Union address, the President called for a new effort to prepare 100,000 effective STEM teachers with strong teaching skills and deep content knowledge over the next decade. That call had roots in a groundbreaking analysis by the President's Council of Advisors on Science and Technology (PCAST) and remains a priority for this Administration. In this effort, we have been assisted by a robust set of partnerships with the private sector. Last month, I hosted a roundtable of more than 30 professionals from inside and outside government committed to the cause of improving the Nation's corps of K-12 science and math teachers. That day, one of our partners, the Howard Hughes Medical Institute (HHMI), announced that it would donate \$22.5 million to the National Math and Science Initiative (NMSI) to accelerate the scale-up of the UTeach program in American universities. UTeach, pioneered at the University of Texas-Austin, is a program that allows undergraduates to earn simultaneously a teaching certificate and a Bachelor's degree in a STEM field. Along with other initiatives such as 100Kin10 (a collaborative effort between nonprofit, philanthropic, and other private organizations), NMSI and UTeach are helping to achieve the President's goal of preparing 100,000 effective STEM teachers over the next decade. In the 2014 Budget, the Department of Education is investing \$80 million to support this goal.

In line with the government-wide STEM-education reorganization, the Department of Education will also restructure its existing efforts to lead a cohesive and robust initiative around improving K-12 instruction. The Budget invests \$150 million to help school districts, individually or in consortia, to build strategic partnerships with universities, Federal science agencies, businesses, museums, skilled volunteers and other educational entities. These partnerships – STEM Innovation Networks – will help district leaders harness local, regional, and national resources to transform STEM teaching and learning by, for example, implementing innovative research-based practices, and building teacher capacity. Each network will engage in activities based on local needs, such as providing quality professional development to STEM teachers and developing and evaluating instructional models that help students meet STEM-focused, college and career-ready standards. The Innovation Networks are modeled on successful State and local efforts such as the partnership between the Ohio STEM Learning Network, the Cleveland Metropolitan School District, GE, and MC2High School. This investment also includes \$5 million to support a STEM Virtual Learning Network, a national, online community of STEM educators that will enable them to exchange STEM education

materials and best practices, including those developed through the Innovation Networks. Additionally, Networks will leverage the expertise of the Nation's most talented science and math teachers—through the Budget's \$35 million investment in a new STEM Master Teachers Corps—to help improve instruction in their schools and districts, and to serve as a national resource for best practices in math and science teaching. This effort builds on the foundation of the \$150 million Math-Science Partnership program, which provides grants to every State to implement and improve STEM education.

The President continues to support undergraduate STEM education reform as a top priority, in part to fulfill PCAST's most recent report on undergraduate STEM education, released last February, calling for the United States to establish a goal of training one million additional STEM graduates over the next decade. To further this goal, the Administration proposes consolidating disparate STEM undergraduate-education activities into a new consolidated program at NSF. This reform will increase the efficiency and effectiveness of these investments by promoting implementation of evidence-based instructional practices and supporting an expanded evidence base. It also supports research on how new technologies can facilitate adoption and use of new approaches to instruction. The 2014 Budget provides \$123 million for this new program.

The Administration is also committed to increasing the number of college graduates with degrees in technical fields. Opportunities to work on real-world research problems can help inspire students to pursue such degrees. The 2014 Budget proposes \$79 million, an increase of \$13 million above the 2012 enacted level, for NSF's Research Experiences for Undergraduates (REU). Since early opportunities to conduct research can be especially influential in maintaining a student's interest in STEM fields, the program will increase its investment in research experiences for those in their first or second year of college.

By reorganizing or eliminating smaller fellowship programs, the Budget will provide \$325 million to expand and enhance NSF's Graduate Research Fellowship program, creating a new National Graduate Research Fellowship. The program will not only continue to support the Nation's most promising students in any STEM field, but will also allow students to gain specialized experiences in areas of significant national need or of particular interest to mission agencies. Reorganizing graduate fellowships will position the Administration to implement a national strategy for fellowships and for graduate education more broadly, streamline the application and award process, and reduce administrative costs.

The Budget adds \$25 million to the Smithsonian Institution to improve the reach of informal STEM education by ensuring that materials are aligned to what students are learning in the classroom. The Smithsonian will work with Federal S&T agencies such as the National Aeronautics and Space Administration (NASA), the U.S. Department of Agriculture (USDA), the National Institutes of Health (NIH), and other science partners to harness their unique expertise and resources to create relevant materials and curricula, on-line resources, and effective delivery and dissemination mechanisms to reach more teachers and students both inside and outside the classroom.

The Budget also proposes additional steps to increase the capacity of the Department of Education to invest in breakthrough innovation. The Budget proposes up to \$65 million for the Advanced Research Projects Agency for Education (ARPA-ED) within the Investing in Innovation (i3) program. ARPA-ED will catalyze the development and deployment of new tools

and technologies to significantly improve student learning. ARPA-ED will push the education research, development, and demonstration field forward by: sponsoring the synthesis and vetting of public and private R&D efforts; identifying breakthrough development opportunities; shaping the next wave of R&D; investing in the development of new education technologies and tools; and identifying and transitioning the best and most relevant R&D from other federal agencies.

These efforts are part of a broader Administration commitment to look carefully at the effectiveness of all STEM-education programs and find ways to improve them. To further this goal, I continue to co-chair the Committee on STEM Education under the NSTC. In December 2011, the Committee released the most comprehensive inventory of Federal STEM efforts ever compiled. The work of this Committee is closely aligned with the vision for STEM education outlined by Congress in the America COMPETES Reauthorization Act and has focused on improving the coordination and effectiveness of all Federal STEM education programs. In this spirit, the Administration released a description of a 5-year Federal STEM education strategic plan and an update to the Federal STEM inventory along with the 2013 Budget. The final strategic plan will be released this spring along with another update to the Federal STEM-education inventory. The strategic plan will outline a path to increased coordination and collaboration among the Federal agencies that invest in STEM education and increase the efficiency and impact of the Federal portfolio of STEM-education programs.

OSTP looks forward to working with this Committee on our common vision for improving STEM education for all of America's students.

Conclusion

The Administration's 2014 Budget reflects the President's deep appreciation of the profound importance of continued progress in science and technology even as we work to reduce budget deficits and hold the line on government spending. To achieve that balance, the Administration has made strategic choices in order to maintain and in some cases increase critical investments that will give rise to new industries and strengthen existing ones; generate well-paying and secure American jobs; help Americans enjoy longer and healthier lives; protect the global climate and other essential environmental conditions and processes; enhance national security while supporting open-ended exploration here on Earth and in space; and educate and train the innovators of tomorrow—all in the context of a disciplined approach to deficit reduction.

As this Committee has long emphasized, the best approach to supporting across-the-board innovation and long-term economic growth is to invest in a broad and balanced research portfolio—one that will produce not just the planned-for and predictable benefits to the Nation but also the entirely unexpected windfalls for society and the world. This country's overall prosperity in the last half century is due in great measure to America's pursuit of this formula and its commitment to a three-way partnership including academia, industry, and government. It is the Administration's goal that the 2014 Budget be applied to and coordinated with these complementary sectors to maintain the momentum of America's prosperity for many decades to come.

The Obama Administration recognizes that leadership across the frontiers of scientific knowledge is not merely a cultural tradition of our Nation; it is an economic, environmental, and national-security imperative. This Administration is committed to ensuring that America remains

at the epicenter of the global revolution in scientific research and technological innovation—a revolution that promises to generate new knowledge, create new jobs, build new industries, and propel the Nation to a vibrant future.

I look forward to working with this Committee to make the vision of the President's 2014 Budget proposal a reality. I will be pleased to answer any questions the Members may have.

DR. JOHN P. HOLDREN is Assistant to the President for Science and Technology and Director of the White House Office of Science and Technology Policy. Trained in aerospace engineering and theoretical plasma physics at MIT and Stanford, he is a member of the National Academy of Sciences, the National Academy of Engineering, and the American Academy of Arts and Sciences, as well as a foreign member of the Royal Society of London and a former President of the American Association for the Advancement of Science. Prior to joining the Obama administration, he was a professor in both the Kennedy School of Government and the Department of Earth and Planetary Sciences at Harvard, as well as Director of the Woods Hole Research Center. From 1973 to 1996 he was on the faculty of the University of California, Berkeley, where he co-founded and co-led the interdisciplinary graduate-degree program in energy and resources.

Chairman SMITH. Dr. Holdren, thank you. I don't know how you got so much in five minutes. And there will be a lot of questions on other subjects as well.

And I will recognize myself for questions. And really, I think I had more observations than questions, and I would ask you to comment on them.

First of all, let me go to NASA. Last December, a National Academy of Sciences' review of NASA's Strategic Direction made the following observation: "The Committee has seen little evidence that a current stated goal for NASA's Human Spaceflight Program—namely, to visit an asteroid by 2025—has been widely accepted as a compelling destination by NASA's own workforce, by the Nation as a whole, or by the international community. On the international front, there appears to be continued enthusiasm for a mission to the Moon but not for an asteroid mission. The President and the Administration are now proposing to capture a small asteroid and bring it closer to Earth as a destination for American astronauts."

I guess my question here is, it seems to me, that most of the scientific community would prefer some form of a return mission to the Moon. Why wouldn't we follow their advice?

Dr. HOLDREN. Let me say, first of all, that I think the situation has changed in a number of important respects since the National Research Council report, which you quote. It is true that there was a degree of lack of enthusiasm, a lack of excitement among some about the initially proposed mission to send U.S. astronauts to an asteroid by 2025, but the things that have changed and have changed that picture very substantially is, number one, NASA has developed an extraordinarily ingenious and cost-effective new approach to that mission, which entails sending a robotic probe to a small asteroid, towing it to a position about 40,000 miles outside the orbit of the Moon, and sending U.S. astronauts to visit there and to sample it and to return the samples using the Space Launch System and the Orion Multi-Purpose Crew Vehicle that are already being developed.

And by the way, we were already planning to visit the location to which that asteroid would be towed, an equilibration point just beyond the orbit of the Moon—

Chairman SMITH. Right. And Dr. Holdren, I—

Dr. HOLDREN [continuing]. As a way station—

Chairman SMITH. Right.

Dr. HOLDREN [continuing]. For heading to Mars.

Chairman SMITH. I know—

Dr. HOLDREN. So we are now seeing a lot of enthusiasm.

Chairman SMITH. Let me just interject real quick. I know this is a new mission, but it never appeared on any of the recommended missions by the Academies or by the various panels that were asked to make recommendations. So it is a new mission. Maybe we need to wait and see how it is received by the scientific community. But it just seems to me to be a little bit of an afterthought when the first mission didn't get supported by the international or by the scientific community. But I realize it is new, and we can weigh it as we go forward.

Another observation is this: as I mentioned in my opening statement, I think there are 13 agencies that engage in climate change research. There is only one agency, NASA, that is engaged in space exploration. Why not let NASA focus on its missions in regard to space and let the other 12 agencies focus on climate change, since NASA is the only one that deals with the space exploration?

Dr. HOLDREN. Well, I would say, first of all, that NASA has long had a mission to planet Earth, a mission looking down as well as a mission looking out, and NASA has unique capabilities, as it does in other areas, including aeronautics and green aviation, next-generation air traffic control. NASA has long been a multi-mission agency with many important missions—

Chairman SMITH. That is true but—

Dr. HOLDREN [continuing]. And our position is NASA needs to pursue all of those missions with the unique resources it has for those purposes.

Chairman SMITH. The President—what concerns me is the President, I think, over the last year or two has shifted something like \$300 million from space exploration into climate change research, and it just seems to me that one agency that does space ought to be allowed to continue to do space and focus on that. It may be just a difference of opinion that we have.

My last observation is this, and that is that in regard to the National Science Foundation grants, many proposals are approved, and only one out of seven is approved, that seem to deal with subjects that might not rise to the level or meet the standards that most people would think that they should meet. A couple of examples would be one study was approved to, I think, analyze the animal pictures in National Geographic from 1988 to 2008. There was another National Science Foundation grant that was approved that I think dealt with Chinese women's labor in the 16th century or something like that, and there have been a number that dealt with situations and cultural changes in China.

I—help me if you will and suggest as to how we might make sure that those who decide to approve these grants might be persuaded to approve grants that seem to focus more on more helpful subjects, more scientific subjects, more basic research?

Dr. HOLDREN. Well, first of all, let me say, Mr. Chairman, that I think there has been a lot of good and important research in the social sciences funded by the National Science Foundation. And I think you would probably agree. There has been research that has strengthened our democracy, that has increased the efficiency of our government, that has improved our foreign policy.

Sometimes, it is hard to tell from the title of the project what its merit is, but I would also concede that as rigorous as NSF's review processes are, there is always room for improvement, and I think some of the recent developments that have called into question some of the grants in the social sciences that NSF has funded will lead to increased scrutiny there as to how their review process can ensure that the social science work that they support contributes in evident ways to the national interest. But we would also not want to undermine the basic research dimension of what the National Science Foundation does, and we should be careful in the ways we intervene not to do that.

Chairman SMITH. Okay. Thank you for that. And I would like to continue to discuss the subject with you and maybe come up with ways to achieve our common goals in that regard. Thank you, Dr. Holdren.

Ms. Johnson is recognized for her questions.

Ms. JOHNSON. Thank you very much.

Dr. Holdren, I don't think it is any surprise that I am very interested in STEM education. And I was enthusiastically supportive of looking at the 127 programs coming together from a number of agencies to see how we could better concentrate. And I do support the goals of the proposal. However, we don't know what the program is now. I question about how this will all work because we are looking at a budget without the plan, and I wonder whether or not we can see the plan soon.

For K-12 programs that are being transferred, how will the mission-specific needs and the decades of education and public outreach experience that built up at the mission agencies like NASA and preserved by Smithsonian, the development in the Department of Education?

NASA has a long history of engaging students outside the classroom, and I have seen so much enthusiasm among students and I worry about the loss by transferring these programs, and I am specifically worried about consolidating too much in the Department of Education, which doesn't have a long history with STEM. And so I am really concerned about not knowing what this restructuring is and how we can work toward achieving the goal of being successful in STEM education.

Dr. HOLDREN. Well, that is a big set of questions, Ranking Member Johnson, but let me quickly try to address a couple of the main pieces of it.

First of all, the reorganization that the budget contains leaves intact a great many programs, still over 100 programs spread across the mission agencies. So it by no means has taken, or is proposing to take away, all of the diverse programs out there. And there has been a very serious effort to make sure to preserve the programs that most leverage the unique assets of the mission agencies, to preserve the programs particularly that reach women and other underrepresented groups in STEM, and in the consolidation, to do it in a way where the additional resources that end up in the Department of Education focused on K through 12; and NSF focused on college, undergraduate, and graduate education; and in the Smithsonian Institution focused on engagement and outreach outside of schools. Those consolidations, those additions of resources, will be managed in a way that interact with the mission agencies and preserve aspects of the programs that they lost that are the most valuable ones.

