AN OVERVIEW OF THE FEDERAL R&D BUDGET FOR FISCAL YEAR 2007

HEARING

BEFORE THE

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED NINTH CONGRESS

SECOND SESSION

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February 15, 2006

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AN OVERVIEW OF THE FEDERAL R&D BUDGET FOR FISCAL YEAR 2007

WEDNESDAY, FEBRUARY 15, 2006

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

The Committee met, pursuant to call, at 10:00 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood L. Boehlert [Chairman of the Committee] presiding.

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

An Overview of the Federal R&D Budget for Fiscal Year 2007

Wednesday, February 15, 2006
10:00 a.m. – 1:00 p.m.
2318 Rayburn House Office Building (WEBCAST)

Witness List

Dr. John H. Marburger III
Director
Office of Science and Technology Policy

Dr. Samuel W. Bodman
Secretary of Energy

Dr. David A. Sampson
Deputy Secretary of Commerce

Dr. Arden L. Bement, Jr.
Director
National Science Foundation

Dr. Charles E. McQueary
Under Secretary for Science and Technology
Department of Homeland Security

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HEARING CHARTER

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

An Overview of the Federal R&D Budget for Fiscal Year 2007

WEDNESDAY, FEBRUARY 15, 2006
10:00 A.M.—1:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Wednesday, February 15, 2006, the House Science Committee will hold a hearing to consider President Bush's fiscal year 2007 (FY07) budget request for research and development (R&D). Five Administration witnesses will review the proposed budget in the context of the President's overall priorities in science and technology. The Science Committee will hold a separate hearing on February 16th to examine the budget request for the National Aeronautics and Space Administration (NASA).

2. Witnesses

Dr. John H. Marburger III is Director of the Office of Science and Technology Policy (OSTP), the White House science office. Prior to joining OSTP, Dr. Marburger served as President of the State University of New York at Stony Brook and as Director of the Brookhaven National Laboratory.

Dr. Samuel W. Bodman is the Secretary of the Department of Energy (DOE). Prior to joining DOE, Dr. Bodman served as Deputy Secretary of the Treasury and Deputy Secretary of the Department of Commerce (DOC). He also served in executive positions in several publicly owned corporations and as a professor of chemical engineering at the Massachusetts Institute of Technology.

Dr. David A. Sampson is the Deputy Secretary of the Department of Commerce, which includes the National Institute of Standards and Technology (NIST) and the National Oceanic and Atmospheric Administration (NOAA). Previously, Dr. Sampson served as Assistant Secretary of Commerce for Economic Development and head of the Economic Development Administration.

Dr. Arden L. Bement is the Director of the National Science Foundation (NSF). Prior to his appointment to NSF, Dr. Bement was Director of NIST and professor and head of the School of Nuclear Engineering at Purdue University.

Dr. Charles E. McQueary is the Under Secretary for Science and Technology (S&T) at the Department of Homeland Security (DHS). Prior to joining the Department, Dr. McQueary served as President of General Dynamics Advanced Technology Systems, as President and Vice President of business units for AT&T, Lucent Technologies, and as a Director for AT&T Bell Laboratories.

3. Background

Overall Budget

Under the President's proposed budget for FY07, overall discretionary spending would increase by 3.2 percent, which the Administration describes as a level just under the projected rate of inflation of 3.3 percent. Consistent with Administration priorities, the increases are heavily weighted toward spending on defense and homeland security. Discretionary spending, excluding defense spending and homeland security spending across the government (i.e., "non-security spending") would be reduced by 0.5 percent, according to the Administration's calculations.

Snapshot of Research and Development (R&D) Spending

There are many ways of describing the R&D budget (see below), depending on what one wants to emphasize or determine. For example, development can be excluded or included; defense and homeland spending can be excluded or included; an

entire agency's budget can be included or only those parts directly related to research and/or development. In addition, different baselines can be used for FY06. For example, supplemental funding can be excluded or included; Congressional earmarks can be excluded or included. In this charter, the FY06 enacted levels are used as the baseline unless otherwise noted.

The President's proposed FY07 budget does not treat R&D uniformly, but rather provides significant increases in priority areas, while reducing or freezing spending in other areas. Therefore, aggregate numbers mask the wide variation in individual agencies and programs. The budget provides large percentage increases for the three physical science agencies included in the *American Competitiveness Initiative* the President announced in the State of the Union message—research funding at the National Science Foundation (NSF), internal programs at the National Institute of Standards and Technology (NIST) and the Office of Science at the Department of Energy (DOE). In keeping with the *Advanced Energy Initiative,* also unveiled in the State of the Union address, some of the energy supply research programs of DOE also receive significant boosts (detailed below). And the basic research programs of DOD, which fund a great deal of university research in the physical sciences, also appear to fare well if earmarks are removed from the FY06 base.

The budgets for other R&D agencies reflect their lower priority. Most notably, the National Aeronautics and Space Administration (NASA), after two years of significant increases, would see its budget increase by one percent (or by 3.2 percent if emergency money to recover from Hurricane Katrina is excluded from the FY06 base). The budget for the National Institutes of Health (NIH), which had seen its budget double in the years leading up to FY06, would be frozen. These proposals damp down the aggregate numbers for research spending since they are larger than the agencies receiving increases. (The proposed budgets for the three agencies in the *American Competitiveness Initiative* total about $10.5 billion, while NASA alone is slated to receive close to $17 billion and NIH is budgeted at more than $28 billion.)

Federal Research and Development Budget

The President's budget proposes to spend $137.2 billion on R&D in FY07, an increase of $3.4 billion, or 2.6 percent, over FY06.[1] Non-security R&D funding grows by $1.1 billion or 1.8 percent. Funding is heavily weighted toward development, which would increase by $4.88 billion, or seven percent).[2] Basic research is up slightly ($357 million, or one percent) and applied research is cut significantly ($1.83 billion, or seven percent).

Federal Science and Technology Budget

The Federal Science and Technology (FS&T) budget, is a method the National Academy of Sciences recommended to evaluate the impact of the budget on true research (as opposed to large development projects that build on the results of research that has already been completed). In the FY07 budget proposal, funding for FS&T declines by one percent, or $594 million, to $59.8 billion. Many of the cuts that contribute to that number reflect the Administration's zeroing out of FY06 earmarks. Earmarking has been increasing rapidly in recent years, and some of the earmarks are for projects that are entirely unrelated to the work of the program being earmarked.

American Competitiveness Initiative

The *American Competitiveness Initiative* calls for doubling the combined (not necessarily the individual) budgets of NSF, NIST and the DOE Office of Science over the next 10 years, and the FY07 budget proposals represent the down-payment to begin that process.

In addition to those funding increases, the Initiative includes education and tax programs. The President's budget request proposes $380 million for new programs at the Department of Education to improve science, technology, engineering, and math (STEM) education at the K–12 levels. Specifically, the programs are designed to enable more teachers to teach Advanced Placement courses, to bring math and science professionals into the classroom to evaluate approaches to teaching math and science, and to improve math instruction at the elementary and middle school levels. Despite the Initiative, the overall discretionary budget for the Department of Education drops by about $2 billion in the President's budget.

Finally, as part of the *American Competitiveness Initiative,* the President has also proposed making the R&D tax credit permanent and working with Congress to mod-

[1] A complete federal R&D spending table is provided at the end of the charter in Appendix II.

[2] Defense development is by far the largest factor in the overall R&D increase, accounting for $3.1 billion in added spending.

ernize the rules companies may use to calculate how much of their R&D spending is eligible for the tax credit. At a cost of about $86 billion over 10 years, the tax credit is by far the most expensive aspect of the Initiative.

Earmarking

The American Association for the Advancement of Science (AAAS) has calculated that Congressional earmarks in R&D programs totaled $2.36 billion in the FY06 appropriations.[3] This is 13 percent higher than in FY05 and 63 percent higher than in FY03. The Administration removes earmarks from an agency's base funding before developing the next year's budget. (The Administration does not necessarily use the same definition of earmark as does AAAS, and the Administration sometimes classifies as "earmarks" whole programs created by Congress, even if they are truly open to all qualified parties.) Moreover, earmarks can be for activities that an agency would otherwise undertake but not necessarily at the earmarked location, for activities related to an agency's programs, or for activities with little connection to an agency's activities. NIST's construction account, for example, has been earmarked for projects that have no relationship whatsoever to that laboratory.

4. Primary Issues

Here are some key questions raised by the FY07 budget request along with relevant background:

Overall Funding Levels and Balance

The *American Competitiveness Initiative* reflects the calls from leaders in industry and higher education to increase spending for physical science research, which has lagged for years behind the bounding growth for biomedical research. Most notably, the report the National Academy of Sciences released last November, *Rising Above the Gathering Storm,* recommended increasing federal funding for long-term basic research for 10 percent a year for seven years, with emphasis on the physical sciences, including in the basic research programs of DOD, and other reports have made similar recommendations.

The issues raised by the overall approach to R&D funding are:

1) **Does the budget set the appropriate priorities for R&D funding and fund them adequately?** The budget does provide additional funding for the physical sciences, far in excess of the overall growth in the budget. However, some critics note that the funding increases are less than those called for in various reports and are below the levels authorized in laws that originated in the Science Committee, such as the *National Science Foundation Authorization Act of 2002* and the *Energy Policy Act of 2005.*

2) **Does the budget provide adequate funding for agencies not considered a priority?** The greatest budget disputes are likely to revolve around funding for NIH and other agencies that do not receive increases. As noted earlier, most of those agencies have increased more rapidly in recent years.

3) **Will the proposed investments ensure future U.S. competitiveness?** Critics of increased spending may argue that holding the line on more spending and focusing on regulatory or other changes would have a greater impact on U.S. ability to fend off international competition. Supporters of the spending increases have varying ideas on how to target the funding (in terms of scientific disciplines, areas of technology, and the riskiness of research) to get the best results. Ideas about targeting could be part of future authorizing legislation. For example, many reports recommend that some research funds should be set aside for riskier, more cross-disciplinary research that may not be selected through normal peer review processes.

Applied Energy Research

Funding for applied research in the FY07 budget is focused on long-range initiatives, such as the President's hydrogen initiative, while shorter payoff areas of research are de-emphasized. For example, energy efficiency R&D is slated to decline by 11 percent, and some deployment programs are eliminated. **Does the budget appropriately balance funding for technologies that could reduce energy dependence in the near term with research on technologies with longer-term expected payoffs, such as hydrogen and fusion?** The budget includes a

[3] Note that the $2.36 billion underestimates the total impact of earmarking on science agencies and programs, as it does not include earmarking of research accounts to pay for non-R&D expenditures. AAAS analysis of earmarks is available at *http://www.aaas.org/spp/rd/earm06c.htm.*

proposal to promote nuclear energy worldwide called the Global Nuclear Energy Partnership. Included in this effort are design efforts for three new projects. These projects would require large outyear funding, in addition to existing outyear funding commitments to the Next Generation Nuclear Plant. **Given the future budget outlook, how will DOE manage these large outyear funding commitments?** The budget also proposes the elimination of DOE's oil and gas R&D, and to repeal the mandatory funding authority for the Ultra-Deepwater and Unconventional Natural Gas program created by the *Energy Policy Act of 2005*. **Should these programs be eliminated?**

NSF Education Funding

The FY07 budget increases the Education and Human Resources (EHR) Directorate at NSF by 2.5 percent to $816 million. While this is a significant improvement over the FY06 request of $737 million, it is still below the FY04 level of $938 million. Within the proposal, elementary, secondary and undergraduate education programs are reduced, while graduate education and human resource development programs are increased. No money for new grants is proposed for the Math and Science Partnership Program, which the Administration seeks to phase out at NSF, while preserving the program at the Department of Education. **Is the funding for NSF education programs adequate, and what is NSF's role in science and math education compared to that of the Department of Education?**

Technology Programs at NIST

While the internal programs of NIST receive healthy increases in the President's budget, the budget proposes again to eliminate the Advanced Technology Program (ATP), which funds research at private firms, and to halve the budget for the Manufacturing Extension Partnership program (MEP), which runs centers across the country to counsel smaller companies. Both programs were created by Congress in 1988. MEP centers generally receive one-third of their funding from the Federal Government, with the remainder equally divided between states and fees charged to companies that use the centers. **Should ATP be eliminated? Can MEP function effectively with sharply reduced federal funding? How high a priority are they compared to other government activities designed to promote applied technology development and U.S. manufacturing competitiveness?**

5. Interagency Research Activities

Budget tables for select interagency programs are provided in Appendix I. The Administration has not proposed any new interagency R&D initiatives for FY07.

National Nanotechnology Initiative (NNI): Between FY01 and FY06, spending on federal nanotechnology R&D has nearly tripled, rising from $464 million in FY01 to $1.3 billion in FY06. The FY07 budget requests an estimated $1.28 billion for the program in FY07, a decrease of $24 million, or 1.8 percent, from the estimated FY06 level.[4] Requested funding for the five agencies[5] authorized in the *21st Century Nanotechnology Research and Development Act* (P.L. 108–153) is $751 million, a 10.1 percent increase over the FY06 level, but below the $955 million authorized for these agencies for FY07 in the Act. Of particular note is the proposed near doubling of funding, from $5 million to $9 million, for EPA to work on potential environmental and safety issues associated with nanotechnology. The Committee held a hearing in the fall at which both industry and environmental groups called for increased research on the potential environmental consequences of nanotechnology.

Networking and Information Technology R&D (NITRD): NITRD is an interagency program coordinating information technology (IT) R&D across twelve agencies. Areas of emphasis include high-end computing systems and software, networking, software design, and human-computer interaction. In addition, for the first time in FY07, cyber security and information assurance research activities will be included in the interagency coordination effort. Information technology research has played a critical role in U.S. economic strength over the past several decades, and consistent with the President's prioritization of areas that impact U.S. competitiveness, the budget request recommends $3.07 billion for NITRD programs in FY07, a 7.7 percent increase over FY06. A significant part of that increase is designated

[4] The Administration notes that the FY06 NNI funding includes over $100 million in earmarks at DOD and over $10 million in earmarks at NASA. When those are removed, the request for NNI is for an increase of 7.2 percent.

[5] The five agencies authorized by the Act are: NSF, DOE, NASA, EPA, and NIST. The total funding authorized by the Act for these agencies is $3.7 billion over four years.

for expanded work on high-performance computing at NSF, the DOE Office of Science, and NOAA.

Cyber Security R&D: Significant increases are requested for cyber security R&D programs in FY07 at NSF, NIST, and DHS. While funding for cyber security activities at NSF and NIST is still below the levels authorized in the *Cyber Security Research and Development Act* (P.L. 107–305),[6] both agencies have directed considerable portions of their overall increases to their cyber security research programs. At NSF, the budget requests $94 million for cyber security R&D (up 27 percent), and keeps cyber security-focused education programs flat at $14 million. At NIST, the request is $21 million for cyber security R&D (up 11 percent from FY06). Within a flat budget at the DHS Science and Technology (S&T) Directorate, the cyber security R&D program was one of a very few programs in which funding is requested to start new projects in FY07; the budget proposes $24.9 million for cyber security R&D, up 50 percent from the FY06 level.[7]

Climate Change Research: The FY07 budget requests $1.7 billion for the interagency Climate Change Science Program (CCSP), about the same level as enacted in FY06. There is an $18 million (two percent) decrease in NASA's contribution to CCSP, offset primarily by a $23 million (14 percent) increase in NOAA and a $5 million (four percent) decrease in DOE's contributions to the program. The request for CCSP includes $200 million for the interagency Climate Change Research Initiative (CCRI), about the same level as enacted in FY06. CCRI is intended to target critical scientific uncertainties and deliver results in three to five years.

The National Earthquake Hazard Reduction Program (NEHRP): NEHRP is an interagency effort aimed at reducing earthquake hazards through activities such as seismic and engineering research, earthquake monitoring, and code development and adoption. It includes NIST, NSF, the U.S. Geological Survey (USGS), and the Federal Emergency Management Agency (FEMA). While the complete NEHRP budget for FY07 is not currently available, NIST requests $1.7 million (up $0.8 million), NSF requests $54.7 million (up $1.0 million), and USGS requests $55.4 million (up $1.6 million) for earthquake activities. Included in the USGS NEHRP budget is $8.1 million for the Advanced National Seismic System (ANSS). The FEMA request is not available.[8] NIST is the lead agency for NEHRP and it is funded at about $10 million below the authorized level.

The National Windstorm Impact Reduction Program (NWIRP): NWIRP, authorized in October 2004, is an interagency effort to improve scientific understanding of wind hazards and developing cost-effective measures to reduce their impact on lives and property through atmospheric research, code development, and creation of risk assessment tools. The participating agencies include NSF, NIST, FEMA, and NOAA. While a plan for program implementation was due to Congress in October 2005, it has not yet been received, and proposed spending levels for this program in FY07 have not been provided to the Committee. The authorized appropriations for FY07 total $25 million—$9.4 million for FEMA, $9.4 million for NSF, $4 million for NIST, and $2.2 million for NOAA.

6. Agency R&D Highlights

Department of Energy (DOE)

The FY07 request for civilian R&D at DOE of $6.3 billion represents an increase of nine percent[9] from FY06 enacted levels. The Administration's top funding priorities are the Office of Science and nuclear energy research focused on reprocessing of nuclear waste to reduce its toxicity, make more fuel available for future use, and reduce the volume of waste requiring disposal.

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[6] For FY07, NSF cyber security programs are authorized at $142 million and NIST cyber security programs are authorized at $92 million.

[7] DHS also supports operational cyber security programs, such as tracking computer and network vulnerabilities and coordinating the monitoring of government networks for cyber incidents. Located in the National Cyber Security Division of the DHS Preparedness Directorate, operational cyber security receives $92 million in FY07, the same as in FY06.

[8] The NEHRP agencies are authorized to receive a total of $160.55 million in FY07, including $12.10 million for NIST, $40.31 million for NSF, $22.28 million for FEMA, and $85.86 million for USGS (of which $36 million is designated for the ANSS).

[9] These figures do not include a proposed cancellation of balances in the dormant Clean Coal Technology account.

Office of Science

As part of the *American Competitiveness Initiative,* the budget requests $4.1 billion for the Office of Science, an increase of $505 million or 14 percent. The budget seeks to strike a balance between support for researchers (45 percent) and the operation of national scientific user facilities (38 percent). Major increases in research support are provided for university-based nuclear physics (up 17 percent to $64.5 million), the development of advanced computing software (up 51 percent to $50 million) and research at the nanoscale (up 62 percent to $158 million). Office of Science funding for the President's Hydrogen Fuel Initiative increases 54 percent to $50 million.

Funding requested for facility operations allows the Office of Science to operate its suite of scientific user facilities at 96 percent of the optimal number of operating hours, compared to 88 percent in FY06. The request also allows DOE to bring into full operation the new Spallation Neutron Source and four of five new Nanoscale Science Research Centers. An additional $20 million is provided for project engineering and design for the National Synchrotron Light Source II project at Brookhaven National Laboratory. In addition, resources are nearly doubled from $54 million to $102 million to acquire and upgrade the leadership computing facilities at Oak Ridge National Laboratory and Argonne National Laboratory.

The budget requests neither R&D nor construction funding explicitly for the Rare Isotope Accelerator (RIA), a nuclear physics facility accorded relatively high priority in the Office of Science's 20-year facilities plan. The budget does request $4 million to continue exotic beam R&D, which are the capabilities RIA or a RIA-like machine would deliver.

The request includes $60 million for FY07 in the Fusion program for ITER, an international partnership to build a large-scale fusion reactor. A significant fraction of that $60 million is a research effort at domestic fusion facilities in support of the ITER program. Direct ITER project costs are slated to increase only $21 million, while the Fusion program overall increases $31 million. The request provides fusion facilities with 51 percent of optimal operating hours.

The request for Biological and Environmental Research (BER) program is the only major program area in the Office of Science with a cut: the requested budget declines $70 million, or 12 percent. However, the request for BER rises to $510 million, a $59 million (13 percent) increase after deducting $130 million of FY06 Congressional earmark. Within BER, climate change research is reduced $6.6 million, including reductions to ocean carbon sequestration research (down $4.9 million) and climate modeling (down $1.5 million).

Applied Energy Programs

The FY07 request for applied energy programs reflects a series of trade-offs to accommodate the *Advanced Energy Initiative.* Overall, in ongoing accounts,[10] the budget for applied energy programs increases one percent or $17 million, from $2.14 billion to $2.16 billion. The Nuclear Energy program shows the largest increases, the Energy Efficiency and Renewable Energy program is flat, and the Fossil Energy and Electricity Distribution and Energy Reliability programs both are proposed for funding reductions.

In the *Office of Nuclear Energy,* after some accounting changes in infrastructure are included, total funding for programs in the jurisdiction of the Science Committee increases $95 million, or 21 percent to $554 million. The biggest funding increase occurs in the Advanced Fuel Cycle Initiative (AFCI), which is tripled from $79 million to $243 million. AFCI is the program to develop fuel reprocessing and recycling technology, and therefore a key component of the Global Nuclear Energy Partnership (see below). Conversely, university support, previously funded at $27 million, is terminated; Generation IV is down by $23 million (down 42 percent to $31 million), including a $16.6 million cut to the Next Generation Nuclear Plant. Nuclear hydrogen R&D also is cut by $6 million (down 25 percent to $19 million). The Nuclear Energy office is now responsible for all of Idaho facilities management, which is cut by $4 million (down four percent to $95.3 million). Radiological facilities management is cut $4.3 million (down eight percent to $50 million).

DOE also announced the creation of the Global Nuclear Energy Partnership (GNEP), a program to promote the use of nuclear power worldwide. The program would manage nuclear fuel through international agreements as a strategy to reduce proliferation risks. GNEP also will include a domestic nuclear fuel reprocessing and recycling component to reduce the need for additional long-term waste storage

[10] The budget proposes to rescind $203 balances in the old Clean Coal Technology account. The statutory authority for this account does not permit new project starts, but a similar demonstration program in the Fossil Energy R&D account has been active for several years.

capacity. While the GNEP activities will be carried out in various programs throughout DOE, the major new funding effort is directed toward accelerating activities in AFCI.

There are major shifts in the *Office of Energy Efficiency and Renewable Energy* (EERE), which overall sees an increase of 0.2 percent (up $3 million to $1,176 million). However, R&D programs are up $81 million (up nine percent to $1,012 million). Reflecting new initiatives announced in the State of the Union address, Solar Energy programs are slated for a $65 million increase (up 78 percent to $148 million), Biomass programs would increase $58 million (up 65 percent to $150 million), Hydrogen programs would increase $40 million (up 26 percent to $196 million), and Wind programs would increase $5 million (up 13 percent to $44 million).

The other item mentioned in the State of the Union, battery research for plug-in hybrids, standard hybrids, and fuel cell vehicles, increases $6.2 million (up 427 percent to $7.6 million), but overall funding for Vehicle research is slated to decrease.

On the Energy Efficiency side, research programs face a proposed total decrease of $36 million (down 11 percent to $289 million). In the largest single cut in EERE, weatherization grants are cut $78 million (down 32 percent to $164 million). This program is not an R&D program, but improves energy efficiency in low-income homes; the reduction will amount to about 30,000 fewer homes being weatherized in FY07. The Vehicles budget is proposed to be cut $23 million (down 12 percent to $166 million); the Buildings budget is proposed to be cut $2 million (down two percent to $77 million); and the Industries budget is proposed to be cut $11 million (down 20 percent to $46 million).

Looking at subaccounts, the largest reduction in Vehicles R&D is to earmarked projects; Materials Technology is proposed to be reduced and as is much of the work on Heavy Vehicles throughout the program. In Buildings, there is a proposed $4 million increase in Building America (program with a goal to achieve zero energy homes by 2020) and a proposed $1.2 million increase to commercial buildings R&D; decreases come from a cancellation of earmarks and some redistribution of other funds.

In the *Office of Fossil Energy,* the R&D account is proposed to be cut $122 million from FY06 levels (down 21 percent to $470 million) with the majority of the savings from the proposed termination of the Natural Gas Technology and Oil Technology programs ($33 million and $32 million in FY06 respectively). An additional $44 million reduction (down 90 percent to $5 million) is proposed in funding for the Clean Coal Power demonstration program. DOE has explained this reduction by noting that there is over $500 million allocated to the program in prior years, most of which has not yet been spent. This reduction is characterized as temporary, "so that the program can take steps to improve the use of funds already provided for projects." In addition to the cancellation of the Oil and Gas technology programs, the budget proposes to repeal the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research program through a future legislative proposal, consistent with the decision to terminate the discretionary Oil and Gas programs. This program was passed as part of the *Energy Policy Act of 2005;* the proposal would result in the rescission of a projected $50 million in mandatory funding.

The *Office of Electricity Delivery and Energy Reliability* was again substantially reorganized and then cut $37 million (down 23 percent to $125 million) with the R&D programs taking the lion's share of the cuts, down $40 million (down 30 percent to $96 million). These programs include superconductivity research, power grid reliability and research on distributed energy systems.

Table 1.

Department of Energy Civilian R&D (1)
FY 2007 Budget Request (dollars in millions)

Account	FY05 Enacted	FY06 Request	FY06 Approps	FY07 Request	FY06-07 change	FY 06-07 percent
Science	3,646	3,464	3,602	4,107	505	14%
High Energy Physics	723	714	717	775	58	8%
Nuclear Physics	394	371	367	454	87	24%
Bio and Envr Research	566	456	580	510	-70	-12%
Basic Energy Sciences	1,084	1,146	1,135	1,421	286	25%
Adv Computing	226	207	235	319	84	36%
Fusion Energy Science	267	291	288	319	31	11%
Other (2)	386	279	282	309	27	10%
Fossil Energy R&D (3)	561	491	592	470	-122	-21%
Energy Effic. and Renewable (4)	1012	975	931	1012	81	9%
Nuclear Energy (5)	454	408	458	554	95	21%
Electric Delivery and Energy Reliability	116	96	162	125	-37	-23%
Applied Energy Programs	2143	1970	2143	2161	17	1%
Total	5,789	5,434	5,745	6,268	522	9%

(1) Some columns may not add due to independent rounding.
(2) Other includes program direction, laboratories infrastructure, education, and other activities.
(3) R&D programs only - not including accounting changes for the Clean Coal Technology Account
(4) R&D programs only - not including weatherization
(5) Includes R&D and Infrastructure- prior years adjusted to match FY07 proposals

National Science Foundation (NSF)

The National Science Foundation is the primary source of federal funding for non-medical basic research conducted at colleges and universities and serves as a catalyst for science, technology, engineering, and mathematics education reform at all levels. As previously mentioned, NSF is one of the research agencies that the President has proposed to double over the next 10 years as part of the *American Competitiveness Initiative.* The FY07 budget request for NSF, therefore, is $6.02 billion, an increase of 7.9 percent, or $439 million over the FY06 level.

The funding increase in the FY07 budget mainly goes to scientific research programs and research facilities and is spread fairly evenly among all fields NSF supports, including engineering, non-biomedical life sciences, physics, and geosciences. New programs begun with the increased research funding include $50 million to begin the acquisition of a leadership-class high performance computer and $20 million requested to support leading edge sensor and related research to help predict and detect explosives and related threats. Some of the new funding is allotted to the expansion of existing high-priority programs, such as a $29 million increase for nanotechnology research and $20 million increase for cyber security research. For research facilities, the account that funds construction of large user facilities increases by $50 million, and NSF requests funding to begin building three new facilities.[11] Finally, the overall funding increase allows NSF to request $50 million in additional funds for various research and education initiatives associated with the International Polar Year, an international activity for which NSF is the lead U.S. agency.

As noted above, the FY07 budget requests an increase (2.5 percent) for the Education and Human Resources (EHR) Directorate, bringing the total funding to $816 million. Additional funds are proposed for graduate education, human resource development (activities to broaden participation in STEM fields), and the new Discovery Research K–12 (DK–12) program, which will focus on the grand challenges

[11] Funding ($81 million) is requested to start construction on Alaska Region Research Vessel (ARRV), Ocean Observatories Initiative (OOI), and National Ecological Observatory Network (NEON). (NSF has requested funding for NEON in past budgets, but no construction funding has been appropriated to date.)

in education, such as the development of quality math and science assessments and the translation of cutting edge research into classroom practice. K–12 and undergraduate education programs would be reduced.

In FY06, the responsibility for the costs of the icebreakers that support scientific research in the polar regions was transferred to NSF from the U.S. Coast Guard, and the budget request proposes that NSF continue in this role in FY07. The actual cost for services and ship maintenance will be negotiated with the Coast Guard, but the estimated cost is $57 million for FY07 (a slight decrease from FY06); this money will all be transferred back to the Coast Guard. In addition, NSF plans to, as in FY06, purchase ice-breaking services on the open market for an additional cost of roughly $10 million.

NSF continues to receive high marks from the Office of Management and Budget for the quality of its management and the excellence of its programs. NSF is one of only three agencies (of the 26 evaluated) to be awarded at least four green lights on the Executive Branch Management Scorecard, which rates agencies with green, yellow and red lights in areas such as financial management, e-government, and human capital management. In addition, ten NSF programs have been examined to date using the Program Assessment Rating Tool (PART),[12] and all ten programs received ratings of "effective," the highest possible rating. NSF remains the only agency in the Federal Government to receive the highest rating on every program that was "PART-ed."

Issues/Questions Raised by the FY07 Request for NSF

Education and Human Resource (EHR) Directorate

The increase (2.5 percent) for the EHR Directorate is not distributed evenly among the variety of education areas supported by NSF. In graduate education, increased funding will enable NSF to maintain its current stipend of $30,000 for top graduate students and further broaden participation in these programs, and the proposed $26 million increase for human resource development will provide expanded support for programs and activities that expand opportunities for traditionally under-served populations. The Math and Science Partnership (MSP) Program, envisioned as part of the President's *No Child Left Behind Initiative* and enacted by the *NSF Authorization Act of 2002,* continues to decline, from $140 million in FY04 to $46 million in FY07. Without additional resources, the amount proposed will be used to fund existing grants only.