And we have commitments from the Department of Education, from NSF, from the Smithsonian that they are already doing that. They are in touch with the agencies. They are working to make sure that this consolidation, which provides more opportunities for coherence, for coordination, and for evaluation that was difficult with the very dispersed and often very small programs that are being consolidated, will all happen.

The second point I would make is the Department of Education is committed to expanding the staff dedicated to STEM education in order to be able to manage these additional responsibilities. And I have spoken with folks at NSF and Smithsonian as well, and they are all building up their capacity to deal with these additional responsibilities.

On the Strategic Plan, we have the benefit in conducting this reorganization of the progress report on the Strategic Plan that was released in 2012 and which was provided to the Congress and posted publicly. But I can tell you that the final version of the Strategic Plan, which is due in May, is, I believe, going to be delivered in May. So you will have it next month and be able to evaluate what is being proposed against it.

Ms. JOHNSON. Well, thank you very much. And I really sincerely hope that is something that is workable. In my experience—and I am in and out of schools all the time—many of the students are excited about external programs that are sponsored by NASA and some of the other groups. I have seen where there have been Title I teachers, for example, that is moving furniture around and not teaching students. So I am not so sure about the oversight that—and how close that is done as well as the other departments and the Department of Education.

But thank you. I yield back.

Chairman SMITH. Thank you, Ms. Johnson. The gentleman from Texas, Mr. Neugebauer, is recognized for his questions.

Mr. NEUGEBAUER. Well, thank you, Chairman. And thanks for holding this important hearing.

As you know, Dr. Holdren, the Keystone pipeline would deliver an estimated 830,000 barrels of oil a day to U.S. refineries and it would alleviate supply pressures that contribute to high gas prices enabling Americans to receive oil from our best ally in Canada instead of our foreign adversaries such as Venezuela.

Last month, the State Department's 1,500-page "Supplemental Environmental Impact Statement," the SEIS, essentially affirmed the safety and environmental soundness of this pipeline, concluding that it was not an impact—it would not impact greenhouse gas emissions, which has been a key environmental objection. As President Obama's Science Advisor with a background in environmental science, I presume that you have been involved in reviewing the climate science and pipeline technologies associated with the Keystone's pipeline decision. Could you describe any official, unofficial, or official advice or guidance that you have provided the President on or the President of the Administration's science agencies in their review of the Keystone pipeline?

Dr. HOLDREN. Congressman, first of all, as you know, the main locus of that decision ultimately will be the State Department. Obviously, the President is interested in it and is looking at it, and Secretary Kerry and the President are obviously committed ultimately to making the decision that is best for the country and best for the American people. The advice that I give to the President I give in my capacity as the Assistant to the President for Science and Technology, and I cannot discuss the content of that, but I can tell you that this has not been a major focus of my activity, and I have not in fact had any conversations with the President at this

point about the Keystone pipeline. He might in the future ask me about scientific aspects of it, but that has not happened until this point.

Mr. NEUGEBAUER. Well, let me ask you a question then. Do you share the perspective of the State Department report that the pipeline does not increase the amount of greenhouse gas emissions, and if it is, it is a negligible amount?

Dr. HOLDREN. We in the Executive Office of the President, again, have not been given the responsibility at this point to review that. I wouldn't want to preview what we might conclude if the President asks us to look more closely at the science in that particular assessment.

Mr. NEUGEBAUER. Have you looked at the science?

Dr. HOLDREN. I personally have started to look at the assessment, but I have not reached any conclusions.

Mr. NEUGEBAUER. So another question that I had was when we look at, particularly, the satellite program for weather and that program has been plagued with a lot of mismanagement. In fact, I want to read something here that the JPSS weather satellite program is projected to cost, I think like \$13 billion between now and 2028.

But last year, an independent review team called the Administration's management of this program dysfunctional and recommended that NOAA refocus the joint JPSS system program on its primary mission—weather centers and not climate monitoring. Do you agree with the review team's assessment about the dysfunctional management priority of the weather centers for the JPSS program?

Dr. HOLDREN. I agree with the findings that there were serious management problems at the time the study was done. NOAA and the Commerce Department have taken those recommendations very seriously and have already implemented a great many reforms in the management of that program. And the JPSS is now on schedule, within budget, and has met a number of its milestones, and is, actually, ahead of schedule. I think that report of the independent review team was extremely useful. And again, it has helped put that program back on track.

Mr. NEUGEBAUER. So what are you doing to monitor that?

Dr. HOLDREN. Well, you know, Congressman, when I came into this position I was told in my confirmation hearing that one of my obligations was to fix the polar-orbiting satellite system, which was a mess. We spent a year and a half working with all the relevant agencies, with NOAA, with NASA, with the Department of Defense, and we believe we did basically put in place the ingredients of a fix. The IRT report was a course correction for the part of it that ended up at NOAA. We are monitoring that very closely. I continue to consider it my responsibility as the Director of OSTP to make sure that that program stays on track. We cannot afford a gap in our polar-orbiting satellite coverage of weather, and it is our intention to avoid a gap.

Mr. NEUGEBAUER. Do you get periodic reports on the progress?

Dr. HOLDREN. Oh, yes, absolutely.

Mr. NEUGEBAUER. Yes. Could you furnish the Committee a copy of the most recent report on that?

Dr. HOLDREN. Well, I can certainly provide some relevant material to you. A lot of the reports that I get are in conversations with the Administrator of NOAA, currently the acting Administrator, Dr. Kathy Sullivan, and in discussions with the acting Secretary of Commerce, Dr. Becky Blank. So I can't provide you transcripts of those conversations, but they have certainly been taking place frequently.

Mr. NEUGEBAUER. So you can—

Dr. HOLDREN. I can provide you with some other material that summarizes our understanding based on those conversations and conversations that have gone on with OMB on the state of progress. I would be happy to do that.

Mr. NEUGEBAUER. Thank you.

Chairman SMITH. Thank you, Mr. Neugebauer.

The gentleman from California, Ms. Lofgren, is recognized for her questions.

Ms. LOFGREN. Thank you, Mr. Chairman. And it is great to see you, Dr. Holdren. Thank you for your service to our country and to science. It is always a pleasure to communicate with you.

And I want to appreciate publicly your efforts with our national labs to make sure that they are getting the support that they need and, especially, thank you also for your trip out to Sandia and Lawrence Livermore last year. It had a tremendous boost for morale for the scientists and it meant a lot, I think, to all of them.

I want to talk about—and I know this will probably come as no surprise to you—the National Ignition Facility at Lawrence Livermore National Lab. And I appreciate that we are trying to make sense of the numbers that are coming out of OMB, but here is what I think is the case. I mean, in 2012 we had a budget for the National Ignition Facility of \$486.8 million. The Administration requested only \$271 million in 2013. As you know, we added \$32 million in a bipartisan effort here in the House, but because we did not get the appropriations bill to the finish line, that in the end was not provided to the National Ignition Facility.

I realize that there are apparently efforts to allow for direct charging by the National Ignition Facility, but it is not clear to me how that is going to work. We spent \$5 billion building the best tool in the world for this. As you know, the National Academy and National Research Council just finished a two-year study on the inertial confinement fusion effort and determined that it is a national research priority and that the NIF is a critical research tool. So here is my question: is it the intent of the Administration to eliminate the fusion energy program at the National Ignition Facility at Lawrence Livermore lab? And if not, how are we going to avoid that result?

Dr. HOLDREN. Well, thank you for that question, Congresswoman Lofgren. As you know, I am committed, Secretary Chu is committed, and I expect, if confirmed, Secretary Moniz will be committed to maintaining this valuable facility and using it for the variety of purposes for which it was designed. As you also know, most of the budget for the National Ignition Facility comes from the National Nuclear Security Administration because of its relation to the Stockpile Stewardship Program, the capability to understand without nuclear explosive testing what we need to understand to

maintain the safety and reliability of our enduring nuclear weapons stockpile. That has always been the case. The primary source of funding was the weapons program and remains so.

There has been a small amount of funding that has come from the fusion energy side of the operation in DOE, which is then based on the proposition that ultimately inertial confinement fusion, as being pursued in this facility, might be a viable commercial energy source. The fusion budget, however, is now under intense pressure because of the rising cost of ITER, the International—

Ms. LOFGREN. Right.

Dr. HOLDREN [continuing]. Thermonuclear Engineering Reactor and the need to maintain a strong domestic plasma physics program. And so this year DOE decided that the modest support for NIF that it provided from the energy side would not continue to be provided—

Ms. LOFGREN. Well—

Dr. HOLDREN [continuing]. But that doesn't mean that the value of NIF to demonstrating ultimately the possibility of harnessing fusion energy in this way will be lost because the main thrust of activities there will continue.

Ms. LOFGREN. If I could—and I thank you for that reassurance that our intent is actually not to close this program. It is confusing, and you have been very helpful in finding—get—helping me understand what OMB is saying, but it sounds as if the intent is to charge off to users more of the cost of the facility and—but the NSF \$18 million has now been removed and—or DOE—and is it the intent that the NNSA will now be charged for their activity?

And, you know, I guess the other question I would ask—this is not something that the facility could decide, but both Russia and China are trying to emulate what we did and build comparable machines. Is it the intention of the Administration to charge off to those two countries experimental work? And what are the security implications if we were to do that?

Dr. HOLDREN. Well, first of all, Congresswoman, I believe that NIF remains the preeminent facility in the world and that nothing Russia or China has done up until now really comes close to its capabilities. I think the United States will remain in the lead in this domain, even though Russia and China are barking at our heels, as it were. But we intend to maintain our position of strength in the field.

As far as the details of who is being charged for what, I have to tell you we got the Congressional justification from OMB at the same time you did—

Ms. LOFGREN. Right.

Dr. HOLDREN [continuing]. And we are still trying to understand the intricacies of what is reflected there in terms of what the numbers—

Ms. LOFGREN. Well—

Dr. HOLDREN [continuing]. Add up to. But I can tell you about our intention. Our intention is to maintain this as a viable, world-leading facility with important applications both for our weapons program and potentially to the future of fusion energy.

Ms. LOFGREN. I thank you very much, Dr. Holdren, and I look forward to continuing to work with you and again appreciate your tremendous effort here.

Chairman SMITH. Okay. Thank you, Ms. Lofgren.

The gentleman from Illinois, Mr. Hultgren, is recognized for his questions.

Mr. HULTGREN. Thank you, Mr. Chairman. Dr. Holdren, good to see you. According to my count, I think this is the fourth time that you and I have had the opportunity to discuss the President's science priorities. And I want to start by just saying I appreciate you, I respect you, but I have to tell you I am disappointed in the President and I am disappointed in your office.

I think the President likes to give great speeches about science, but I don't think he actually really understands the importance of pure discovery research. And if you look at the chart that I have got here in my hand, now we have got up on the board, I see no evidence that you or the President have given a second thought to the input from this Committee over the last several years. This chart tells the same story it does as the chart I showed you last year.

The President favors massive increases to his pet projects in the alternative energy sector, and the closer the investment gets to pure discovery science, the less he cares about them. When it comes to high-energy physics, he once again wants to use it as a piggy bank to pay for other things. You said a year ago that you are not content for us to leave the future of cutting-edge facilities in high-energy physics to the rest of the world, but that we were constrained, and that everybody knows the budget challenges under which were operating.

And I look at the President's budget request this year, and I find myself thinking, sure, you can use that as a convenient excuse to cut high-energy physics yet again, but does an almost 40 percent increase in ARPA-E and an almost 60 percent increase in EERE strike you as constrained approaches? Does yet another real-dollar cut to high-energy physics strike you as supportive of high-energy physics?

Dr. HOLDREN. Well, let me say that, first of all, as I know you know, we are in a world of pain when it comes to the amounts of money available to us overall. I mentioned in my opening remarks that areas that were increased had to be bound by areas that were decreased. And difficult choices were made in that domain and reasonable people can disagree about what the most reasonable pattern of decisions would have been. But we are maintaining a world-leading program in neutrino physics at the Fermilab, which, of course—

Mr. HULTGREN. Well, let me jump in on that real quickly. Particle physics has been singled out by the Administration for decreased investment year after year. It lost annual purchasing power almost 25 percent in the last decade, which is in direct contrast to every other program in the Office of Science. Bill Brinkman, in his recent testimony to Congress, stated that we have squeezed too hard, yet you and President Obama continued to decrease investment in this important area of basic research, as is shown again in the latest budget request. How is this consistent

with maintaining a position of leadership in the world in basic scientific research?

Dr. HOLDREN. Well, first of all, we have benefited from a very high degree of international collaboration in this domain, which has saved us some money. The extraordinary work to discover the Higgs-Boson, which took place at CERN in Switzerland, was carried out with enormously elaborate, expensive detectors and teams from the United States. The fact that it took place in Switzerland on a machine, much of which was paid for by other countries, saved us money, but it did not diminish U.S. leadership—

Mr. HULTGREN. Well, I would say it did. You know, I think that should have happened here. I think we could have done much of that here. To maintain a position of leadership in any domain of particle physics, the plan of the U.S. community is to define leadership at the Intensity Frontier—where the focus of the greatest flux of particles and not the highest energy. The LBNE, as you mentioned, is a key facility necessary to establishing leadership in the area of particle physics. Why is investment decreasing in LBNE in fiscal year 2014 at a critical time, again when strong international participation is being sought?

Dr. HOLDREN. There is funding for the LBNE within the Office of Science request for 2014. We continue to support it. And we believe that the overall plan that we are working to develop for out-year support for facilities will be able to support the LBNE. We have no disagreement with you about the importance of the Intensity Frontier and—

Mr. HULTGREN. I appreciate your agreement, that just doesn't follow up with the budget plans. There are cuts there, and I think it really does send a very poor message. When we are out there seeking international partners, we are at the leadership of neutrino research, and yet we are undercutting these programs.

I just want to show—my time is running out—but the latest edition of the *Scientific American* talks about “Strange, Surprising Neutrino Physics,” much of the research again that is going on with LBNE. But from that, on the cover, they are featuring neutrinos. Particle physics has never been more exciting. As you mentioned, we have seen remarkable advances with the discovery of the Higgs and crucial measurements of the properties of neutrinos. These discoveries have had important participation from American scientists as you mentioned, but they have really been led and enabled by facility investments in Europe and China.

It seems to me that the President's budget plan that you are defending cedes American leadership in high-energy physics to Europe and China.

And my time is up, but to just a kind of highlight that again, I was looking back through your testimony of last year and reading through, and I will point you to the second page of your testimony today, the bottom paragraph. It is interesting because you had that exact same paragraph in your testimony last year, but one thing was changed, and that is, last year, you talked about these three jewel-in-the-crown agencies referring to NSF, Office of Science, and you have taken that out in your most recent, the idea of the jewel-in-the-crown agencies. It is the only thing that is removed from that paragraph. And my fear is that is exactly what is happening.

We are taking away by undercutting investment in these important programs. We are taking away and ceding our leadership opportunity.