NSF reorganized the EHR Directorate in FY06, masking some additional downward funding trends. Specifically, while a notable increase ($11 million) is proposed for a newly formed DK–12 program, the three K–12 programs[13] that were merged into DK–12 suffered significant cuts from FY05 to FY06. This year's proposed increase does little to restore those reductions. In addition, research and evaluation activities[14] have declined each of the past two years and are down $25 million overall. Finally, undergraduate education programs have also declined over the same period. While workforce development programs, such as the Advanced Technological Education, Noyce Scholarships, and STEP (a.k.a. Tech Talent), have grown slightly, capacity-building programs have fallen appreciably in the past two years-for example, the Curriculum, Course, and Laboratory Improvement program would decline by $8 million between FY05 and FY07.

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[12] PART is described by the budget as a tool "developed to assess and improve program performance so that the Federal Government can achieve better results. A PART review helps identify a program's strengths and weaknesses to inform funding and management decisions aimed at making the program more effective."

[13] The Instructional Materials Development Program, the Teacher Professional Continuum Program, and the Centers for Learning and Teaching Program were combined to form the new Discovery Research K–12 (DK–12) Program in FY06.

[14] "Research and evaluation activities" refer to the Research, Evaluation and Communication Program (REC), which was renamed the Research and Evaluation on Education in Science and Engineering (REESE) and shifted from a stand-alone program into the new Division of Research on Learning in Formal and Informal Settings (DRL).

Table 2.

National Science Foundation
FY 2007 Budget Request (dollars in millions)
(Source: Agency Budget Justification)

Account	FY05 Actual	FY06 Current Plan	FY07 Request	Change FY06 to FY07	
				Amount	Percent
RRA	4235	4331	4666	334	7.7%
BIO	577	577	608	31	5.4%
CISE	490	496	527	30	6.1%
ENG	577	581	629	48	8.2%
GEO	697	703	745	42	6.0%
MPS	1069	1085	1150	65	6.0%
SBE	197	200	214	14	6.9%
OCI	123	127	182	55	43.5%
OISE	43	35	41	6	17.6%
OPP	350	391	440	49	12.6%
IA	131	137	131	-6	-4.2%
EHR	844	797	816	20	2.5%
MREFC	165	191	240	50	26.0%
S&E	223	247	282	35	14.2%
OIG	10	11	12	1	4.4%
NSB	4	4	4	0	-1.0%
Total	**5481**	**5581**	**6020**	**439**	**7.9%**

Acronyms:
RRA = Research and Related Activities
EHR = Education and Human Resources
MREFC = Major Research Equipment and Facilities Construction
S&E = Salaries & Expenses
OIG = Office of Inspector General
NSB = National Science Board
BIO = Biological Sciences
CISE = Computer & Information Science & Engineering
ENG = Engineering
GEO = Geosciences
MPS = Mathematical and Physical Sciences
SBE = Social, Behavioral, and Economic Sciences
OCI = Office of Cyberinfrastructure
OISE = Office of International Science and Engineering
OPP = Office of Polar Programs
IA = Integrative Activities

Table 3.

NSF Education and Human Resources Directorate
FY 2007 Budget Request (dollars in millions)
(Source: Agency budget justification)

Account	FY05 Actual (Prior to Restructuring)	New Organizational Structure	FY06 Current Plan, based on New Structure	FY07 Request	$ Change (FY06 – FY07)	% Change (FY06 – FY07)
EISE	**182**	**DRL**	**215.2**	**215**	**-0.2**	**-0.1%**
IMD	29	DK-12 (combination of IMD, TPC, CLT)	93	104	11	11.8%
TPC	61					
CLT	26					
ISE	63	ISE	63	66	3	4.7%
		REESE (formerly REC and a separate line item)	48	41	-7	-14.5%
REC	**66**	(renamed REESE, transferred to DRL)				
DUE	**154**	**DUE**	**212**	**197**	**-15**	**-7.0%**
Tech Talent	25	Tech Talent	25.5	26	0.5	2.0%
CCLI	94	CCLI	88	86	-2	-1.8%
Noyce	8	Noyce	9	10	1	11.4%
		MSP (formerly a separate line item)	63	46	-17	-27.2%
MSP	**79**	(transferred to DUE)				
DGE	**155**	**DGE**	**153**	**161**	**8**	**4.9%**
HRD	**119**	**HRD**	**118**	**144**	**26**	**21.8%**
EPSCOR	**93**	**EPSCOR**	**99**	**100**	**1**	**1.3%**
TOTAL	**844**	**Total**	**797**	**816**	**19**	**2.5%**

*Not a complete list of education programs. **Bold** distinguishes separate budgetary line items.

Acronyms:
EISE – Division of Elementary, Secondary and Informal Education
DRL – Division of Research on Learning in Formal and Informal Settings (the old EISE, with REC added)
IMD – Instructional Materials Development Program
TPC – Teacher Professional Continuum Program
CLT – Centers for Learning and Teaching Program
DR-K12 – Discovery Research K-12 Program
ISE – Informal Science Education Program
REC – Research, Evaluation and Communication
REESE – Research and Evaluation on Education in Science and Engineering (the old REC) Program
DUE – Division of Undergraduate Education
CCLI – Course, Curriculum and Laboratory Improvement Program
MSP – Math and Science Partnership Program
DGE – Division of Graduate Education
HRD – Division of Human Resource Development
EPSCoR – Experimental Program to Stimulate Competitive Research

Homeland Security R&D

Homeland Security R&D at the Department of Homeland Security (DHS)

The vast majority of R&D at DHS is funded by the Science and Technology (S&T) directorate. Proposed funding for S&T is $1.0 billion, a decrease of $485 million (33 percent) below the FY06 enacted level. This decrease reflects the transfer of almost all nuclear and radiological programs to the Domestic Nuclear Detection Office (DNDO), which reports directly to the Secretary. In addition, the program to develop countermeasures to shoulder-fired anti-aircraft missiles will be concluding in FY07. Accounting for these changes, the FY07 request is a $47 million reduction (4.5 percent) from FY06.

S&T directorate funding is split among various technical portfolio areas, such as biological countermeasures, standards, critical infrastructure protection, and support of DHS component agencies (such as Customs and Border Protection and the

U.S. Secret Service). A complete list of portfolios and their funding is provided in Table 4.

Within the relatively flat budget, a few new initiatives are proposed. An additional $8.3 million is proposed for cyber security R&D for Internet security projects, cyber security testbeds and data sets, and research on identity management. Also, a Joint Agro-Terror Defense Office will be created within the Biological Countermeasures portfolio to enhance the interagency coordination of advanced development of agro-defense countermeasures.

A number of portfolios will receive significant decreases. Of greatest concern is the 23 percent decrease in the Standards portfolio, which is responsible for activities that include coordinating the development of metrics for equipment performance and certification, protocols for testing and training, and evaluation of equipment. This decrease will hamper DHS's ability to provide standards and guidelines for existing commercial technologies as well as for novel products being developed by other DHS programs. Another area being cut deeply is the Emergent and Prototypical Technologies portfolio, a combination of basic research on emerging threats and rapid prototyping of new technologies. The $18 million (41 percent) decrease in this portfolio will limit DHS's ability to tackle potential threats outside the existing portfolios, perform basic research for vulnerability characterization and countermeasure identification, and quickly address DHS-specific requirements for technologies.

Despite the decrease in funding for the DHS S&T directorate, the overall funding devoted to R&D at DHS does not drop appreciably, as a substantial increase is requested for DNDO (up $221 million). DNDO now includes all the radiological and nuclear countermeasures activities formerly within DHS S&T, including development and evaluation of detection equipment and forensics, attribution, and standards programs. Of the $536 million requested for DNDO for FY07, $103 million ($46 million above the FY06 level) is for transformational research and development projects to be conducted at universities and national laboratories and in industry.

Homeland Security R&D at Other Agencies

Approximately $3.4 billion is proposed for homeland security R&D programs in departments and agencies outside of DHS (Table 10). The bulk of this funding, $1.8 billion (up 6.3 percent from FY06), is for bio-defense programs at NIH, such as basic research on infectious microbial agents, applied research on diagnostics, vaccines, and therapeutics, and construction of bio-containment facilities. The remaining funds (approximately $1.7 billion) go to a number of other agencies, such as: EPA, which has been sharply increasing its funding for research on detection of chemical and biological agents in the water supply, microbial risk assessment and environmental decontamination; NSF, for research related to critical infrastructure protection, microbial genomics, and a new program for sensor technologies; the U.S. Department of Agriculture (USDA), for research on animal disease diagnostics and vaccines; DOD for detection systems, protective gear, and medical countermeasures for biological and chemical agents; and DOE's National Nuclear Security Administration for research on detection and attribution of radiological and nuclear materials.

In addition to individual agency programs, a number of cooperative efforts between DHS and other agencies exist: NSF and DHS jointly fund a cyber security testbed; DHS provides funding to NIST for standards work in a number of areas, such as standards for radiation detectors; and EPA and DHS co-fund a university center on microbial risk assessment.

Issues/Questions Raised by the FY07 Request for DHS

Balance of DHS S&T Programs: Most of the work of the S&T directorate is heavily weighted toward development. Relatively little goes to fund longer-term, more basic research. As a result, relatively little of the funding is available to universities, although DHS S&T does fund several university centers. Whether this shorter-range focus is optimal for U.S. long-term security has been a matter of debate.

Priorities across Threat Areas: DHS S&T has to balance research priorities across a wide range of different kinds of threats—from cyber attacks to dirty bombs to foot and mouth disease—as well as supporting technology adoption in a wide variety of environments, including new inter-operable communications systems for first responders and stand-alone laboratories that can safely receive and identify unknown hazardous substances. Yet for the first time since DHS was formed in FY03, funding for the S&T directorate has decreased. In these circumstances, robust risk assessment methodologies both within and across portfolios are needed.

Table 4.

Department of Homeland Security Science and Technology Directorate
FY 2007 Budget Request (dollars in millions)
(Source: Agency Budget Justification)

Account	FY05 Actual	FY06 Appropr.	FY07 Req.*	Amount Change	Percent Change
Biological Countermeasures (including NBACC and PIADC)	452	376	386	10	2.6%
Nuclear & Radiological Countermeasures	131	19	0	-19	-100.0%
Domestic Nuclear Detection Office (DNDO)		315	0	-315	-100.0%
Chemical Countermeasures	61	94	95	1	1.3%
Explosives Countermeasures	19	44	92	49	111.7%
Threat Awareness (formerly TVTA)	84	43	45	3	6.6%
Counter-MANPADS	52	109	5	-104	-95.5%
Support of DHS Components	52	79	99	20	24.8%
Transferred R&D Programs**	0	99	0	-99	-100.0%
Standards	40	35	27	-8	-23.2%
Rapid Prototyping Program	66	35	0	see EPT	
Emerging Threats	13	8	0	see EPT	
Emergent & Prototypical Technology (EPT)			25	-18	-41.4%
University Centers & Fellowship Programs	114	62	60	-2	-3.7%
Cybersecurity	18	17	25	8	50.4%
Critical Infrastructure Protection	65	40	21	-20	-48.9%
Interoperability and Communications	7	26	33	7	26.3%
SAFETY Act Implementation	1	7	6	-1	-19.1%
Administration/Salaries	69	80	84	4	4.5%
Total	**1,244**	**1,487**	**1,002**	**-485**	**-32.6%**
Total without DNDO, Nuclear & Radiological Countermeasures, and Counter-MANPADS		**1,044**	**997**	**-47**	**-4.5%**

*The FY07 Request removes Management and Administration funds from each account to create a more accurate picture of the centralized Administration/Salaries line item going forward. However, for the purposes of comparison to FY06, the removed Management and Administration funds have been added back into each portfolio in this table.
**The R&D programs transferred into DHS S&T from elsewhere in DHS in FY06 are mainly from the Transportation Security Administration, and these funds have been redistributed to the Explosives Countermeasures Portfolio and the Support of DHS Conventional Missions.

Note: The request for DHS S&T presents proposed and past funding levels by technical topic, not by organizational unit or research performer. At this time, DHS is not able to provide information on how funds will be distributed among research performers (e.g. the private sector, national laboratories, and universities) in FY06 or FY07 or how they were distributed in FY05.

Acronyms:
DNDO = Domestic Nuclear Detection Office
NBACC = National Biodefense Analysis and Countermeasures Center
PIADC = Plum Island Animal Disease Center
MANPADS = Man Portable Air Defense Systems

National Institute of Standards and Technology (NIST)

NIST's Laboratory Programs

The FY07 budget requests $467 million for a wide range of research conducted at NIST laboratories in Gaithersburg, Maryland, and Boulder, Colorado. The request is $67 million (17 percent) above the FY06 enacted level of $399 million and is $41 million above the FY06 request. The request also includes $68 million for construction and renovation of NIST's scientific facilities.

The increase in laboratory programs for FY07 comprises 12 initiatives that span a range of scientific and engineering disciplines. Two of the initiatives are major upgrades and enhancements of NIST national research facilities: the NIST Center for Neutron Research (NCNR) and the Center for Nanoscale Research and Technology (CNRT, located within NIST's Advanced Measurements Laboratory). One initiative is to expand NIST's existing presence at the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory. The other nine initiatives are increases to NIST laboratory and technical programs that are directed at solving measurement and other technical problems in energy, medical technology, manufacturing, homeland security, and public safety.

Issues/Questions Raised by the FY07 Request for NIST

Impact of Proposed Elimination of the Advanced Technology Program (ATP): The FY07 budget request proposes to eliminate ATP (funded at $80 million in FY06). Moreover, ATP funded an estimated $8 million worth of R&D conducted at the NIST laboratories in FY06. Therefore, the proposal to end ATP could result in a reduction in research funding to the NIST laboratories, eating up a portion of the proposed increase under the American Competitiveness Initiative.

Impact of Scaling Back the Manufacturing Extension Partnership (MEP) Program: The FY07 request for MEP is $46.3 million, which represents a 56 percent cut from the FY06 enacted level of $106 million. At this level, it is unclear how the MEP program would function as a national network.

Table 5.

National Institute of Standards and Technology
FY 2007 Budget Request (budget in millions)
(Source: Agency Budget Justification)

Account	FY 2005 Enacted	FY 2006 Enacted	FY 2007 Request	Amount Change	Percent Change
Laboratories					
EEE	48.9	50.1	50.9	0.8	1.5%
ME	23.5	22.1	24.5	2.3	10.5%
CST	43.4	44.7	50.2	5.6	12.5%
Phys	41.2	42.1	62.5	20.4	48.4%
MSE	60.1	33.1	38.9	5.9	17.7%
BFR	21.5	22.0	24.4	2.4	10.7%
CSAM	62.9	64.6	69.7	5.1	7.9%
STS	15.4	16.0	18.3	2.4	15.2%
RS[1]	56.5	60.6	-	(60.6)	-
MS	-	-	20.0	20.0	
PD	-	-	10.9	10.9	
CS			6.8	6.8	
BS	-	-	12.1	12.1	
BQP	5.4	7.0	7.6	0.6	6.8%
Facilities					
CNR	0	-	38.5	38.7	--
N3F	0	37.4	31.6	(5.9)	(15.7%)
Total, NIST Labs	**378.7**	**399.9**	**467.0**	**67.5**	**17%**
Construction[2]	72.5	175.9	68.0	(107.9)	(61.3%)
ITS					
ATP	140.4	80.0	0	(80.0)	(100.0%)
MEP	107.5	106.0	46.3	(59.6)	(56.3%)
NIST TOTAL	699.1	761.8	581.3	(180.5)	(23.7%)

[1]The $60.1 million decrease in Research Support account is due to the institution of new budget lines (MS, PD, CS, and BS) and removal of earmarks.
[2] When $127 million in earmarks are removed from the FY06 appropriation for the NIST construction account, the FY07 budget actually requests a 39 percent increase for NIST construction funds.

Acronyms:
EEE = Electronics and Electrical Engineering
ME = Manufacturing Engineering
CST = Chemical Science and Technology
Phys = Physics
MSE = Materials Science and Engineering
BFR = Building and Fire Research
CSAM = Computer Science and Applied Mathematics
STS = Standards and Technology Services
RS = Research Support
MS = Measurement Services (new in FY07)
PD = Postdoctoral fellowships (new in FY07)
CS = Computer support (new in FY07)
BS = Business systems (new in FY07)
BQP = Baldrige Quality Program
CNR = Center for Neutron Research
N3F = National Nanotechnology and Nanometrology Facility
ITS = Industrial Technology Services
ATP = Advanced Technology Program
MEP = Manufacturing Extension Partnership

National Oceanic and Atmospheric Administration (NOAA)

The FY07 budget requests $3.7 billion for NOAA, a decrease of $227 million (six percent) compared to the FY06 enacted level of $3.9 billion. However, NOAA's FY06 budget includes approximately $600 million worth of earmarked projects. If these earmarks are removed from the FY06 baseline, then the President's budget could be construed as proposing an additional $345 million (10 percent increase) for NOAA in FY07.

National Weather Service

The FY07 budget requests $882 million for the National Weather Service (NWS), an increase of $33.6 million (four percent). The increase includes $29 million to develop, operate, and maintain a variety of warning and forecast systems such as the Tsunami Warning Program, the Air Quality Forecasting Program, and the Wind Profiler Network which improves tornado, severe storm, and flash flood forecasting.

Satellite Acquisition

The FY07 budget requests $1.03 billion for satellite programs at NOAA, an $82 million (8.6 percent) increase over the FY06 enacted level of $952 million. The proposed increase is for procurement and construction of the next generation of geostationary and polar weather satellites, and it is in line with the original budget plans for these satellite systems. In FY07, NOAA expects to let the prime contract for its next generation of geostationary satellites, "GOES–R." The geostationary satellites provide a constant watch for severe weather conditions such as tornadoes, flash floods, hail storms, and hurricanes, and they are important for short-term (between real-time and two days) weather forecasts. In contrast, NOAA's polar-weather satellites are essential for long-term (between three and seven days) weather forecasts, tracking of severe weather, and climate observations.

Hurricane Research

The FY07 budget includes requests for $13 million for high performance computing (a 100 percent or $6.5 million increase over FY06 enacted levels) and also includes $2.5 million in new funds to accelerate hurricane research programs. Both requests will help NOAA improve its hurricane forecast models, in particular, its models of hurricane intensity.

Issues/Questions Raised by the FY07 Request for NOAA

Weather Satellite Program Management: NOAA's next generation polar weather satellite program, National Polar-orbiting Operational Environmental Satellite System (NPOESS), is currently running as much as $3 billion (more than 25 percent) over budget and as many as three years behind schedule. Since NPOESS is a joint NOAA–DOD program, this large cost increase triggered a review under the DOD's Nunn-McCurdy process. The review will finish in May or June. Currently, no increased funding is anticipated (or requested) in the FY07 budget as a result of the review, but increased funding will be required in future years. This could force NOAA to take resources away from other important missions at the agency.

Table 6.

National Oceanic & Atmospheric Administration
FY 2007 Budget Request (dollars in millions)
(Source: Agency budget documents)

Account		FY05 Actual	FY06 Enacted	FY07 Request*	Amount Change	Percent Change
National Ocean Service (NOS)		**669**	**590**	**413**	**(177.3)**	**(30.0%)**
	ORF	541	493	394	(98.7)	(20.0%)
	PAC	127	91	13	(78.6)	(86.1%)
	Other	1	6	6	0.0	0.0%
Oceanic and Atmospheric Research (OAR)		**414**	**380**	**349**	**(30.9)**	**(8.2%)**
	ORF	404	370	338	(31.9)	(8.6%)
	PAC	10	9	10	1.0	10.8%
	Other	0	0	0	0.0	0.0%
National Weather Service (NWS)		**783**	**848**	**882**	**33.6**	**4.0%**
	ORF	704	747	783	36.7	4.9%
	PAC	79	101	98	(3.0)	(3.0%)
	Other	0	0	0	0.0	0.0%
National Environmental Satellite, Data, and Information Service (NESDIS)		**907**	**952**	**1,034**	**81.6**	**8.6%**
	ORF	176	178	150	(28.1)	(15.8%)
	PAC	731	774	884	109.8	14.2%
	Other	0	0	0	0.0	0.0%
Program Support		**449**	**491**	**406**	**(84.8)**	**(17.2%)**
	ORF	368	358	364	5.8	1.6%
	PAC	64	113	21	(91.8)	(81.6%)
	Other	18	20	21	1.2	6.1%
National Marine Fisheries Service		**824**	**804**	**737**	**(66.9)**	**(8.3%)**
Other/Transfers		**(128)**	**(117)**	**(136)**	**-----**	**-----**
Total		**3,918**	**3,948**	**3,684**	**(244.4)**	**(6.1%)**

*NOAA removes earmarks from its budget request each year. Earmarks from FY06 in each of the line offices were NOS, $221 million; OAR, $73 million; NWS, $16 million; NESDIS, $39 million; Program Support, $93 million; and NMFS, $130 million.

Acronyms:
ORF = Operations, Research and Facilities
PAC = Procurement, Acquisition and Construction

7. Witnesses Questions

All of the witnesses have been asked to:

1. Review the R&D budget request in the context of the Administration's overall priorities in science and technology.
2. Describe the mechanisms that the Administration uses to determine priorities across scientific disciplines.
3. Describe the mechanisms the Administration uses to coordinate its scientific research and technical development activities with other federal agencies.

In addition, Dr. Bodman has been asked to:

1. Describe how the budget request will contribute to the development of climate change technologies.

APPENDIX I: Budget Tables for Selected Interagency Programs.

Table 7.

National Nanotechnology Initiative

(Dollars in Millions)

	FY05 Actual	FY06 Estim.	**FY07 Proposed**	Change FY06-07	
				Amount	Percent
NSF	335	344	373	29	8.4%
Defense	352	436	345	-91	-20.9%
Energy	208	207	258	51	24.6%
NIST	79	76	86	10	13.2%
NASA	45	50	25	-25	-50.0%
NIH	165	172	170	-2	-1.2%
NIOSH	3	3	3	0	0.0%
EPA	7	5	9	4	80.0%
DHS	1	2	2	0	0.0%
USDA	3	5	5	0	0.0%
Justice	2	1	1	0	0.0%
Total	1200	1301	1277	-24	-1.8%

(Source: Federal budget analytical perspectives, page 52, with updates provided by Office of Management and Budget)

Acronyms
NIH = National Institutes of Health
NIOSH = National Institute for Occupational Safety and Health
USDA = U.S. Department of Agriculture

Table 8.

Networking and Information Technology R&D

(dollars in millions)

	FY06 Estim.	**FY07 Proposed**	Change FY06-07	
			Amount	Percent
Defense	1053	**1081**	29	2.7%
NSF	810	**904**	93	11.5%
HHS	562	**548**	-14	-2.5%
Energy*	291	**387**	95	32.8%
NIST	39	**43**	4	10.3%
NOAA	16	**23**	8	47.5%
NASA	78	**82**	4	5.0%
EPA	6	**6**	0	0.0%
Total	2855	**3074**	219	7.7%

(Source: Supplement to the Budget: Guide to the NITRD Program FY06-FY07)

Note: Comparable FY05 Actuals are not available, as this year improved accounting methods were used to more accurately reflect ongoing IT R&D programs, such as including cybersecurity research activities and projects underway in the Defense Services (Air Force, Army, Navy).

* Department of Energy numbers include the DOE Office of Science and the DOE National Nuclear Security Administration.

Acronyms

HHS = Department of Health and Human Services

APPENDIX I: Budget Tables for Selected Interagency Programs. (Continued)

Table 9.

Climate Change Science Program
(dollars in millions)

	FY05 Actual	FY06 Estimate	**FY07 Request**	Change FY06-07	
				Amount	Percent
NSF	198	197	**205**	8	4.1%
Energy	127	131	**126**	-5	-3.8%
Commerce	124	163	**186**	23	14.1%
EPA	20	19	**17**	-2	-10.5%
NASA	1237	1043	**1025**	-18	-1.7%
Total	1706	1553	**1559**	6	0.4%

(Source: Federal budget analytical perspectives, page 52)

Table 10.

Homeland Security R&D
(dollars in millions)

	FY05 Actual	FY06 Actual	**FY07 Request**	Change FY06-07	
				Amount	Percent
HHS	1,608	1,673	**1,779**	106	6.3%
DHS	1,017	1,482	**1,387**	-95	-6.4%
Defense	884	1073	**959**	-114	-10.6%
NSF	324	328	**370**	42	12.8%
Justice	61	58	**81**	23	39.7%
USDA	31	37	**79**	42	113.5%
Commerce	57	61	**67**	6	9.8%
Energy	32	52	**52**	0	0.0%
EPA	25	32	**40**	8	25.0%
Treasury	3	3	**3**	0	0.0%
Transportation	35	30	**26**	-4	-13.3%
Total	4,079	4,828	**4,843**	526	10.9%

(Source: Office of Management and Budget)

APPENDIX II:

Federal R&D Spending (adapted from FY07 Budget Request)*

By Agency		2005 Actual	2006 Estimate	2007 Proposed	$ Change 06-07	% Change 06-07
Defense		69,743	71,946	74,234	2,288	3%
Health and Human Services		28,687	28,767	28,737	-30	0%
NASA		10,197	11,394	12,245	851	7%
Energy		8,596	8,563	9,158	595	7%
National Science Foundation		4,138	4,199	4,548	349	8%
Agriculture		2,410	2,411	2,012	-399	-17%
Homeland Security		1,182	1,484	1,508	24	2%
Commerce		1,133	1,079	1,065	-14	-1%
Transportation		549	704	557	-147	-21%
Veterans Affairs		742	765	765	0	0%
Interior		622	637	600	-37	-6%
Environmental Protection Agency		640	600	557	-43	-7%
Other		1,235	1,232	1,218	-14	-1%
	Total	**129,874**	**133,781**	**137,204**	**3,423**	**3%**
Basic Research						
Defense		1,485	1,470	1,422	-48	-3%
Health and Human Services		15,752	15,996	16,037	41	0%
NASA		2,386	2,305	2,226	-79	-3%
Energy		2,937	2,987	3,315	328	11%
National Science Foundation		3,427	3,478	3,687	209	6%
Agriculture		838	846	771	-75	-9%
Homeland Security		55	95	49	-46	-48%
Commerce		53	56	87	31	56%
Transportation		33	39	39	0	0%
Veterans Affairs		297	306	306	0	0%
Interior		36	42	40	-2	-5%
Environmental Protection Agency		110	101	94	-7	-7%
Other		155	169	174	5	3%
	Subtotal	**27,564**	**27,890**	**28,247**	**357**	**1%**
Applied Research						
Defense		4,787	5,169	4,478	-691	-13%
Health and Human Services		12,573	12,605	12,540	-65	-1%
NASA		1,957	1,759	1,118	-641	-36%
Energy		2,770	2,730	2,723	-7	0%
National Science Foundation		332	319	379	60	19%
Agriculture		1,124	1,157	974	-183	-16%
Homeland Security		842	1,093	943	-150	-14%
Commerce		813	779	769	-10	-1%
Transportation		304	392	305	-87	-22%
Veterans Affairs		401	414	414	0	0%
Interior		533	545	510	-35	-6%
Environmental Protection Agency		415	387	359	-28	-7%
Other		587	591	594	3	1%
	Subtotal	**27,438**	**27,940**	**26,106**	**-1,834**	**-7%**
Development						
Defense		63,336	65,221	68,315	3,094	5%
Health and Human Services		57	37	37	0	0%
NASA		3,494	5,174	6,755	1,581	31%
Energy		1,759	1,804	1,990	186	10%
National Science Foundation		N/A	N/A	N/A	N/A	N/A
Agriculture		156	164	155	-9	-5%
Homeland Security		133	195	335	140	72%
Commerce		148	118	94	-24	-20%
Transportation		194	255	194	-61	-24%
Veterans Affairs		44	45	45	0	0%
Interior		50	47	47	0	0%
Environmental Protection Agency		115	112	104	-8	-7%
Other		461	424	409	-15	-4%
	Subtotal	**69,947**	**73,596**	**78,480**	**4,884**	**7%**

*Agency totals also include the Facilities and Equipment category, which has not been itemized here.

Source: Analytical Perspectives, Budget of the United States Government, Fiscal Year 2007, pages 49-50.

Chairman BOEHLERT. This hearing will come to order. I want to welcome everyone here today for our first hearing of the new year, which is also the first hearing in Congress to bring together all the research agencies that will be participating in the American Competitiveness Initiative. I want everyone in this room and everyone viewing this hearing to remember that phrase, American Competitiveness Initiative. This is one of the most important topics that can be discussed at any place at any time.

It is a rare thing to think of a budget hearing as a time of celebration, but I think that that's how we should view this morning's proceedings. For a long time, a long time, many of us, particularly on this committee, have been calling for a renewed emphasis on research in the physical sciences. The commitment that would be demonstrated, not with rhetorical feints, but with genuine investments. The eloquent words in the State of the Union, recited by the President of the United States, had to be followed by meaningful deeds, when the budget was submitted by the Congress and the American people, and they were.

Perhaps more importantly, the Nation's leaders in industry and higher education have been calling for such an investment, because they see it as a must, if the United States is to retain its competitive edge. One might say that there has been a gathering storm of lobbying on this subject, as an increasing number of leaders have issued thundering statements about the need to rethink our research and education and energy policies. But now that the storm can abate a bit, or at least blow over Capitol Hill, because in the Executive Branch our words have been heard and they have been heeded. And I want especially to thank Dr. Jack Marburger and Secretary Sam Bodman for their tireless efforts to bring the American Competitiveness Initiative into being. I have to say to Secretary Bodman that I didn't think I'd ever see a cabinet officer have such an immediate visible and positive impact on a department. I salute you, sir.

And let me just tell everyone, there's a new dynamic and we should all be thrilled with that new dynamic. In the past, the Science Committee would beat a path to a door of the decisionmakers and say you must, absolutely must, invest more in science on the part of the United States Government. And we would say to those same leaders of government, you must, you must invest more and do it better in providing quality educational training, starting at the very earliest level in science and math. You must do that.

And then people like Tom Friedman issue a book and goes to number one in the bestseller list. But the new dynamic is this: it's not just those of us on the Science Committee promoting science, or scientists promoting science, because the people on the other end listening, say well, that's sort of self-serving. You want to broaden your portfolio. Or you're after your special interest. And it's not just the education people saying we must invest more in K through 12 science and math education. They'd say well, you've got vested interest. The new dynamic is that the business community is providing leadership. They are engaged, in a sense "Rising Above the Gathering Storm," that outstanding report issued by the National Academy of Science. Business all over is saying you know what?

We've got to be involved. And you know what? They have to be involved, and the good news is that they are, so I couldn't be happier.

Now it's our job in Congress to follow through. We're calling for leadership, but there better darn well be followership, because we've got to be on the same page and we've got to move forward and I think we will. I know that everyone on this committee will be devoted to that effort. We've already been in contact with our colleagues on the Appropriations Committee, and Chairman Wolf and Chairman Hobson share our enthusiasm, and I couldn't be happier about that. How refreshing it is for veterans of Capitol Hill to look up here and to see authorizers and appropriators marching hand in hand in common cause. That is really refreshing. We all understand that the future employment and prosperity of the American people are at stake. In my speeches around the country, I say the same thing: we're still number one. That's a position I like, but we used to be so far ahead of the others that when we looked over our shoulder, the second and third place and beyond were way back. We could hardly see them even with binoculars. Now we can't take a nanosecond to just glance over our shoulder, because the competition is breathing down our neck. And boy, if that's not a signal, I don't know what is. So we've got to move and I'm confident we will.

On this committee, we will also pass and enact whatever authorizing legislation will help make the proposed funding a reality both this year and years to come. That's a pledge. That's a commitment and it's not just from me, and it's not just a Republican Chairman, where the Republicans enjoy the majority. It's the Democrats, with Congressman Gordon providing real leadership. We're all working together in common cause and that is very, very helpful. But I don't want to pass bills that are a laundry list of new or duplicative programs that will never come into being. I want to focus on a few key issues and programs that will help promote and wisely use additional appropriations, and I'm sure that we'll be working more publicly on all this next month.

In developing legislation and a hearing agenda, we will be looking at the Advanced Energy Initiative as well as the American Competitiveness Initiative. The Energy Initiative is just as important and just as promising as the efforts to increase research funding in the basic sciences, but I remain concerned that our nation still lacks a sensible energy policy. We still haven't got it right, in my estimation, and we need to get beyond the illusion that pouring money into technology development, which we need to do, is enough to transform our energy portfolio. The market will not adequately value a collective need to become more energy independent before prices become intolerable. So the Energy Initiative is a necessary but hardly sufficient step in the right direction.

Now while today's hearing is a celebration, I don't want to leave the impression that there are no problems with the proposed budget. Keep in mind, I'm from the Legislative Branch. We want to have our say. I expect that Mr. Gordon won't leave that impression any way, but I do have concerns, such as the inadequate funding for education programs at the National Science Foundation. We've got to deal with that. But we can get to those in questions and in other statements, and I won't belabor those points now. I think it's

important that our main message this morning be one of victory, because we need to communicate that message to our colleagues concerning the American Competitiveness Initiative in reality. We're not going to declare victory and go home. We're not going to put up a sign, mission accomplished. Rather, we need to think of it this way: we won the battle and now it's time to win the war.

I look forward to working with today's witnesses and with all of my colleagues to do just that, and I thank you for your indulgence. I went over my five-minute limit, but I have the advantage of being the Chair and I control the clock. Mr. Gordon.

[The prepared statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD L. BOEHLERT

I want to welcome everybody here today for our first hearing of the year, which is also the first hearing in Congress to bring together all the research agencies that will be participating in the American Competitiveness Initiative.

It's a rare thing to think of a budget hearing as a time of celebration, but I think that that's how we should view this morning's proceedings. For a long time, many of us have been calling for a renewed emphasis on research in the physical sciences—a commitment that would be demonstrated not with rhetorical feints, but with genuine investments.

Perhaps more importantly, the Nation's leaders in industry and higher education have been calling for such an investment because they see it as a "must" if the United States is to retain its competitive edge. One might say that there has been a "gathering storm" of lobbying on this subject, as an increasing number of leaders have issued thundering statements about the need to rethink our research and education and energy policies.

But now that storm can abate a bit—or at least blow over to Capitol Hill—because in the Executive Branch our words have been heard and they have been heeded. And I want especially to thank Dr. Marburger and Secretary Bodman for their tireless efforts to bring the American Competitiveness Initiative into being. I have to say to Secretary Bodman that I don't think I ever seen a cabinet officer have such an immediate, visible and positive impact on a department.

Now it's our job in Congress to follow through. And I think we will. I know that everyone on this committee will be devoted to that effort. We have already been in contact with our colleagues on the Appropriations Committee, and Chairman Wolf and Chairman Hobson share our enthusiasm—which should come as no surprise given their longstanding positions on science funding. We all understand that the future employment and prosperity of the American people are at stake.

On this committee, we will also pass and enact whatever authorizing legislation will help make the proposed funding a reality both this year and in years to come, and whatever legislation will help ensure that any additional funds are spent as wisely as possible. We are currently reviewing all the ideas that have been offered up around this town, as well as our own, and we will develop bipartisan legislation on funding, education and energy.

But I don't want to pass bills that are laundry lists of new or duplicative programs that will never come into being. I want to focus on a few key ideas and programs that will help promote and wisely use additional appropriations. And I'm sure that we'll be working more publicly on all of this next month.

In developing legislation and a hearing agenda, we will be looking at the Advanced Energy Initiative as well as the American Competitiveness Initiative. The energy initiative is just as important and just as promising as the effort to increase research funding in the basic sciences.

But I remain concerned that our nation still lacks a sensible energy policy, and we need to get beyond the illusion that pouring money into technology development—which we need to do—is enough to transform our energy portfolio. The market will not adequately value the collective need to become more energy independent before prices become intolerable. So the energy initiative is a necessary, but hardly sufficient step in the right direction.

Now while today's hearing is a celebration, I don't want to leave the impression that there are no problems with the proposed budget. I expect that Mr. Gordon won't leave that impression anyway. But I do have concerns, such as the inadequate funding for education programs at the National Science Foundation (NSF). But we

can get to those in questions and in other statements, and I won't belabor those points now.

I think it's important that our main message this morning be one of victory because we need to communicate that message to our colleagues to turn the American Competitiveness Initiative into reality. We're not going to "declare victory and go home." Rather, we need to think of it this way: we've won the battle, now it's time to win the war.

I look forward to working with today's witnesses and with all my colleagues to do just that. Thank you.

Mr. GORDON. Thank you, Mr. Chairman. Let me first compliment you on your very sincere passion and energy into this competitive agenda. You have been tireless in your—not only your rhetoric, but also trying to make things happen, and I say that sincerely. I also share your concerns about the lack of funding, in terms of the K to 12 science portion, for education, within the NSF, but simply looking at this budget, I can't share your optimism. I am concerned that we're going to have a situation similar to when the President rolled out his lunar Mars mission. It was a big splash one day, but then the money didn't come and we haven't heard anything about it since. So I guess, what did your—our President say, for us to verify? I think we're going to have to do our part to try to verify and make sure that there is follow up. So I want to join you in welcoming our distinguished panel to this morning's hearing. I'm glad to see all of you again. However, I think it's unfortunate that we have all of you here for just one day of hearings. I'm afraid that the Committee is once again acquiescing its oversight responsibility not holding individual hearings for each of the five important agencies before us today.

The good in this budget request is the proposed increase in the Federal R&D. The bad news is that that increase is less than the projected rate of inflation. So once again we're investing less than the rate of inflation at a time when many of our international competitors are increasing their investment in science and technology at faster rates than ever before. Even more alarming is the fact that the Administration's science and technology investment is actually decreasing. The Federal S&T budget is the best method to evaluate research funding. S&T represents the amount of funding directed toward creation of new knowledge and technologies as opposed to development activities. Dr. Marburger himself has stated that the Federal R&D is an imperfect measure of evaluating science and technology funding, and most agree that the S&T is the correct metric.

A lot of numbers will be thrown around this morning to put a pretty face on the budget, but the fact of the matter is that the Administration's own table, 5–2, clearly shows, and I'll show you here, a one percent decrease in the Federal S&T investment for fiscal year 2007. And knowing the fact and being aware that Dr. Marburger's statements in recent budget hearings, in the spirit of the Olympics, Dr. Marburger, I would like to nominate you for a gold medal. The category would be statistical gymnastics for making a one percent decrease look like a one percent increase, despite the fact that it's almost $600 million less than fiscal year 2006 funding and $1 billion less than the Administration requested last year, according to their own budget document. So in the same breath, the Administration decries the earmarks in last year's

budget, but then counts earmarks when showing how much the S&T budget has increased during the Administration, from 2001 to 2007.

As for the National Science Foundation fiscal year 2007 funding, I'm very pleased that the Administration has proposed an eight percent increase. In 2002 the Congress passed and the President signed into law an authorization bill doubling NSF funding over five years. However, the President's request for NSF since that signing ceremony are still $3.8 billion short of that commitment. And when we dig deeper, we find, at least in my opinion, misguided priorities. I was very disappointed to see a continued de-emphasis of the K to 12 science education at the National Science Foundation. Even as the NSF budget grows, the Administration proposes a seven percent cut to the K to 12 programs, on top of already 37 percent cuts. NSF has been a leader in improving science and math education for over 50 years. I do not understand how ignoring NSF's expertise in education helps our competitiveness.

From my point of view, competitiveness is about keeping our good jobs and creating even more and better jobs. Yet the Administration proposes to cut MEP funding by 56 percent. MEP is the only federal program designed specifically to assist small manufacturers. MEP is the only program that has a proven track record in creating and retaining manufacturing jobs. We've lost 2.8 million manufacturing jobs since 2001. This year alone we've lost 55,000 manufacturing jobs. I don't see how cutting MEP by 56 percent, and NIST overall by 23 percent, increases American competitiveness. The bipartisan National Association of Governors has wholeheartedly endorsed the MEP Program. So yes, there are winners, but unfortunately there are also many losers.

Now hopefully, as our nation becomes more familiar with the Augustine Report, we will all recognize that when we talk about science funding, it's more than just welfare for people in lab coats looking through microscopes. It's not an academic exercise, knowledge for the sake of knowledge. It's about jobs, competing in the global, in our kids, in our grandkids' standard of living.

As the Augustine Commission pointed out, "the thrust of our findings is straightforward. The standard of living of Americans in the years ahead will depend to a large extent on the quality of jobs that they are able to hold. Without quality jobs, our citizens will not have the purchasing power to support the standard of living which they seek and to which many have become accustomed. Tax revenues will not be generated to provide for strong national security and health care, and the lack of a vibrant domestic consumer market will provide a disincentive for either U.S. or foreign companies to invest in jobs in America." That means we must invest in S&T, but I'm afraid this budget simply does not make an adequate investment.

However, bipartisan legislation in the Senate includes many of the recommendations of the Augustine Commission. I've also introduced legislation that will incorporate the education and energy recommendations of the Augustine report. So I'm hopeful that we can mount a bipartisan, bicameral effort, together with Executive Branch cooperation, to improve this budget into something that

truly helps our nation remain strong economically now and long into the future. Thank you, Mr. Chairman.

[The prepared statement of Mr. Gordon follows:]

PREPARED STATEMENT OF REPRESENTATIVE BART GORDON

Thank you Mr. Chairman. I join you in welcoming our distinguished panel to this morning's hearing. It's good to see you all again. However, I do think it's unfortunate that we have you all here for only one day of hearings.

I'm afraid that this committee is once again acquiescing its oversight responsibilities by not holding individual hearings for each of the five important agencies in front of us today.

The good news in this budget request is the proposed increase in federal R&D. The bad news is that that increase is less than the projected rate of inflation. So, once again, we are investing less than the rate of inflation at a time when many of our international competitors are increasing their investment in science and technology at faster rates than ever before.

Even more alarming is the fact that the Administration's science and technology investment is actually *decreasing*. The federal S&T budget is the best method to evaluate research funding. S&T represents the amount of funding directed towards the creation of new knowledge and technologies as opposed to development activities.

Dr. Marburger himself has stated that federal R&D is an imperfect measure for evaluating science and technology funding and most agree that S&T is the correct metric.

A lot of numbers will get thrown around this morning to put a pretty face on the budget but the fact of the matter is that the Administration's own Table 5–2 clearly shows a one percent decrease for Federal S&T investment for FY07 *(see attachment)*.

Knowing that fact and being aware of Dr. Marburger's statements in recent budget briefings, in the spirit of the Olympics, I'd like nominate to Dr. Marburger for a gold medal in the category of statistical gymnastics for making a one percent decrease look like a one percent increase despite the fact that it's almost $600 million less than FY06 funding and $1 billion less than what the Administration requested last year according to their own budget documents.

So, in the same breath, the Administration decries earmarks in last year's budget but then counts earmarks when showing how much the S&T budget has increases during their administration from 2001–2007.

As for NSF FY07 funding, I'm glad that the Administration has proposed an eight percent increase. In 2002, the Congress passed, and this President signed into law, an authorization bill doubling NSF funding over five years. However, the President's requests for NSF since that signing ceremony are still $3.8 billion short of their commitment.

When we dig deeper we find, at least in my opinion, misguided priorities. I was very disappointed to see a continued de-emphasis of K–12 science education at NSF. Even as the NSF budget grows, the Administration proposes a seven percent cut to K–12 programs.

NSF has been a leader in improving science and math education for over 50 years. I do not understand how ignoring NSF's expertise in the education component of the President's initiative helps competitiveness.

From my point of view competitiveness is about keeping our good jobs and creating even more and better jobs. Yet, the Administration proposed to cut MEP funding by 56 percent. MEP is the only federal program designed specifically to assist small manufacturers. MEP is the only program with a proven track record in creating and retaining manufacturing jobs right now. We have lost 2.8 million manufacturing jobs since 2001. This last year alone, we lost another 55,000 manufacturing jobs.

I don't see how cutting MEP 56 percent, and NIST overall by 23 percent, increases American competitiveness. The bipartisan National Association of Governors has wholeheartedly endorsed MEP.

So Yes, there are winners but unfortunately there are too many losers.

That's the reason we have hearings and hopefully as we go through the legislative process we be able to realign some of these priorities in ways that increase our nation's competitive edge.

As people become more familiar with the Augustine Report, they will recognize that when we talk about science funding, it's more than just welfare for people in lab coats looking though microscopes. It's not an academic exercise—knowledge for

the sake of knowledge—it's about jobs, competing in the global market and our kids and our grandkids' standard of living.

As the Augustine Commission pointed out, "The thrust of our findings is straightforward. The standard of living of Americans in the years ahead will depend to a very large degree on the quality of the jobs that they are able to hold. Without quality jobs our citizens will not have the purchasing power to support the standard of living which they seek, and to which many have become accustomed; tax revenues will not be generated to provide for strong national security and health care; and the lack of a vibrant domestic consumer market will provide a disincentive for either U.S. or foreign companies to invest in jobs in America."

That means we must invest in S&T. But I'm afraid this budget simply does not make an adequate investment.

However, bipartisan legislation in the Senate includes many of the recommendations of the Augustine commission. I also have introduced legislation that will incorporate the education and energy recommendations of the report.

I hope we can mount a bipartisan, bi-cameral effort together with executive branch cooperation to improve this budget into something that truly helps our nation remain strong economically now and long into the future.

Thank you and I yield back to the Chairman.

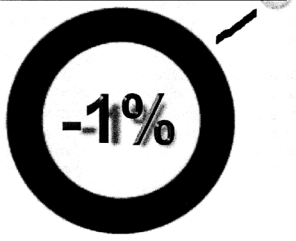
Attachment

5. RESEARCH AND DEVELOPMENT 51

Table 5–2. FEDERAL SCIENCE AND TECHNOLOGY BUDGET

(Budget authority, dollar amounts in millions)

	2005 Actual	2006 Estimate	2007 Proposed	Dollar Change: 2006 to 2007	Percent Change: 2006 to 2007
By Agency					
National Institutes of Health [1]	**28,444**	**28,410**	**28,428**	**18**	**0%**
NASA	**8,128**	**7,680**	**7,073**	**–607**	**–8%**
Science	5,502	5,254	5,330	76	1%
Aeronautics	962	884	724	–160	–18%
Exploration Systems [2]	1,664	1,542	1,019	–523	–34%
Energy [3]	**5,642**	**5,636**	**6,155**	**519**	**9%**
Science Programs	3,600	3,596	4,102	506	14%
Electricity Transmission & Distribution	101	136	96	–40	–29%
Nuclear Energy	393	416	559	143	34%
Energy Efficiency and Renewable Energy Resources [4]	976	896	933	37	4%
Fossil Energy [5]	572	592	465	–127	–21%
National Science Foundation	**5,472**	**5,581**	**6,020**	**439**	**8%**
Defense	**6,273**	**6,628**	**5,900**	**–728**	**–11%**
Basic Research	1,485	1,470	1,422	–48	–3%
Applied Research	4,788	5,158	4,478	–680	–13%
Agriculture	**2,111**	**2,160**	**1,921**	**–239**	**–11%**
CSREES Research and Education [6]	659	675	569	–106	–16%
Economic Research Service	74	75	83	8	11%
Agricultural Research Service [7]	1,102	1,131	1,001	–130	–11%
Forest Service: Forest and Rangeland Research	276	279	268	–11	–4%
Interior (USGS)	**935**	**962**	**945**	**–17**	**–2%**
Commerce	**855**	**938**	**873**	**–65**	**–7%**
NOAA: Oceanic & Atmospheric Research	404	370	338	–32	–9%
NIST Intramural Research and Facilities	451	568	535	–33	–6%
Environmental Protection Agency [8]	**780**	**761**	**816**	**55**	**7%**
Veterans Affairs [9]	**743**	**765**	**765**	.....	.....
Transportation	**542**	**567**	**598**	**31**	**5%**
Highway research: Federal Highway Administration	411	430	468	38	9%
Federal Aviation Administration: Research, Engineering, and Development	131	137	130	–7	–5%
Education	**355**	**342**	**342**	.....	.....
Special Education Research and Innovation	83	72	72	.....	.....
National Institute on Disability and Rehabilitation Research	108	107	107	.....	.....
Research, Development, and Dissemination [10]	164	163	163	.....	.....
Total	**60,280**	**60,430**	**59,836**	**–594**	**–1%**



Chairman BOEHLERT. Thank you very much, particularly for your close. Eloquent words and I think you'll find that we're all in agreement with those words. And let me observe this. I, too, wish we had just more than one hearing with this very distinguished

panel, but guess what? The reality is, these people, everyone wants their time. We're getting them first and we're having a good opportunity for a thorough dialogue, a meaningful dialogue, and then, as in all previous years, we'll have our subcommittees go into play and deal with each of the agencies in a meaningful way.

Secondly, and I know this because we've participated in many joint sessions where we have one or more of these distinguished guests sitting down over a cup of coffee in the office and after we get talking about baseball—tomorrow's the first day of spring training—then we get down to serious business. But these are very busy people and we're fortunate to have them. These are the lead-off hitters. We're anxious to hear from them and I think today will be a very important start of something really significant, not just for this Administration or this committee, but for our beloved country.

[The prepared statement of Mr. Calvert follows:]

PREPARED STATEMENT OF CHAIRMAN KEN CALVERT

I welcome our honored witnesses today and look forward to their testimony. In the State of the Union Address, the President committed $5.9 billion in the upcoming fiscal year, and more than $136 billion over ten years to increase our nation's investment in R&D, to strengthen education and to encourage entrepreneurship and innovation. The centerpiece of the American Competitiveness Initiative will help to ensure our global leadership by doubling over 10 years, our investment in key federal agencies that support basic research in the physical sciences and engineering. Your agencies are the recipients of this critical investment and now have a mandate to keep our country competitive globally.

We all expect this to be a tough budget year, but I believe there is strong bipartisan support for this initiative and I plan to work with the President and my colleagues to ensure strong funding for our science programs and science agencies, including NASA, in order to retain our global competitiveness and to grow our economy through the next generation.

[The prepared statement of Mr. Ehlers follows:]

PREPARED STATEMENT OF REPRESENTATIVE VERNON J. EHLERS

The President's FY 2007 budget request reflects several pressing national priorities, including the continuing war on terrorism, facilitating economic stimulus, and maintaining fiscal responsibility. The Congress will have many difficult choices to make in order to balance these priorities, control the deficit and implement our considerable domestic spending commitments.

In making these choices, we must not overlook the fact that scientific research and development underpins all of these priorities. Scientific research and development forms the foundation of increased innovation, economic vitality and national security. Scientific research is an investment that promises, and has historically delivered, significant returns on that investment.

I strongly support the President's call to maintain the competitive ability of the United States in an increasingly innovative world economy. His American Competitiveness Initiative (ACI) requests focused funding on areas that will improve STEM education and promote domestic innovation and economic productivity.

Our investment in physical science research has been slipping, and our overall national investment in research and development is at a rate much slower when compared to other growing economies. Furthermore, Congress has actually reduced the appropriated funds for the physical sciences in recent years, compared to the request.

I want to particularly emphasize three science research and development programs that have garnered the attention of the President and deserve Congress' utmost attention: the National Institute of Standards and Technology, the National Science Foundation, and the Department of Energy's Office of Science.

I am pleased that the budget request includes $467 for the core NIST laboratory programs arid facilities in FY07, a 17 percent increase over FY06 enacted. This increase includes $72 million for new research initiatives and enhancements to NIST's user facilities. I believe it is very important to support this request, as it represents a significant yet sensible investment in programs that give the U.S. a significant

head start in several fields of emerging technology in quantum physics and nanotechnology that will ultimately have great economic impacts.

While I am pleased that the President has included NIST labs in his ACI, I am very concerned about other manufacturing programs at NIST. The President's FY 2007 budget request cuts the Manufacturing Extension Partnership (MEP) program by over 50 percent to $46 million. I have worked very hard over the years to help my colleagues in Congress understand that MEP is vital to retaining American competitiveness and American jobs, and I believe they appreciate the value of this program. Furthermore, I continue to support the Advanced Technology Program (ATP) and am disappointed that the Administration has again included no funds for the program in the budget request. ATP is NIST's only extramural research grant program, funding high-risk, high-return technology research and development on a cost-shared basis with U.S. industry, and as such can make a major contribution to the American Competitiveness Initiative.

The NSF's FY 2007 budget request of $6.0 billion is an eight percent increase over FY 2006 appropriations, the first year in a ten-year commitment to double its budget. This marks a shift from previous budget requests, as the NSF budget has been stagnant in recent years, and even cut in FY 2005. The request is still well below the authorized funding level necessary to complete the commitment Congress made to double NSF funding in 2002, but I am confident that this request is the start of a new doubling path that we can follow.

While I am heartened by the commitment the Administration's request shows for the fundamental research budget at NSF, I would like to register my concern that the education programs at the Foundation have not been included in the ACI. NSF is the primary federal supporter of science and math education; it underwrites the development of the next generation of scientists and engineers. In the FY 2007 budget request, many of the education programs at the K–12 and undergraduate level will be cut. I am particularly concerned about the trend of the current budget request that restructures the Education and Human Resources (EHR) budget at the Foundation and eliminates three programs critical to our nation, including the Math and Science Partnership program. These budget choices seriously undercut the ACI's goals to improve math and science education and to ensure that America has an educated workforce capable of competing in the global economy.

The Department of Energy's Office of Science funds 40 percent of our nation's physical science research. To maintain our economic, technical, and military preeminence, the Federal Government must continue to support research in alternative energy sources, nanotechnology and supercomputing. I am pleased that the Office of Science is included in the President's ACI and that the FY 2007 budget request for the Office of Science is $4.1 billion—an increase of 14 percent from the FY 2006 enacted level. Last year the Office endured significant cuts that, in part, led to layoffs and the delay of many important instruments. As part of the American Competitiveness Initiative, the Office of Science is not only important to the future of U.S. science, but also our competitiveness and energy security.

FY 2007 will be another tough budget year. Significant sacrifices and compromises in spending must be made. We must not, however, sacrifice the research and education which future generations will need to ensure their economic prosperity and domestic security. I look forward to working with my colleagues and the witnesses testifying today to bolster American research and education.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good morning. I want to thank the witnesses for appearing before our committee to discuss the President's FY07 Budget for research and development. Today's hearing serves as an opportunity for oversight of certain departmental programs.

Although I am pleased with the Administration's strong commitment to the FutureGen Initiative and the Biofuels Initiative, I am disappointed to learn that important jobs programs were severely cut and the fossil energy research and development budget was decreased.

First, as part of the Administration's "American Competitiveness Initiative," the President's budget proposes significant increases to support basic research in physical sciences for the Department of Energy (DOE) Office of Science, National Science Foundation (NSF) and parts of the National Institute of Standards and Technology (NIST). While I am pleased there are increases in this area, the majority of science and technology programs are faced with significant losses in the FY07 budget. For instance, the overall federal science and technology budget has been targeted for a decrease again this year by the Administration.

Competitiveness is about job creation and retention. Yet, the single best government program to provide immediate help to U.S. manufacturers, the Manufacturing Extension Program (MEP), is severely cut again this year. MEP is the only federal program with a proven track record in creating and retaining manufacturing jobs; yet, the Administration proposes to cut MEP by 56 percent. Annually, the Illinois Manufacturing Extension Center (IMEC) provides assistance to about 450 small and mid-sized manufacturers. These companies reported an average cost savings of $179,000 with IMEC's assistance. Year after year, MEP Centers struggle to survive rather than focus on what they do best: helping businesses increase efficiency and productivity in order to be competitive in the global marketplace.

Additionally, the Advanced Technology Program (ATP) is targeted for elimination. Both MEP and ATP have widespread Congressional and private sector support because they help in job creation now and in the future and reduce the loss of jobs overseas. The lack of funding for these jobs programs shows complete disregard for important domestic priorities, such as maintaining high-skill, high-wage jobs for hard working Americans.

Second, the Department of Energy's Fossil Energy Research and Development programs make prudent investments in long-range research and development that help protect the environment through higher efficiency power generation, advanced technologies and improved compliance and stewardship operations. These activities safeguard our domestic energy security. This country will continue to rely on traditional fuels for the majority of its energy requirements for the foreseeable future, and the activities funded through this account ensure that energy technologies continue to improve with respect to emissions reductions and control and energy efficiency. The Fossil Energy Research and Development program impacts my congressional district because the coal industry is of great importance to the economy and livelihood of my constituents in Southern Illinois. Therefore, I am disappointed to learn that coal programs within fossil energy and research and development received $330 million in FY07, a decrease of $46 million from FY06. I have been a strong advocate for developing technology that focuses on carbon sequestration and am proud of the $7.6 million increase it received in the President's budget. However, I would like to see a future increase of advanced research and coal-based fuel programs and will work with my Democratic and Republican colleagues to accomplish these goals.

Third, I applaud the Administration's strong commitment to launch a public-private partnership, FutureGen, to develop a coal-based facility that will produce electricity and hydrogen with essentially zero atmospheric emissions. This budget includes $54 million in FY07 and proposes an advance appropriation of $203 million for the program in FY08. I am committed to working with the Department of Energy, the Committee, and appropriators from both sides of the aisle to secure funding for FutureGen. I strongly believe the project is a great national investment and Illinois stands ready to provide the resources and expertise needed to operate this state-of-the-art coal-fired power plant.

I have led the effort to locate FutureGen in Illinois, including a bipartisan effort in the House to secure funding for the project. The Illinois delegation has sent a letter to Secretary Bodman, expressing our strong support for locating the FutureGen project in Southern Illinois.

Lastly, the FY07 budget proposes $149.7 million for a Biomass and Biorefinery Systems Research and Development program to support the new Biofuels Initiative to develop cost competitive ethanol from cellulosic materials (agricultural wastes, forest residues, and bioenergy crops) by 2012. With the enactment of the Energy bill last August, the Renewable Fuels Standard (RFS) was signed into law, and it is expected to double ethanol production and use by 2012. Illinois ranks second in U.S. corn production and corn grown and Illinois is used to produce 40 percent of the ethanol consumed in the United States. We are in a unique position to service this demand. I support the Biofuels Initiative because it will boost ethanol production in my state, and will work towards achieving the ultimate goal of reducing our dependence on foreign sources of oil.

I welcome our panel of witnesses and look forward to their testimony.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman and Ranking Member.

I would like to welcome all of the witnesses who are here today. The agencies you represent shape our federal science and technology enterprise.

For the fourteen years that I have been a Member of Congress, I have advocated for federal leadership in S&T and sustained, strong federal investment in agencies such as the Department of Energy, Department of Commerce, National Science Foundation and the Department of Homeland Security.

It is unfortunate that the current federal leadership has overlooked the potential of the physical sciences when it comes to national prosperity. While the biological sciences have received funding increases in recent years, the physical sciences have not been supported. As a result, our national competitiveness has suffered.

The President's recent State of the Union address contained promising language suggesting that a more favorable science budget authority is on the horizon. I am interested in the details.

The details will reveal the true commitment—or lack thereof—when it comes to support of the physical sciences.

Again, I thank all of the witnesses for coming today to discuss details with us. I know you walk a fine line of science advocacy that can be particularly challenging during years of budget constraint. I appreciate your leadership and encourage you to continue to take a stand for science.

Thank you, Mr. Chairman. I yield back.

[The prepared statement of Mr. Honda follows:]

PREPARED STATEMENT OF REPRESENTATIVE MICHAEL M. HONDA

I thank Chairman Boehlert and Ranking Member Gordon for holding this important hearing today, and I thank our distinguished panel of witnesses for making the time to be here.