My time is expired. I do appreciate you so much and the work you are doing. I know these are difficult times, but this is the stuff we have got to do. And so I ask and implore and look for ways that we can be working together to strengthen this investment and see where we can be taking money again where huge increases have happened in certain areas and put it back where we absolutely have to be doing it, where the market can't do it in basic scientific research.

With that, I yield back. Thank you, Mr. Chairman.

Chairman SMITH. Thank you. Thank you, Mr. Hultgren. And the other gentleman from Illinois, Mr. Lipinski, is recognized.

Mr. LIPINSKI. Thank you, Mr. Chairman.

Thank you, Dr. Holdren, for all the work that you do, it is very important that we maintain our leadership in the world on science, and I appreciate what you are doing.

The first thing I want to talk about is NSF's Innovation Corps Program. For those who aren't familiar with it, I-Corps is essentially an education program developed by serial entrepreneurs in Silicon Valley that teaches researchers how to develop a viable product from their research while also connecting them with potential customers and venture capitalists so that they can get feedback on their work. It is based on the Lean Startup model, which you can read about in an article written by the father of the movement, Steve Blank, which is in the May issue—the most recent issue of the *Harvard Business Review*.

I really believe that I-Corps has the potential to leverage our federal investments in research to create new jobs and new companies. We have already seen some success despite the fact that the program has only been operating for less than two years. Now, recently, one of the I-Corps teams—former I-Corps teams that went through the program formed a company called Neon and was able to secure funding from a private venture capital group. I bring this up because the company's current product and business model came as a result of their participation in the I-Corps program, and they readily admit that that is the case.

Now, recently, the ARPA-E program entered into an agreement with NSF to train some of their researchers in the I-Corps program. And I think more agencies could benefit as well. And this is—those were—are going—getting funding to take part in the I-Corps program are researchers who have already received federal grants. So today, I am sending letters to NIH and the Department of Energy to ask them to consider participating in the I-Corps program with some of their research divisions.

So, first, I want to applaud the Administration's commitment to innovative approaches to technology transfer like I-Corps. And second, I wanted to get your thoughts, Dr. Holdren on the I-Corps program and whether some form of entrepreneurial education like I-Corps might make sense at other science agencies. I just want to get your perspective on that.

Dr. HOLDREN. Well, thank you, Congressman Lipinski. I am very grateful for this question, because we in this Administration are

very strong supporters of NSF's I-Corps program and of the broader proposition that there is tremendous leverage in measures that can accelerate the transition of discovery in laboratories, whether they are research universities, laboratories, or national laboratories or corporate laboratories. They can accelerate the transition of discovery into practical products in the marketplace, meaning the national interest. I-Corps is doing, I think, a great job of that.

We are delighted that the I-Corps and ARPA-E are now in consultation. We have had a number of other projects and programs with the same general aim of trying to foster entrepreneurship in the scientific community that will move things in this direction. These efforts have included components of the STEM education programs we have at the college level, where we are encouraging colleges to offer courses in entrepreneurship for their scientists and engineers to take so that when they go out in the world with their advanced degrees, they are not just specialists in their particular field of scientific or engineering advancement and discovery, but they are knowledgeable about how to translate those discoveries into practical products, into companies, into new jobs. And I certainly applaud your interest in trying to expand this model even further.

Mr. LIPINSKI. Thank you. And very briefly, I know there are a number of initiatives on advanced manufacturing in the President's budget, the total requested \$2.9 billion across the Federal Government. Can you give a brief overview of the Administration's strategy and vision on this revitalized U.S. manufacturing in 46 seconds?

Dr. HOLDREN. The basic notion, of course, is that advances in additive manufacturing, formerly called 3-D printing; advances in materials, which we are promoting through what we call the Materials Genome Initiative; trying to cut in half the time it takes to develop and certify new materials; advances in robotics all together provide the possibility of a very substantially revitalizing American manufacturing. It is already happening. It is already showing results.

We think there is the possibility to generate more jobs, more businesses that are using these advanced technologies in the manufacturing domain, and that is going to help in part because when you separate the laboratory and the discovery from the manufacturing process, as has happened to some extent over the past couple of decades, you lose the opportunity for close feedback, which tends to improve the manufacturing process as it increases its efficiency, lowers costs. As we bring these manufacturing activities back to the United States and create and keep those jobs here, we are also going to benefit through increased efficiencies because of the feedback between research activities, development activities in the actual manufacturing plant.

Mr. LIPINSKI. Thank you very much. And I agree. I concur with what the Ranking Member said in her opening statement. We need to make more here in America. Thank you for your work on that. I yield back.

Chairman SMITH. Thank you, Mr. Lipinski.

The gentleman from Florida, Mr. Posey, is recognized for his questions.

Mr. POSEY. Thank you, Mr. Chairman.

And thank you, Dr. Holdren, for coming to share with us today.

I would like to read for you a couple titles of some research grants that the National Science Foundation recently funded. Picturing animals in *National Geographic* for the years 1888 to 2008 costing \$227,000; kinship, women's labor and China's economic performance in the 17th through 21st century costing \$267,000; regulating accountability and transparency in China's dairy industry costing \$152,000. The press has reported, as I am sure you know, many other examples of social and political science studies, and the Committee has got obviously other examples of questionable studies that cost over \$600,000. NSF's current spending on social, behavioral, and economic science studies is over \$250 million a year. And the President's request increases this research spending over 70 percent—over seven percent, I am sorry.

Within that \$250 million, staff says, approximately \$10 million goes toward political science studies. This comes at a time when many households are being asked to pay more taxes to fund more studies like this. And, you know, the questions our constituents beg for answers to are how do we justify such questionable studies as a priority for funding?

Dr. HOLDREN. Well, I would offer a couple of comments. One, I am not qualified to even try to defend every social science grant that NSF has ever given, and it is a perilous business sometimes to try to determine from the title of a grant, or even from a description of it what value it might have as fundamental research in social and behavioral sciences.

What I will say is that there have been many extremely valuable—from the clear standpoint of the national interest—valuable studies funded by NSF in political science and other social and behavioral sciences. I will give you one example. Elinor Ostrom—the late Elinor Ostrom, the only woman and the only political scientist ever to receive an economics Nobel Prize, did work showing that local management of resources held in common can be effective and sustainable without centralized regulatory control. This is a finding that should have considerable appeal on both sides of the aisle. She got a Nobel Prize for it. She was funded by a series of NSF grants in political science.

Mr. POSEY. Well, I think we will all agree that it is probably a good subject to study, you know, how our economy works, how we make our economy better, but Chinese dairy industry regulation, China's economic performance kinship, picturing animals—I mean it is just hard to conceive how those are important to our national security or our national interest.

And, you know, while I am not advocating we stop all social science study spending, I just think it might be appropriate that much of that be left to the private sector, and I know the recently enacted Coburn amendment requires that the Director of the National Science Foundation certify that each and every social science study meets the criteria of promoting national security or economic interest of the United States of America. And I think that is a good and proper filter by which all future studies should be considered. Do you agree?

Dr. HOLDREN. I respectfully do not agree. I think that is too narrowly drawn. I think there have been many beneficial results from research funded by NSF in the social, behavioral, and economic sciences that have contributed, for example, to a better understanding of how our democracy works and how to make it stronger, that have contributed to making our government more efficient. Saying that the only possible justifications are clear economic benefit or national security benefit, I think, would leave out a variety of important domains of NSF research.

And I think with respect to the private sector, we know that the private sector won't fund—

Mr. POSEY. Can you state just a couple of those for me?

Dr. HOLDREN [continuing]. Fundamental research.

Mr. POSEY. Give me some of those other domains, then, so maybe I can get a better handle on this bigger picture you are talking about.

Dr. HOLDREN. Okay. Again, improving the efficiency of the United States Government. There has been a huge amount of work supported by NSF in that domain—

Mr. POSEY. I think that is an economic interest and the national security, quite frankly.

Dr. HOLDREN. Well, you can make that argument and maybe it is, but I think it is a dangerous thing for the Congress or anybody else to be trying to specify in detail what kinds of fundamental research the NSF should support. The NSF has developed on the whole an enormously respected track record in supporting basic research across a wide range of disciplines in which it works. And we know the private sector is not going to support basic research to the extent that society's interests require. The uncertainties are too great, the timescale for return too long, the appropriability of the results inadequate. This is a responsibility of the government to fund basic research, including basic research in social sciences. And if you say it has to have a specific application, you are pulling the rug out from under the capacity of the NSF to fund basic research.

Mr. POSEY. Well, maybe some of my colleagues share my feelings and some of them don't, but, you know, the picturing of animals in *National Geographic* costing \$227,000, I don't think that is a basic—personally—research that American taxpayers need to foot the bill for. And I think if there is someone who thinks that is beneficial to them, perhaps they should start paying \$227,000 for picturing animals in *National Geographic* during that period of time.

Chairman SMITH. The gentleman's time—

Dr. HOLDREN. Again, it is not my field. I cannot comment on what merit or lack of merit that particular project had as basic social science.

Mr. POSEY. Well, do you think there should be some parameters? Don't you think there—

Mr. POSEY. —should be some—

Dr. HOLDREN [continuing]. An elaborate and rigorous review process at NSF. That is not to say it couldn't be made better.

Mr. POSEY. Thank you.

Chairman SMITH. Thank you, Mr. Posey.

The gentlewoman from Maryland, Ms. Edwards, is recognized.

Ms. EDWARDS. Thank you, Mr. Chairman.

And thank you, Dr. Holdren. I want to go back to the question of STEM education in the reorganization because I actually—I do generally support the idea that we are consolidating some of these STEM education programs. I think it is important that the NSF play a very functional role in identifying what are the criteria for successful programs, what kind of guidance teachers need in order to be effective teachers.

And it seems to me that there are a couple of categories that are distinguishable in our STEM funding: the sort of pre-K–12 area, undergraduate, graduate education, and then the sort of nonprofit informal sector. And I think that there are different things that, for example, our centers in NASA or NOAA engage in communities and in developing STEM programs that are very distinct from the needs that take place in the K–12 area in classroom and in the informal sector.

And where I have seen a real problem is in the wide range of STEM programs in the informal sector, and without sometimes a lot of rhyme or reason in terms of the educational value and not because they are bad people doing those things but because they just don't know what makes a good program and in what communities is there a successful program. What are the demographic groups that we are targeting so that we make sure that the educational value makes sense?

And so I would hope that going forward you would be able to make these distinctions from a budget standpoint so that the good stuff that is happening like at Goddard Space Flight Center and the role that it plays in our local community in working with our school system and the NOAA center, that those things aren't wiped out with the responsibility of the scientists who are really engaged in the research playing a role in developing that program as distinct from these sort of informal programs that need, I think, a little bit more guidance and coherence.

And so I wonder if you could tell me if you envision a role for, you know, scientists on the ground to participate with NSF, with the Department of Education in rolling out effective programs in communities and developing materials, because I would think that we would not want to lose that kind of expertise and that sort of hands-on involvement of people who are really, you know, doing real work on a day-to-day basis but also engage with our young people in the classrooms.

Dr. HOLDREN. The short answer is absolutely yes. I appreciate very much the work that these programs at NOAA and NASA and for that matter DOE and the Department of Defense that have practicing scientists and engineers on the ground contributing to the educational process. These have been of great value. A lot of these programs have been left intact.

Again, this reorganization affects about half of the dispersed programs that were out there, so half remain in place. And the ones that are being consolidated and moved in terms of their management to NSF or the Department of Education or the Smithsonian Institution, as I mentioned before, all of those agencies are determined to continue to tap the expertise in the dispersed mission agencies for these purposes. They have made that commitment to me. I have been talking to the leadership of all of those agencies

about it. We are talking about it in the meetings of the Committee on STEM Education of the National Science and Technology Council, which I chair, together with the acting NSF Director, Cora Marrett. And I believe it is going to happen. I believe we are going to get this right.

Ms. EDWARDS. And just to follow up on that, can you also tell me about how you plan to continue to engage funding of basic research in historically black colleges and universities and minority-serving institutions, because then those become the filters for graduate—undergraduate, and graduate education, and it seems to me that if you really want to get students engaged, a diverse population of students engaged, that they have to get—there have to be opportunities in those institutions that serve them. And so I would hope that there is kind of a parallel development of funding of research in those institutions with what is happening in this reorganization of STEM programs.

Dr. HOLDREN. I agree with that as well and I would make two further points. One is that in this reorganization we took care not to impact any programs connected with historically black colleges and universities or other programs that were explicitly focused on women or minorities in STEM. We are now in the process of conducting a further review to make sure that we didn't miss anything in terms of indirect connections that might be affected because we are in complete agreement in this Administration. The President feels very strongly about this, that one of the core elements of our STEM education efforts has to be to improve opportunities and access for women and minorities, and other underrepresented groups in the STEM fields. So we are taking that very seriously.

Chairman SMITH. Thank you, Ms. Edwards.

the gentleman from California, Mr. Rohrabacher, is recognized for his questions.

Mr. ROHRABACHER. Thank you, Mr. Chairman. And thank you, Dr. Holdren, for being with us today and having this exchange of ideas and views and enlightening us to some things about our budget requests that we have to deal with.

From 1990 through the end of 2013, America will have spent \$42 billion through the U.S. Global Change Research Program, \$42 billion. In your testimony, you state that this work is, "including but not limited to climate change." What other global change areas is being worked on and what percentage of the \$2.8 billion dedicated to these—will be dedicated to these non-climate change areas that is coming out of the U.S. Global Change Research Program?

Dr. HOLDREN. Some of the areas on which the USGCRP focuses include water, soils, desertification, deforestation, oceans. Please keep in mind there are 13 different agencies involved here with a wide variety of missions. They have different pieces of the action. It is not by any means limited to climate change alone, although I have to say climate change has become such a pervasive phenomenon that it is linked in various ways with most of these other issues, with soils issues, with water issues, with ocean issues, and so on.

Mr. ROHRABACHER. Well, obviously, what we have been concerned about here on this end of the debate is that many of the things you are talking about—deforestation, water, et cetera—that

the people in the Departments and agencies perhaps have felt that if they really want to get the money for their—and it is sequestered for their little interest or their mission, just attach it to deforestation under climate change and water under climate change, et cetera. Do you think there is any validity to that worry?

Dr. HOLDREN. Basically, I don't.

Mr. ROHRABACHER. Okay.

Mr. HOLDREN. That is, I think there is lots of work going on under the USGCRP on these domains that is not particularly focused on the climate change dimension, but it is also important that work go on that does look at the interactions.

Mr. ROHRABACHER. Well, have you—can you give us an example of this \$42 billion in research that we have had since 1990, has there been anything there that has been discovered that will in some way alter our ability to live on this planet and to survive and to prosper on this planet?

Dr. HOLDREN. Oh, absolutely.

Mr. ROHRABACHER. Okay.

Dr. HOLDREN. Understanding what is going on in the ocean in terms of acidification, other impacts on ocean food chains is extremely relevant to our ability to live prosperously on this planet.