In his State of the Union address, President Bush said some things that sounded pretty good—he proposed an American Competitiveness Initiative and said we need to break our addiction to oil. Unfortunately, this budget request does not live up to the lofty expectations set in that address. Instead, it cuts funding for other science and technology programs to fund the Initiative, doesn't invest sufficiently in the kind of energy programs we will need to break our addiction to oil, falls short of what is needed to create an educated and skilled workforce for the future, proposes to kill the very federal programs which are able to create jobs, and even places its funding initiatives in peril by coupling them with cuts to popular programs that Congress is likely to restore.

Despite a purported focus to end our oil addiction, the budget for some programs with the Energy Efficiency and Renewable Energy office would decrease by 18 percent. Increases in programs such as solar and biomass come at the expense of wind, down two percent; energy efficiency, down 13 percent; weatherization, down 27 percent, and hydropower and geothermal, which are eliminated. The NSF Math and Science Partnerships Program is cut by 27 percent, and the undergraduate education program is reduced seven percent. These reductions, coupled with the President's proposal to eliminate 42 education programs and cut the Department of Education budget by the largest dollar amount ever, are incompatible with the President's rhetoric about the importance of educating our future workforce.

Two of the most effective government programs at helping to create and maintain high tech jobs in the U.S. are the Manufacturing Extension Partnership (MEP) Program and the Advanced Technology Program (ATP). In a departure from the MEP authorization bill passed by this committee last year, the budget would cut the funding for the program by 56 percent. And once again, like a broken record, the budget proposes eliminating ATP. This year the rationale is that the program isn't needed "due to the growth of venture capital and other financing sources." While VCs raised a great deal of money last year, their investments did not go up appreciably, and in 2005, VCs cut their seed funding by 54 percent from the 2004 level, from $118.3 million down to $54.3 million. This is the stage of technology development that ATP funds, and it is clearly needed to fill a growing gap in private sector funding.

Finally, I am worried that in the shell game that this budget is, DOE science will ultimately be short changed. The budget is able to increase funding for this by making unrealistically low requests in other areas, such as the Army Corps of Engineers budget. Congress is sure to restore the Corps funding, and since those programs are in the same appropriations bill as the DOE research funding, I see serious obstacles to getting the total research funding appropriated.

[The prepared statement of Mr. Carnahan follows:]

PREPARED STATEMENT OF REPRESENTATIVE RUSS CARNAHAN

Chairman Boehlert and Ranking Member Gordon, thank you for hosting this hearing. Dr. Marburger, Dr. Bodman, Dr. Sampson, Dr. Bement, and Dr. McQueary, thank you for taking the time to share your perspectives on the science-related components of the President's annual budget.

Many of us were delighted to hear President Bush declare a national focus on science and math education and a renewed interest in cultivating an innovative workforce in the United States. As a co-sponsor of Congressman Gordon's three bills to implement the Augustine Report recommendations, I am strongly supportive of efforts to get our nation's STEM education and workforce back on pace.

However, I am saddened to realize that many of the same budget cuts proposed last year in the area of science have been again included in the President's budget request. In particular, the funding for the Manufacturing Extension Partnership program, an invaluable program that helps small manufacturers improve productivity through new technologies has been slashed by 56 percent.

While the Department of Energy's Efficiency and Renewable Energy Resources line item has remained relatively level in this budget, I am aware that major energy efficiency programs, including LIHEAP, weatherization and electricity have seen significant cuts in an effort to boost up other programs. I look forward to discussing these choices as well during this hearing.

Finally, I am greatly concerned with funding for the National Earthquake Hazard Reduction Program (NEHRP) because my congressional district resides along the New Madrid fault line. While it appears that portions of the NEHRP budget have been increased, NIST, the lead agency for NEHRP is funded at about $10 million below the authorized level.

Thank you for your time today. I look forward to hearing your testimony.

[The prepared statement of Ms. Jackson Lee follows:]

PREPARED STATEMENT OF REPRESENTATIVE SHEILA JACKSON LEE

Chairman Boehlert, Ranking Member Gordon, thank you for organizing this important hearing to discuss the federal research and development budget for the 2007 fiscal year. Clearly, you have compiled an impressive panel of witnesses from some of the top agencies affected by this budget. The five panelists here represent some of the brightest and hardest working minds in America and I look forward to working with all of them in the future to improve our nation's scientific and technological capabilities.

I wholeheartedly support the work of the science community, and the goal of President Bush's "American Competitiveness Initiative." In spite of claims that this 2007 budget includes $5.9 billion for this initiative, however, the picture for science and technology looks bleak. $4.6 billion of the $5.9 billion simply extends the existing research and development tax credit. I applaud the increases in basic research at the DOE, NSF and NIST, but I am upset that President Bush's Administration decided it was necessary, in order to pay for these increases, to make severe cuts to other research areas, including applied research.

Overall, when you exclude research for weapon systems (called the Federal Science and Technology Budget), the budget for research is actually cut by one percent.

As Chair of the Congressional Children's caucus, I am especially aware of the effect the government's budget can have on children. Cuts across the board in the President's budget are especially hurtful to our children, including to Head Start, No Child Left Behind, and children's health care, will undermine the President's goals of ensuring our country remains a competitive nation in the global economy into the future. A good amount of money has been redistributed to help science and math education, but those truly concerned with the preservation of our technological dominance on the world stage agree that we must go much further to help the advancement of our children, especially young women and minorities.

Further, this Administration's budget continues to pass record deficits on to our children and continues the same bad choices that have led to huge deficits and mounting debt during the last four years. For the fourth year in a row, the Administration's budget contributes to record deficits, and offers no real plan to put the budget in balance. This deficit hasn't materialized because our Administration has invested so much into the science and technology budget; instead, money is funneled to fund tax cuts for the rich. Sadly, with the exception of a few well deserving agencies, the overall budget does not fund programs that advance our future interests. I strongly agree with Ranking Member Gordon's comment that although recognition

was given in the State of the Union address to the importance of the research and development budget, the rhetoric does not match the reality.

The National Institute of Standards and Technology (NIST) FY07 request is also well below its authorized level. I am appalled by the Administration's effort to slash funding to the Manufacturing Extension Program (MEP) and eliminate the Advanced Technology Program (ATP) in the National Institute of Standards and Technology (NIST) budget. The MEP is a successful federal/State partnership designed to help small manufacturers retain their competitive edge. The Administration's request of $46.8 million is less than one-half of what is required to maintain a fully operational national network of MEP Centers. MEP helps smaller manufacturers take advantage of the latest technology. Similarly, the ATP provides grants to companies for pre-competitive research; this program is now being completely eliminated from the Bush Administration budget. This is no way to help the crisis we face in the great loss of manufacturing jobs in this nation. In spite of these tremendous job losses, this Administration chooses to basically eliminate two successful government job creation programs. I find this kind of fiscal mismanagement to be baffling, and hope our committee can address some of these problems forward.

Four years ago, the President signed P.L. 107–368, doubling the National Science Foundation (NSF) funding over five years. Unfortunately, the requests for NSF since the signing ceremony have been lackluster at best. As a result of these deficient funds, NSF is still $3.8 billion (39 percent) below its FY 2007 authorized target.

Shortly after this year's horrific hurricane season ended, we sat in this room during a hearing and heard how the only agency that performed well during the response to Hurricane Katrina was the National Oceanic and Atmospheric Administration (NOAA). The President has rewarded their hard work by again cutting their budget, down to $3.68 billion from $3.85 billion in FY06 and from $3.91 billion in FY05.

Research and development cuts in this budget also target programs within the Federal Energy Efficiency and Renewable Energy Office at the Department of Energy (an 18 percent cut) and the Environmental Protection Agency (a seven percent cut).

Despite the great deals of flaws in the President's budget and the woeful lack of funding for R&D, I remain hopeful. I remain hopeful because we still have many tremendous R&D programs that can impact the lives of the American people in so many different ways. I look forward to seeing our scientific community continue to make advances and improve upon our technological infrastructure. I also look forward to working with fellow Members of the Science Committee in defending these programs for which we all care so much. I am excited to hear from our distinguished panel about how their agencies will accomplish the lofty standards they have set for themselves, the achievement of which we are all so proud. Thank you very much.

Chairman BOEHLERT. And with that, let me introduce our distinguished panel; Dr. John H. Marburger III, Director of the Office Science and Technology Policy, affectionately referred to as Science Advisor to the President; Dr. Samuel W. Bodman, Secretary of Energy; Dr. David A. Sampson, Deputy Secretary of Commerce; Dr. Arden L. Bement, Jr., Director, National Science Foundation; and for his farewell presentation, Dr. Charles E. McQueary, Under Secretary for Science and Technology, Department of Homeland Security.

And, Dr. McQueary, let me say to you, I know you announced last week that you've submitted your resignation. We are going to miss you and we thank you for your significant contribution to shaping responsible public policy and having that responsible public policy implemented. It has been a delight to work with you and we wish you well.

With that, gentlemen, let's go forward. We'll put the clock on but ignore the lights. I mean, but just when the red light goes on after the five minutes, just say well, maybe I better think about wrapping it up. And I'm always offended. You know, we have some of the greatest talent in the world. Nobel laureates before the Committee. We have some of the most dedicated and effective public

servants in the world, cabinet officers and people who are developing public policy for the Nation, and we ask them on Capitol Hill to summarize, in 300 seconds or less, what they want to tell us. So I couldn't agree more with Bart Gordon. I mean, we'd liked to have more of your time, but we've got to deal with the reality. With that, Dr. Marburger, you're first up.

STATEMENT OF DR. JOHN H. MARBURGER III, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY

Dr. MARBURGER. Thank you very much, Mr. Chairman and Ranking Member Gordon and Members of the Committee. Thanks for inviting me to testify again this year on the President's research and development budget, and I have submitted a written statement, a very detailed statement for the record, so I can be brief. And now, thanks to your remarks, Mr. Chairman, everyone here does know that President Bush's State of the Union message last month spoke to the importance of basic research for America's future economic strength, and launched a new American Competitiveness Initiative in that speech.

The initiative includes multi-year increases in funding for three agencies, whose programs support high-impact basic research in the physical sciences: the National Science Foundation, the Department of Energy Office of Science, and the National Institute of Standards and Technology. And the figure that's showing on your screen shows how their budgets would increase over a decade. These prioritized agencies enjoy a collective increase of 9.3 percent in this fiscal year 2007 request, and a commitment to double their total over the next decade, which would require an average increase of seven percent per year.

This initiative also includes enhanced incentives for corporate investments in research, improvements in immigration policy for highly qualified technical workers and students, programs to improve the quality of math and science education, experience, and pre-college education, and expansion of worker training programs for 21st century careers. There's a copy of a brochure describing this initiative. It's been distributed to the Members of the Committee and others. It's widely available. And I direct your attention to that brochure for further information, although we will certainly answer questions about it.

The President also announced the Advanced Energy Initiative in his State of the Union message, and my colleague, Secretary Bodman, will have more details about that in his testimony.

I want to emphasize that while this initiative identifies priorities, it does not abandon or diminish the importance of other areas of science and technology, such as biomedical research or space science. The case for increased funding for the ACI priority agencies is documented in many reports and studies that link strong physical sciences research to progress in all fields. And I want to thank the organizations like the President's own Council of Advisors on Science and Technology, the Council on Competitiveness, and the National Academy of Sciences for their excellent reports and advocacy on themes that the President's initiative addresses.

Your own actions, Mr. Chairman, as well as those of other Committee Members and Members from both parties of the House and

the Senate, have added significantly to the favorable reception of this initiative and will continue to be important as it works its way through Congress. My colleagues on today's panel will speak to the impact of this initiative on their agencies, but the President's proposal maintains significant strength across the breadth of science and adds new funding where it is most needed to sustain America's highly successful innovation economy.

Now a superficial examination of the R&D section of the President's fiscal year 2007 budget will show that funding proposed for some key science areas is lower than appropriated amounts for the current year, fiscal year 2006. In nearly all cases, this difference is due to the removal of so-called earmarks that agencies did not request for fiscal year 2006 and that do not contribute to the highest priority needs of their programs. The budget proposal before you responds to agency priorities as determined by careful planning and consultation with scientists, engineers and educators who are experts in their fields. This Administration believes strongly that the best way to spend public funds for science is through a process that judges the merits of proposals from scientists by independent panels of experts. I ask this committee's assistance in ensuring the best use of these scarce dollars for research upon which our future quality of life depends.

Well, overall, this year's R&D budget exceeds last year's by 2.6 percent, establishing a new all-time high of $137 billion, an increase of 50 percent since 2001, and the figure that's now on the screen shows the trend in non-defense R&D in constant dollar outlays. It is true that there is a more meaningful measure of our investment in science and technology, the Federal Science and Technology budget category. As the Ranking Member noted, that category is down by one percent, relative to 2006 appropriations, but it's up by 3.7 percent when earmarks are set aside. The request number, by the way, shows—which is a slightly different number. We need more gold medals for statistics. There's many of us that have to be experts in order to interpret this budget. But the reason for the specific number that Congressman Gordon referred to is due to a change in the category of applied research within NASA for the Crew Exploration Vehicle to development. As that program matures, the nature of the work changes and there was more than $2 billion transfer in categories that affect the bottom line FS&T number.

I regret to say that earmarks in the category, Federal Science and Technology, are now estimated to be $2.7 billion, which is five percent of the entire Federal Science and Technology budget. Actually, since the NIH and NSF budgets are thankfully spared from this practice, that $2.7 billion is approximately 10 percent of those budgets that are earmarked. Multi-agency initiatives such as the National Nanotechnology Initiative and Networking and Information Technology R&D also received increases in the President's budget, excluding earmarks. Our office produces a detailed budgetary supplement document for each of these programs, which we will deliver to Congress as soon as possible. One of them is available today on the Networking and Information Technology R&D Program. I'm glad that we were able to get that out so timely. The next one will be ready soon.

Moving on to other agencies. The $28.4 billion top-line budget for the 27 NIH institutes and centers is being held constant in this proposal, at a level that exceeds the original NIH doubling figure by $1.2 billion. The President strongly supports the priorities and distribution of funds within NIH, advocated by Director Zerhouni and his forward-looking roadmap process. NASA's top line, the 2006 to 2010 five-year budget, is also maintained at the $86.4 billion in last year's request, while NASA science increases 1.5 percent with, or 2.1 percent without, earmarks. I want to say that these two agencies have outstanding directors, who enjoy the confidence of this Administration. I would point out that research budgets for NASA and NIH have been more commensurate with the opportunities in their fields, than have budgets of other agencies with significant basic physical science research missions.

One other important physical science and engineering agency is the Department of Defense, whose basic and applied research budget is severely earmarked with more than $1 billion of designated funding not requested by the DOD agencies. The President's fiscal year 2007 budget proposes and increase of eight percent for DOD 6.1 and 6.2 research, relative to its own earmarked base.

Mr. Chairman, the President's research and development budget for fiscal year 2007 demonstrates a significant commitment to science essential for the future leadership of our country. I look forward to working with you and your Committee to begin delivery on that commitment during the coming months, and I thank you for this opportunity.

[The prepared statement of Dr. Marburger follows:]

PREPARED STATEMENT OF JOHN H. MARBURGER III

Chairman Boehlert, Ranking Minority Member Gordon, and Members of the Committee, I am pleased to appear before you once again to discuss the President's research and development (R&D) budget. This is my fifth year coming before you soon after the budget release to discuss the President's commitment to research and development. Once again, let me say that I greatly appreciate the effective working relationship between our office and your committee, which I believe has resulted in good outcomes for the Nation's science and technology enterprise.

One of these outcomes has been recognition by this Administration of the critical nature of research as the foundation to our nation's economic competitiveness. This is a message that the President has elevated through his American Competitiveness Initiative (ACI), which received prominent attention during his State of the Union Address, and in many of his speeches and remarks since then.

I will discuss the ACI in a moment, but first I want to provide some overall context for this year's budget.

President Bush has made it very clear that his top budget priority is to cut the deficit in half by 2009 by continuing the President's strong pro-growth economic policies and limiting the growth in federal spending. The President's FY 2007 Budget does what is required to achieve this goal by reducing non-Department of Defense, non-Homeland Security discretionary spending by one-half of one percent. Of course, a budget is all about priorities. And while winning the war on terror and securing the homeland are the top two, investing in America's future competitiveness through research and development is also of critical importance to this Administration. The proof of this is a two percent increase in non-defense R&D within a declining overall non-defense budget. Under the FY 2007 Budget, R&D is 14.3 percent of non-defense discretionary budget authority, compared to 13.7 percent in 2001 when the President took office. At a record $59 billion, non-defense R&D is up $1.1 billion in this year's request.

MAXIMIZING THE EFFECTIVENESS OF RESEARCH FUNDING

Before I get into specifics about this year's budget, I want to draw your attention to the very serious impact of earmarking on the science budget. I do this with some

trepidation here, but I believe the problem has escalated in recent years and threatens to harm the effectiveness of our nation's science if it is not addressed.

R&D earmarks have been increasing at a rate much faster than the growth in the overall R&D budget. The American Association for the Advancement of Science (AAAS), which uses a narrow definition of earmark, recently estimated that R&D earmarks total $2.4 billion in 2006, an increase of 13 percent over the Association's 2005 estimate. The total has increased by about 63 percent since 2003. Other organizations have estimated even higher levels of R&D earmarking. This serious problem is noted in the President's Budget: "Notwithstanding the recent progress in restraining discretionary spending, there is a widespread public perception that the number of earmarked spending items is excessive, and that too many of them are difficult to justify on the merits. The large number of earmarks, the lack of transparency, and the lack of a rigorous justification process make it difficult to assure taxpayers that their dollars are being spent wisely."

This administration supports awarding research funds based on merit review through a competitive process refereed by scientists, engineers, or other relevant experts. Such a system has the best prospects for ensuring that the most important research is supported. Research earmarks signal to potential investigators that there is an acceptable alternative to creating quality research proposals for merit-based consideration. Fortunately, Congress has not traditionally earmarked the budgets of the National Science Foundation or the National Institutes of Health. But major portions of other important science budgets are directed outside the agency advisory, planning, and evaluation processes. The problem is particularly serious within the Department of Defense, where the basic and applied research budgets have been subject to earmarks in excess of a billion dollars this year. The consequences of excessive earmarking go beyond underfunding the best possible science—it also impacts agency jobs and stability. For example, just last week the Department of Energy's Renewable Energy Laboratory (NREL) was forced to reduce its staff by 32 people to meet budget shortfalls caused by earmarked funding.

The existence of earmarks also affects the interpretation of the numbers that appear in the FY 2007 Budget. To maximize the impact of competitive, merit-based programs, the Administration often does not request funds for projects that had been earmarked the previous year. The existence of earmarks in the FY 2006 estimates and their absence in the FY 2007 request means that it can appear that the 2007 Budget requests less funding for programs, even in instances where relevant program content actually is increasing. The fact that a significant fraction of an agency's appropriated funds may be unavailable for the agency's mission needs deserves much wider attention. In the NIST budget, for example, the FY 2006 appropriated budget includes $137 million in earmarks, many of which do not contribute to NIST's mission. This is a huge amount compared to NIST's total budget of about $400M. The President is requesting a 24 percent increase for the NIST core budget, which amounts to $104M, but since this is less than the earmarks the total appearing in the budget documents for NIST appears to be a reduction of 5.8 percent from the current year.

President Bush has called upon Congress to ensure that funds provided under the American Competitiveness Initiative are free of earmarks. As we discuss the importance of pursuing the best science to contribute to U.S. competitiveness, I hope the Congress will join with us to encourage competition for research funding by rejecting research earmarks in the FY 2007 appropriations process.

THE PRESIDENT'S FY 2007 R&D BUDGET

Given the overall environment of fiscal discipline, it is notable that President Bush once again proposes a record R&D budget—over $137 billion, $3.4 billion more than this year's funding level. This represents an increase of more than 50 percent during this Administration. Funding proposed for basic research is $28.2 billion in 2007, up from $21.3 billion in 2001—a 32 percent increase. While this year much focus is justifiably being placed on the President's words in his State of the Union address and the American Competitiveness Initiative, it is important to emphasize that the President's budgets have consistently supported research and development at levels commensurate with other major priorities throughout this Administration. Real five-year growth in the conduct of the R&D budget has exceeded 40 percent for each of the last two years, the first time five-year inflation adjusted R&D outlays have topped 40 percent since 1967 and the Apollo era.

AMERICAN COMPETITIVENESS INITIATIVE (ACI):

American economic strength and national security depend on our nation's rich tradition of innovation. To strengthen our technological leadership in the world and build on the Administration's record of results, President Bush announced the

American Competitiveness Initiative (ACI) in his State of the Union address. The ACI commits $5.9 billion in FY 2007, and more than $136 billion over 10 years, to increase investments in R&D, strengthen education, and encourage entrepreneurship and innovation.

The centerpiece of the American Competitiveness Initiative is the President's proposal to double, over ten years, priority basic programs emphasizing the physical sciences and engineering. Physical sciences research develops and advances knowledge and technologies that are used by scientists in nearly every other field. President Bush seeks to strengthen federal investments in this area by providing three key, innovation-enabling research agencies with landmark initial investments in 2007: the National Science Foundation (NSF)—$6 billion; the Department of Energy's Office of Science (DOE SC)—$4.1 billion; and the Department of Commerce's National Institute of Standards and Technology (NIST) core programs—$535 million. In addition to the collective doubling effort at these agencies, the President's Budget also prioritizes the similarly high-leverage basic and applied research at the Department of Defense in 2007 by requesting $5.9 billion, $442 million (eight percent) more than last year's request.

In 2007, the ACI proposes overall funding increases for NSF, DOE SC and NIST core of $910 million, or 9.3 percent. To achieve ten-year doubling, overall annual increases for these agencies will average roughly seven percent. This amounts to a total of $50 billion in new investments in high-leverage, innovation-enabling research that will underpin and complement shorter-term R&D performed by the private sector. To encourage private investment in innovation to be equally bold, President Bush continues to propose making the R&D tax credit permanent and supports modernizing it to make it even more effective.

While the President has prioritized and focused physical science funding in past budgets through such coordinated programs such as the Networking Information Technology Research and Development (NITRD) program, the National Nanotechnology Initiative (NNI) and others, the ACI represents an elevation of the role of the physical sciences contributing to national competitiveness and a significant ramping up of funding over a sustained budget period. This is good news for the science community and is a recognition and endorsement of the importance of the physical sciences and math and science education. Members of Congress—including many on this committee—have helped to bring attention to these issues in our national discourse. Many other groups also deserve credit for highlighting the importance of investment in this area, including the President's Council of Advisors on Science and Technology (PCAST), the Council on Competitiveness and the National Academy of Sciences. It is a rare day when so many different organizations speak with one voice. I am optimistic that with your help and the support of the scientific community, we can provide funding for ACI with a minimum of research earmarks.

Networking Information Technology R&D (NITRD)

A key interagency priority related to ACI is the Networking and Information Technology R&D (NITRD). President Bush's 2007 Budget contains $2.8 billion for NITRD and represents an increase of nine percent over 2006 and a 57 percent increase since 2001. This brings total investment in this area over six years to more than $13.7 billion. Tools and capabilities that result from research in networking and information technologies propel advances in nearly every area of science and technology, and enhance the Nation's competitiveness. Agencies participating in the NITRD program actively coordinate their research programs, making these programs far more productive than if they were independent.

High-end computing (HEC) continues to be a major focus of NITRD. DOE's Office of Science (DOE SC), NSF and NASA are all engaged in developing and/or operating leadership class computing systems as recommended in the 2004 *Federal Plan for High-End Computing,* with the goal of deploying petascale computing systems by the year 2010. The DOE SC 2007 investment of $103 million in leadership class computing, coupled with NSF's investment of $50 million in their Office of Cyber Infrastructure, will ensure that U.S. scientists and researchers have access to the most powerful computational resources in the world. Similarly, NASA continues to emphasize high-end computing within its NITRD portfolio through the operation of the *Project Columbia* supercomputer. All three agencies have pledged to make a portion of their leadership class computing systems available to other federal users and the larger research community. A nine percent increase in support for advanced networking research in 2007, primarily by NSF, DARPA and DOE SC, will ensure that large-scale networking technologies will keep pace with the rapid development of petascale computing systems, so that the results of petascale computations are immediately accessible for analysis.

The 2007 Budget also includes significant increases in long-term fundamental research in cyber security and information assurance, as recommended by the President's Information Technology Advisory Committee.

National Nanotechnology Initiative

The President's 2007 Budget also provides over $1.2 billion for another key ACI interagency priority, the National Nanotechnology Initiative (NNI). The FY 2007 NNI request brings the total investment since the NNI was established in 2001 to over $6.5 billion and nearly triples the annual investment since the first year of the Initiative. This sustained investment is advancing our understanding of the unique phenomena and processes that occur at the nanometer scale and expedite the responsible use of this knowledge to achieve advances in medicine, manufacturing, high-performance materials, information technology, and energy and environmental technologies.

Critical, broad-ranging investments continue to be made by NSF, reflecting the agency's mission in supporting fundamental research across all disciplines of science and engineering, whereas the DOD investment emphasizes development of materials, devices, and systems that address the department's mission. DOE is in the process of completing five Nanoscale Science Research Centers that will make advanced research facilities and instrumentation, as well as technical expertise of DOE laboratory staff, available to researchers from across the scientific research community.

In addition to supporting the development of nanotechnology for beneficial uses, the NNI funds research on the human and environmental health implications of nanotechnology and methods for managing potential risks. The funding within the EPA will nearly double in 2007 and additional efforts in this area are funded by NSF, HHS, NIST, DOD, and USDA.

In response to recommendations by the President's Council of Advisors on Science and Technology (PCAST) in its May 2005 report assessing the NNI, the Departments of Labor and Education have become participants in the interagency group that manages the NNI, thereby facilitating progress toward the education and workforce goals of the Initiative.

Advanced Energy Initiative (AEI):

In his State of the Union address, President Bush outlined the Advanced Energy Initiative (AEI) in pursuit of a national goal of replacing more than 75 percent of U.S. oil imports from the Middle East by 2025. Since 2001, nearly $10 billion has been invested by the Federal Government to develop cleaner, cheaper and more reliable alternative energy sources. The AEI provides a 22 percent increase for certain clean-energy R&D programs at the Department of Energy (DOE). The Initiative will accelerate breakthroughs in two vital areas.

The Administration will work to diversify energy sources for American homes and businesses through: the President's Coal Research Initiative, with $281 million in FY 2007 for development of clean coal technologies—nearly completing the President's $2 billion commitment four years ahead of schedule; the FutureGen project, a key part of the Coal Research Initiative, with $54 million in 2007 to support the partnership between government and the private sector to build a near-zero atmospheric emissions demonstration coal plant that captures the carbon dioxide it produces and stores it in deep geologic formations; the President's new $148 million Solar America Initiative—an increase of $65 million over FY 2006—to accelerate the development of semiconductor materials that convert sunlight directly to electricity; $44 million for wind energy research—a $5 million increase over the 2006 level; and clean and safe nuclear energy under the new $250 million global nuclear energy partnership.

The President also proposes acceleration of the development of domestic, renewable alternatives to gasoline and diesel fuels through: $150 million for the Biofuels Initiative—a $59 million increase over FY 2006—to help develop bio-based transportation fuels such as "cellulosic ethanol" from agricultural waste products, such as wood chips, stalks, or switch grass; $31 million to speed the development of advanced battery technology to extend the range of hybrid vehicles and make possible "plug-in" hybrids and electric cars—a 27 percent increase over FY 2006; and $289 million for the President's Hydrogen Fuel Initiative.

Climate Change Science and Technology

The Administration is also carrying out two important climate change programs that represent a continuation of our commitment to understanding the climate system and developing technologies that will lead to cleaner, cheaper and more reliable alternative energy sources.

The U.S. Global Change Research Program, authorized by the *Global Change Research Act of 1990,* and the President's Climate Change Research Initiative of 2001 are integrated in the comprehensive U.S. Climate Change Science Program (CCSP). The CCSP published the *Strategic Plan for the U.S. Climate Science Program* in 2003, describing a strategy for developing knowledge of climate variability and change and for application of this knowledge. The 2007 CCSP budget sustains the level enacted in 2006. The CCSP comprises over 13 agencies, but nearly 90 percent of the CCSP funding is distributed among NASA, NSF, NOAA and DOE. The Climate Change Research Initiative, a focused component of CCSP, is sustained at $200 million in 2007.

The U.S. Climate Change Technology Program (CCTP) supports research, development, deployment, and voluntary programs to reduce greenhouse gas emissions via renewable energy, fossil energy and nuclear energy, and also to improve efficiency and carbon sequestration. Led by DOE, CCTP recently published a *Vision and Framework for Strategy* which outlines six strategic goals that will guide the CCTP strategy planning and interagency coordination. These goals are:

- Reduce Emissions for Energy End-Use and Infrastructure
- Reduce Emissions from Energy Supply
- Capture and Sequester Carbon Dioxide
- Reduce Emissions of Non-CO_2 Greenhouse Gases
- Improve Capabilities to Measure and Monitor GHG Emissions
- Bolster Basic Science Contributions to Technology Development

CCTP will work toward these goals by employing several core approaches that will stimulate participation by others and ensure progress in this important area. These approaches include strengthening climate change technology research and development by helping to coordinate and prioritize ongoing activities, creating new opportunities for partnerships and international collaboration, and providing technology policy recommendations.

AGENCY BUDGET HIGHLIGHTS

National Science Foundation (NSF):

Funds are requested to increase the budget for NSF by 7.9 percent to $6.02 billion in FY 2007, 36 percent above 2001's $4.4 billion level. Similar investments in the past have yielded important scientific discoveries, which boost economic growth and enhance Americans' quality of life.

The centerpiece of the American Competitiveness Initiative is President Bush's plan to double investment over a 10-year period in key federal agencies that support basic research programs emphasizing in physical sciences and engineering. NSF is one of the three key agencies, as it is the primary source of support for university and academic research in the physical sciences, funding potentially transformative basic research in areas such as nanotechnology, advanced networking and information technology, physics, chemistry, material sciences, mathematics and engineering. The NSF funding derived from the ACI initiative is expected to support as many as 500 more research grants in 2007 and provide opportunities for upwards of 6,400 additional scientists, students, post-doctoral fellows and technicians to contribute to the innovation enterprise.