Mr. ROHRABACHER. Okay. I agree with that. And some people tie that to climate change; other people say—

Dr. HOLDREN. Well, some parts—

Mr. ROHRABACHER [continuing]. That it is not necessarily as a—

Dr. HOLDREN. No, there are non-climate phenomena that are at work there as well—

Mr. ROHRABACHER. Okay.

Dr. HOLDREN [continuing]. And they are important, and our improved understanding of them has improved our capacity to manage these problems, our capacity to manage forests—

Mr. ROHRABACHER. Okay.

Dr. HOLDREN [continuing]. Which is very important to our future well-being has been improved under these programs.

I would be happy to get back to you if you would like with a breakdown—

Mr. ROHRABACHER. Well, I think you have done a good job right here, and I appreciate your sincerity and your knowledge on that.

Last question: I have, as you are aware, been concerned that technology transfers to countries that could someday be our enemies is something we should be looking at and that, because of concerns that citizens of the People's Republic of China, the PRC, have been given broad access to NASA facilities and NASA technology, which then enables them to bring back to China with them information that was developed and technology and data that was developed by our investment. I asked General Bolden how many PRC citizens had access to NASA facilities. He has provided me with this report, which I would submit for the record, Mr. Chairman.

Chairman SMITH. Without objection, so ordered.

[The information may be found in Appendix 2.]

Mr. ROHRABACHER. Okay. This report states that 293 Chinese nationals had access to our critical aerospace centers, and just a few weeks ago, we saw that one of these PRC citizens, who had

broad access to NASA Langley Research Center, was founded trying to skip the country with hidden laptops that were filled with stolen data. So clearly, whatever protection measures we have in place to prevent this sort of thing need to be double-checked and looked at and beefed up if they are inadequate. And who knows how many times this thing has happened that people haven't been caught?

So what I am asking you today is simply for the record—and I know you don't have this information with you now—but could I have a commitment from you that you will provide it, and just a number of how many PRC citizens have access to our national science, space, and technology facilities; those that are run by the Federal Government or funded by the Federal Government; and information that is broken down by agency and by the nature of the access that these people had?

And if you could—and I know you wouldn't be able to answer that now, but if you can have your staff get me that information—I think it is important for our national security not to have Chinese citizens gathering up information at our research centers and our very sophisticated science operations and taking that information back to China.

Dr. HOLDREN. Well, we will certainly do our best to pull that information together for you. It sounds like quite a task. I can tell you that only U.S. citizens may work at the Office of Science and Technology Policy, so the answer for OSTP is zero.

Mr. ROHRABACHER. Okay.

Chairman SMITH. Thank you, Mr. Rohrabacher.

The gentleman from California, Mr. Swalwell, is recognized.

Mr. SWALWELL. Thank you, Mr. Chair. And welcome, Dr. Holdren.

I am very grateful having—I am a representative for Lawrence Livermore National Laboratory and also Sandia National Laboratory, and I am grateful that my colleague on this Committee, Ms. Lofgren, has been a tireless and fierce advocate for our laboratories. And many times Members of Congress are advocates for what is in their district and it is hard to look outside the district, but I am grateful that Ms. Lofgren has been such a champion for the laboratories.

And I wanted to follow up on some of her questions about NIF, because it is very important. And the Administration is proposing cuts to NIF and the Inertial Confinement Fusion and High-Yield Campaign over fiscal year 2012. And these cuts could lead to the ending of research at this recently completed world-class facility.

NIF has long received, as Ms. Lofgren pointed out, bipartisan support in the Congress. And it is at Lawrence Livermore National Laboratory, which is the largest employer in my Congressional district and it houses the world's most powerful laser and the pre-eminent tool in the world for this type of fusion research. It is also a critical part of our Stockpile Stewardship Program.

And today, as we look around the world and we look at the threat of a nuclear weapon being used against the United States, particularly with Iran or North Korea, I think making sure that stewardship is taking place with our stockpile has never been more

important. And as we look forward and to the future, this research from NIF can lead to clean, safe, plentiful fusion energy.

And so I believe that the funding reduction for NIF greatly puts us at risk for our stockpile stewardship. I am also afraid that it is ceding America's leadership when it comes to fusion to Russia or China, and France as well. They have also accelerated their investments in this area to compete in confinement fusion. And I believe this could put the United States behind.

Dr. Holdren, given our sizable investment in NIF, and up to this point it has been the \$5 billion initial investment and the continuing operational investment, do you think we should pull support just as this facility is demonstrating its potential?

Dr. HOLDREN. Congressman, with respect, we are not pulling support. I think that the cuts in the NIF budget, as I currently understand them, are modest. They are not insignificant, but they do not, in my judgment, imperil our Stockpile Stewardship Program. They do not imperil the continued operation of the facility. If I discovered that the contrary were true, I would join you in alarm. Our Stockpile Stewardship Program is important. This is a cutting-edge facility, which is important to that program and to the potential future use of inertial confinement fusion as an energy source, and it is not our intention to shut it down.

Mr. SWALWELL. But Dr. Holdren, wouldn't you agree, I mean, going from fiscal year 2012 a funding level of \$486.8 million to fiscal year 2013 a request at \$271.7, that that is a sizable reduction that will greatly affect the operations at NIF, will reduce the staffing at NIF, and will set them behind in their fusion goals?

Dr. HOLDREN. I think there were a number of changes that contributed to that reduction in budget, partly the expanded use of the facility as a user facility and some changes in bookkeeping, which affected it as well.

I do want to mention that I was a full-time employee of the Livermore lab from 1970 to 1972 and a consultant from '74 to '94, including a consultant to the division that built NIF. And I have a strong attachment to the importance of that facility, and as I said, if I thought that what was going on in the budget was imperiling the future use of that facility, I would do everything I could to prevent that outcome.

Mr. SWALWELL. And I was also—I was an intern for Ellen Tauscher in 2001 in this town. I saw NIF at its inception and I see it as my role. And again, I am very grateful that I have a colleague up here who also understands the importance not just for our nuclear security but also the future of our energy security, and I hope we can work together to make sure that it does have an adequate funding level so it can continue to make progress, and more importantly, reach the goals which I hope we are close to reaching there.

Dr. HOLDREN. I will certainly continue to work with you and with Congresswoman Lofgren to that effect.

Mr. SWALWELL. Great. Thank you, Doctor.

Chairman SMITH. Thank you, Mr. Swalwell.

The gentleman from Arizona, Mr. Schweikert, is recognized for his questions.

Mr. SCHWEIKERT. Thank you, Mr. Chairman.

Doctor, I am going to back up a little bit and have you sort of educate me on some of the process you go through. Your substantial portfolio is determining priorities and priorities for funding and you make recommendations to the President?

Dr. HOLDREN. The process that leads to recommendations to the President is a process that involves OSTP, OMB, and all of the departments and agencies that have science and technology budgets and that process is—

Mr. SCHWEIKERT. And are you the—sort of the—

Dr. HOLDREN [continuing]. Multiple phases and back-and-forth iterations.

Mr. SCHWEIKERT. Doctor, would you consider yourself sort of the overall coordinator of such? I mean, you know—

Dr. HOLDREN. Jointly with the Director of OMB. I have the responsibility in the White House for overseeing those budgets and for making recommendations to the President. But again, we do it jointly with the departments and agencies.

Mr. SCHWEIKERT. All right. And as you do that, how the you—I mean how do you manage—particularly as a scientist as you are, how do you manage, say, we are going to work to maximize primary research, basic research, and avoid political folklore, political goals being moved into those research and science allocations of resources?

Dr. HOLDREN. The short answer to how I and we manage this is with difficulty. This isn't—

Mr. SCHWEIKERT. I mean, it is human nature. I mean, we all have our—

Dr. HOLDREN. This is in enormous challenge, and one of the ways we avoid or try to avoid bias and political fads, as you suggest, is by having a great many voices in the process, again, voices from the departments and agencies, voices from the diverse staff of OSTP. I don't do this by myself.

Mr. SCHWEIKERT. And I would love a side conversation with you because I can build you a model saying that is exactly the wrong way to do it because of sort of collective folklore that we all operate with. I mean, we all have our perception bias.

But within there, I mean one simple sort of a one-off example, I am looking at some of the NOAA funding—what is it, the JPSS? And it looks like some of those dollars went to NASA but not to manned spaceflight. It has gone into sort of the climate monitoring activities of NASA. Is that a—sort of an example of, okay, this is our political belief system, this is, you know, our goal, and stripping and moving monies around to keep financing them?

Dr. HOLDREN. No, it was not in the sense that the money that left NOAA was money that had supported a specific set of climate change monitoring sensors, and NASA now has the responsibility for managing that set of sensors so the money went with it.

Mr. SCHWEIKERT. Okay. So my understanding, though, the NASA resources as prioritized by your Office and the President and, you know, the President's budget folks is moving down manned spaceflight and moving up, you know, climate monitoring even though those resources, as you say, came from NOAA? I mean, am I at least getting that balance correct?

Dr. HOLDREN. Well, we are doing our best to fund human spaceflight and exploration under the instruction of the Congress in a manner that simultaneously builds the next generation space launch system, multi-purpose crew vehicle that provides adequate funding for the development of a commercial space industry so that we can get cargo and astronauts to the International Space Station. It is a juggling act. I have often said in this hearing and elsewhere that NASA has long had the problem of 20 pounds of missions in a 10-pound budget.

Mr. SCHWEIKERT. No, just—

Dr. HOLDREN. And they continue to.

Mr. SCHWEIKERT. I need to sort of take us back. In the whole sort of allocation of grants, resources, it is—how would you—if I came to you and said I want you to design a system, so clean slate, you know, no more sort of the grant review process we use today where often the university that has the best grant writers and those—because if you look at where much of the money goes, there seems to be consolidations and concentrations. How would you design a grant system that was truly based on trying to fund basic research? What would you do different than we do today?

Dr. HOLDREN. Well, first of all, I think the key to successful funding of basic research is a rigorous peer-reviewed system. And there are parts of the Federal Government's support for research which could use an increased infusion of peer-reviewed research as opposed to other approaches to allocating funds. And certainly if I were king, I would make some modifications in that direction.

But what I would add to this process is an interactive process that also includes the Congress. When we look at NASA's budget, we have had clear instruction from the Congress about a number of things that NASA's budget absolutely has to do. And we take that seriously. We follow to the best of our ability within the overall constraints the guidance of the Congress on—

Mr. SCHWEIKERT. And I was sort of moving more onto sort of the primary basic research, and how do we make sure that resources go where we get, you know, maximum benefit to our society, the world, and not to, you know, necessarily the best grant writer or, you know—you know, it is—I have great concern on the benefits we are receiving and the allocation of how we do the grants.

Dr. HOLDREN. I can only say again that this is a huge challenge. I mean the question, for example, of how do you compare the leverage of investments in basic biomedical research with the leverage of investments in nanotechnology or fusion energy? In fact, what we find in many cases—and this is the reason we have more cross-cutting programs than we used to have—is that these fields intersect in interesting ways. And some of the most important opportunities now emerging in biomedicine are sitting at the intersection of genomics, engineering, physics, and measurement.

Mr. SCHWEIKERT. Doctor, dozens of other questions.

Mr. Chairman, thank you for your tolerance.

Chairman SMITH. Thank you, Mr. Schweikert.

The gentlewoman from Connecticut, Ms. Esty, is recognized for her questions.

Ms. ESTY. Thank you, Mr. Chairman.

And thank you, Dr. Holdren, for joining us here today. I want to return to flesh out a little bit the priorities and the approaches on energy. This budget proposes the establishment of a new Energy Security Trust, which would support research into a range of technologies that would help us transition from oil towards more secure alternatives. I understand from what I see that the trust would be funded by revenue generated from federal oil and gas development. But can you give us any more details about how that trust would actually be carried out? For example, would the money go directly towards augmenting current programs, relevant programs in DOE's Office of Energy Efficiency and Renewable Energy or ARPA-E? Or are you proposing some kind of new mechanisms or programs for supporting research?

Dr. HOLDREN. The set of questions around exactly how this would work is one that we expect to be in a continuing conversation with the Congress about. We would envision a variety of approaches, including strengthening the support for some existing programs, and providing support for some new opportunities not currently being funded. But again, that is at an early stage of formulation and we would expect to do it in consultation with the Congress.

Ms. ESTY. Following up on that a bit, there has been—the proposal has a substantial increase in the ARPA-E budget, and I know that was already sort of referenced a little bit earlier. Can you flesh out the basis for that? Sort of what accomplishments have been achieved to date and if—that would justify an increase at a point when obviously we have got severe fiscal constraints? And what are the sorts of projects that you would contemplate being carried out if this funding is approved?

Dr. HOLDREN. Well, you know, ARPA-E in its short history has developed a strong reputation for thinking outside the box and for developing new ideas that can contribute substantially. Some of those ideas have been in the domain of energy storage, advanced batteries, fuel cells, and so on. Some of them have been in the domain of advanced biofuels. Some of them have been in the domain of how we can make our grid much smarter and much more efficient. I think folks who follow the energy technology field closely believe that money invested in ARPA-E has had a lot of leverage and so we are proposing to expand it on that basis.

Ms. ESTY. I appreciate that. This is an area that is of enormous interest. In Connecticut, we have a lot of fuel cell energy, other companies that are startups that are very interested in working on this. And obviously, basic research that can augment what the private sector would try to develop is of great interest. But again, we need to be looking at accountability.

If I can switch gears for a moment, you referenced, just a moment ago, synergies between different areas, and one I would like to turn to is on the bioeconomy, is some of the developments that the White House last year released a National Bioeconomy Blueprint about supporting economic activity. Again, I have the Jackson labs moving into my district from—to support efforts that were created in part around state efforts at stem cell. We are now building on this at University of Connecticut and at Yale. Could you flesh out a little bit more about what sort of support there would be for

basic R&D as contemplated as part of this process, especially updating training programs, what is contemplated in this initiative?

Dr. HOLDREN. Well, if you look at the range of challenges and human needs that we face across the space of health and across the space of food and agriculture and across the space of materials and sustainable resources, what we found in the bioeconomy blueprint is that there is enormous potential at the intersection of several branches of biology, including genomics, to contribute to really path-breaking advances that would affect all of these domains, that would affect health, that would affect food and agriculture, that would affect the development of new, better, and more sustainable materials.

And so we envision substantial support for the basic and early stage applied research in these domains that is essential if you are going to then build economic activity, if you are going to develop new firms, jobs, products, and so on. And I would be happy to provide you with more detail about that or sort of an update on the pace of progress on different aspects of the bioeconomy blueprint. But that would probably be more detailed than I can run through in a hearing.

Ms. ESTY. Thank you very much and I will follow up. Thank you.

Vice Chairman ROHRABACHER [presiding]. Thank you very much. Now, I just want to note that here it is. I finally got the gavel here.

Mr. WEBER. I see that.

Vice Chairman ROHRABACHER. And Mr. Weber from Texas is recognized.

Mr. WEBER. Well, congratulations.

Dr. Holdren, in your exchange with Congressman Posey regarding his questionable—the questionable studies money with taxpayer dollars spent, analyzing pictures of animals in National Geographic and he named a couple of studies, China's dairy industry, you literally made the comment—I wrote it down—that it was a dangerous thing for Congress or anybody else to specify funding in research. Do you recall that?

Dr. HOLDREN. Certainly what I meant to say, Congressman, it can be dangerous to try to micromanage funding in basic research outside the peer-review process. The peer-review process is the backbone of our basic research enterprise, and we have done very well with it. That doesn't say it never makes mistakes, but I think it is better than any alternative, including me or you trying to determine what is good basic research in fields not our own.

Mr. WEBER. You went on to say that it was the responsibility of government to fund basic research in those comments.

Dr. HOLDREN. Absolutely.

Mr. WEBER. I have a question about that. Can you give me the constitutional basis for that?

Dr. HOLDREN. There are lots of things that we do that are not explicitly set forth in the Constitution. The responsibility of government—in the judgment of many anyway—is to carry out those activities in the interest of society that the private sector is unlikely to carry out for reasons that we understand.

Mr. WEBER. Let me give you—

Dr. HOLDREN. Basic research we know has been the—

Mr. WEBER. Let me give you Article I, Section 8. The eighth enumeration out of 18 of them says “Congress is to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries,” which would sound like patents.

Dr. HOLDREN. It would.

Mr. WEBER. So I would like for us, from a policy standpoint, to dispel the idea that somehow we have got to fund all the studies and that Congress shouldn’t be, in your words, micromanaging at this various level—at this very low level all of these types of studies.

And I will go back to Mr. Schweikert’s comments about he will build you a model that says it is exactly the wrong thing to put everybody in the room and say that we ought to decide exactly what trends we ought to follow, because we are in a budget crisis now, in my opinion, because we have just said, look, we can research anything we want, we can fund studies to do anything we want, whether they are the dairy habits over in China, no matter what they are.

So I just want to make sure that from an agency standpoint, you being one of the leaders in the agency, I hope that you all have an attitude and an understanding that it is Congress’ purview to get involved in this, and it is our responsibility to make sure that we spent the American taxpayer dollars properly and correctly and wisely. That just kind of bothered me when you said that.

And let me go down to a specific question. Gasoline prices and regulations, as you know, the EPA has recently proposed new gasoline regulations, the Tier 3 level—I am sure you are familiar with that—that could, in fact, raise gas price—cause gas prices to rise by \$.10 on the gallon and cause multiple oil companies to close, multiple refineries to close. Even though the EPA did not complete a congressionally mandated study—here we are talking about Congress getting involved—on whether those rules are even necessary.

So being an advisor to the President, Dr. Holdren, what—can you tell us what specific provisions in the President’s budget will help reduce gas prices this year and get America—I am going to have a couple questions for you—and get some relief at the gas pump and help those who are hurting, working families? What specific provisions in his budget have you recommended?

And secondly, do you agree that regulations of those type result in higher joblessness and higher energy costs, which, in fact, impact Americans’ health negatively, a lot of worry they can have the kind of health checkups and preventative maintenance, if you will, that they need.

So what, specifically, have you seen or proposed in the President’s budget to help alleviate some of those higher fuel costs? And do you agree that those kinds of EPA regulations actually negatively impact Americans’ health?

Dr. HOLDREN. That is a multipart question. Let me first say I am very well aware that Congress is responsible for determining the levels of funding—

Mr. WEBER. I think we have established that.

Dr. HOLDREN [continuing]. Across the entire government. I would never dream of disputing that.

Mr. WEBER. Okay.

Dr. HOLDREN. My previous point was whether it was valuable for Congress, at a very fine level of detail, to try to substitute for the peer-review process in individual grant-making. There is no question that Congress determines how much money NSF gets. Congress can determine how much of that goes to social—

Mr. WEBER. Yes, we have established that—

Dr. HOLDREN [continuing]. And behavioral sciences—

Mr. WEBER [continuing]. But we are running out of time, so please go on to the other two questions.

Dr. HOLDREN. And again—but I don't want to be misunderstood on that point.

Secondly, with respect to EPA regulations, with respect to the recent proposals, there are real differences of opinion as to what the impact on the price of gasoline would be. Some people have said \$.01, some people have said \$.09, and there needs to be more analysis to determine what that would be. I do not accept the general proposition that EPA regulations cause adverse impacts on the American population's health. We work very hard, EPA works hard, we work hard in the Administration reviewing their proposed regulations to ensure that the opposite is true.

Mr. WEBER. Their regulations, Dr. Holdren, cause joblessness. That does not have an adverse effect on Americans?

Dr. HOLDREN. If their regulations did cause joblessness, that would have an adverse effect. However, in many cases, regulations create new jobs even while impacting jobs in another sector. And in fact, any intervention the government makes tends to add jobs some places, cut jobs other places. You have to do a very careful analysis of the net effects before you conclude that regulation has cost American jobs. And of course the aim of the regulation is to reduce air pollution, which we know adversely impacts the health of Americans, increases our national health care costs, and is devoutly to be reduced if we can do so in a cost-effective manner.

Mr. WEBER. And that is—

Vice Chairman ROHRABACHER. The gentleman's time—

Mr. WEBER. Yes, I would love to discuss more, and I am sorry, Mr. Chairman, I have gone over my time, but I yield back. Thank you.

Vice Chairman ROHRABACHER. All right. We next have Ms. Bonamici from Oregon.

Ms. BONAMICI. Thank you very much, Mr. Chairman.

Dr. Holdren, thank you for your testimony. Another encouraging aspect of the President's budget that you pointed to in your testimony is a focus on manufacturing innovation, particularly through partnerships between universities, community colleges, and the private sector. In my State of Oregon, we have the Oregon Nanoscience and Microtechnologies Institute, also known as ONAMI, where the University of Oregon, Portland State University, Oregon State University, and other public and private sector partners collaborate to bring innovative ideas to the marketplace.

Also important in Oregon are the Manufacturing Extension Partnerships, or MEPs, that you mentioned in your testimony. I recently met with a business that received about \$50,000 in MEP funds in partnership with the Oregon MEP. They used that fund-

ing to hire 11 new workers who each earn about \$60,000. So in this kind of situation, the Federal Government sees a quick return on its investment through tax revenues from these new jobs and from a small company experiencing meaningful growth.

So can you talk about the multiplier effect that these types of partnerships which leverage public funds by pairing them with private funds have in the context of the federal budget and how significant are these programs when we are facing severe budgetary constraints?

Dr. HOLDREN. Well, I would start by saying that the great advantage of partnerships is to leverage government funds, combining them with private sector funds and in some cases with philanthropic funds to get a much larger impact than the government could ever do alone. But even more important than that is the leveraging of insight that resides in the private sector with the kinds of capabilities and insights that reside in national laboratories and in government-funded research universities.

We have been promoting these kinds of partnerships across a wide range of activities ranging from STEM education where we have the Educate to Innovate Initiative that raised three quarters of \$1 billion in private and philanthropic money, in part to bring practicing scientists, mathematicians, and engineers into classrooms to work with teachers to improve curriculum and to provide role models, who were also seeing a lot of success in the domains that you discussed, including particularly enabling small business to have access to facilities that enable them to develop new products and services that they would never be able to develop that they didn't have access to these facilities that they are too small to afford on their own.

And we see this happening in the nanotech domain where there are nanotech startups that have been able to use the nanotech facilities of our research universities and our national labs to develop new products, which then create jobs and economic growth going forward. I think it is a terrific model, and I am delighted that so much of it is working well for Oregon.

Ms. BONAMICI. I thank you so much. And I want to ask another question as well. On the topic of climate and weather monitoring, I wanted to ask about the enhanced focus on weather priorities. I have some coastal area in my district, and weather monitoring can be the key to the livelihood of mariners who rely on data from the National Weather Service when they are preparing to leave the harbor. Recently, NOAA stated that they planned not to repair a monitoring buoy, and I contacted them. The district was very concerned about that.

I am glad that the President's plan to focus on weather issues is highlighted here. To what extent is this renewed focus on weather monitoring a reflection of the growing understanding that global climate change is leading to more severe weather events, as noted by the 2013 National Climate Assessment Draft?

Mr. HOLDREN. Well, I think you have put your finger on it. We are experiencing more extreme weather of a wide variety of kinds, and that makes it all the more important to be able to predict when and where that extreme weather is going to strike, and that requires, obviously, increased investments in prediction capabilities

ranging from buoys, satellites, other kinds of monitoring stations to high-speed computing, and the models run on high-speed computers in order to be able to translate monitoring data into accurate forecasts. We are putting very heavy emphasis on that because the livelihoods, the economic well-being, and the health of the American people depend on accurate weather forecasts, as you note.

Ms. BONAMICI. Absolutely. And my time is about to expire. Thank you very much, Mr. Chair. I yield back.

Vice Chairman ROHRABACHER. Thank you very much. And for a new Member of the Committee, you are certainly an active Member of the Committee, and I have noticed that very much over the last month. You have got something to say.

All right. And next, we have from the home State of California, Mr. Takano.

Mr. TAKANO. Takano.

Vice Chairman ROHRABACHER. Takano, pardon me.

Mr. TAKANO. You are forgiven.

Vice Chairman ROHRABACHER. But he comes from a district very close to my own, so you may proceed.

Mr. TAKANO. I thank my distinguished colleague, who hails from an area 45 miles to the south and west.

So Dr. Holdren, welcome. My question relates to—I had the privilege of visiting during the most recent spring recess the Dryden facility, now renamed, I think, Neil Armstrong facility out at Edwards Air Force Base and was able to take a look at the collaboration between NASA and, I believe, it was Boeing or one of the aerospace firms.

You know, a lot of talk about the involvement of government and private industry in manufacturing, but there was some research jointly being done on a new type of aircraft, and there is some promise of this aircraft being significantly more fuel efficient. I can't remember the name of the—the aircraft looks like somewhat like a triangle, like a flying wing. I forget the name of it. But can you just comment on how critical this sort of joint research with—between industry and NASA has been to develop our aerospace industry in this country and keeping it ahead?

Dr. HOLDREN. The short answer is that NASA is working the aeronautics domain, and its partnerships with the private sector have been extremely important. You know, a striking thing that people are aware of is that the fuel economy of jet airliners has improved by an enormous factor over the last 35 years. The fuel consumption per seat mile is now much less than half in modern aircraft of what it was 35 years ago, and that is the result, in a very substantial measure, of NASA's aeronautics research in their partnerships with the private sector. We are seeing that moving forward in the kinds of projects that you visited at the Neil Armstrong facility.

I said before that we need to be very careful when we think about NASA's budget and imagine that the only element of NASA's budget that matters is human space exploration or robotic probes or space telescopes. Those are all enormously important and we support them, and we support them to the extent that our overall budget permits, but it would be a big mistake to allow NASA's pro-

grams in aeronautics to wither. It would be a big mistake to allow NASA's programs in Earth observation to wither.

Mr. TAKANO. Dr. Holdren, if I am not mistaken—and this may not be either one of our areas—but it seems to me that the building of large commercial aircraft is an important part of America's balance of trade. It is a major export for us. And it seems to me that there has been an intricate interlocking between government/industry, and I see some of my colleagues on the other side of the aisle often criticizing the government for being involved in picking winners and losers in the domain of, say, alternative energy. But this seems to be an example that all Americans would agree has been very vital.

I am struck that the aeronautics budget is a very small part of the overall NASA budget. Is there any thought the Administration might want to increase this budget line?

Dr. HOLDREN. Well, we are constantly looking at the balance, as I said in response to some other question, it is challenging because there is not enough money overall to do everything that we should be doing. I mean, I have said in other forums already this year—I think this President's budget for fiscal year 2014 is a good budget for science and technology under the fiscal circumstances we face, but it is not the budget that I would want to have in better times.

And in better times, there would be more money for human space exploration, there would be more money for planetary science, and there would be more money for aeronautics. I am not going to second-guess on the fly the current balance in NASA, which was carefully arrived at over the long sort of interactive process that I described, but as a general matter, I think society would benefit if we could invest more in this and many other domains—

Mr. TAKANO. Well, very quickly because I know the distinguished Chairman is interested in our competition and potential rivalry with the People's Republic of China. Do we—and they rapidly are trying to develop their own aviation and aeronautics industry. Do we know how much by comparison that they are investing in research in this area?

Dr. HOLDREN. We do have some data on the pattern of Chinese research investments. I could get back to you on that.

Mr. TAKANO. Sure, please.

Dr. HOLDREN. I don't have it on the top of my head what they are investing in this area. It is clear that we are still well ahead. That is where I would like to stay.

Vice Chairman ROHRBACHER. Thank you very much.

Next, we have Mr. Veasey from Texas.

Mr. VEASEY. Dr. Holdren, thank you. I wanted to ask you a specific question about advanced manufacturing. There was a really good article last year in the *Wall Street Journal* about German companies coming over to America to train workers here to work very highly skilled manufacturing jobs, jobs such as, you know, various machinist type jobs, robotics specialists. One of the things that we talk a lot about here in Congress and people are talking about nationally—you have talked about it—is STEM education, which is very, very important.

But I do believe that there are a lot of kids that are graduating from high school that don't necessarily have a STEM background,

but they are ready to get to work if they can find a good job. And last year, about 600,000 of these highly advanced manufacturing jobs went unfilled, largely because the kids graduating from the high schools didn't have the skill set to go work some of these jobs that start off at \$22, \$24 an hour. Can you talk a little bit about the Administration's long-term goal for sort of revitalizing, you know, manufacturing in this particular area and how it fits into the budget?

Dr. HOLDREN. Congressman Veasey, that is a great question, and it is one that we have been working on very hard. A couple of components to it: one, we have a program around redesigning the high school experience in this country so that kids graduating from high schools are better prepared for some of the highly skilled jobs of the 21st century. We are also working with community colleges and partnerships between community colleges and the private firms, the industries in the same region with the community college to develop community college curricula that prepares students for precisely the jobs that exist in the companies in their particular regions. This is an extremely important part of our overall STEM ed strategy.

Mr. VEASEY. Do you see in the future it being talked about more? And I understand why people want to talk more about the STEM and why that has gotten the attention that it has gotten, but I think that this is an area—and I think that you would agree—that we should, you know, definitely encourage our young people to—and even parents to sort of think about more.

Dr. HOLDREN. I completely agree, and the President agrees.

Mr. VEASEY. Thank you.

Vice Chairman ROHRABACHER. And we have Ms. Wilson from Florida.

Ms. WILSON. Thank you, Mr. Chair. Just a follow-up a little bit to Mr. Veasey's concerns. I am concerned about the reduction in informal science education activities and budgets in many agencies including NSF. A lot of these hands-on afterschool activities are what get very young children excited about science. I am a former school principal and that is important.

Can you elaborate on the new role of the Smithsonian in coordinating informal STEM education efforts under the STEM reorganization proposal? Is there an existing office and staff who will—new capacity—where new capacity have to be built at the Smithsonian? How much of the 2014 request of \$25 million is for capacity-building versus for direct funding of the programs transferred from the mission agencies?