NSF leads two previously mentioned Administration priority research areas that promise to strengthen the Nation's economy: the National Nanotechnology Initiative (NNI) and the Networking and Information Technology R&D program (NITRD). NSF-funded nanotechnology research, proposed at $373 million in FY 2007, an 8.4 percent increase over 2006 and 149 percent since 2001, has advanced our understanding of materials at the molecular level and has provided insights into how innovative mechanisms and tools can be built atom by atom. This emerging field holds promise for a broad range of developing technologies, including higher-performance materials, more efficient manufacturing processes, higher-capacity computer storage, and microscopic biomedical instruments and mechanisms. NSF's investments in NITRD, funded at $904 million in 2007, up $93 million over 2006 and 42 percent since 2001, support all major areas of basic information technology (IT) research. NSF also incorporates IT advances into its scientific and engineering applications, supports using computing and networking infrastructure for research, and contributes to IT-related education for scientists, engineers, and the IT workforce.

Continuing concerns about the vulnerability of computers, networks and information systems have prompted increased NSF investments in cyber security research, education and training. The NITRD investment includes $35 million, an increase of $10 million, for Cyber Trust, a cutting-edge research program to ensure that com-

puters and networks underlying national infrastructures, as well as in homes and offices, can be relied upon to work even if faced with cyber attacks. Cyber Trust is part of a larger NSF Cyber Security and Information Assurance research effort totaling $97 million, an increase of 26 percent for FY 2007.

NSF will invest $20 million in fundamental research on new technologies for sensors and sensor systems to improve detection of explosives, including Improvised Explosive Devices (IEDs).

The Foundation, in close cooperation with other agencies, will also address policy-relevant Science Metrics with a new research effort funded at $6.8 million. The goal is to develop the data, tools and knowledge needed to establish an evidence-based 'science of science policy' as a means for informing policy-makers about opportunities and to encourage innovation.

The FY 2007 Budget will continue NSF"s efforts to prepare U.S. students for the science and engineering workforce. The new Discovery Research K–12 program will invest $104 million to strengthen K–12 science, technology, engineering and mathematics education by supporting the development of effective science and math assessments, improving learning in K–12 education and introducing cutting edge discoveries into K–12 classrooms.

Department of Energy (DOE):

DOE is the lead agency for the President's Advanced Energy Initiative, highlighted above. The 2007 Budget proposes:

- $148 million for the Solar America Initiative (an increase of $65 million over FY06) to accelerate development of cost-effective photovoltaic materials;
- $150 million for the Biofuels Initiative (a $59 million increase over FY06), to help enable cellulosic ethanol to be practical and competitive within six years;
- $31 million for development of high-energy, high-power batteries (a $6.7 million increase over FY06) for hybrid-electric and "plug-in" hybrid vehicles (includes $1.4 million for the Department of Transportation);
- $289 million for the Hydrogen Fuel Initiative (an increase of $53 million over FY06) to accelerate development of hydrogen fuel cells and affordable hydrogen-powered cars;
- $44 million for wind energy research (a $5 million increase over FY06) to help improve the efficiency and lower the costs of wind technologies for use in low-speed wind environments; and
- $54 million for the FutureGen Initiative (an increase of $36 million over FY06) to develop technologies for a coal gasification plant with near-zero atmospheric emissions.

The 2007 budget also proposes $250 million for the Global Nuclear Energy Partnership (an increase of $171 million over FY06), with the goals to demonstrate advanced fuel cycle technologies, to expand the domestic use of nuclear power, and to provide for safe, environmentally responsible global nuclear energy systems that support non-proliferation objectives.

The Office of Science in DOE (DOE–SC) is one of the three priority agencies in the President's American Competitiveness Initiative, supporting scientific studies and infrastructure for a wide range of R&D related to economically significant innovations. Within DOE–SC, the new funding from ACI is expected to support approximately 2,600 new researchers. Highlights of the FY07 budget proposal within DOE–SC include:

- completion of the Center for Integrated Nanotechnology and the Center for Functional Nanomaterials;
- maximum capacity operations of the full suite of major x-ray light source and neutron research facilities;
- support for project engineering and design and R&D for the National Synchrotron Light Source II;
- upgrade of the leadership class computing facilities at Oak Ridge and Argonne;
- upgrade of the NERSC supercomputer facility at LBNL;
- full operations for the high-energy physics facilities at SLAC and Fermilab;
- increase in support for R&D towards a potential linear collider;
- robust operations for the nuclear physics facilities at TJNAF and RHIC;
- project engineering and design towards an accelerator upgrade for the facility at TJNAF;

- full funding for ITER;
- increase in operations over FY06 for the domestic fusion facilities;
- optimum operations of the BER facilities;
- increase in support for the GTL research.

National Institute of Standards and Technology (NIST):

National Institute of Standards and Technology (NIST) "core" programs receive $535 million, an increase of 24 percent after earmarks are excluded from the enacted FY 2006 level, but a decrease of 5.8 percent relative to 2006 appropriated funds. In 2007, the American Competitiveness Initiative proposes overall funding increases for NIST to focus on meeting the Nation's most urgent measurement science and standards to speed innovation and improve U.S. competitiveness. The FY 2007 request is a 55 percent increase over 2001. The Administration continues to insist on the highest priority for NIST lab research which is producing the scientific foundation for new technologies and providing essential technical support through its standards activities for industrial development and commercialization of new and emerging technologies, in such areas as advanced manufacturing, nanomanufacturing and nanometrology, homeland security, biosystems and health, and quantum computing.

To improve efficiency, the Budget also streamlines administrative layers within the Technology Administration (TA). The Budget reflects TA's intent to evaluate its current operating practices and incorporate methods to improve the effectiveness of its operations.

Department of Defense (DOD):

DOD's FY 2007 R&D budget is over $74 billion. This level of funding will support the Department's transforming commitment to reorient its capabilities and forces for greater agility, while enabling effective responses to asymmetric and uncertain challenges of future conflicts.

These funds will also help address emergent threats through countermeasures to biological agents and novel technologies to detect and neutralize improvised explosive devices, mines, rockets and mortars.

The Science and Technology (S&T) component of the overall DOD R&D budget includes basic research (6.1), applied research (6.2), and advanced technology development (6.3). At $11.1 billion in the FY 2007 Budget, DOD S&T exceeds last year's request by $442 million. From 2000 to 2006, Congressional adds to DOD S&T quadrupled. For 2006, there were over 1,300 of these adds (totaling $3.1 billion) that must be identified and tracked down, advertised in a way specific to the Congressional mark, evaluated, negotiated and awarded, all separate from other potential awards. This means that those awards consume several times the staff and management resources of the average research award, and may not even target a military-specific need. A total of $5.9 billion is provided for DOD basic and applied research. This is $738 million less than the FY 2006 enacted level in this category, but $561 million greater than the FY 2006 budget request. The struggle continues over Congressional earmarks and true DOD priorities. The Administration wishes to work with Congress to align Legislative and Executive priorities for funding the best scientific research possible to support our military forces.

Events of the last few years, including the Global War on Terror and federal assistance to disasters in the U.S. and around the world, have emphasized the importance of continuing our investment in next generation command, control and communication technologies and our ability to integrate with sensor platforms. Specific high potential S&T programs relating to these challenges have been increased in this budget by $42.3 million (30 percent over 2006 enacted levels).

The DOD also understands the importance of continued investment in power and energy technologies. These efforts span a range of topics—from novel battery technologies to reduce the weight burden that soldiers must carry to power their critical equipment—to research on advanced propulsion technologies to enable revolutionary aerospace capabilities. These aerospace propulsion investments include an additional $33 million (13 percent above 2006 enacted) in certain applied research and advanced technology development programs.

The S&T needs of the DOD are diverse and highly challenging, drawing upon the best minds in the Service labs, industry and academia. The development of the future workforce to support defense S&T remains an important challenge. We continue to confront issues relating to training the next generation, attracting the best candidates and rewarding top performers. Important programs such as the National Defense Science and Engineering Graduate (NDSEG) Fellowship program and the Science, Mathematics and Research for Transformation (SMART) Defense Scholar-

ship program allow us to provide support and incentive to graduate and undergraduates to enter into DOD-relevant research careers. In fact, this budget virtually doubles the SMART program funding to $19.5 million.

Department of Homeland Security (DHS):

The President's FY 2007 request includes $1 billion for the DHS Directorate of Science and Technology (including funding for research at TSA, Coast Guard and Secret Service) and $536 million for the Domestic Nuclear Detection Office.

R&D at DHS S&T is focused on countering the threat of terrorism through improved threat awareness and infrastructure protection, as well as the development of countermeasures against chemical and biological agents, explosives, and other catastrophic threats. The President's FY 2007 budget request will provide $86.5 million for R&D projects to address the threat from conventional explosives used in the form of improvised or vehicle born explosive devices, which remain one of the most accessible weapons available to terrorists to attack and cripple critical infrastructure, or to inflict severe casualties.

To continue to develop the tools necessary to prevent the terrorist use of a nuclear weapon against the United States, the President's FY 2007 Budget supports aggressive R&D and operational programs for nuclear defense with a 70 percent increase over FY 2006 funding to expand and support the capabilities of the Domestic Nuclear Detection Office (DNDO) DNDO is working to develop and deploy a comprehensive system to detect and mitigate any attempt to import, assemble or transport a nuclear explosive device, fissile material or radiological material intended for illicit use within the United States.

The Administration is also eager to protect civilian and commercial aviation from the threat of man-portable air defense systems (MANPADS). The government has developed a multi-layered defense against this threat consisting of risk reduction at major airports, counter proliferation efforts, and development of new countermeasures. In the 2007 Budget the President has requested $6 million to complete DHS's counter-MANPADS program. The final phase of this program calls for actual live testing of the two systems under development.

National Aeronautics and Space Administration (NASA):

Two years ago, the President outlined a bold vision for sustained and affordable human and robotic exploration of space, with the Moon as a first step toward human missions to Mars and beyond. NASA instituted various organizational and programmatic steps to pursue this vision in the initial months after its release. Over the last year, NASA has continued working to redirect its existing human space flight programs—the Space Shuttle and International Space Station (ISS)—toward the goal of supporting the vision. Further, it has determined the launch and spacecraft architecture requirements necessary to implement the vision in earnest. An exciting array of space science missions is also being planned that will enhance our understanding of the solar system, the complex interaction between the Earth and space and its impact on our environment, and the origin, structure, evolution, and destiny of the universe.

In support of these goals, the President has requested $16.8 billion in his 2007 budget for NASA, a 3.2 percent increase over the enacted 2006 level (excluding one-time supplementals), reflecting a strong commitment by the Administration to continued pursuit of the exploration vision. Of this amount, the budget provides $5.33 billion for earth and space science activities 1.5 percent increase in FY 2007 over FY 2006 in order to continue advancing our knowledge of the Sun, Earth, planets and broader universe. Further, the budget requests $3.98 billion for the new vehicles and technologies necessary to move forward on the exploration activities contained in the vision. Such activities include beginning development of the Crew Exploration Vehicle (which will eventually carry astronauts to the Moon), pursuing the lunar robotic exploration program, and researching other critical new technologies to support exploration. The budget also proposes $6.23 billion for operating the Space Shuttle and continuing assembly and operations of the ISS. With regard to this activity, NASA has selected a configuration for the ISS that is consistent with the President's vision and meets the needs of our international partners, while employing the minimum number of Shuttle flights required to complete assembly of the ISS before Shuttle retirement in 2010. I should note here that, of necessity, the budget for NASA also makes some difficult decisions, canceling some projects with high technical risk and/or whose cost would have led to the certain delay or cancellation of other important programs.

In addition to supporting a broad range of space activities, the President has requested $724 million for NASA's aeronautics program. NASA is restructuring its aeronautics activities in order to dedicate itself to the mastery and intellectual stew-

ardship of the core competencies of aeronautics in all flight regimes, as well as ensuring that research is focused on appropriate areas that are unique to NASA's capabilities. NASA will implement a completely replanned Airspace Systems Program in FY 2007 that aligns with key research requirements of the Next Generation Air Transportation System, and is working with the DOD to take a strategic, national asset view of aeronautics facilities such as wind tunnels.

NASA is also working with the DOD to take a strategic, national asset view of aeronautics facilities such as wind tunnels.

National Oceanic and Atmospheric Administration (NOAA):

For the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce, the FY 2007 Budget provides $338 million for Oceanic and Atmospheric Research (OAR), an 8.6 percent reduction from 2006 enacted, due mostly to earmarks. This investment provides for ongoing research on climate, weather, air quality, and ocean processes. For NOAA programs that support the climate change science program, $181 million is provided, and the National Sea Grant College Program is sustained at the 2006 level of $55 million.

Environmental Protection Agency (EPA):

The FY 2007 request for science and technology funding at EPA is $788 million, approximately eight percent above the FY 2006 level, even before accounting for earmarks. This investment supports core Agency programs and strengthens high priority program areas, including maintaining and improving our nation's water collection and distribution systems, understanding the potential environmental impacts of nanotechnology, and expanding EPA's computational toxicology program. In addition, the FY 2007 request continues to support the Integrated Risk Information System (IRIS) and the Science to Achieve Results (STAR) program. (OMB version)

Department of Transportation (DOT):

The FY 2007 Budget request for highway-related research is $562 million, which is $38 million more than 2006. Highway research includes the Federal Highway Administration's transportation research and technology contract programs and National Highway Traffic Safety Administration research and analysis. These research programs include the investigation of ways to improve safety, reduce congestion, improve mobility, reduce life cycle construction and maintenance costs, improve the durability and longevity of highway pavements and structures, enhance the cost-effectiveness of highway infrastructure investments, and minimize negative impacts on the natural and human environment.

The 2007 Budget request for Federal Aviation Administration (FAA) Research, Engineering, and Development is $130 million, including $88 million for continued research on aviation safety issues. The remaining research funding is for mobility and environmental issues, including $18 million for the Joint Planning and Development Office for the advancement of the Next Generation Air Transportation System.

In addition, the 2007 Budget requests $8.2 million for the Research and Innovative Technology Administration to coordinate and advance the pursuit of transportation research that cuts across all modes of transportation, such as hydrogen fuels and remote sensing. DOT research programs also support the National Nanotechnology Initiative, the U.S. Climate Change Technology Program, and the President's Hydrogen Fuel Initiative.

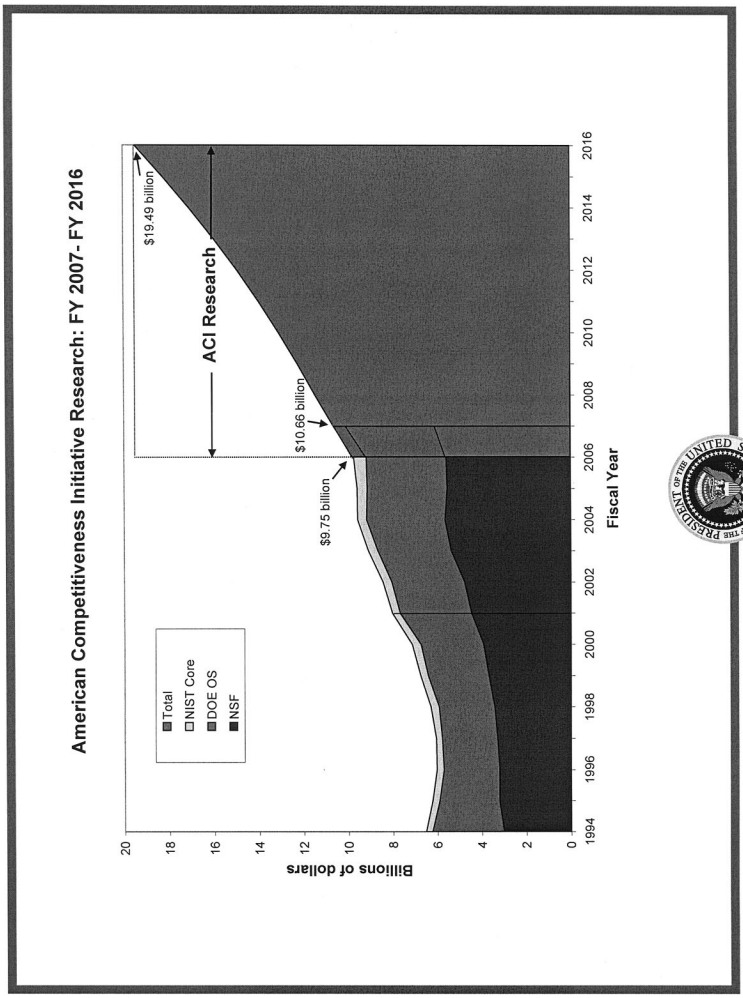
CONCLUSION

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

America currently spends one and a half times as much on federally funded research and development as Europe, and three times as much as Japan, the next largest investor. Our scientists collectively have the best laboratories in the world, the most extensive infrastructure supporting research, the greatest opportunities to pursue novel lines of investigation, and the most freedom to turn their discoveries into profitable ventures if they are inclined to do so.

We lead not only in science, but also in translating science to economically significant products that enhance the quality of life for all people.

This budget will sustain this leadership and maintain science and technology capabilities that are the envy of the world. I would be pleased to respond to questions.


American Competitiveness Initiative Research: FY 2007- FY 2016
Billions of dollars
Fiscal Year
Total
NIST Core
DOE OS
NSF
ACI Research
$19.49 billion
$10.66 billion
$9.75 billion
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14
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1994
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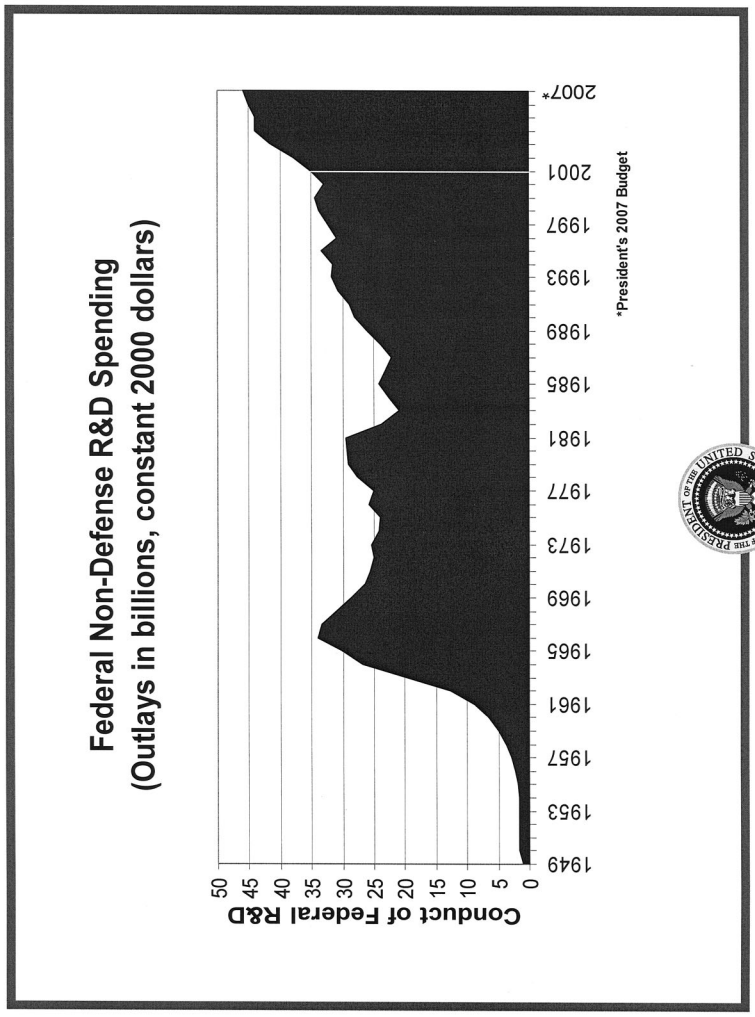
Federal Non-Defense R&D Spending
(Outlays in billions, constant 2000 dollars)
Conduct of Federal R&D
50
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2007*
*President's 2007 Budget

BIOGRAPHY FOR JOHN H. MARBURGER III

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

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

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

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

While on leave from Stony Brook, Marburger carried out the mandates of the Department of Energy to improve management practice at Brookhaven National Laboratory. His company, Brookhaven Science Associates, continued to produce excellent science at the lab while achieving ISO14001 certification of the lab's environmental management system, and winning back the confidence and support of the community.

Chairman BOEHLERT. Thank you very much, Dr. Marburger. Secretary Bodman.

STATEMENT OF DR. SAMUEL W. BODMAN, SECRETARY, DEPARTMENT OF ENERGY

Secretary BODMAN. Good morning, Mr. Chairman and Ranking Member Gordon. I'm very happy to be here. I'm very proud to be here representing the Department of Energy today, and I hardly need to tell you that there is a great sense of excitement and enthusiasm within the entire Department of Energy, and in particular the Office of Science, which deals with the subject of this morning's activities, or at least some of the subjects of this morning's activities.

Our Office of Science is responsible for 10 world-class national laboratories and is the primary builder and operator of large scientific facilities in the United States, and this office plays a critical role in ensuring the continued American leadership as well as contributions to our overall economic well-being. Investments in these facilities is a lot more than just bricks and mortar. It is an investment in, if you will, in discovery, in the future of our country. As you've heard in the State of the Union and has been talked about, the President announced several new priorities in the energy area, including two new Presidential initiatives. We believe that these

initiatives will significantly change the future of science in this country and will be a bold statement to our science colleagues around the world. All of this is spelled out in detail in my formal written remarks.

Let me just take this opportunity, while I have the floor, to mention a few highlights. As a part of the ACI, the 2007 budget includes a $505 million increase for the Office of Science in the Department of Energy. That is a 14 percent increase up to a level of $4.1 billion. Frankly, we are thrilled with that and we think we know exactly how to put that money to work. This reflects the President's commitment to double the federal investment in the most critical basic research programs in the physical sciences over the next ten years. Developing revolutionary science-driven technology is at the heart of the Department of Energy's mission. And to ensure that America remains at the forefront in our very increasingly competitive world, our department is pursuing what we have come to call transformational new technologies in the cutting edge scientific fields that will be important in this next century, areas like nanotechnology, material science, biotechnology, and high speed computing.

The President has also announced the new Advanced Energy Initiative, to increase spending on clean energy sources that will transform our transportation sector. It will literally transform our entire economy and reduce our dependence on imported fossil fuel. Specifically, the 2007 budget request proposes $149 million for biomass and biofuel programs, and a like amount, $148 million, for solar energy. Both are increases of about $50 million, so very sizable percentage increases.

In addition, the budget requests a total $288 million to support implementation of the President's Hydrogen Fuel Initiative, and provide $60 million for U.S. participation in the International Thermonuclear Experimental Reactor, or ITER, as we have come to call it. The goal of ITER is to tap nuclear fusion as an enormous source of energy, a plentiful and environmentally safe energy. All of that is true, but it is a long-term investment that will take, it is expected, a number of decades.

As part of the President's Advanced Energy Initiative, the department's 2007 budget also features $250 million to begin investments in the Global Nuclear Energy Partnership. This is a groundbreaking new international effort to help meet the world's rapidly growing electricity needs with safe emissions-free nuclear power, while enhancing our ability to keep nuclear technology and material out of the hands of those who seek to use it for non-peaceful purposes.

Mr. Chairman, that's just a brief outline of the science and research activities that are part of this budget and that we're engaged in. I look forward to discussing any of these matters or other issues in the budget with you. Thank you.

[The prepared statement of Secretary Bodman follows:]

PREPARED STATEMENT OF SAMUEL W. BODMAN

Good morning, Chairman Boehlert, Ranking Member Gordon and Members of the Committee. I am pleased to appear before you today along with my Administration colleagues to discuss the President's FY 2007 budget request for the Department of

Energy (DOE) and the role that DOE plays in the President's science and energy initiatives.

In his State of the Union address on January 31 President Bush laid out an ambitious and exciting path for the Administration when he unveiled his *American Competitiveness Initiative* and the *Advanced Energy Initiative.* The American Competitiveness Initiative will invest in and reverse a trend of static funding for research and development in the physical sciences; as a result we in the Energy Department believe this initiative is a real landmark. The proposal will double the federal commitment to the most critical basic research programs in the physical sciences over the next ten years; a total of $50 billion of new funding through DOE's Office of Science, the National Science Foundation, and the Department of Commerce's National Institute of Standards and Technology. This historic commitment will significantly change the future of science in this country and will be a bold statement to our science colleagues around the world. An important element of the Advanced Energy Initiative is the *Global Nuclear Energy Partnership,* a comprehensive strategy to enable the safe and secure expansion of nuclear energy around the world. We in the Energy Department are excited about this vision and mission and the role we will play in it. I am pleased to have the opportunity to testify before you today to urge the Science Committee to join us in this initiative.

The Department of Energy's budget for Fiscal Year (FY) 2007 follows the blueprint laid out by the President's new initiatives. The $23.5 billion budget request seeks to address America's short-term energy needs while positioning our country for the future. The budget request makes bold investments to improve America's energy security while protecting our environment, puts policies in place that foster continued economic growth, spurs scientific innovation and discovery, and addresses and reduces the threat of nuclear proliferation.

Most notably, this budget request contains:

- **A Landmark Investment in Scientific Research**

  The FY 2007 budget includes a $505 million increase in DOE's Science programs, which is part of a commitment to double funding for certain high-leverage science agencies over the next ten years. The *American Competitiveness Initiative* recognizes that scientific discovery and understanding help drive economic strength and security. Developing revolutionary, science-driven technology is at the heart of the Department of Energy's mission. The increase proposed for the Department's Science programs reflects the significant contribution DOE and its world-class research facilities make to the Nation.

- **Strategic Investments to Reduce America's Dependence on Foreign Oil and Develop Clean Energy Technologies**

  The President's *Advanced Energy Initiative* provides a 22 percent increase for research that can help reduce America's dependence on foreign oil and advance clean energy technologies. The FY 2007 Budget proposes $149.7 million for Biomass and Biorefinery Systems Research and Development (R&D) program to support the new *Biofuels Initiative* to develop cost competitive ethanol from cellulosic materials (agricultural wastes, forest residues, and bioenergy crops) by 2012.

  In addition, the budget request continues to pursue the vision of reducing greenhouse gas emissions through the development of a hydrogen economy. The FY 2007 Budget requests a total of $289.5 million (including $1.4 million requested by the Department of Transportation) to support implementation of the President's *Hydrogen Fuel Initiative.* The FY 2007 Budget also provides a 27 percent increase for advanced battery technologies that can improve the efficiency of conventional hybrid electric vehicles (HEV) and help make "plug-in" HEV's commercially viable.

  To help develop clean electricity, the FY 2007 Budget funds diverse technology R&D programs. The FY 2007 Budget includes $148.4 million for a new *Solar America Initiative* to develop cost competitive solar photovoltaic technology by 2015. The FY 2007 Budget also provides $60.0 million for U.S. participation in *International Thermonuclear Experimental Reactor* (ITER), an international experimental reactor program that has the potential for putting us on a pathway to tap nuclear fusion as an enormous source of plentiful and environmentally safe energy. The FY 2007 Budget advances the Administration's commitment to the *FutureGen* project, which will establish the capability and feasibility of co-producing electricity and hydrogen from coal with near-zero atmospheric emissions of pollutants and greenhouse gasses.

- **Strategic Investments to Enable Nuclear Energy Expansion in a Cleaner, Safer Manner**

  The Department's FY 2007 budget features $250 million to begin investments in the *Global Nuclear Energy Partnership* (GNEP). GNEP is a comprehensive strategy to enable an expansion of nuclear power in the U.S. and around the world, to promote non-proliferation goals, and to help resolve nuclear waste disposal issues.

  The Energy Information Administration projects that over the next 25 years, demand for electricity in the United States alone will grow by over 40 percent. Nuclear power is an abundant, safe, reliable and emissions-free way to help meet this growing demand for energy throughout the world. As part of the GNEP strategy, the United States will work with key international partners to develop and demonstrate new proliferation resistant technologies to recycle spent nuclear fuel to reduce waste. To help bring safe, clean nuclear power to countries around the world, the international GNEP partners will also develop a fuel services program to supply developing nations with reliable access to nuclear fuel in exchange for their commitment to forgo developing enrichment and recycling technologies.

  As a complement to the GNEP strategy, the Department will continue to pursue a permanent geologic disposal site for nuclear waste at Yucca Mountain, and the FY 2007 budget includes $544.5 million to support this goal. Based on technological advancements that would be made through GNEP, the volume and radio-toxicity of waste requiring permanent disposal at Yucca Mountain could be greatly reduced, delaying the need for an additional repository indefinitely. It is important to emphasize, however, that GNEP does not diminish in any way the need for, or the urgency of, the nuclear waste disposal program at Yucca Mountain. Yucca Mountain is still required under any fuel cycle scenario. Even with the successful development of a recycling program, there will remain a significant amount of "once-through" spent nuclear fuel that will require final disposal in a repository. In addition, the residual material from the recycling program also will require final disposition in a repository. The GNEP will affect the longer-term scope of the repository program, but not the near term need for the Department to put in place a program to begin accepting spent nuclear fuel for disposal as quickly as feasible.

  GNEP builds upon the successes of programs initiated under President Bush's leadership to encourage the construction of new nuclear power plants here in the United States. The FY 2007 budget includes $632.7 million for nuclear energy programs, a $97.0 million increase above the FY 2006 appropriation. In addition to the $250 million for GNEP, Generation IV (Gen IV) research and development ($31.4 million) will improve the efficiency, sustainability, and proliferation resistance of advanced nuclear systems and Nuclear Power 2010 ($54.0 million), will lead the way, in a cost-sharing manner, for industry to order new, advanced light-water reactors by the end of this decade. In addition, ongoing implementation of the *Energy Policy Act of 2005* (EPACT) will establish federal insurance to protect sponsors of the first new nuclear power plants against the financial impact of certain delays during construction or in gaining approval for operation that are beyond the sponsors' control.