Dr. HOLDREN. Congresswoman Wilson, I can actually provide you those numbers in detail. I was just in touch yesterday with the folks at the Smithsonian who are running this effort. There is an Assistant Secretary for Education and Outreach in charge of this effort. They have actually gone through a very extensive process to develop their ideas about how this \$25 million would be used. I actually have a detailed breakdown of the numbers, how much goes to information technology, how much goes to revitalizing education activities, broadening access, excelling in related research.

But they have a series of goals. The first goal is around the creation of content in programs. That means working with these agen-

cies that historically have been providing the kinds of activities you are talking about to improve the content and the programs in these domains. The second goal is to develop and maintain the infrastructure to deliver that content, including creating a portal for the transfer of knowledge about these kinds of activities as accessible to everybody. The third goal is creating community teachers and student agency partnerships that will create learning communities that figure out how to do this better. The fourth goal is evaluation of these efforts.

And they have already at the Smithsonian existing activities in all of these categories which they are going to build on and expand. So it really is a well-thought-out effort, and it is an effort in which they are already in touch with most, if not all, of the agencies that have been engaged in some of these smaller programs that are being consolidated.

Ms. WILSON. Thank you.

Vice Chairman ROHRABACHER. Well, thank you very much. And first of all, I would like to thank Dr. Holdren for his valuable testimony and the Members have asked some questions. We are hopeful that they will be—some of their requests will be complied with in writing and as soon as you can. It might take some time, but, you know, even the question I asked, it would take some time to compile.

But we thank you for being here and giving us your frank opinion. Would you—Ms. Johnson, would you like to have a closing statement? Go right ahead.

Ms. JOHNSON. Thank you very much, Mr. Chairman.

I just wanted to say that there are questions that I will be submitting. I want to thank you, Dr. Holdren, for being here, but it leads to questions I will be submitting for the record.

Vice Chairman ROHRABACHER. Thank you very much. And if any other Members of the Committee have additional questions, we will ask that you respond to those questions in writing. And the record will remain open for two weeks for additional comments and written questions.

Just a couple little things—I can't help myself, just a thought. Of the 13 agencies that we are talking about in terms of climate change research, we are spending \$2.7 billion over those 13 agencies for climate change research, and we are only spending \$80 million for weather research, just a thought. Okay.

The other thing is that many of us are concerned that peer review—and Eisenhower warned us about this in his farewell address, that peer review in the science community can become clique review and that we have an academe—and I know when Henry Kissinger was asked about how horrible the spirit of the beating down your opponent was in politics, he said, well, it is nothing like academe. And, you know, you have these things both in the academic world and then the political world where we need to respect each other's opinions, and we need to realize that, you know, we are not calling anybody names by simply focusing on what we believe is important.

For example, you talked about the fuel consumption per mile of our airplanes, and I think that is an important part to make up. And I know that you are very proud of the research that has taken

place by our government. Some of us look at it and go, oh, the fuel consumption per mile, maybe that has something to do with the deregulation of the airlines that it would seem now that our airplanes are full, when before deregulation they were flying with 10 percent of their seats—10, 20, and 30 percent of their seats vacant.

So it—you know, it all depends on how you are looking at something. But both sides are right obviously. Both sides have an assessment. Our airlines are becoming more efficient.

And so, anyway, I want to thank you for presenting your side and the Administration's side of this, and your answers have been enlightening and provocative.

And with that, I say that this hearing is adjourned.

[Whereupon, at 12:05 p.m., the Committee was adjourned.]

Appendix I

ANSWERS TO POST-HEARING QUESTIONS

QUESTIONS FOR THE RECORD
THE HONORABLE LAMAR SMITH (R-TX)
U.S. House Committee on Science, Space, and Technology

A Review of the President's Budget Request for Science Agencies

Wednesday, April 17, 2013

1. The FY 14 budget transfers responsibility for the JPSS climate sensors from NOAA to NASA. NASA's Earth Science budget seems to increase to \$1.8 billion, but NASA's Planetary Science budget appears to be the primary bill payer for these Earth Science budget increases. NASA's Planetary Science budget is approximately \$300 million less than it was two years ago.
 - a. Is it an accurate assessment of how the Administration made budget trade-off decisions? Has it been a conscious decision on the part of the Administration to boost NASA's Earth Science climate research budget at the expense of human spaceflight and planetary science, at approximately \$300 million a year?

The reduction in NASA's Planetary Science budget was already proposed in the 2013 Budget, for reasons having to do with meeting the principal Congressional and Presidential priorities for the agency under a highly constrained NASA total. The 2014 Budget proposal for Planetary Science is \$1.22 billion, about the same as the 2013 Budget figure of \$1.19 billion. Thus, it is inaccurate to suggest that the level of the request for Planetary Science in FY14 fell by \$300 million in order to pay for climate sensors that are first proposed to be transferred from NOAA to NASA in FY14.

2. The Triana satellite – first envisioned by Vice President Al Gore in the late 1990s – was taken out of storage and renamed DSCOVR in order to fulfill a critical solar flare monitoring mission. Over time, it appears as though climate sensors have crept back onto the satellite. For instance, NOAA began funding the climate sensors EPIC and NISTAR, despite claiming to not have enough to fund satellites used for weather monitoring and severe storm prediction. Last year Congress denied NOAA's request to fund them again – now through NASA.
 - a. Why has the Administration expanded the scope of the DSCOVR mission beyond what was originally planned for monitoring solar flares?
 - b. What is NASA going to cut in order to pay for these sensors?

The DSCOVR spacecraft was designed originally to carry Earth observation instruments. Congress appropriated funds for NASA in Fiscal Years 2009 and 2010 to refurbish and recalibrate the Earth Polychromatic Imaging Camera (EPIC) and NIST Advanced Radiometer (NISTAR) Earth observation instruments, which NASA has done. Modest investments to support the integration and flight of these Earth observation instruments is the most cost-effective and expeditious way to complete the DSCOVR satellite and is the most cost-effective way to redeem the nation's investment in these instruments by allowing their measurements to be used to advance science.

No other programs or projects have been cut to fund the EPIC and NISTAR sensors. NASA continues to maintain a balanced portfolio of missions. The President's FY14 budget request balances risk, introduces selected refinements in implementation approaches, and capitalizes on efficiencies being realized across ongoing activities in the portfolio.

3. I am concerned about the lack of transparency in major EPA rule-makings. You and EPA officials have been asked repeatedly over the last several years about the Agency's unwillingness

to make public major data sets that are behind EPA's Clean Air Act regulations' claimed health benefits. These data sets are responsible for \$1.7 trillion of the \$2 trillion of the Clean Air Act benefits that EPA has attributed to the major air quality rules proposed and finalized in this Administration. In your role as the President's Science Advisor, you are charged with "ensuring that data and research used to support policy decisions undergo independent peer review."

The EPA has not provided this underlying data to the Science Committee, despite repeated requests since September 2011. This was confirmed in an April 10 letter to Chairman Smith. This letter also states that "The EPA recognizes that the data provided... are not sufficient... to replicate the analyses in the epidemiological studies..." Despite these admissions, the Agency continues to regulate based upon findings substantiated by this secret data. This is alarming for an Administration that claims to be the "most transparent in history."

- a. During a June 2012 hearing before this Committee, you stated that "... absolutely the data on which regulatory decisions and other decisions are based should be made available to the Committee and should be made public..." Do you still agree with this statement?
- b. In a February 2012 hearing before this Committee, you committed to provide this underlying data and promise to "start working on it immediately." What steps have you taken to make the underlying EPA data publically available?
- c. The President's nominee to serve as head of EPA swore under oath that she had provided the relevant data, and that any information that was excluded would reveal confidential health information. In light of your role in pursuing access to data and information for the Administration, has EPAQ or Gina McCarthy consulted with your office on the ability to provide public or Congressional access to this data?
- d. Your February 2012 Memorandum stated that: "The Administration is committed to ensuring that, to the greatest extent and with the fewest constraints possible... the direct results of federally funded scientific research are made available to and useful for the public, industry, and the scientific community. Such results include peer-reviewed publications and digital data." The studies I have referenced were both federally-funded—paid for by American taxpayers. Are EPA's actions consistent with this Memorandum?

My full statement at the June 2012 hearing was: "I think the principle is—absolutely the data on which regulatory decisions and other decisions are based should be available to the Committee and should be made public unless there is a classification reason." I agree that scientific data on which regulatory and other decisions are based should be made publicly available where possible, but, as I stated then, classification on national-security grounds is one reason it may not be possible, and other reasons that I should have added include patient-privacy concerns and business proprietary information. My February 2013 memorandum, *Increasing Access to the Results of Federally Funded Scientific Research*, elaborates at greater length on the factors that bear on the stated condition, "to the greatest extent and with the fewest constraints possible."

In consultation with EPA officials subsequent to my 2012 statements to the Committee, in which I pledged to work on this matter, I have learned that the EPA itself does not possess all of the raw data that went into these studies and that EPA is engaging with the relevant research institutions and researchers possessing the raw data to work towards obtaining the requested materials and providing them to Congress.

4. As you know, EPA recently proposed new Tier 3 gasoline regulations that could raise gas prices by up to 10 cents and cause multiple refineries to close, despite not having completed a Congressionally-mandated study on whether these rules are even necessary.
 - a. Do you think joblessness and higher energy costs associated with this rule could have negative health impacts for American citizens?
 - b. Do you agree with the principle that major regulations should examine and analyze the possible negative public health effects associated with regulatory costs?
 - c. What specific provisions in the President's budget will help reduce gas prices this year?

Proposed Federal regulations should be and are evaluated taking into account all of the identifiable effects of the proposal, positive and negative. EPA is currently reviewing the public comments received on the proposed Tier 3 motor-vehicle emission and fuel standards and will carefully consider these comments as it works to develop a final rule.

Regarding gasoline prices more generally, as I stated in my testimony before the Committee, the 2014 Budget establishes an Energy Security Trust to support research into a range of transportation technologies that would shift our cars and trucks off oil and insulate American families from volatile gas prices. The proposal, \$200 million in 2014 and \$2 billion over ten years, would set aside and redirect some of the royalty revenues generated by oil and gas development in Federal waters of the Outer Continental Shelf (OCS) to fund this research. This proposal is designed to invest in breakthrough research that will make future technologies cheaper and better through a reliable stream of funding for research focused on developing cost-effective transportation alternatives to current vehicle technologies. Funding would support research into technologies such as advanced vehicles that run on electricity, homegrown biofuels, fuel cells, and domestically produced natural gas.

5. When developing major regulations, federal agencies will often monetize the "value of a statistical life" in order to compare the mortality benefits of a regulation to its cost.
 - a. What is the proper Value of a Statistical Life that should be used by federal agencies in rulemaking?
 - b. In just the last three years, federal agencies have valued human life at \$8.7 million (EPA), \$5.8 million (Department of Transportation) to \$106,308 per life-year (Food and Drug Administration). Which of these values is correct? Why are they different?
 - c. Do you agree that federal agencies should use consistent approaches to regulatory cost-benefit analysis?

The Value of a Statistical Life (VSL) depends on a variety of assumptions, some of which depend on context-specific circumstances such as the average age of the individuals most at risk from the activity and the types of risks being regulated. The principal responsibility in the Executive Office of the President for working with Federal department and agencies on the appropriateness of assumptions used in these types of calculations rests with the Office of Management and Budget (OMB). OMB's Circular A-4 provides guidance to Federal agencies on the application of regulatory cost-benefit analysis and the use of VSL estimates.

QUESTIONS FOR THE RECORD
THE HONORABLE LARRY BUCSHON (R-IN)
U.S. House Committee on Science, Space, and Technology

A Review of the President's Budget Request for Science Agencies

Wednesday, April 17, 2013

1. In November 2012, the Administration awarded a \$30 million pilot for the National Network for Manufacturing Innovation (NNMI) initiative President Obama announced during his 2012 State of the Union address. Despite the Administration's request for a one-time \$1 billion mandatory spending request in FY14, no mandatory funding was provided in FY13. Could you please break down the FY13 funding contributions for the Youngstown pilot center from the DOD, DOE, NSF, NASA, and NIST?

Furthermore, I understand that in the President plans to award three more Institutes for Manufacturing Innovation awards before the end of the current fiscal year, using existing FY 13 funds. Could you please delineate which agencies will fund the two DOD-led and one DOE-led new institute, what amounts from each agency, and from which account those FY 13 funds will be derived?

The National Additive Manufacturing Innovation Institute (NAMII) was launched with \$30 million in FY12 appropriated funds; the award was made in August 2012. At that time, agency contributions totaled \$19 million: \$5 million from the Department of Energy (DOE), \$1 million from NASA, \$1 million from the National Science Foundation (NSF), and the remaining \$12 million from the Department of Defense (DOD). The remaining \$11 million in appropriated funds will be allocated in FY 2013 and FY 2014, primarily from DOD. Non-Federal sources will contribute \$39 million in co-investment.

In May 2013, the Administration issued Funding Opportunity Announcements for three new Institutes. Final agency contributions have yet to be determined. The two DOD-led Institutes combined will be funded at up to \$130 million over four years in Federal funds, primarily from DOD, with possible contributions from other Federal agencies including the National Institute of Standards and Technology (NIST), NASA, and NSF. The DOE-supported Institute on Wide Band-Gap Power Semiconductor Electronics Devices will receive nearly all of its up to \$70 million in Federal support over four years from DOE, although other Federal agencies may contribute. These Federal funds will be matched by non-Federal funds.

2. What are OSTP's budgetary initiatives to advance the research and development of smart manufacturing technologies like robotics, automated guided vehicles, additive manufacturing, and 3D imaging? What does OSTP envision for the role of standard setting organizations and standards to advance the smart manufacturing sector? How will OSTP support their role?

The DOE and NIST labs play a critical role in advancing competitiveness through their research and involvement in standards setting bodies. How are we utilizing these labs to look at and explore the next wave of emerging technologies similar to nanotechnology and additive manufacturing? Are the labs working with the private sector in these new areas?

As noted in my written testimony, the Budget provides \$2.9 billion for Federal advanced manufacturing R&D at the National Science Foundation (NSF), the Department of Defense (DOD), the Department of Energy (DOE), the Department of Commerce (DOC), and other agencies, an 87 percent increase from 2012. Investments include supporting innovative manufacturing processes that dramatically reduce energy use and strengthening investments in platform technologies like nano-manufacturing, bio-manufacturing, robotics through the National Robotics Initiative, advanced materials through the Materials Genome Initiative and other materials science and engineering investments, and defense technologies to fundamentally change the way we build things and dramatically reduce the time from design to production.