PROMOTING SCIENCE AND TECHNOLOGICAL INNOVATION

As the millennium unfolds, we stand on the threshold of scientific revolutions in biotechnology and nanotechnology, in materials science, in fusion energy and high-intensity light sources, and in high-performance computing, to touch on only a few important fields. The nations that lead these scientific revolutions will likely dominate the global high-tech economy for the foreseeable future. We are on the verge of major new discoveries about the nature of our universe, solutions to some of the deepest mysteries of the cosmos and the fundamental understanding of matter—insights that will transform the way we think about ourselves and our world.

The President's *American Competitiveness Initiative* will encourage American innovation and bolster our ability to compete in the global economy through increased federal investment in critical areas of research, especially in the physical sciences and engineering. This initiative will generate scientific and technological advances for decades to come and will help ensure that future generations have an even brighter future.

Twenty-first century science requires sophisticated scientific facilities. In many fields, private industry has neither the resources nor the near-term incentive to make significant investments on the scale required for basic scientific research to

yield important discoveries. Indeed, in recent years, corporate basic research has declined. That is why the Department's Office of Science, which is responsible for ten world-class U.S. national laboratories and is the primary builder and operator of scientific facilities in the United States, plays such a critical role. Investment in these facilities is much more than bricks and mortar: it is an investment in discovery and in the future of our nation. The Office of Science is also educating and training our next generation of scientists and engineers. Roughly half of the researchers at Office of Science-run facilities are university faculty or graduate or postdoctoral students (who work side by side with scientists and researchers employed directly by the labs), and about a third of Office of Science research funds go to institutions of higher learning. In addition, the National Nuclear Security Administration (NNSA) operates three world-class national laboratories which greatly advanced the frontiers of science in connection with their national security mission and which have many interactions with universities.

I am pleased to inform the Committee that the Department is already achieving meaningful scientific results with our latest high end supercomputing systems, including Blue Gene L and Purple at Lawrence Livermore National Laboratory and our Red Storm supercomputer at Sandia National Laboratory. Within a month of coming online, weapons designers at Lawrence Livermore and Los Alamos, working jointly, have discovered key physics that are important to weapons design that could not have been identified using less capable computers. This discovery is critically important to predicting the behavior of weapons, and, as a result, our ability to be responsive to national needs. Because of the interrelationships among the Department's science-based programs, these new, remarkably powerful computers are already having a major, positive effect on science in several of our laboratories.

The President's FY 2007 budget request of $4.1 billion for the Office of Science will move us forward on several scientific fronts designed to produce discoveries that will strengthen our national competitiveness. Final international negotiations are close to being completed with our international partners in *ITER,* the fusion experimental reactor designed to demonstrate the scientific and technological feasibility of fusion as a plentiful, environmentally benign source of energy. A request of $60.0 million in FY 2007 provides funding for the second year of the ITER project. The return on investment will expand across international borders and has the promise of tremendous economic opportunity and development.

The FY 2007 budget also includes $105.9 million to enable us to continue construction of the *Linac Coherent Light Source* (LCLS), the world's first x-ray free electron laser. The LCLS will allow us to watch matter in action, one molecule at a time, and witness chemical reactions at the microscopic level in real time. The structural knowledge obtained with x-rays holds the key to understanding the properties of matter such as mechanical strength, magnetism, transport of electrical currents and light, energy storage, and catalysis. Likewise, in biology much of what we know about structure and function on a molecular level comes from x-ray studies. Such knowledge forms the basis for the development of new materials and molecules and the enhancement of their properties, which in turn will advance technology, fuel our economy, and improve our quality of life. In addition, the FY 2007 Budget seeks $19.2 million in FY 2007 for the first full year of operations of each of four facilities for nanoscience research and $19.4 million to continue with construction of a fifth.

The FY 2007 budget provides $171.4 million for the *Spallation Neutron Source* (SNS), which enters its first full year of operation as the world's foremost facility for neutron scattering.

The FY 2007 budget request also includes $135.3 million for the *Genomes: GTL* research, which will help us understand how nature's own microbial communities can be harnessed to remove carbon from the atmosphere, generate hydrogen for fuel, and turn cellulose into ethanol.

Within the $4.1 billion FY 2007 budget request for Science, $143.3 million is provided to support near full operation of the *Relativistic Heavy Ion Collider* (RHIC), which gives us a lens into the early universe, and $80.0 million is allocated to allow near full operation of the *Continuous Electron Beam Accelerator Facility* (CEBAF), which will give new insight on the quark-structure of matter. Early studies of nuclear and particle physics provided the foundation for technologies that have changed our daily lives, giving us televisions, transistors, medical imaging devices, and computers, and has enormous potential to lead to unexpected discoveries. The *Large Hadron Collider* (LHC) at CERN, in Switzerland, is scheduled to be completed in 2007, will open a new chapter in illuminating the structure of matter, space and time. At this new energy frontier, qualitatively new phenomena of nature should emerge. There are many possibilities—supersymmetry, extra space dimensions, or unexpected new symmetries of nature—but finding out which, if any, are true can only be settled by experiment. In FY 2007, $56.8 million is requested to

support U.S. participation in the LHC research program. The new results anticipated at the LHC can be significantly advanced by discoveries at a potential next generation International Linear Collider (ILC) which would break new ground in our understanding of nature. In FY 2007, funds for ILC research and development are doubled with a funding request of $60.0 million.

The budget also includes $318.7 million to solidify America's leadership in the economically vital field of *high-performance computing,* a tool increasingly integral not only to advanced scientific research, but also to industry. The budget will provide the pathway toward the development of computational systems that enable researchers to attack a wide range of currently intractable scientific problems through modeling and simulation, enabling the U.S. to extend our leadership in this strategic area. Additionally, from development of the suite of scientific software and applications for the petascale computers, U.S. industry will be able to accelerate innovation, potentially saving billions in development costs and giving our economy untold competitive advantages.

We are on the verge of a revolution across multiple sciences as profound as any humanity has witnessed—one that will transform our vision of nature and, ultimately, our industry and economy.

ADVANCING AMERICA'S ECONOMIC AND ENERGY SECURITY

The *Energy Policy Act of 2005,* signed by President Bush on August 8, 2005, advances the United States towards a secure energy future. The FY 2007 budget request of $2.6 billion to support energy programs fulfills President Bush's pledge to promote a strong, secure economy and expand our nation's energy supply by developing a diverse, dependable energy portfolio for the future.

The President has proposed the *Advanced Energy Initiative* to help reduce America's dependence on foreign sources of oil and accelerate development of clean energy technologies through targeted increases in federal investment. This initiative has served as the blueprint for DOE's FY 2007 budget proposal.

The FY 2007 budget request of $1.2 billion for energy efficiency and renewable energy includes two initiatives to emphasize technologies with the potential for reducing our growing reliance on oil imports and for producing clean electricity with reduced emissions. The FY 2007 budget proposes $149.7 million for the *Biofuels Initiative* to develop by 2012 affordable, domestically-produced bio-based transportation fuels, such as ethanol, from cellulosic feedstocks (such as agricultural wastes, forest residues, and bioenergy crops), and accelerate the development of biorefineries. Biomass has the promise to deliver a plentiful domestic energy resource with economic benefits to the agricultural sector, and to directly displace oil use. The President's *Solar America Initiative* is proposed to be funded at $148.4 million, a substantial increase of $65.3 million above FY 2006 funding. The increase accelerates the development of solar photovoltaics, a technology that converts energy from the sun directly into electricity. The goal of this R&D initiative is to make this emissions-free technology cost-competitive with other electricity generation sources by 2015.

The President's *Hydrogen Fuel Initiative* is funded at $289.5 million and includes $195.8 million for DOE's Energy Efficiency and Renewable Energy program, $23.6 million for DOE's Fossil Energy program, $18.7 million for DOE's Nuclear Energy program, $50.0 million for DOE's Science program, and $1.4 million for the Department of Transportation. Hydrogen and fuel cell technology holds the promise of an ultra-clean and secure energy option for America's energy future. The increase of $40.2 million above the FY 2006 appropriation accelerates activities geared to further improve the development of hydrogen production and storage technologies, and evaluate the use of hydrogen as an emissions-free transportation fuel source.

While the budget proposes increases for Biomass, Solar and Hydrogen research, the Geothermal Program will be closed out in FY 2007 using prior year funds. The 2005 Energy Policy Act amended the *Geothermal Steam Act of 1970* in ways that should spur development of geothermal resources without the need for subsidized federal research to further reduce costs.

Nuclear power, which generates 20 percent of the electricity in the United States, contributes to a cleaner, more diverse energy portfolio. In FY 2007 a total of $632.7 million is requested for nuclear energy activities. Within the total, $250 million will support the *Global Nuclear Energy Partnership* (GNEP). GNEP is a comprehensive strategy to enable an expansion of nuclear power in the U.S. and around the world, to promote nuclear nonproliferation goals; and to help resolve nuclear waste disposal issues.

GNEP will build upon the Administration's commitment to develop nuclear energy technology and systems, and enhance the work of the United States and our international partners to strengthen nonproliferation efforts. GNEP will accelerate efforts to:

- Enable the expansion of emissions-free nuclear power domestically and abroad;
- Reduce the risk of proliferation; and
- Utilize new technologies to recover more energy from nuclear fuel and dramatically reduce the volume of nuclear waste.

Through GNEP, the United States will work with key international partners to develop new recycling technologies that do not result in separated plutonium, a traditional proliferation risk. Recycled fuel would then be processed through advanced burner reactors to extract more energy, reduce waste and actually consume plutonium, dramatically reducing proliferation risks. As part of GNEP, the U.S. and other nations with advanced nuclear technologies would ensure developing nations a reliable supply of nuclear fuel in exchange for their commitment to forgo enrichment and reprocessing facilities of their own, also alleviating a traditional proliferation concern.

GNEP will also help resolve America's nuclear waste disposal challenges. By recycling spent nuclear fuel, the heat load and volume of waste requiring permanent geologic disposal would be significantly reduced, delaying the need for an additional repository indefinitely.

The Administration continues its commitment to open and license Yucca Mountain as the Nation's permanent geologic repository for spent nuclear fuel, a key complement to the GNEP strategy. Managing and disposing of commercial spent nuclear fuel in a safe and environmentally sound manner is the mission of DOE's Office of Civilian Radioactive Waste Management (RW).

To support the near-term domestic expansion of nuclear energy, the FY 2007 budget seeks $54.0 million for the *Nuclear Power 2010* program to support continued industry cost-shared efforts to reduce the barriers to the deployment of new nuclear power plants. The technology focus of the Nuclear Power 2010 program is on Generation III+ advanced light water reactor designs, which offer advancements in safety and economics over the Generation III designs. If successful, this seven-year, $1.1 billion project (50 percent to be cost-shared by industry) could result in a new nuclear power plant order by 2009 and a new nuclear power plant constructed by the private sector and in operation by 2014.

Funding of $1.8 million is provided in FY 2007 to implement a new program authorized in the recently enacted *Energy Policy Act of 2005.* The program will allow DOE to offer *risk insurance* to protect sponsors of the first new nuclear power plants against the financial impact of certain delays during construction or in gaining approval for operation that are beyond the sponsors' control. This program would cover 100 percent of the covered cost of delay, up to $500 million for the first two new reactors and 50 percent of the covered cost of delay, up to $250 million each, for up to four additional reactors. This risk insurance offers project sponsors additional certainty and incentive to provide for the construction of a new nuclear power plant by 2014.

The FY 2007 budget request includes $31.4 million to continue to develop next-generation nuclear energy systems known as *Generation IV* (GenIV). These technologies will offer the promise of a safe, economical, and proliferation resistant source of clean, reliable, sustainable nuclear power with the potential to generate hydrogen for use as a fuel. Resources in FY 2007 for GenIV will be primarily focused on long-term research and development of the Very-High Temperature Reactor.

The *University Reactor Infrastructure and Educational Assistance* program was designed to address declining enrollment levels among U.S. nuclear engineering programs. Since the late 1990s, enrollment levels in nuclear education programs have tripled. In fact, enrollment levels for 2005 have reached upwards of 1,500 students, the program's target level for the year 2015. In addition, the number of universities offering nuclear-related programs also has increased. These trends reflect renewed interest in nuclear power. Students will continue to be drawn into this course of study, and universities, along with nuclear industry societies and utilities, will continue to invest in university research reactors, students, and faculty members. Consequently, federal assistance is no longer necessary, and the 2007 Budget proposes termination of this program. The termination is also supported by the fact that the program was unable to demonstrate results from its activities when reviewed using the Program Assessment Rating Tool (PART), supporting the decision to spend taxpayer dollars on other priorities. Funding for providing fresh reactor fuel to universities is included in the Research Reactor Infrastructure program, housed within Radiological Facilities Management.

Recognizing the abundance of coal as a domestic energy resource, the Department remains committed to research and development to promote its clean and efficient

use. U.S. coal accounts for twenty five percent of the world's coal reserves. For the last three years, the Department has been working to launch a public-private partnership, *FutureGen,* to develop a coal-based facility that will produce electricity and hydrogen with essentially zero atmospheric emissions. This budget includes $54 million in FY 2007 and proposes an advance appropriation of $203 million for the program in FY 2008. Funding for FutureGen will be derived from rescinding $203 million in balances no longer needed to complete active projects in the Clean Coal Technology program. Better utilization of these fund balances to support FutureGen will generate real benefits for America's energy security and environmental quality.

The budget request for FY 2007 includes $4.6 million to support *Alaska Natural Gas Pipeline* activities authorized by Congress in late 2004. Within the total amount of $4.6 million, $2.3 million will be used to support an Office of the Federal Coordinator and the remaining $2.3 million will support the loan guarantee portion of the program. Once constructed, this pipeline will be capable of delivering enough gas to meet about 10 percent of the U.S. daily natural gas needs.

The budget request proposes to terminate the oil and gas research and development programs, which have sufficient market incentives for private industry support, to other energy priorities.

The *Energy Policy Act of 2005* established a new mandatory oil and gas research and development (R&D) program, called the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research program, which would be funded from federal revenues from oil and gas leases beginning in FY 2007. These R&D activities are more appropriate for the private-sector oil and gas industry to perform. Therefore this budget proposes to repeal the program through a future legislative proposal.

The FY 2007 budget includes $124.9 million for a refocused portfolio of energy reliability and assurance activities in the *Office of Electricity Delivery and Energy Reliability.* This will support research and development in areas such as high temperature superconductivity, and simulation work needed to enhance the reliability and effectiveness of the Nation's power supply. This office also operates the Department's energy emergency response capability and led DOE's support effort during and after the Gulf Coast hurricanes.

ENSURING A CLEAN ENVIRONMENT

The Bush Administration is laying a strong technological foundation to develop cost-effective options to meet clean development and climate objectives. While maintaining core programs in renewable energy, energy efficiency, nuclear power, fusion, and other areas, the Administration has launched important new initiatives and programs, including President Bush's Hydrogen Fuel Initiative, the FutureGen advanced clean coal project, and advanced nuclear power. Internationally, the U.S. has initiated a number of technology collaborations, including the Asia-Pacific Partnership for Clean Development and Climate, the Carbon Sequestration Leadership Forum, the International Partnership for a Hydrogen Economy, the Generation IV International Forum, and the Methane to Markets Partnership, and it joined the ITER fusion project.

The United States leads the world in the development of climate-friendly technologies and spends more on climate change science and technology development—$2 billion and $3 billion in FY 2006, respectively—than any other country. As a result of technological progress, we are on track to meet the President's goal of reducing GHG intensity by 18 percent by 2012. For FY 2007, the President is proposing, through the Advanced Energy Initiative announced during the State of the Union Address, large increases in funding for solar, bioenergy, hydrogen, nuclear, and advanced clean coal R&D to change the way we produce power for our homes and automobiles and to reduce oil imports. The Department's FY 2007 budget also reflects our continuing strategy to reduce the greenhouse gas intensity of the American economy. A vital part of this strategy is the Climate Change Technology Program (CCTP). CCTP was established within the Department of Energy in the fall of 2002 and was authorized by Congress as part of the *Energy Policy Act of 2005.* The goal of CCTP is to accelerate the development of advanced, cost-effective technologies that reduce, avoid, or capture and sequester GHG emissions. Through leadership in research, development, demonstration and deployment, the U.S. approach aims to build on America's strengths in innovation and technology and inspire others, at home and abroad, to participate in an ambitious technological undertaking to address climate change concerns.

CONCLUSION

The Administration recognizes that science and energy are central to our economic and national security. Indeed, energy helps drive the global economy and has

a significant impact on our quality of life and the health of our people and our environment. The FY 2007 Budget Request balances the need to address short-term challenges while planning for long-term actions as the President outlined in his new initiatives, the *American Competitiveness Initiative* and the *Advanced Energy Initiative.* The request reflects our belief that basic science research must remain strong if we are to remain competitive with our global partners. The request contains bold new initiatives in nuclear, biomass, and solar energy. It continues the President's strong commitment to clean coal, hydrogen, and fusion. The request honors our commitment to deal with civilian nuclear waste, as well as legacy waste from the Cold War, and to further our already successful nonproliferation programs in order to help ensure a safer world for generations to come.

BIOGRAPHY FOR SAMUEL W. BODMAN

Samuel Wright Bodman was sworn in as the 11th Secretary of Energy on February 1, 2005 after the United States Senate unanimously confirmed him on January 31, 2005. He leads the Department of Energy with a budget in excess of $23 billion and over 100,000 federal and contractor employees.

Previously, Secretary Bodman served as Deputy Secretary of the Treasury beginning in February 2004. He also served the Bush Administration as the Deputy Secretary of the Department of Commerce beginning in 2001. A financier and executive by trade, with three decades of experience in the private sector, Secretary Bodman was well suited manage the day-to-day operations of both of these cabinet agencies.

Born in 1938 in Chicago, he graduated in 1961 with a B.S. in chemical engineering from Cornell University. In 1965, he completed his ScD at Massachusetts Institute of Technology. For the next six years he served as an Associate Professor of Chemical Engineering at MIT and began his work in the financial sector as Technical Director of the American Research and Development Corporation, a pioneer venture capital firm. He and his colleagues provided financial and managerial support to scores of new business enterprises located throughout the United States.

From there, Secretary Bodman went to Fidelity Venture Associates, a division of the Fidelity Investments. In 1983 he was named President and Chief Operating Officer of Fidelity Investments and a Director of the Fidelity Group of Mutual Funds. In 1987, he joined Cabot Corporation, a Boston-based Fortune 300 company with global business activities in specialty chemicals and materials, where he served as Chairman, CEO, and a Director. Over the years, he has been a Director of many other publicly owned corporations.

Secretary Bodman has also been active in public service. He is a former Director of M.I.T.'s School of Engineering Practice and a former member of the M.I.T. Commission on Education. He also served as a member of the Executive and Investment Committees at M.I.T., a member of the American Academy of Arts & Sciences, and a Trustee of the Isabella Stewart Gardner Museum and the New England Aquarium.

Secretary Bodman is married to M. Diane Bodman. He has three children, two stepchildren, and eight grandchildren.

Chairman BOEHLERT. Thank you very much, Mr. Secretary. Dr. Sampson.

STATEMENT OF DR. DAVID A. SAMPSON, DEPUTY SECRETARY, DEPARTMENT OF COMMERCE

Dr. SAMPSON. Good morning, Chairman Boehlert and Ranking Member Gordon and Members of the Committee. I'm delighted to join my colleagues this morning to talk about the President's R&D budget request and the critical matter of American competitiveness. Like my colleagues, I'd also like to make a few brief comments and ask that my written testimony be a part of the hearing record.

Let me say at the outset that American companies and workers are the most competitive and innovative in the world. We have the strongest and most diversified economy, so we begin this discussion from a position of strength. Over the past four years, the United States has experienced faster growth than any other major industrialized nation. Our unemployment rate of 4.7 percent is one of

the lowest. Payrolls are growing in almost every single state. And one of the major reasons for our success is the enormous improvements in worker productivity. In fact, U.S. productivity has had one of the fastest five-year periods of growth in almost 40 years, and the reason for that is that we are a nation of innovators. We have a reputation for coming up with new technologies that make us more productive.

But the challenge is this: how do we maintain our leadership role in an increasingly competitive global economy? We need to attack this problem on a number of fronts, as outlined in President Bush's new and ambitious American Competitiveness Initiative. This initiative reflects many of the issues that were raised in December at a national summit on competitiveness that we hosted at the United States Department of Commerce. Chairman Boehlert and Subcommittee Chairman Ehlers, among many others, were very supportive of and participated in it. It was a highly successful meeting with over 50 CEOs and university presidents and officials from virtually every federal research agency participating.

At the core of the President's competitiveness initiative are major increases in Federal R&D funding over the next 10 years, and let me focus on what we're proposing at the Commerce Department for fiscal year 2007. First, at the National Institute of Standards and Technology, the President's budget calls for a 24 percent increase in funding, over $104 million for our core laboratory programs and the facilities to support them. This funding will allow scientists at NIST, who have won three Nobel prizes in recent years, to advance research in promising fields. For example, $72 million would go for cutting edge efforts in areas such as nanotechnology, hydrogen fuels and quantum information. These initiatives hold the promise of leading to new cancer therapies, fuel cells for pollution-free cars, or unbreakable codes to protect electronic transactions.

We're planning to invest in critical national assets, notably the Center for Neutron Research, and we're also seeking $32 million to maintain and upgrade our labs, including the aging facilities in Boulder, Colorado.

At the National Oceanic and Atmospheric Administration, we're requesting a $345 million increase to our base programs, in order to continue improving key predictions and warnings for a variety of weather, climate and water conditions, working towards sustainable fisheries and supporting safe and efficient transportation. Specifically, we're seeking increases in several high priority areas, including $112 million for the next generation of weather satellites that I know this committee has great interest in, $108 million for ecosystem management, $46 million for weather and water information, including $12 million to operate the Tsunami Warning Program, and $24 million for climate services to better predict and better inform the public about droughts.

Mr. Chairman, President Bush, the Commerce Department and this Administration are committed to maintaining America's leadership in the global economy, and one of the best ways to do that is by creating an environment that encourages innovation and risk taking, and that focuses R&D spending on the most promising and productive fields. And we believe our R&D budget at the Department of Commerce significantly advances those goals. I look for-

ward to working with the Committee as we move forward on what I believe is one of the most crucial issues we face as a nation and I obviously look forward to answering any questions that you or the Committee may have.

[The prepared statement of Dr. Sampson follows:]

PREPARED STATEMENT OF DAVID A. SAMPSON

Mr. Chairman and Members of the Committee, I am pleased to join you today as we examine the Administration's FY 2007 budget request for research and development at the Department of Commerce. I want to thank the Committee, especially Chairman Boehlert, for your continued support and leadership on innovation issues. You have been a constant and strong voice for the science and technology community, and I look forward to continuing our work together to ensure that America remains the world leader in the science and technology field.

INTRODUCTION

Innovation and competitiveness drive the Nation's economy. The Department of Commerce provides the tools to help maximize U.S. competitiveness and ensure the economic health of American industries, workers, and consumers.

I was pleased to play a role in the National Summit on Competitiveness that was held at the Department of Commerce on December 6, 2005. The purpose of the summit was to raise awareness about the seriousness of the global competitiveness challenge and to promote an action agenda to ensure continued U.S. leadership in innovation. Our major international competitors are committing significant resources to their scientific and technological infrastructure, and increasing their ability to compete with the United States. This has led to a growing concern among industry and academia that America should increase its response to the changing competitive landscape.

The summit involved key leaders from Government including Commerce Secretary Carlos Gutierrez, Energy Secretary Sam Bodman, Education Secretary Margaret Spellings, Labor Secretary Elaine Chao and National Science Foundation Director Arden Bement. About 50 corporate CEOs and university leaders joined with these Government officials to discuss actions necessary to strengthen America's innovation capacity, particularly in science and technology research, education, workforce development, and the deployment of new technologies.

In his State of the State of the Union address, President Bush made it clear that we are faced with a choice in responding to the increasingly global economy. We can pursue the path of isolationism or we can choose to compete with confidence. President Bush has chosen the latter path by announcing the American Competitiveness Initiative (ACI), which will help ensure that America meets this goal and remains a leader in science and technology advances. The centerpiece of the ACI is the President's strong commitment to double over 10 years investment in key federal agencies that support basic research programs in the physical sciences and engineering—the National Science Foundation, the Department of Energy's Office of Science, and the Department of Commerce's National Institute of Standards and Technology (NIST).

Under the ACI, NIST is slated for $535 million for its laboratory research and facilities appropriations. This budget proposal includes a $104.1 million increase above NIST's FY 2007 base—or more than 24 percent. If appropriated this would be the largest dollar increase ever for NIST's laboratory research.

The increase reflects the importance of the work that NIST undertakes to promote competitiveness and innovation—with the aim of improving economic security and improving the quality of life. It also reflects the importance that this Administration places on improving the environment for innovation and competitiveness. This commitment—as evidenced by the NIST budget proposal—is extraordinary in a budget that is mindful of the need to be stringent and restrain federal spending and reduce the deficit.

This funding will support the work of 3,900 scientists and engineers from Government, industry and universities—an increase of 600 researchers over FY 2006. Their work in areas including nanotechnology, hydrogen and quantum information will lead to the innovations of tomorrow, such as much more efficient batteries, and smaller computer chips to power our digital devices, as well as fuel cells to power pollution-free cars and unbreakable codes to protect electronic financial transactions and video transmissions.

The Department also proudly houses another extremely important science agency, the National Oceanic and Atmospheric Administration (NOAA). NOAA's mission is

to understand and predict changes in the Earth's environment, as well as to conserve and manage wisely the coastal and marine resources to meet our nation's economic, social, and environmental needs. The work performed at NOAA touches the daily lives of every person in the United States and in much of the world. The agency:

- provides weather, water, and climate services;
- manages and protects marine resources and ecosystems;
- conducts atmospheric, climate, and ecosystems research;
- promotes efficient and environmentally safe commerce and transportation; and
- provides emergency response and vital information in support of homeland security.

In addition to using science and technology to create jobs, stimulate innovation and improve economic prosperity, the Department is also directing resources toward disaster prediction and prevention, to better understand and minimize the loss of life and property from disasters.

The 2005 Atlantic hurricane season was the busiest on record and extended the current period of increased hurricane activity which began in 1995—a trend likely to continue for years to come. This season shattered records that have stood for decades—the most named storms, most hurricanes and most category five storms. Arguably, it was the most devastating hurricane season the country has experienced in modern times.

The devastation along the Gulf Coast from Hurricanes Katrina, Rita and Wilma is of historic proportions. It is catastrophic. However, without NOAA's forecasts and warnings, and its extensive recovery activities after the passage of each storm, the devastation and loss of life would have been far greater. As Chairman Ehlers himself has noted, NOAA "alone pays for itself over and over in terms of the protection it gives to people and to property."

NOAA's forecasts and warnings for the 2005 Gulf hurricanes pushed the limits of state-of-the-art hurricane prediction. Our continuous research efforts, including observations, modeling, and expanded computational resources at NOAA, and in partnership with other federal agencies, have led to our current predictive capabilities and improved ways of describing uncertainty in prediction. But NOAA's work does not end there. NOAA assessed damage from storms, as well as the impact to the areas' fisheries. It continues to support hazardous materials containment and abatement efforts, provide necessary data critical for post-storm response and recovery operations, and assist dredging operations, allowing our nation's ports and waterways impacted by the storm to open.

NOAA's science is just as critical to our understanding and management of our oceans. In December 2004, the Administration released the *U.S. Ocean Action Plan* (Plan), in response to the U.S. Commission on Ocean Policy's report entitled, *An Ocean Blueprint for the 21st Century*. NOAA will continue to play a key role in implementing many of the Plan's ocean policy measures, including the establishment of a coordinated ocean governance structure. Chairman Ehlers has noted that "these are critical issues crucial to the survival of humans on the planet when we consider the extent and the complexity of the oceans and life on the planet." Consistent with this approach, the Administration continues to support Commerce's leadership role in oceans policy and activities by promoting passage of a NOAA Organic Act.

NOAA's global leadership extends to monitoring the planet through the development of the Global Earth Observation System of Systems (GEOSS). Last April, the United States released its first-ever plan to monitor the Earth. As a collaborative effort of 15 federal agencies and three White House offices, the 10-year Strategic Plan for the U.S. Integrated Earth Observation System will, over time, benefit people and economies around the world by improving the ability to monitor, understand and predict changes to the Earth. The completion of this plan marks a significant milestone in the ongoing development of GEOSS, involving nearly 50 other countries, the European Commission and 29 international organizations. The GEOSS will provide NOAA and others with the tools to better understand our planet through an integrated, comprehensive, and sustained Earth-observation program.

NOAA also serves as the lead coordinating agency for the U.S. Climate Change Science Program (CCSP) which integrates a broad range of climate-related observations, field studies and computer model projections sponsored by 13 federal agencies. CCSP has a goal of substantially improved understanding of both the causes and the potential effects of climate variability and change, on time scales extending from weeks to decades. NOAA's mission also includes the implementation of climate pre-

dictive and interpretive services for a wide range of applications, thereby providing significant benefits to users in several sectors of the economy.

HIGHLIGHTS OF THE FY 2007 BUDGET REQUEST

The FY 2007 President's budget request for the Technology Administration is $582.8 million, including $1.5 million for the Office of the Under Secretary and $581.3 million for NIST. TA and its various components seek to maximize technology's contribution to economic growth, high-wage job creation, and the social well-being of the United States. TA and NIST serve as advocates for technological innovation and analyze the factors that affect our competitiveness.