The Administration continues to support the pilot manufacturing innovation institute in Youngstown, Ohio, which focuses on additive manufacturing. As these R&D initiatives move forward, standards-setting organizations and industry-led standards will help to advance the adoption of advanced-manufacturing technologies and processes by private firms. The National Institute of Standards and Technology (NIST) is a leading partner in the Federal advanced manufacturing R&D effort and is also the agency charged with helping to equip U.S. industry with the standards-related tools and information necessary to compete effectively in the global marketplace. OSTP will continue to support NIST's standards work.

I am in full agreement with you that the DOE and NIST labs, as well as other Federal and national laboratories, play a critical role in advancing U.S. economic competitiveness through their research and through their involvement in standards-setting bodies.

3. The President's FY14 budget request for STEM education activities proposes a significant restructuring among 14 different federal agencies with their own STEM initiatives. The President's budget request would cut or consolidate 114 STEM programs, while adding more funding in the Department of Education, National Science Foundation, and Smithsonian Institute. The President's proposal also cuts NASA's STEM education initiatives by almost \$50 million. On what basis did you find NASA's STEM education initiatives to be ineffective and in need of cutting? What evaluation criteria did the Administration use to base its decisions for which agency's STEM education programs should be cut or expanded?

The FY14 reorganization proposal reflects a set of difficult choices made with two overarching purposes: freeing up funds, under a constrained total STEM-education budget, for expanding such potentially transformative efforts as the 100k-in-10 initiative to train 100,000 high-quality STEM teachers over the next decade; and improving the coordination, coherence, and susceptibility to evaluation of the large number of smaller programs currently spread across the mission agencies. Even so, the 2014 Budget proposal would leave intact over 100 programs spread across those agencies. The programs eliminated accounted for only about 6 percent of the \$2.9 billion in Federal STEM-education funding in FY2012.

In making the choices about what programs would be eliminated or consolidated with others, the relevant entities in the Executive Office of the President—notably the Office of Management and Budget, the Domestic Policy Council, and the Office of Science and Technology Policy—were guided by the aims in preliminary versions of the Federal STEM Education 5-Year Strategic Plan (issued by the Committee on STEM Education of the National Science and Technology Council (NSTC), and delivered to Congress in final form

on May 31), as well as by inputs from the departments and agencies and by the President's desire to re-organize STEM-education programs for greater coherence, efficiency, ease of evaluation, and focus on transformative possibilities. We were also attentive to preserving those of the mission-agency programs that best leverage the unique assets of those agencies or respond directly to their own needs for trained personnel, as well as the programs serving groups underrepresented in STEM fields. At NASA, the proposal includes resources to conduct a competitive process to separate those programs that have been shown not to be effective from those assets that meet the goals of the Nation's STEM Education efforts, and should continue within NASA.

QUESTIONS FOR THE RECORD
THE HONORABLE EDDIE BERNICE JOHNSON (D-TX)
U.S. House Committee on Science, Space, and Technology

A Review of the President's FY 2014 Budget Request for Science Agencies

Wednesday, April 17, 2013

1. With respect to the Administration's proposed reorganization of Federal STEM education programs, for K-12 programs that are being transferred, how will the mission-specific needs and the decades of education and public outreach experience built up at mission agencies like NASA be preserved by Smithsonian and the Department of Education? NASA has a long history of engaging students outside of the classroom. I worry what will be lost by transferring these programs and I specifically worry about consolidating too much in the Department of Education, which doesn't have a long history with STEM

S&T agencies such as NASA, NIH, and NOAA possess valuable domain expertise, passionate employees, strong relationships with industry, and unique assets for educators, both formal and informal, across the Nation. Under the reorganization proposal, all of these agencies would retain many of the programs through which they apply these assets to STEM-education activities that build on the unique competencies of the respective agencies and/or meet their needs as employers of individuals with particular STEM skills.

At the same time, the proposal's "lead agencies" for K-12 education (Department of Education), undergraduate education and graduate fellowships (NSF), and outreach (Smithsonian Institution) have already conducted or are in the process of convening meetings with these and other science agencies to identify modes of cooperation through which valuable assets and activities from programs that would be eliminated under the reorganization could be brought to bear more broadly and effectively across the government going forward, as well as to discuss agency-mission-specific needs that can be met by STEM education and engagement efforts supported by the leads. While it is premature to define exactly how these interactions will work in the long run, as agencies are currently working to determine how best to structure these collaborations, all lead agencies are committed to engaging the collaborating agencies to leverage their expertise and unique resources, as described in STEM Strategic Plan released in May.

2. The Department of Education is proposing to create a new ARPA-ED program focused on educational technology R&D. As I look through the description of this program in your testimony, I wonder why this program isn't a partnership between the Department of Education and the National Science Foundation? NSF has historically been the leader in shaping the next wave of educational R&D, as you put it in your testimony, and has invested extensively in R&D and evaluation of educational technologies specifically. What is the rationale for placing this program solely at the Department of Education? How will the Administration ensure that the Department makes use of NSF's expertise in this area?

NSF plays an invaluable role in supporting R&D related to education, learning, instruction, and technology. Yet, in the same way that the Department of Defense has a sizable traditional R&D budget and infrastructure, but still uses DARPA to pursue breakthrough innovations, the proposed Advanced Research Projects Agency for Education (ARPA-ED) will focus its efforts on creating dramatic improvements in educational technology at scale.

ARPA-ED will aim to identify and determine how to harness at scale the best and most relevant R&D with possible applications in education from other Federal agencies. In this connection, it will pursue coordination with NSF, in particular, to ensure that the Foundation's research is leveraged to the extent relevant and possible, and not duplicated. ARPA-ED's Advisory Board is one mechanism to facilitate this coordination, as is regular contact between the ARPA-ED Director and his/her counterparts at Education's Institute of Education Sciences (IES) and NSF.

3. In February, in response to a requirement in the 2010 COMPETES Act, you issued a policy memorandum directing Federal science agencies to develop plans to make the published results of federally funded research freely available to the public within one year of publication and requiring researchers to better account for and manage the digital data resulting from federally funded research.
 - a. Based on your memo, draft plans are due from agencies in August. Do you have any sense of when is the earliest we can expect final policies to be in place?
 - b. What was the rationale for allowing flexibility both in the embargo period and in whether the repositories are centralized or distributed?

Do any agencies require legislative authority to implement their plans or do you believe that any further legislation is necessary to keep the implementation of your memo on track?

The Administration is committed to dramatically increasing public access to the results of Federally-funded scientific research, including both publications describing research results and digital scientific data. Different Federal agencies are at different starting points and are facing different infrastructure, logistical, and economic challenges for implementing these policies. Furthermore, we want to facilitate opportunities to create common solutions, reduce redundant efforts, and maximize the public impact of agency efforts. We therefore anticipate that some agencies will be able to finalize their policies before others.

To date, most of our experience in increasing access to published research results is in biomedical research. There, we have seen tremendous public benefit using a 12-month embargo period and no appreciable harm to the publishing industry. In fact, the biomedical publishing industry has grown since NIH started its public-access policy. We therefore decided to expand that experiment to all other fields of science and explicitly call the 12-month embargo period a guideline to ensure that agency policies can evolve based on evidence rather than be locked into a static embargo period. Simply put, some fields of research may be able to tolerate substantially shorter embargo periods than others and the public may reap more benefit from Federal investments by evolving the embargo period.

Similarly, we have experience with a centralized model through NIH's PubMed Central archive, but we do not think that a centralized solution is the only way to effectively increase access. Indeed, we believe there is real benefit to experimenting with different models for access. The key is to ensure that research results are widely accessible and useful and that as we gain experience with increasing access, we are able to evolve the archival solutions for increased access to maximize public benefit.

All agencies that required to implement the policy have indicated to OSTP that they will be able to do so, and that none are significantly limited by legislative authority. There may be a need to provide additional authorities in the future, however, after agencies have

established their public-access policies. The greatest challenge to agencies will be implementing their plans and policies during challenging fiscal times. We believe that there is no need for new legislation on the issue of increasing public access at this time, and believe that agencies will benefit from being allowed to implement the requirements of the memorandum.

QUESTIONS FOR THE RECORD
THE HONORABLE DANIEL LIPINSKI (D-IL)
U.S. House Committee on Science, Space, and Technology

A Review of the President's FY 2014 Budget Request for Science Agencies

Wednesday, April 17, 2013

1. Dr. Holdren, in its FY14 Budget Request, the Administration proposes to consolidate all STEM education programs at the National Science Foundation, the Department of Education, and the Smithsonian Institution. The Smithsonian is identified as the lead for all informal STEM education activities in the proposal and is the potential beneficiary of more than \$25 million in new, reprogrammed funding – along with 48 associated new FTEs – from terminated competitive grant programs to informal science institutions like science centers and museums. This proposal raises a number of concerns.
 - a. Does the Smithsonian have an inclusive plan to make external grants to non-Smithsonian entities contributing to informal science education? If so, what is that plan?
 - b. What will happen to the existing intellectual and scientific resources – not to mention the institutional knowledge – already exist within the science mission agencies? Would the plan be to transfer some of those staff to the Smithsonian as part of the 48 FTE increase?

Does this consolidation plan run the risk of failing to utilize existing, community-based informal STEM education institutions as resources to meet local educational needs?

S&T agencies such as NASA, NIH, and NOAA possess valuable domain expertise, passionate employees, strong relationships with industry, and unique assets for educators, both formal and informal, across the Nation. Under the reorganization proposal, all of these agencies would retain many of the programs through which they apply these assets to STEM-education activities that build on the unique competencies of the respective agencies and/or meet their needs as employers of individuals with particular STEM skills. The 2014 Budget proposal would leave intact over 100 programs spread across fourteen agencies, and every agency that had a STEM-education portfolio before the reorganization would continue to have one. The programs that would be eliminated accounted for only about 6 percent of the \$2.9 billion in Federal STEM-education funding in FY2012.

At the same time, the proposal's "lead agencies" for K-12 education (Department of Education), undergraduate education and graduate fellowships (NSF), and outreach or informal STEM education (Smithsonian Institution) have already conducted or are in the process of convening meetings with these and other science agencies to identify modes of cooperation through which valuable assets and activities from programs that would be eliminated under the reorganization could be brought to bear more broadly and effectively across the government going forward, as well as to discuss agency-mission-specific needs that might be met by STEM education and engagement efforts supported by the leads. While it is premature to define exactly how these interactions will work in the long run, as agencies are currently working to determine how best to structure these collaborations, all lead agencies including the Smithsonian are committed to engaging the collaborating agencies to leverage their expertise, unique resources, institutional knowledge, and existing relationships as described in the STEM Strategic Plan released in May. Please see also the response to your next question.

2. Dr. Holdren, the CoSTEM Strategic Plan is still under development, with involved agencies tasked with working together to develop a more coherent STEM education plan for our nation; as a result of this ongoing work I am concerned that this budget consolidation and the programmatic eliminations it proposes may be premature. In particular, informal STEM education is currently filling the gaps in our local educational systems, and children benefit when they are able to interact directly with scientists and engineers conducting federally supported research at places like science museums. The President's budget specifically eliminates NOAA's Environmental Literacy Grants (ELG) program; NASA's Competitive Program for Science Museums, Planetariums and NASA Visitor Centers Plus Other Opportunities (CP4SMP+); and NIH's Science Education Partnership Awards (SEPA) program which currently accomplish these goals.
 - a. If these programs are eliminated as proposed, I fear that informal STEM education in specific STEM fields may become stagnant. How will the elimination of these programs allow for a continued leveraged investment in offerings that explain and highlight federal agency work undertaken by NOAA, NASA, and NIH while simultaneously engaging our next generation of STEM workers?

I delivered the final CoSTEM Strategic Plan to Congress on May 31. The 2014 Budget was prepared with the benefit of insights from the February 2012 Progress Report on the Strategic Plan, as well from subsequent albeit pre-final drafts of the Plan itself. The Budget's proposals are consistent with the aims set forth in the Plan. Although a number of the informal STEM-education programs at NOAA, NASA, and other Federal agencies are proposed for elimination in the 2014 Budget, the reorganization proposal redirects \$ 25 million in funding to the Smithsonian Institution to take the Federal lead role in this domain. The Strategic Plan calls for the lead agencies to collaborate with other CoSTEM agencies to ensure that informal STEM-education offerings will continue to be robust and will continue to draw on the talent and expertise of all of those agencies. By designating initial lead and collaborating agencies in some of the priority STEM education investment areas, the Strategic Plan encourages a more deliberative focus among new and existing efforts, the expansion of existing collaborations, and the creation of new synergies. The intent is to establish a coordinated, coherent portfolio of STEM education investments across the Federal Government so efforts and assets are deployed effectively and efficiently, for greatest potential impact.

In informal STEM education, the Strategic Plan describes the Smithsonian's role as focusing "its convening efforts on the priority goal of 'Increase and Sustain Youth and Public Engagement in STEM.' As part of the effort, Smithsonian will work with NSF, ED, the other CoSTEM agencies including NASA, NOAA, USDA, NIH, DOI, and other science partners to best understand the agencies' unique expertise and resources for engaging learners with science, and will explore existing and potential approaches to improving infrastructure and access." To quote further from the Strategic Plan, "The other CoSTEM agencies will be key collaborators, working with the lead agencies to find ways to build on their existing investments in STEM education, and leverage the passion and expertise of their staff and other STEM professionals who will continue to provide access to STEM content and Federal assets that can be used in formal and informal learning environments."

QUESTIONS FOR THE RECORD
THE HONORABLE ALAN GRAYSON (D-FL)
U.S. House Committee on Science, Space, and Technology

A Review of the President's FY 2014 Budget Request for Science Agencies

Wednesday, April 17, 2013

1. The President of the United States has set a goal to reduce emissions 83% by 2050. He has also made the commitment to take "urgent action" to keep global warming below 2C above pre-industrial levels. The carbon footprint of the Keystone XL pipeline and the 13 million barrels of tar sands crude that is planned to flow through it for its 50-year lifetime is about 9.5 gigatons of carbon dioxide. Its annual carbon footprint would be the equivalent of the 10 dirtiest coal plants in the US, combined. Can you explain to me how the US will meet the President's goals of reducing emissions 83% by 2050 and keeping global warming below 2C if the Keystone XL pipeline is operational?

The Administration has not made a decision on the Keystone XL pipeline. The State Department is still reviewing public comments on its draft supplemental Environmental Impact Statement, preparatory to issuing a final version. President Obama did make clear, in his speech on climate and energy policy at Georgetown University on June 25, that climate effects will be an important factor in State's final 'national interest determination.'

QUESTIONS FOR THE RECORD
THE HONORABLE SCOTT PETERS (D-CA)
U.S. House Committee on Science, Space, and Technology

A Review of the President's FY 2014 Budget Request for Science Agencies

Wednesday, April 17, 2013

1. Over the past several years, our nation has experienced historic and devastating natural disasters. Numerous communities across America are still recovering and rebuilding. Hurricane Sandy was the nation's costliest storm since Hurricane Katrina, killing hundreds of people in its path and causing upwards of \$70 billion in damages. How does the President's budget request address the need for our communities to be more resilient to natural disasters? Can you provide justification for that amount?

As we have seen in just the last year, our communities and our economy remain vulnerable to the impacts of extreme weather, from heat waves and droughts to wildfires and floods, and from extreme weather events such as Sandy. The overwhelming judgment of science is that the climate is changing, and it is only responsible to be prepared for increased frequency and severity of extreme weather events and other climate-related impacts. Building a prosperous America means ensuring that our people are safe and secure, and that the investments we make in our communities and critical infrastructure are viable over the long term in the face of climate change, as well as in the face of natural disasters unrelated to weather and climate. The President's Budget supports a range of programs and activities designed to strengthen the Nation's preparedness and resilience by: safeguarding Federal investments and ensuring delivery of Federal services; building stronger, safer communities by supporting local efforts to strengthen climate preparedness and resilience; ensuring the long-term preparedness and resilience of the Nation's infrastructure and making information to guide these efforts more available and usable; and protecting critical natural resources. In the 2014 Budget, these efforts to strengthen the Nation's preparedness and resilience are integrated across programs, and the Budget does not attempt to separate out line items for preparedness and resilience efforts.

QUESTIONS FOR THE RECORD
THE HONORABLE DEREK KILMER (D-WA)
U.S. House Committee on Science, Space, and Technology

A Review of the President's FY 2014 Budget Request for Science Agencies

Wednesday, April 17, 2013

1. An increasing number of states, including Washington, are creating a statewide system of regional STEM innovation networks that accelerate the transfer of best practices in STEM and improved outcomes. These programs in our region help enable both local innovation and statewide impact, as well as equity, which is important in a state like ours with rural, tribal and other underserved communities. How does the Administration envision that the regional STEM Innovation Networks proposed in the President's 2014 budget will both leverage and advance existing efforts in our states? Will a consortium of regional STEM Innovation Networks be eligible to apply?

The Administration's STEM Innovation Networks proposal is a recognition of the kinds of success that collaborative networks such as STEMx and other state-wide systems have had in connecting students to real-world learning opportunities in fields that meet community needs. The Department of Education is already utilizing knowledge gained from the operation of these model networks to inform the design of the STEM Innovation Networks. Furthermore, as noted in the Department of Education's Congressional Justification for the 2014 Budget, the possibility of the STEM Innovation Networks engaging with existing networks at the state and local level to increase student engagement and achievement in STEM has been recognized in the design of this program.

Appendix II

ADDITIONAL MATERIAL FOR THE RECORD

LETTER TO HON. DANA ROHRBACHER, CHAIRMAN, SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS, COMMITTEE ON FOREIGN AFFAIRS, FROM CHARLES F. BOLDEN, JR., ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

National Aeronautics and Space Administration
Office of the Administrator
Washington, DC 20546-0001



June 20, 2012

The Honorable Dana Rohrabacher
Chairman
Subcommittee on Oversight and Investigations
Committee on Foreign Affairs
U.S. House of Representatives
Washington, DC 20515

Dear Chairman Rohrabacher:

Thank you for your most recent letter of January 31, 2012, requesting further information on the purported access of Dr. Zhang Litong to a NASA facility in Cleveland, Ohio, between 1989 and 1991, as well as "a list of all People's Republic of China (PRC) citizens who have engaged in programs controlled or funded by NASA at any time, at any level." In response to your request, Enclosure 1 provides a detailed response to your most recent query. Enclosure 2 provides a listing of the 18 expired or suspended cooperative agreements between NASA, since the Agency's inception, and the PRC; while it is impossible to identify which PRC citizens may have been engaged in these programs, Enclosure 2 provides brief summaries of each of these cooperative activities.

With respect to the PRC citizens currently approved for access to NASA facilities and/or information technology (IT) resources, it is important to note that NASA policies require that the decision to grant such access can be made only after a thorough review of the foreign national visit request. These requirements apply to all foreign visitors, including foreign national civil servants, contractors, researchers, and international partners covered by International Space Act Agreements (ISAAs), as well as high-level protocol visitors (HLPV), foreign nationals with the news media, and NASA sponsored Exchange Researchers on J-1 Visas. The NASA Identity Management System is used to capture, store, and track identity and access data, as well as export control or other restrictions required for any foreign national visitor.

As an initial matter, each foreign visitor must have a NASA sponsor who establishes the foreign visitor's need for access. In general, each foreign national visitor must be affiliated with a NASA agreement, contract, or program activity and must be reviewed by NASA Center Export Control personnel to assure that the appropriate technology transfer control plans are in place for technology access prior to access being granted. In addition, all foreign nationals from "Designated Areas," such as China, must be reviewed and approved by NASA Headquarters prior to access being granted.

Before a foreign national can be granted access to a NASA facility or asset, a series of database checks is completed for each individual to identify persons who should be denied access. Each NASA Center employs an International Visits Coordinator (IVC), who is responsible for assuring that all appropriate database checks, investigations, and identity documents (e.g., passport and visa) are reviewed and captured.

Consistent with established NASA policy, visits for the purpose of gathering information or conducting discussions in technological areas that NASA considers sensitive (e.g., for proprietary, national security, or export control reasons) are generally disapproved. Requests are approved only to the extent that discussions and information provided by the NASA representatives will be confined to information that has been previously approved for release to the general public.

Assuming a foreign national passes the steps described above, foreign nationals who have been in the United States for fewer than three years are issued temporary local credentials for an appropriate period of time, as determined by Center security managers based on applicable individual restrictions such as date of visa/passport expiration, date of I-94/W expiration, or assignment end date. Foreign nationals resident in the United States for greater than three years are eligible to undergo the same level investigation as is done for full-time employees and contractors. Access to additional physical or IT assets is managed via an access control plan tailored to the specific requirements of the visit.

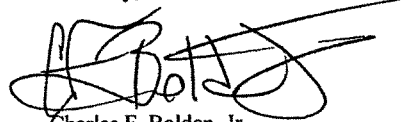
The PRC nationals with current access to NASA facilities were all subject to – and passed – screenings based on these protocols.

The NASA Office of Protective Services, including its Counterintelligence and Counterterrorism Program and the security programs in place at all NASA Centers and facilities – as well as the NASA Export Control Program and our Chief Information Officer(s) – continue to aggressively implement the Agency's longstanding practice of protecting NASA's technology and facilities from loss or inappropriate access.

Additionally, I would like to emphasize that, consistent with restrictions codified in Section 539 of the FY 2012 Consolidated and Further Continuing Appropriations Act (P.L. 112-55), NASA has no ongoing or planned bilateral activities with China or Chinese-owned companies.

I appreciate the opportunity to relay the results of our research into – and understanding of – these important matters and would be pleased to discuss them with you in greater detail if you wish.

Sincerely,



Charles F. Bolden, Jr.
Administrator

Enclosure 1

In response to the January 31, 2012, request from the Subcommittee on Oversight and Investigations, Committee on Foreign Affairs, U.S. House of Representatives, NASA conducted two separate, thorough investigations to determine whether Dr. Zhang Litong ever had direct access, as she claims, to any NASA facility and to identify the most accurate information NASA could provide regarding any and all PRC citizens who have engaged in programs controlled or funded by NASA at any time, at any level. The results of these separate, intensive investigations are outlined below.

Regarding the purported access to NASA facilities by Dr. Zhang, the Glenn Research Center (GRC) was first informed of this matter in September 2011. During the course of their initial investigation, they checked all available records from the time periods referenced in Dr. Zhang's biography and interviewed former and current employees within GRC's Structures and Materials Division and the Space Processing and Experiments Division to determine whether Dr. Zhang had ever been granted direct access to GRC. The investigation found no records or recollections of Dr. Zhang having ever been on the grounds at the GRC.

As indicated in your letter, Dr. Zhang's biography states that she "... came to the U.S. NASA Space Structures Materials Business Development Center and ... worked on ceramic matrix composites ... in a NASA Center for the Commercial Development of Space (CCDS) as a Senior Visiting Scholar from April 1989 to January 1991." Based on the results of the investigations NASA has conducted into her claims, NASA views these assertions in Dr. Zhang's biography (that she worked in a NASA facility) to be factually inaccurate.

Through NASA's investigations into these claims, it was determined that the "Center for the CCDS" referenced in Dr. Zhang's biography was, in fact, a research program being conducted at Case Western Reserve University (CWRU) in Cleveland during that time. It is important to note that this particular CCDS at CWRU was not a NASA facility. It was part of a program operated by, for, and at universities. The program was funded partially by NASA, but also by the universities, industry leaders, and other private organizations. The program at CWRU was created in July 1987 along with seven other similar programs across the country. The goal was for these centers to become self-sustainable after several years of support from Federal funding. However, in 1993, each center was terminated due to lack of evidence of the possibility of self-sustainment.

Upon receipt of your most recent letter, NASA asked GRC to look again into this matter regarding Dr. Zhang. GRC conducted another investigation, combing all available records and again interviewing employees and retirees who worked in the Structures and Materials Division and the Space Processing and Experiments Division who may have had any interaction with the CWRU CCDS during the time periods referenced in Dr. Zhang's biography. Again, no recollection or record of Dr. Zhang ever having had direct access to any division within GRC (or any other NASA facility) could be uncovered.

As for Dr. Zhang's work as a "Senior Visiting Scholar" in the "Center for the CCDS" at CWRU, investigative personnel from GRC conducted interviews with faculty members at CWRU who had been part of – or had knowledge of – the program from 1987 – 1993, and no recollection or record of Dr. Zhang having been associated with the program at CWRU could be uncovered.

Again, the program at CWRU was not held at a NASA facility. It was a university research program funded only partially by NASA (among others). The research being done in these programs throughout the country, while sometimes beneficial to NASA, did not expose the researchers to classified or sensitive proprietary NASA information regarding "continuous fiber reinforced ceramic composite exploration research." While NASA's multiple investigations into Dr. Zhang's involvement in this program at CWRU cannot definitively rule out the possibility that she may have been involved with the program in some minor way, NASA's research and records do not lead to any concrete evidence that she was involved in any way.

Regarding your request for "a list of all PRC citizens who have engaged in programs controlled or funded by NASA at any time, at any level," NASA observes that, over the last decade, the Agency has had very limited bilateral cooperation with Chinese entities, in accordance with the proscriptions of U.S. law and policy. In fact, in April 2011, when the FY 2012 Full-Year Continuing Appropriations Act (P.L. 112-10) was enacted, which specifically limited NASA's bilateral activities with China, NASA had only one active agreement with the Chinese Academy of Sciences (CAS). All activities under this agreement were immediately suspended following passage of this law.

As mentioned in the cover letter, our records indicate that, in the more than 50 years since the Agency's inception, NASA has had 18 cooperative agreements with the PRC, including the agreement with the CAS noted above. All of these agreements are either expired or suspended. While it is impossible to identify which PRC citizens may have been engaged in these programs, NASA can provide brief summaries of each of these cooperative activities, as reflected in Enclosure 2.

Over the years, it is likely that a number of PRC citizens have worked on programs under NASA grants to U.S. educational institutions, since there was previously no NASA-specific limitation on bilateral activities with China. However, NASA does not have a pre-existing mechanism to provide a comprehensive list of PRC citizens who have engaged in these types of programs that were funded (at least in part) by NASA, as they were managed by non-governmental organizations such as universities.

However, NASA is able to identify all PRC citizens who are currently approved for access to NASA facilities. As of March 2012, 293 PRC citizens were approved for access. Of these 293, 126 are persons lawfully admitted for permanent residence (as defined by 8 U.S.C. 1101(a)(20)), and are considered "U.S. Persons" in accordance with the International Traffic in Arms Regulations, 22 CFR §120.15, and the Export Administration Regulations, 15 CFR 734.2. This leaves 156 PRC citizens who are not admitted for permanent residence in the United States who have access to NASA facilities.

NASA has reviewed the access privileges of these 156 PRC citizens and identified the following categories explaining their access to NASA facilities.

- 88 persons are granted on-site access as graduate/post-graduate research scholars under the auspices of the Universities Space Research Association (USRA), National Institute of Aerospace (NIA), Oak Ridge Associated Universities (ORAU), or other NASA Post-doctoral Program (NPP) affiliates.
- 42 persons are granted remote-access only (no on-site access to NASA facilities) for fundamental scientific research.
- 17 persons are granted access because they are affiliated with the Department of Energy's Alpha-Magnetic Spectrometer (AMS) Program. These people only have access to unrestricted access areas and their specific project area within the NASA site.
- 8 persons are granted access because they are non-NASA-affiliated visitors of tenants at the NASA Stennis Space Center. Stennis tenants are part of a non-NASA activity/program located on the Center grounds and only have access to unrestricted access areas and their specific building(s), not any other buildings on the Stennis grounds.
- 1 person is granted access for child day-care facilities only. People granted access to child day-care facilities on NASA grounds have access through the main gate to go to unrestricted access areas and the child-care facility only, not into any other buildings on site.

As described more fully in the cover letter, these 156 PRC nationals were all subject to – and passed – screenings under NASA's security protocols, including a series of database checks for each individual to identify persons who should be denied access.

Summary of NASA Cooperative Agreements with the PRC

Enclosure 2

| Filing Number/Agreement Number | Title | Activity Description | Entry to Force Date | Expiration Date | Agreement Status | Foreign Corp./Agency(ies) |
|--------------------------------|---------------------------------|--|---------------------|-----------------|------------------|---------------------------------------|
| CH-001-0 | Analysis of Cosmic Dust Outlets | Investigation of the cosmic dust environment. The primary objective is to determine their chemical composition and their mass. This project is part of the International Cosmic Dust Experiment (ICDE) in the Earth's orbit. | 10-Sep-87 | 10-Sep-92 | Expired | Chinese Academy of Sciences (CAS) |
| CH-005-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 1-Jan-71 | 1-Jan-99 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 1-Jan-71 | 1-Jan-97 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 26-Jan-76 | 26-Jan-93 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 1-Jan-76 | 1-Jan-94 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 31-Jan-79 | 31-Jan-94 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 24-Jan-80 | 24-Jan-94 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 19-Jan-82 | 31-Dec-99 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 11-Mar-83 | 11-Mar-99 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 1-Aug-85 | 31-Dec-94 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 1-Aug-85 | 30-Sep-92 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 18-Nov-82 | 14-Jun-99 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 14-Jun-86 | 27-Mar-92 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 27-Mar-92 | 27-Mar-92 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 15-Nov-95 | 15-Nov-99 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 8-May-89 | 8-May-94 | Expired | State Meteorological Administration |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 26-Sep-84 | 30-Sep-99 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 28-Dec-81 | 28-Dec-92 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 15-Mar-95 | 15-Mar-99 | Expired | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 19-Mar-90 | 19-Mar-99 | Suspended | Chinese Academy of Sciences (CAS) |
| CH-009-0 | Lunar Sample Studies | Study of lunar samples returned by the Apollo lunar landing missions. The project includes the analysis of lunar rocks and thin materials returned by the Apollo lunar landing missions. | 18-Oct-95 | 31-Dec-99 | Suspended | Natural Environment Protection Agency |