For NOAA, we request a total of $3.684 billion. The request is an increase of $345 million or 10 percent above NOAA's FY 2007 base. This FY 2007 request reflects our continuing effort to better serve the American people by restraining spending and advancing only the most mission-critical services. The NOAA staff of dedicated professionals, working with extramural researchers and our international partners, is extending our knowledge of climate change, expanding meteorological prediction capabilities, improving coastal resource management, charting more of our oceans and coasts, and enhancing environmental stewardship.

For the remainder of my testimony I would like to focus on the Department's science and technology budget priorities for the upcoming fiscal year as reflected in TA/NIST's and NOAA's requests. The Commerce Department's budget illustrates our commitment to preserve the core competencies of TA, NIST and NOAA, and to promote competitiveness, innovation and economic growth.

Technology Administration Programs

The Technology Administration and its various components—NIST, the National Technical Information Service, and the Office of the Under Secretary—seek to maximize technology's contribution to economic growth, high-wage job creation, and the social well-being of the United States.

National Institute of Standards and Technology

NIST has long been a center for high-impact basic research, as evidenced by the three Nobel Prizes that have been awarded to its scientists in the last decade. NIST research has led to innovations that we can see today, from the high-density magnetic storage technology that makes devices such as computer hard drives and mp3 players so compact, to protective body armor for law enforcement officers and diagnostic screening for cancer patients.

NIST's Scientific and Technical Research and Services ($467.0 million)

The NIST budget is divided into three appropriations, the first of which is $467.0 million covering Scientific and Technical Research and Services (STRS). This includes $459.4 million for NIST's *laboratory research,* which is the core of NIST's operations. Through these laboratories, NIST plays a unique role in the Nation's scientific, industrial and business communities. Scientists, engineers, health care professionals, manufacturers and business people compare and trade data, test results, manufactured goods, and commodities with greater confidence when NIST is present in the background—anchoring the national measurement and standards system that is the language of research and commerce.

This is the oldest and one of the most important of NIST's long-standing missions. It affects every American who goes to the store, buys gasoline or pays a utility bill, because each year $4.5 trillion in wholesale and retail trade is measured against standards that are ultimately traceable to NIST. It affects:

- every American whose job depends on the ability of our industries to innovate and to compete in global trade—because product quality and productivity depend on the ability to measure and precisely control the production process, and because more and more high-tech and high-value products are subject to foreign regulations that require measurements traceable to internationally recognized standards;
- every American who relies on fundamental business services and communications devices—because so many of these services depend upon NIST measurements and standards in ways that are invisible to most consumers and service sector employees; and
- every American concerned with homeland security—because NIST is being called upon increasingly to provide the measurement assurance behind sensitive detection systems for chemical, biological, explosive or radiological weapons.

It is a vital mission, and one that is far from static, because a modern, progressive, industrialized society imposes constant demands for improvements in its measurements and its standards. The pace of America's technological innovation both drives and is driven by our ability to observe and to measure, and NIST's infrastructure is vital to accelerating that innovation.

NIST's reputation and past accomplishments are known worldwide because of its laboratory-based work, and its level of excellence is the goal for all measurement research institutions. NIST is increasingly focused on the most intriguing and challenging technologies and industries of the new century, and the measurements and standards that will be crucial if U.S. industry is to innovate, compete, and excel in the future.

The requested increases for the NIST laboratories match the President's R&D priorities and the Nation's measurements and standards needs. Discoveries and advances in nanotechnology and manufacturing supply chain integration have the potential to dramatically transform manufacturing and business industries through innovation and productivity improvements. Similarly, developments and discoveries in quantum information science, hydrogen research, and new imaging techniques for materials and medical applications will potentially improve not only the life of every American, but will also have an impact on the future of people throughout the world. The ability of U.S. companies to sell their goods and services overseas to growing global markets will depend on NIST's work to open markets for U.S. workers and exporters. The complex information systems that are crucial for our daily lives will be more secure with the assistance of NIST's computer security expertise. These are the challenges and opportunities that face the Nation and NIST in the 21st Century, challenges that NIST will be better equipped to address as a result of this budget.

The President's American Competitiveness Initiative for NIST totals $104.1 million in enhancements for the core NIST programs including the NIST laboratories and facilities improvements. The major NIST focus of the American Competitiveness Initiative includes the following:

- *Targeting the most strategic and rapidly developing technologies ($45 million)*
  - Enabling Nanotechnology from Discovery to Manufacture ($20 million),
  - Enabling the Hydrogen Economy ($10 million),
  - Quantum Information Science: Infrastructure for 21st Century Innovation ($9 million),
  - Innovations in Measurement Science ($4 million), and
  - Cyber Security: Innovative Technologies for National Security ($2 million).
- *Increasing the capacity and capability of critical national assets ($27 million)*
  - NIST Center for Neutron Research (NCNR) Expansion and Reliability Improvements: A National Need ($22 million including $10 million in STRS for instrumentation development and $12 million in CRF for design of new guide hall), and
  - Synchrotron Measurement Science and Technology: Enabling Next Generation Materials Innovation ($5 million).
- *Meeting near-term needs ($12 million)*
  - Manufacturing Innovation through Supply Chain Integration ($2 million),
  - Structural Safety in Hurricanes, Fires, and Earthquakes ($2 million),
  - International Standards and Innovation: Opening Markets for American Workers and Exporters ($2 million),
  - Bioimaging: A 21st Century Toolbox for Medical Technology ($4 million), and
  - Biometrics: Identifying Friend or Foe ($2 million).
- NIST facilities improvement plan ($20.1 million)
  - Phase I design of the renovation of the main Building 1, in Boulder, Colorado ($6.3 million)
  - Design and limited renovation of Building 4 in Boulder, Colorado ($3.8 million), and
  - Increasing the base for Safety, Capacity, Maintenance and Major Repairs of NIST facilities ($10 million).

I want to emphasize and provide additional information about several of these important initiatives, to explain why the President has decided that they merit such an investment in tight budget times.

Enabling Nanotechnology from Discovery to Manufacture (+$20 million)

Nanotechnology is anticipated to be the major breakthrough technology in the 21st century—with the nanotechnology-related market predicted to exceed $1 trillion globally by 2015. Within the next 10 years, experts expect at least half of the newly designed advanced materials and manufacturing processes to be at the nanoscale. The United States is making significant investments in nanoscience and nanotechnology, and it is essential that we rapidly and efficiently transfer our basic scientific discoveries to practice within our manufacturing sector. Globally, no one country or region has a significant technological lead in this area—with the European Union, Japan, and other countries each investing about the same amount of government resources as the United States.

Successfully translating nanoscale discoveries into manufactured products will be critically dependent on:

- developing process technologies to efficiently and reliably produce commercially significant quantities of nanomaterials,
- developing advanced measurement and process-control technologies—including standard reference materials—to monitor production processes and for quality control, and
- close cooperation and interaction between the research sector, the manufacturing sector, and the national measurement standards system.

Enabling the Hydrogen Economy (+$10 million)

President Bush issued a challenge to the Nation's scientists and engineers in his 2003 State of the Union speech to overcome technical obstacles so that "the first car driven by a child born today could be powered by hydrogen, and pollution-free." Hydrogen fuels are expected to reduce the environmental impact of energy use as well as lower dependence on foreign energy sources. NIST has the technical expertise, unique facilities, and the mandate from Congress needed to make substantial contributions toward a robust hydrogen economy.

For the past 50 years, NIST has been a leading provider of data on the chemical and physical properties of hydrogen. NIST's Center for Neutron Research (NCNR) is a premier facility for the study of hydrogen. The NCNR already is being used in conjunction with major U.S. manufacturers to study the flow of hydrogen through operating fuel cells to help improve the efficiency and durability of these devices. NIST is, in fact, the lead agency for weights and measures for vehicle fuels and will need to develop physical reference standards, calibration services, and new consensus standards to help ensure equitable trade of hydrogen in the marketplace. The safe handling, production, and distribution of hydrogen presents significant challenges—which is why Congress has charged NIST with helping to develop standards for pipeline safety and reliability. NIST's expertise in building and fire research will be essential for developing model building codes that foster adoption of hydrogen technologies in local communities.

Moreover, NIST's expertise in manufacturing will be critical for advancing hydrogen process control technologies and the design of fuel cells that can be manufactured cost-effectively. That is why the President is requesting additional funding for NIST's laboratory work in this area as part of the effort to achieve the vision of a hydrogen economy.

Quantum Information Science: Infrastructure for 21st Century Innovation (+$9 million)

America's future prosperity and economic security may rely in part on the exotic properties of some of the smallest particles in nature to accomplish feats in physics, information science, and mathematics that are impossible with today's technology.

Research in quantum information seeks to control and use these properties for scientific and societal benefits. Researchers are working toward quantum computers that can solve problems in *seconds* that today's best supercomputers could not solve in *years*. Much like the way computers of today greatly improved our quality of life, quantum computers of the future will solve problems beyond our current imagination. We do know that they will create unbreakable codes to protect commercial communications, including financial transactions and video transmissions, but we also believe they will do much more. Advances in quantum information science have the potential to expand and strengthen the U.S. economy and security in the 21st century just as transistors and lasers did in the last century.

NIST is a leader in quantum research with several world-renowned scientists, including three Nobel laureates—and it is perfectly positioned to play a more critical role in advancing the quantum realm of science and harnessing its power to achieve benefits for the economy and for our security.

Under the FY 2007 initiative proposed by the President, NIST will accelerate the field by expanding its in-house research efforts and by enhancing its effort to exploit the fundamental properties of quantum systems to develop new metrology tools and methods. Moreover, NIST will establish a Joint Quantum Institute to leverage NIST's own expertise and resources with those of a university and the National Security Agency. Specific, practical benefits will include: improved security for electronic commerce; maintenance of the U.S. lead in computing and information processing; improved accuracy for electrical and other standards based on better understanding of quantum systems; and establishment of U.S. industry as the leader in the emerging field of quantum engineering.

It takes wonderful, talented people—the best in the world—to conduct the kind of Nobel Prize-winning, McArthur Genius Award-winning, National Medal of Science-winning work that is done by NIST. It also takes facilities where this work gets done, which is one reason that the President's Budget for 2007 includes $68 million—including a $32.1 million program increase (including $12 million in the NIST Center for Neutron Research initiative and $20.1 million for the NIST Facilities Improvement Plan—for *NIST's Construction and Research Facilities (CRF)* account). Moreover, these investments at NIST also support industrial innovation and competitiveness by making available special research facilities used by scientists and engineers from industry, universities, and other agencies. Congress has helped NIST to tackle some of its most pressing facilities needs, resulting in two relatively new additions. The NIST campuses in Boulder, Colorado, and Gaithersburg, Maryland, are showing their age (50 and 40 years old, respectively). Additional investments are needed if these sites are to remain fully serviceable and allow the researchers that use these facilities to be as productive as possible.

The President's proposal for CRF includes resources for safety, maintenance, repair, and facilities upgrades. The CRF request would fund:

- Construction and renovations at the NIST Center for Neutron Research, tied in with the parallel R&D initiative in STRS ($12 million),
- Increases for the NIST safety, capacity, maintenance and major repairs (SCMMR) budget to repair aging facilities ($10 million), and
- Building renovations at the agency's Boulder, Colorado, site ($10.1 million). This is a repeat request that we are making for these sorely needed renovations. We have been moving forward as quickly as possible to complete the needed projects.

Finally, the President is requesting $46.3 million to fund the *Hollings Manufacturing Extension Partnership* program. This is a reduction from the FY 2006 level that would be made in order to address the Nation's most pressing funding needs in an austere fiscal environment. NIST will focus the FY 2007 funding to maintain an effective network of centers with an emphasis on activities that promote innovation and competitiveness in small manufacturers.

The FY 2006 appropriations and estimated recoveries will be sufficient to meet all existing obligations of the *Advanced Technology Program* and to phase it out. Accordingly, no FY 2007 funds are requested.

Office of the Under Secretary ($1.5 million)

The key administrative and policy operations within the Office of the Under Secretary will be streamlined. TA will remain an effective advocate for technology within the Department of Commerce. TA, for instance, was the lead office at the Commerce Department responsible for working on the recent competitiveness summit hosted at the Department.

National Technical Information Service (fee supported)

The National Technical Information Service (NTIS), the third unit of the Technology Administration, is a repository of much of the Government's technical information that is used by the science and technical communities. NTIS maintains, sells and distributes a collection of scientific and technical information from various federal agencies. NTIS covers its operating costs through fees for its products and services; in keeping with past practice, there is no FY 2007 appropriation request.

National Oceanic and Atmospheric Administration Programs

Americans look to NOAA for a wide variety of services and support ranging from the local weather forecast, to a sustainable supply of quality seafood, to the safe

transport of millions of tons of water-borne cargo. Our scientists and managers also help keep the coastline safe and economically vibrant, and maintain detailed research on the climate from the frozen Arctic to the depths of the oceans.

NOAA's budget proposes increases for the following high priority areas:

- Satellite Continuity (+$124 million for GOES–R and NPOESS)
- Ecosystem Management (+$108 million, including $19.7 million for fisheries activities in the Gulf of Mexico and $6 million for the Open Rivers Initiative)
- Weather and Water Information (+$46 million, including $12 million to complete and operate the Tsunami Warning System and $1.4 million to operate and maintain Hurricane Buoys)
- Climate Services (+$24 million, including $6.5 million for High-Performance Computing and $4 million for the National Integrated Drought Information System)
- Commerce and Transportation (+$19.5 million, including $10.5 million to address nautical survey backlog and $5 million for critical mapping, charting, and data improvements)
- Improved facilities (+$30 million)

Mission Support/People and Infrastructure

The backbone of the NOAA infrastructure is our integrated observation effort, including building state-of-the-art satellite programs. NOAA serves with NASA and OSTP as lead for the Federal Government in developing our U.S. integrated observing strategy. Our efforts include state-of-the-art satellite programs, supported by a requested increase of $20.3 million for the tri-agency National Polar-orbiting Operational Environmental Satellite (NPOESS) program, which will replace the Polar Orbiting System (POES) program after completion of the current K–N' series of satellites.

As you are aware, the NPOESS program has encountered significant cost and schedule overruns, which are not included in the FY 2007 request. NPOESS is currently undergoing a recertification review in accordance with Nunn-McCurdy DOD regulatory requirements. This review will shape the way forward, and consequently, the Administration's future budget requirements. The Department of Defense request for NPOESS matches the NOAA request for FY 2007, as part of the shared funding arrangement.

We are also developing the next generation of geostationary satellites to maintain continuity of satellite data into the future. The FY 2007 NOAA budget requests $113.4 million to move the GEOS–R series satellites into the acquisition and operations phase of its procurement.

Ecosystems ($107.6 million increase)

The FY 2007 Budget request includes significant resources for NOAA's ocean and coastal programs, and fisheries and protected species activities in support of the President's *U.S. Ocean Action Plan.* NOAA's primary initiative is to advance ecosystem-based approaches to resource management. By applying innovative strategies to improve internal and external coordination and integration based on ecosystem principles, and by establishing baselines and integrated observations of ecosystem indicators, NOAA will increase the effectiveness of its many program activities intended to produce healthy and productive ecosystems that benefit society. Initiating ecosystem approaches to management requires better monitoring and characterization, and more effective integration and collaboration among NOAA programs and its external partners.

Highlights of the FY 2007 request in this area include $19.7 million to support fisheries programs in the Gulf of Mexico. As the Gulf region rebuilds, these programs will ensure that adequate science and management resources are available to promote sustainable fisheries. In addition, the request includes $6 million for the Open Rivers Initiative in support of cooperative conservation. This will be a competitive grant program that utilizes a community-based model to remove obsolete river barriers in coastal states. NOAA will also extend its Habitat Restoration Program to the Great Lakes, expand dedicated fishery access privilege programs, improve regional collaboration and planning of coastal state managers to improve management of coastal watersheds and marine resource areas, and enhance observing and information delivery systems to inform the public as part of the U.S. Integrated Ocean Observing System (IOOS). These increases allow NOAA to meet our responsibilities as stewards of living marine resources for the benefit of the Nation, through science-based conservation and management and the protection of ecosystem health.

Climate ($24.1 million increase)

NOAA requests $24.1 million increase (for a total of $230 million) for programs and activities increasing our ability to predict and assess current and future impacts of climate events such as droughts, floods, and trends in extreme climate events. These programs provide vital information for farmers, utilities, land managers, weather risk industry, fisheries resource managers, and other customers to make better decisions. One such investment will enable NOAA to continue building the global component of the Integrated Earth Observing System. Advancing observing systems toward global coverage will allow NOAA to better understand the state of the climate system and improve climate predictions. Another key investment is the request for $4.0 million to go towards drought impact research for the National Integrated Drought Information System (NIDIS), which will aid decision makers faced with drought and water resource management issues. The request also includes $7 million to establish the capacity to produce consistent and continually updated climate analysis data, deliver regular and systematic explanations of the state of the climate system, and advance understanding and predictions of climate extremes.

NOAA's FY 2007 Budget request includes an increase for Data Centers and Information Services, which provide access to the world's largest collection of data, including climate data, to more than 50,000 users per year. The request also includes an increase of $6.5 million for high-performance computing and communication, which will allow NOAA to use advanced computing power to forecast the Nation's weather and climate, to model ecosystems and the ocean, to and disseminate environmental information.

Weather and Water ($46.1 million increase)

The FY 2007 budget includes $46.1 million in increases to sustain and improve weather forecasts and warnings. NOAA's weather and water services make a tremendous contribution to the Nation's health and economic vitality. For instance, weather warnings protect the public from extreme environmental events while forecasts are essential to weather- and climate-sensitive industries, which account for one-third of the Nation's GDP. As an example of the benefits, during a typical hurricane season NOAA's efforts save the Nation $3 billion. Annually, drought costs the Nation $6 to $8 billion, and floods cost $5 billion and cause more than 80 deaths. There are estimates that indicate that the United States can reap a 12-to-1 return annually for every dollar invested in better water resource forecasting.

Support of the FY 2007 budget request will strengthen NOAA's ability to sustain critical services and to provide crucial enhanced services. Warning improvements include $12.4 million to operate the U.S. Tsunami Warning System and expand its scope from the Pacific to the Atlantic and Caribbean. We will use $2.5 million to provide critical infrastructure protection for the National Weather Service Telecommunications Gateway (NWSTG). Funds will be used to implement a telecommunications network solution which resolves an existing single-point-of-failure issue associated with the commercial service provider to the NWSTG. This network solution will ensure uninterrupted delivery of critical meteorological data necessary for the protection of life and property. The budget request includes $3.5 million to support the Wind Profiler Network, which will fund engineering design and award a development contract for new frequency compliant transmitters, develop contingency plans in coordination with data users for the loss of Profiler data in the case of potential search and rescue satellite (SARSAT) interference, and provide operations and maintenance for the current Wind Profiler Network.

Commerce and Transportation ($19.5 million increase)

The U.S. economy relies upon an intermodal transportation network of ship, rail, highway, and air transport to move people, cargo and commerce to, from and across the Nation. This movement is heavily dependent upon the information and services that NOAA provides—weather and ice forecasts, real-time and forecast water level conditions and obstruction surveys, navigational charts, hazardous materials response, and satellite search and rescue. From 1990 to 2003, the value of U.S. international merchandise trade increased an average six percent annually, from $889 billion to about $2 trillion (in current dollars). The U.S. Marine Transportation System (MTS) carried 95 percent of this trade by volume and 41 percent by value in 2003, more than any other transportation mode. The Nation also loses at least $4 billion annually due to economic inefficiencies resulting from weather-related air-traffic delays, and the injuries, loss of life, and property damage from surface weather-related crashes cost an average of $42 billion annually. NOAA's products and services help maintain the efficient flow of transportation and commerce.

Among our Commerce and Transportation programs, we are requesting $2.0 million to continue implementation of the National Vertical Datum Transformation

Tool database, or VDATUM. VDATUM allows Federal, State, and local government agencies to share geospatial data more effectively and benefits NOAA's modernization efforts. The FY 2007 budget request also includes $1.9 million to continue NOAA's efforts to provide Electronic Navigational Charts (ENCs). Sustained funding at this level will enable NOAA to cover all U.S. waters by 2010. In addition, $2.7 million is requested for tide and current data; $2.0 million of these funds will be used to rebuild and strengthen the National Water Level Observation Network's (NWLON) ability to provide navigation and storm tide information throughout extreme weather and water events such as hurricanes. Several stations were damaged or destroyed during the 2005 hurricane season. Lastly, $1.2 million is requested for Aviation Weather, which will fund procurement and fielding of 75 additional water vapor sensors as part of an Integrated Upper Air Observing System to continue to improve U.S. aviation safety and economic efficiencies. Water vapor information is critical to depicting weather hazards and reducing forecast errors. The remaining $0.7 million will enable NOAA to maintain the existing 13 PORTS® as well as continue expanding the program for the next several years.

CONCLUSION

We are pleased that the President's Budget reflects the important work of the science agencies housed in the Department of Commerce. The Department's research and development budget includes a number of investments critical to our nation. Thank you for the opportunity to appear here today. I welcome any questions that you may have.

BIOGRAPHY FOR DAVID A. SAMPSON

David A. Sampson is the Deputy Secretary of the U.S. Commerce Department. Dr. Sampson was nominated by President George W. Bush on April 1, 2005 and confirmed by the U.S. Senate, on July 22. He was also designated by President Bush on June 16, 2005 as a Member of the Board of Directors of the Overseas Private Investment Corporation.

Previously, he served as Assistant Secretary of Commerce for Economic Development and head of the Economic Development Administration, which leads the Federal Government's efforts to promote economic growth and regional competitiveness.

As Deputy Secretary, Sampson serves as the Department's chief operating officer, with responsibility for the day-to-day management of its approximately $6.5 billion budget, 13 operating units, and 38,000 employees. In that capacity, Sampson is also a member of the President's Management Council. The Department's portfolio is extremely varied. Its missions include promoting U.S. exports, negotiating and enforcing international trade agreements and regulating sensitive goods and technologies exports.

The Department also is the Nation's steward of the oceans and coastal marine resources; weather forecaster and climate researcher; and the lead policy agency on technology and telecommunications and administrator for federal radio frequency spectrum. In addition, Department bureaus conduct the national census; track the economy and release regular updates; issue patents and trademarks; develop and apply technology, measurements, and industrial standards; promote economic growth in distressed communities; and encourage minority business development.

Prior to joining the Bush Administration in August 2001, Sampson worked in both the private and public sectors, serving as President and Chief Executive Officer of the Arlington, Texas Chamber of Commerce; Chairman of the Texas Council on Workforce and Economic Competitiveness; and Vice Chair of the Texas Strategic Economic Development Planning Commission in then-Governor Bush's Administration.

Sampson is a graduate of David Lipscomb University, the New Orleans Baptist Theological Seminary and earned his doctorate at Abilene Christian University. He and his family currently reside in Northern Virginia.

Chairman BOEHLERT. Thank you very much. Dr. Bement.

STATEMENT OF DR. ARDEN L. BEMENT, JR., DIRECTOR, NATIONAL SCIENCE FOUNDATION

Dr. BEMENT. Ranking Member Gordon and Members of the Committee, thank you for this opportunity to provide you with some context for our 2007 budget request. As I mentioned to Chairman Boehlert before the hearing, my face muscles are getting sore from

wearing a constant grin, and it's always a special pleasure to come before the Committee when we have a budget request such as the one we have and will be discussing today.

You're well aware the President's request for NSF for 2007 is $6.02 billion, or a 7.9 percent increase over last year, and the first installment in the Administration's planned ten-year doubling of NSF's budget. Mr. Chairman, we're grateful to you for your personal leadership and also for the Committee's leadership on this issue and looking forward to working with you in the months and years ahead to achieve this ambitious goal.

NSF has been selected to play major roles in the President's American Competitiveness Initiative. These include investing in a generation of fundamental discoveries that produce valuable and marketable technologies, providing world-class facilities and infrastructure that are essential to transform research and enable discovery, and preparing the Nation's scientific, technological, engineering and mathematics workforce for the 21st century, while improving the quality of math and science education in America's schools.

By its longstanding practice of integrating graduate research with education, NSF will facilitate the direct transfer of new concepts to the private sector as graduate students involved in their discovery enter the workforce. The President's request for NSF will increase funding for Research and Related Activities by 7.7 percent to $4.7 billion. This should enable NSF to reverse a decline in our success rate by providing 500 more research grants and 6400 additional scientists, students, post-doctoral fellows, and technicians to contribute to the innovation enterprise. This increase will also bolster our ability to fund more high-risk ideas. We already make available up to five percent of research funds for small grants for exploratory research. Combined with targeted activities throughout the research directorates, more than nine percent of the research budget specifically challenges the community to take risks and engage in research at the interdisciplinary frontiers.

We will also make investments in several Administration priority initiatives. We are pleased to be the lead agency in two of the Nation's major physical science research programs, the Networking and Information Technology Research and Development Initiative, or NITRD, and the National Nanotechnology Initiative, or NNI. Funding in the request for NITRD will increase by 11.5 percent, or $93.4 million, and NNI will increase by $29.4 million, or 8.6 percent.

Within our investment that supports unique tools and world-class facilities are two new starts in our Major Research Equipment and Facilities Construction account. We are requesting $56 million for the Alaska Region Research Vessel, a ship designed to conduct essential scientific studies in waters that are home to enormous fisheries and challenged by climate change. The budget also includes $13.5 million for the Ocean Observatories Initiative, which will revolutionize our understanding of the complex interplay among oceans, geology and life in the seas. Both facilities respond to recommendations from the Congressionally-mandated U.S. Commission on Ocean Policy. The budget includes $597 million, an increase of 15 percent, for new cyberinfrastructure, including $50

million for transitioning from terascale to petascale computing. In addition, $35 million is included for NSF's Cyber Trust Program, to improve the reliability of computer systems, even if under attack. These programs will be conducted in close cooperation with the Department of Energy, DARPA and NASA.

Yet another aspect of NSF's role in the President's initiative will focus on preparing a technological workforce and improving the math and science education of children. Although the Education and Human Resources account increases $19 million, or 2.5 percent over last year, this does not reflect the total investment in education activities at NSF. After accounting for various base changes such as the planned $17 million phase-down in the Math and Science Partnership Program, and contributions from the research account, K to 12 investments actually increased by over 10 percent, and investments in undergraduate education increased by over six percent. The budget request proposes significant increases in all other Congressionally-mandated programs such as graduate fellowships and traineeships, research experiences for undergraduates and teachers, faculty early career development, Robert Noyce Scholarships, advanced technology education in two-year colleges, and informal science education. Investments to broaden participation of women, under-represented minorities and persons with disabilities will increase throughout the foundation to $640 million, with nearly $100 million from the research account. These investments will focus on proven programs that have shown success in increasing the pathways for broadening participation.

Mr. Chairman, I am very aware and appreciative of the Committee's longstanding bipartisan support for NSF, and I'll be happy to respond to any questions.

[The prepared statement of Dr. Bement follows:]

PREPARED STATEMENT OF ARDEN L. BEMENT, JR.

Chairman Boehlert, Ranking Member Gordon, and Members of the Committee, thank you for this opportunity to provide you with some context for our FY 2007 budget request. It is always a pleasure to come before you, but it is a greater pleasure when we have a budget request such as the one before us today.

As you no doubt know, the President's request for NSF for 2007 is $6.02 billion, or a 7.9 percent increase over the appropriation enacted last year. As part of the President's American Competitiveness Initiative, this request represents the first step in the Administration's firm commitment to doubling the NSF budget over the next 10 years.

The ACI encompasses all of NSF's investments in research and education. These investments—in discovery, learning, and innovation—have a longstanding and proven track record of boosting the Nation's economic vitality and competitive strength.

Our focus for 2007 emphasizes four priorities. The first of these—*Advancing the frontier*—is at the heart of everything NSF does. In a science and technology-based world, to divert our focus from the frontier is to put our nation's global preeminence in science and engineering at peril.

One of NSF's strong points is multi-disciplinary integration at the frontier, where disciplinary boundaries blur and knowledge converges. To explore that territory, our strategy must be to keep *all* fields and disciplines of science and engineering healthy and strong.

Frontier research is NSF's unique task in pursuing the Administration's research priorities within the larger federal research and development effort. Over the years, NSF has advanced the frontier with support for pioneering research that has spawned new concepts and even new disciplines. The NSF budget provides strong support in fundamental research for activities coordinated by the National Science and Technology Council (NSTC).

NSF is the lead federal agency supporting NSTC's Networking and Information Technology Research and Development (NITRD) program. The '07 budget includes investments of $904 million in NITRD—an increase of $93 million.

A highlight of the Foundation's contribution to NITRD is a $35 million investment—an increase of $10 million—in Cyber Trust. Cyber Trust supports cutting-edge research to ensure that computers and networks that underlie national infrastructures, as well as in homes and offices, can be relied on to work even in the face of cyber attacks. It's part of a larger effort in cyber security research, which totals $97 million.

NSF is also the lead in the multi-agency National Nanotechnology Initiative (NNI). NSF's '07 investment in NNI is $373 million, an increase of $29 million. Of that total, $65 million will fund Nanoscale interdisciplinary research teams (NIRTs). These awards encourage team approaches to address nanoscale research and education themes, where a collaborative blend of expertise is needed to make significant contributions.

NSF will invest $205 million—an increase of $8 million—in the interagency Climate Change Science Program. NSF supports a broad portfolio of research activities that provides a comprehensive scientific foundation for understanding climate and climate variability. Climate has a pervasive effect on the U.S. through its impact on natural resources, the economy, and the environment, so this is work of great significance to the Nation.

NSF investments in basic research in Homeland Security also increase by $42 million to $384 million. An important new effort will support a program of fundamental research on novel technologies for sensors and sensor systems to improve the detection of explosives, with a particular emphasis on Improvised Explosive Devices (IEDs).

Fundamental research can play a vital role in helping to stem this threat, and at the same time, advance the entire field of sensor research. A focal point of this $20 million activity will be improving the sensitivity and fine resolution of sensors to recognize threats earlier than current technologies.

The International Polar Year (IPY) in 2007 to 2008 will mark the 50th anniversary of the International Geophysical Year. That was a year in which unparalleled exploration of Earth and space led to discoveries in many fields of science—and we hope to emulate that success. The U.S. vision for IPY, articulated by the National Academies,[1] urges the U.S. scientific community and federal agencies to participate as international leaders.

The Administration has asked NSF to lead U.S. IPY activities. In 2007, we will invest $62 million to address major challenges in polar research. Key research programs include: Observing Environmental Change in the Arctic; Studying Ice Sheet Dynamics and Stability; and Life in the Cold and Dark.

Recent advances in elementary particle physics strongly suggest that we are on the verge of a revolution in our understanding of the nature of matter, energy, space, and time. NSF will expand its substantial investment in elementary particle physics by $15 million. The opportunities for discovery today are greater than at any point in the last half-century, particularly for the study of dark matter, dark energy, and the physics of the universe.

A new research effort to address policy-relevant Science Metrics is funded initially at $6.8 million, through the Social, Behavioral and Economic Sciences Directorate. The goal is to develop the data, tools, and knowledge needed to establish the foundations for an evidence-based science policy. NSF intends to pursue this in close cooperation with other agencies.

The National Science Foundation has been selected to play major roles in the President's American Competitiveness Initiative (ACI). These include:

- Investing in the generation of fundamental discoveries that produce valuable and marketable technologies;
- Providing world-class facilities and infrastructure that are essential to transform research and enable discovery; and
- Preparing the Nation's scientific, technological, engineering, and mathematics workforce for the 21st Century while improving the quality of math and science education in America's schools.

In pursuit of these ACI goals, NSF will continue to make major contributions to America's innovation systems by advancing new scientific and engineering concepts.

These investments are all part of the request in the President's Budget to increase support for research and related activities by 7.7 percent to $4.7 billion. This will

[1] *A Vision for the International Polar Year 2007–2008,* National Academies Press.

enable NSF to support as many as 500 more research grants and provide opportunities for upwards of 6,400 additional scientists, students, post-doctoral fellows and technicians to contribute to the innovation enterprise.

A hallmark of NSF's approach is to develop the Nation's talent pool by integrating research and education. This longstanding NSF practice facilitates the direct transfer of new knowledge to the private sector. It happens every time graduate students with experience working at the frontiers of discovery enter the work force. This is a strong suit in U.S. competitiveness, and it is one of NSF's greatest contributions to the Nation's innovation system.

As a priority within our overarching mandate *to prepare the STEM workforce for the 21st century,* NSF will continue to emphasize programs aimed at tapping the potential of those under-represented in the science and engineering workforce—especially minorities, women, and persons with disabilities. Support for this priority will total over $640 million in '07.

Three highly successful programs form the core of this investment: the Louis Stokes Alliances for Minority Participation (LSAMP), the Alliances for Graduate Education and the Professoriate (AGEP), and the Centers of Research Excellence in Science and Technology (CREST). These programs increase by $16.2 million—or 24 percent.

Broadening participation also applies to institutions. In '07, we will increase efforts to ensure that the U.S. enjoys a strong capability in science and engineering across all regions of the country. NSF will invest $100 million in EPSCoR, the Experimental Program to Stimulate Competitive Research.

Providing world-class facilities and infrastructure is our third priority for 2007. NSF has a long-established role in providing state-of-the-art infrastructure to meet major research challenges. Our strategy is to invest in tools that promise significant advances in a field of research and to make them widely available to a broad cross-section of investigators.

Total funding in the Major Research Equipment and Facilities Construction (MRFEC) account is $240.45 million. This investment funds five on-going projects and two new starts.

The two new projects are the feature attractions of our major equipment investment in 2007: the Alaska Region Research Vessel (ARRV) and the Ocean Observatories Initiative (OOI). Both projects will help to fulfill the Administration's 2004 U.S. Ocean Action Plan, developed in response to the U.S. Commission on Ocean Policy.

ARRV is a ship that will dramatically improve access to Arctic waters. With an operating year as long as 300 days, this ship could accommodate some five hundred researchers and students annually. A variety of complex regional and global ecosystem and climate studies require a technologically advanced oceanographic platform to conduct field research at the ice edge as well as in ice up to three feet thick.

OOI is an integrated observatory network, distributed among coastal and deep-sea sites, that will help advance our understanding of oceanographic and geological features and processes. With these fundamentally new tools for local, regional and global ocean science, researchers and students will now have continuous, interactive access to the ocean.

As our facilities increase in sophistication and capability, so does the amount of data they produce. The sheer volume of information is overwhelming our current computational capacity.

Cyberinfrastructure is a key factor in addressing this problem—and also in establishing and continuing global research excellence for many years to come. It remains a significant NSF priority. In 2007, funding for cyberinfrastructure research and development will reach $597 million—an increase of $77 million, or 15 percent.

NSF will invest $50 million to begin the acquisition of a leadership-class high performance computing system. This will be our first step on the road toward computation and data processing and storage, for petascale-level science and engineering. It will be a major milestone in NSF's multi-year plan to provide and support a world-class computing and data management environment that will make the most powerful high performance computing assets broadly available to the science and engineering community.

NSF's fourth priority for '07 is perhaps the most compelling: *Bolstering K–12 Education.* Today's youngsters face a world of increasing global competition. We depend on the excellence of U.S. schools and universities to provide them with the wherewithal to meet this challenge and to make their own contributions to America's future.

We clearly need to do more to build strong research foundations and foster innovation in K–12 science and mathematics education. In line with Administration's focus on this vital national priority NSF will invest $104 million in a new effort

named Discovery Research K–12 that aims to strengthen K–12 science, technology, engineering, and mathematics education. We will refocus our efforts on a vital cluster of research in three well-defined grand challenges:

- Developing more effective science and mathematics assessments for K–12;
- Improving science teaching and learning in the elementary grades; and
- Introducing cutting-edge discoveries into K–12 classrooms.

We will also increase funding for the Graduate Teaching Fellowships in K–12 Education—better known as GK–12—by nearly 10 percent to $56 million, supporting an estimated 1,000 graduate fellows. By pairing graduate students and K–12 teachers in the classroom, this program has been particularly successful in encouraging effective partnerships between institutions of higher education and local school districts and in exposing young minds to role models.

Although the Education and Human Resources account increases $19 million, or 2.5 percent over last year, this does not reflect the total investment in education activities at NSF. After accounting for various base changes, such as a planned $17 million phase down in the Math and Science Partnership program, and contributions from the research account, K–12 investments actually increase by over 10 percent and investments in undergraduate education increase by over six percent. The budget request proposes significant increases in all other Congressionally mandated programs, such as graduate fellowships and traineeships, research experiences for undergraduates and teachers, faculty early career development, Robert Noyce scholarships, advanced technology education in two-year colleges, and informal science education.

Today, I have only mentioned just a few of the FY 2007 investment highlights. With this first installment of the ten-year commitment to double NSF's budget, we will be able to capitalize on the many areas of emerging promise already on the horizon.

That means generating quality programs year, after year, after year—and continuing to lead the federal momentum toward more robust business practices as we put tax dollars to work for the Nation. We are proud of the leadership we've provided through the President's Management Agenda. As is highlighted in the budget, NSF is one of three agencies recognized as models of excellence in Grants Management, and we are committed to upholding that tradition.

The President's American Competitiveness Initiative makes clear the larger rationale for investments in science and engineering. This is to put knowledge to work—to improve the quality of life and enhance the security and prosperity of every citizen. NSF is committed to cultivating a science and engineering enterprise that not only unlocks the mysteries of the universe but that addresses the challenges of America and the world.

Mr. Chairman, I hope that this brief overview conveys to you NSF's commitment to advance science and technology in the national interest. I am very aware and appreciative of the Committee's long-standing bipartisan support for NSF, and I would be happy to respond to any questions that you have.

BIOGRAPHY FOR ARDEN L. BEMENT, JR.

Arden L. Bement, Jr., became Director of the National Science Foundation on November 24, 2004. He had been Acting Director since February 22, 2004.

He joined NSF from the National Institute of Standards and Technology, where he had been Director since Dec. 7, 2001. Prior to his appointment as NIST Director, Bement served as the David A. Ross Distinguished Professor of Nuclear Engineering and head of the School of Nuclear Engineering at Purdue University. He has held appointments at Purdue University in the schools of Nuclear Engineering, Materials Engineering, and Electrical and Computer Engineering, as well as a courtesy appointment in the Krannert School of Management. He was Director of the Midwest Superconductivity Consortium and the Consortium for the Intelligent Management of the Electrical Power Grid.

Bement served as a member of the U.S. National Science Board from 1989 to 1995. The board guides NSF activities and also serves as a policy advisory body to the President and Congress. As NSF Director, Bement will now serve as an ex officio member of the NSB.

He also chaired the Commission for Engineering and Technical Studies and the National Materials Advisory Board of the National Research Council; was a member of the Space Station Utilization Advisory Subcommittee and the Commercialization and Technology Advisory Committee for NASA; and consulted for the Department

of Energy's Argonne National Laboratory and the Idaho National Engineering and Environmental Laboratory.

Bement joined the Purdue faculty in 1992 after a 39-year career in industry, government, and academia. These positions included: Vice President of Technical Resources and of Science and Technology for TRW Inc. (1980–1992); Deputy Under Secretary of Defense for Research and Engineering (1979–1980); Director, Office of Materials Science, DARPA (1976–1979); Professor of Nuclear Materials, MIT (1970–1976); Manager, Fuels and Materials Department and the Metallurgy Research Department, Battelle Northwest Laboratories (1965–1970); and Senior Research Associate, General Electric Co. (1954–1965).

He has been a Director of Keithley Instruments Inc. and the Lord Corp. and was a member of the Science and Technology Advisory Committee for the Howmet Corp. (a division of ALCOA).

Bement holds an engineer of metallurgy degree from the Colorado School of Mines, a Master's degree in metallurgical engineering from the University of Idaho, a doctorate degree in metallurgical engineering from the University of Michigan, an honorary doctorate degree in engineering from Cleveland State University, and an honorary doctorate degree in science from Case Western Reserve University. He is a member of the U.S. National Academy of Engineering.

Chairman BOEHLERT. Thank you very much. Dr. McQueary.

STATEMENT OF DR. CHARLES E. MCQUEARY, UNDER SECRETARY, SCIENCE AND TECHNOLOGY, DEPARTMENT OF HOMELAND SECURITY

Dr. MCQUEARY. Thank you, Mr. Chairman, Congressman Gordon, distinguished Members of the Committee. It is a pleasure to be here with you today to discuss the budget for research and development activities of the Department of Homeland Security's Science and Technology Directorate. The House Science Committee was the first Congressional committee I appeared before following my confirmation in the spring of 2003, and as I am leaving my post next month, I expect this to be the last Congressional committee I will testify before as DHS Under Secretary for Science and Technology, so this hearing today would come full circle.

As this committee and many of the Nation's leaders recognize, advancement in science and technology play a vital role in protecting our country from natural and manmade disasters. Making such advancements happen and carrying them from their hypothetical beginnings to real-life application is the job of the Science and Technology Directorate. We are doing this, of course, to get the critical tools to those who stand between us and disasters.

In the days and weeks that followed Hurricane Katrina, the Science and Technology Directorate staff provided valuable subject matter expertise in diverse areas that including emergency responder communications, evacuation logistics, robot-assisted search and rescue, and hazardous biological material disposal. S&T also contributed to modeling and simulation analyses of petroleum shortages and disease impacts, critical infrastructure damage and economic impact, and of course we all know that there were tremendous difficulties there and that continues to be discussed at great length within the Congress and our country.

Many of our ongoing efforts focus on improving tools and systems that will enhance emergency response capability. Some of these include standards to ensure the reliability of equipment and processes, personal protective equipment to help responders function well in contaminated environments, and a framework for wireless

inter-operability so the responders can communicate effectively with one another during an emergency.

I'd like to highlight a few of the many accomplishments of the R&D programs of the past year. S&T collaborated with local partners to implement second generation enhancements to BioWatch, a bioaerosol monitoring system operating in more than 30 U.S. urban areas. We have significantly increased the number of air collectors in the top threat cities, extending protection to more people while fortifying our coverage of transit systems and special events. We also commenced operation of the National Bioforensics Analysis Center, the Nation's leading resource for the analysis of forensic samples to identify perpetrators of biological attacks. We transitioned the PROTECT chemical detection system for public facilities to the New York City Metro Transit Authority, and PROTECT is now operating in subway systems in New York City, Washington, D.C. and Boston.

In the explosives area, S&T collaborated with the Office of Domestic Preparedness, which is now called the Office of Grants and Training, on preliminary testing of blast-resistant trash receptacles. We are using the test results to write the first national standard for this technology. S&T's Border Watch Program is advancing our border surveillance and monitoring capabilities and supporting border patrol agents in remote locations. We're developing a wireless communications framework that equips field agents with sophisticated tools that enable them to quickly determine if people crossing the border illegally present a criminal or terrorist threat to the United States.

On the cyber front, and I know that's an area you have a great personal interest, as does the Committee, on the cyber front, we established the Cyber Security Testbed Program to explore threats to network security without compromising the Internet. Just as you need a secure biocontainment facility to handle live viruses, you need a secure cyber containment facility to work with computer viruses, and this is what the testbed provides, and I also should say that this work was done jointly with NSF. S&T is now participating in the Interagency Networking and Information Technology R&D Program to help ensure that the department's cyber security and critical infrastructure R&D activities are coordinated with those of other federal agencies.

Manufacturers and sellers who can produce and distribute effective anti-terrorism technologies require certain protections to encourage the development of countermeasures that are critical in the fight against terrorism. Towards this end, we have certified or designated some 57 technologies as qualified anti-terrorism technologies, making them eligible for the Safety Act protections, and we are on schedule in reviewing all applications that have been submitted to date. A far more extensive summary of the accomplishments are in the written testimony for the record and you can read that at your leisure.

Let me just briefly mention the 2007 plan and then I'll wrap up. We do support the department's goals and objectives through strategic RDT&E investments that weigh the risks facing the Nation and the estimated cost and benefits and solutions—for fiscal year 2007, the S&T Directorate proposes a budget of approximately $1

billion and 383 full-time equivalent employees. And this year we now have the M&A account properly accounted for and it will be much more visible to the Congress and others as to how that money is being spent, and that's been discussed with with your staff people, I believe, so that there's an understanding there.

Finally, the requested R&D and acquisition operations appropriations which we're requesting is $806 million. And I think, sir, with that, I will wrap up my comments and thank you for the opportunity for appearing before you and I look forward to trying to answer the questions you have.

[The prepared statement of Dr. McQueary follows:]

PREPARED STATEMENT OF CHARLES E. MCQUEARY

INTRODUCTION

Good morning Chairman Boehlert, Congressman Gordon, and distinguished Members of the Committee. It is a pleasure to be with you today to discuss the research and development activities of the Department of Homeland Security's (DHS) Science and Technology (S&T) Directorate.

As this committee and many of our nation's leaders recognize, advancements in science and technology play a vital role in protecting our nation from natural and man-made disasters. Making such advancements happen—carrying them from their hypothetical beginnings to real-life applications—is the job of the S&T Directorate.

We are committed to developing cutting-edge tools and systems that will enable the dedicated men and women who protect and secure our homeland to serve more effectively and efficiently. Providing these end-users at all levels of government with the technological capabilities they need, regardless of the type of threat, is our most important mission.

For example, in the days and weeks that followed Katrina, S&T Directorate staff provided valuable subject matter expertise in diverse areas, including emergency responder communications, evacuation logistics, robot-assisted search and rescue, appropriate technology applications, hazardous biological materials disposal, and site preparation, and rapid deployment of mobile and modular shelters. Our staff also contributed modeling and simulation analysis in areas that include petroleum shortages, disease impacts, critical infrastructure damage, and economic impact. In addition, a number of staff members worked as volunteers, supporting Federal Emergency Management Agency (FEMA) in the relief effort.

Many of our ongoing efforts are improving tools and systems that will enhance emergency response capabilities. We are developing standards for emergency response to ensure the reliability of equipment and processes; developing personal protective equipment for emergency responders when operating in hazardous chemical, biological or nuclear environments; and developing inter-operable systems to keep the lines of communication open and clear during a disaster. In addition, the S&T Directorate made significant organizational strides:

- With the transfer of the Transportation Security Laboratory into the S&T Directorate, we completed the plan to consolidate existing research, development, testing and evaluation (RDT&E) within DHS. Given our principal responsibility of coordinating and organizing research and development (R&D) activities throughout the Department, I consider this a major accomplishment that will enable the Department to maximize its science and technology resources.
- The S&T Directorate also made internal management changes that will enable us to productively focus our efforts and work more efficiently. Last year, we established the position of the Chief Financial Officer to oversee finance, budget, planning, and program analysis and evaluation. We also established the position of Director of Plans, Programs and Requirements to coordinate the direction and activities of the S&T Portfolios. I will describe these Portfolios further when I discuss the organization of the S&T Directorate.
- As a three-year-old organization, I am very proud of the great progress the S&T Directorate has made on creating a Strategic Plan that will solidify our five to ten-year-vision for RDT&E. An accompanying performance management system now in development will enable us to establish highly effective, adaptable business operating policies and procedures that will position the or-

ganization to meet the current and future needs of our nation, regardless of the threats we face.

SHORT- AND LONG-TERM RESEARCH

At the S&T Directorate, we know we must also push qualified technologies out of the development pipeline faster and deploy them in actual operating environments so that we are better prepared the next time we are put to the test. To that end, the Directorate has focused its efforts on near-term development and deployment of technologies. However, as part of the Nation's science and technology complex, we recognize the importance of a sustained effort to expand our knowledge and resource base for the future.

Our investments are diversified not only in terms of challenges and opportunities, but also in terms of technological maturity as well. Some scientific problems are basic—we must achieve a core understanding of some phenomena. Others are problems of application—we must learn how to apply our knowledge and understanding of an issue or problem to our own mission. Finally, other technological problems involve engineering development—we must investigate and determine how to move applied knowledge from the laboratory bench to the user. The Department invests in all three. We conduct and sponsor *basic* and *applied* research as well as *advanced technology development.*

- Basic research is sponsored in the expectation that its results will eventually give us new and better ways of accomplishing our mission. For example, understanding terrorist motivations and being able to predict intent; or improving our fundamental knowledge of the properties of non-traditional chemical agents.
- Applied research takes what we already know how to do, and forms it into a useful homeland security application. Integration of biometric data into identification documents and devices used to secure shipping containers during transit are examples of this type of activity.
- Advanced technology development leads to the invention of new devices and systems that can ultimately be transitioned to end-users. Our new handheld scanners for chemical countermeasures are a good example of this.

These three kinds of work have very different timetables. Basic research has the longest—it may take a decade or more before a fundamental discovery results in a technology deployed in the field. Applied research tends to progress in months and years. Developmental research is closest to the user—here we work to take advantage of identified opportunities to rapidly develop technologies and deliver them to end-users.

In fiscal year (FY) 2005 approximately two percent of our funding went to basic research, 79 percent to applied research, and 19 percent to developmental research—very similar to our FY 2004 funding distributions. I expect the distribution in FY 2006 and FY 2007 to be similar. In addition, it is important to note that the S&T Directorate has established an improved method for tracking these types of obligations, which will improve the accuracy of these estimates in the future.

FY 2005 ACCOMPLISHMENTS

I am pleased to report to you the progress we have made in just three years. Much of the work the S&T Directorate carries out requires years of scientific pursuit before it comes to fruition. However, we are beginning to see knowledge and technology emerge that will provide the foundation for strong and resilient homeland security for the Nation.

I would like to highlight in more detail the accomplishments in our research and development programs over the past year.

Regarding our efforts to develop and implement chemical, biological, and explosive countermeasures, we:

- Initiated deployment of BioWatch Enhancement (Generation 2) in more than 30 U.S. urban areas, in collaboration with local partners This enhancement places significantly more air collectors in the top threat cities (including collectors that cover transit systems and special events), allowing them to further increase their broad population protection while also providing targeted coverage of their most vulnerable venues.
- Conducted detailed technical material threat assessments on six agents. This work is done in direct support for the procurement of countermeasures under the DHS/HHS BioShield program.

- Began operating the National Bioforensics Analysis Center (NBFAC) as the Nation's lead facility for technical analysis of forensic samples in order to support attribution, or identify perpetrators, of biological attacks.
- Approved a record of decision on the Environmental Impact Statement (EIS), awarded an architect-engineer design contract, and awarded a contract for construction management services for the National Biodefense Analysis and Countermeasures Center (NBACC).
- Completed and provided the FY 2006 Bioterrorism Risk Analysis to the Administration. This risk assessment, mandated by Homeland Security Presidential Directive (HSPD)–10, is targeted to inform national plans and priorities for biodefense investments and will be a helpful tool to guide DHS policy-makers regarding the Department's efforts to anticipate, prevent and respond to acts of bioterrorism.
- Conducted an Interagency exercise to study an incident involving persistent highly toxic chemical agent release.
- Transitioned the Program for Response Options and Technology Enhancements for Chemical Terrorism (PROTECT) networked chemical detection system to the New York City Metro Transit Authority. PROTECT is a chemical detection and response system that was designed for public facilities. It was first installed in the Washington, D.C. metro transit system, and is now operating in the New York and Boston subway systems as well.
- Began establishing the Explosives Knowledge Center, which will enable State, local, and tribal communities to assess the risks of explosive attack and the costs of countermeasures.
- Drafted the first-ever performance standard for a point chemical agent vapor detector for use by civilian responders which is being vetted through the standards organization, ASTM International.
- Developed standards for calibration and optimization of performance for hand-held, trace-explosive detectors.

Within the areas of support to the Department's components, we:

- Conducted an exercise with Customs and Border Protection (CBP) under the Northern Border Security Initiative that identified capability gaps and the technologies needed to address them. The exercise identified what technologies both Canada and the United States agree will improve border security capabilities. The S&T Directorate will use these outcomes to help focus and maximize the development of border security technologies. A report to Congress was delivered in January 2006 on this issue. This effort was in support of CBP.
- Conducted end-to-end testing of the Border and Transportation Security Network (BTSNet) wireless communications backbone installed at the U.S. Border Patrol Station in Douglas, Arizona. The testing focused on the transfer of data from handheld and vehicle-mounted mobile computers to the border patrol station via an existing tower infrastructure. This effort was in support of CBP.
- Designed, built, and tested through the Maritime Automated Scene Understanding (ASU) project, a system that fuses RADAR, camera, and Automatic Identification System (AIS) data, and alerts watchstanders to anomalies in the coastal environment. This effort was in support of the U.S. Coast Guard.
- Completed Phase I design of the Advanced Container Security Device (ACSD). The ACSD is a security device being designed to monitor and communicate security breaches from each of the six sides of a container, as well as detect human presence inside containers. This effort was in support of CBP.
- Developed the Supply Chain Security Architecture (SCSA) that gives DHS the capability to bridge data and information between container security devices and the National Targeting Center. This effort was in support of CBP.
- Brought the Interagency Modeling and Atmospheric Analysis Center (IMAAC) to full operational capability. IMAAC integrates the Nation's best modeling capabilities to provide accurate information to predict the movement and spread of the contaminate cloud in the event of a major disaster or terrorist attack, thereby saving lives and assisting with timely response decisions. This effort is in support of federal, State, and local response organizations through the Homeland Security Operations Center (HSOC), serving as the dissemination point for the Department.

- Established the "Training Exercise and Lessons Learned" program to support continuous improvement of our nation's preparedness to respond to catastrophic events, as called for in HSPD–8, *"National Preparedness."* This effort is in support of federal, State, and local response organizations through the Office of Grants and Training.
- Developed in partnership with the U.S. Coast Guard, the U.S. Navy and others, a low cost commercial anti-swimmer system to protect high value assets from underwater attack. This effort was in support of U.S. Coast Guard.
- Tested non-intrusive technologies to quickly inspect shipboard spaces, to locate or inspect hidden compartments for contraband, and technologies to communicate with boarding team members. This effort was in support of U.S. Coast Guard.
- Began support of three efforts to enhance personal protection for U.S. Secret Service personnel: Escape Mask, Handheld Suicide Bomber Detector, and Portable Entry Point Screening Portal for Explosive Detection. This effort was in support of the U.S. Secret Service.

Within the areas of critical infrastructure protection and cyber security, we:

- Established the Cyber Security R&D Center, the S&T Directorate's primary interface with the academic and industrial cyber security research communities.
- Established the Infrastructure Security Program, the goal of which is to develop more secure and robust mechanisms that will enable the Internet to support the Nation's needs now and in the future.
- Established the Cyber Security Testbed Program, which enables a wide community of researchers to explore threats to network security without risk of compromising the actual Internet.
- Completed development of software algorithms in coordination with the Electric Power Research Institute for a fast-running modeling and simulation prototype for use in preventing cascading blackouts.
- Published two reports that identified technology aids that significantly close existing operational gaps, to increase the accuracy and reduce the time and cost for personnel background investigations for private security guards and insiders in sensitive positions.
- Issued the first annual National Critical Infrastructure Protection R&D Plan that addressed R&D priorities in the areas of protection and prevention, sensors and detectors, insider threats, social and behavioral issues, and future needs.
- Initiated 11 new projects (bringing our total number of those underway to 22) including rapid prototyping at the Kentucky Critical Infrastructure Protection Institute to support the Department's ability to protect community-based infrastructure.

Within the emerging threats and rapid prototyping areas of the S&T Directorate, we:

- Evaluated the compounded infrastructure threat by investigating ways in which infrastructure (i.e., planes into buildings, nuclear plants, chemical plants) could be used as a weapon. The effort was used to discover and identify those infrastructures not previously viewed as concerns.
- Initiated the Rapid Technology Application Program (RTAP) to expeditiously provide needed new technologies to federal, State and local components of the homeland security mission. End-users have generated 28 urgent rapid prototyping requirements including the need for specialized personal protective equipment, rapid biological screening tools, portable explosive trace detectors, and systems to immediately locate emergency responders in the field.

Within other areas of the S&T Directorate, we:

- Established the National Science and Technology Threat Awareness and Reachback (NSSTAR) system to provide real time, technical analysis and support to the homeland security community for anticipating, preventing, and responding to chemical, biological, radiological, nuclear, and high explosive (CBRNE) threats.
- Established an Institute for Discrete Sciences (IDS) to investigate and develop the specialized computing algorithms and hardware architectures necessary

to analyze massive amounts of diverse data from multiple, disparate, distributed data sources and to model terrorist attacks and simulate consequences on a real-time, high-resolution basis.

- Completed an engineering design for the Enhanced International Travel Security (EITS) system, which allows the validity of travel documents and the identity of travelers to be determined in real time at U.S. borders and other points of entry.
- Created the Interagency Center for Applied Homeland Security Technology (ICAHST) to enable collaboration among intelligence and law enforcement community agencies on the testing, evaluation, and prototyping of information analysis and sharing technologies.
- Established Regional Communications Inter-operability Pilot (RCIP) projects in Nevada and Kentucky. These pilots focused on developing models for improved communications and inter-operability to address challenges faced nationwide.
- Established two additional DHS Centers of Excellence at national universities: the National Center for the Study of Terrorism and Responses to Terrorism, and the Center for the Study of High Consequence Event Preparedness and Response. This brings the total number of such university based national centers to five.
- Supported approximately 300 undergraduate and graduate students in DHS mission-relevant fields through the Scholars and Fellows Program, as well as funded postdoctoral scientists and engineers to perform advanced research in areas of critical importance to DHS.
- Integrated two competing Counter-Man Portable Air Defense System (MANPADS) prototypes with planned airframes and performed on-board ground and flight testing to verify system performance and continued air worthiness of the aircraft with the countermeasure system installed.
- Updated SAFECOM's coordinated grant guidance that outlines eligibility requirements, the purposes for which grants may be used, and the guidelines for implementing a wireless communication system. SAFECOM is a communications program that provides RDT&E, guidance, tools, and templates on communications-related issues to local, State, and federal public safety agencies.
- Prepared the survey tools for the Interoperability Baseline Study, which will provide a quantitative National assessment of public safety communications inter-operability.
- Prepared a revised application kit for the *Support Anti-terrorism by Fostering Effective Technologies Act of 2002,* known as the SAFETY Act, that is easier to use and understand, with examples to assist applicants.
- Processed more than 260 pre-applications and 134 unique technology applications under the SAFETY Act. As of Jan. 5, 2006, we granted Designation and Certification to 41 qualified anti-terrorism technologies. An additional 16 technologies have been granted "designation only" status.

FY 2006 ACTIVITIES

As the S&T Directorate matures, we have continued to re-evaluate and reassess our priorities to better facilitate capabilities needed by the Department and other customers to make information and analysis sharing possible, to protect the Nation's borders and critical infrastructure, and to ensure that technical and operational solutions enable federal, State, and local emergency personnel to anticipate, respond to, and recover from attacks on the United States. Just as the Nation's science and technology capabilities have helped us defeat enemies overseas in the past, so too will they help the Nation defeat future efforts of terrorists to successfully attack and disrupt the American way of life. To prepare the Nation to counter threats from weapons of mass destruction as well as natural disasters, the FY 2006 budget request included increase for initiatives that supported R&D to mitigate these weapons and their potentially devastating effects as well as efforts aimed at leveraging technology to produce rapid advances in capabilities to enable DHS personnel to protect the homeland more efficiently and effectively across many components.

Our major ongoing FY 2006 initiatives are aimed at mission-critical areas and problem sets. Some highlights include:

- **National Bio and Agrodefense Facility (NBAF)—**The proposed NBAF is envisioned to provide the Nation with the first integrated agricultural, zoonotic disease, and public health RDT&E facility with the capability to address threats from human pathogens, high-consequence zoonotic disease agents, and foreign animal diseases. This supports the complementary missions of DHS, the Department of Human Health and Services (HHS) and the United States Department of Agriculture (USDA). NBAF will provide new RDT&E infrastructure that will allow for research to enhance agricultural and public health. This capability is needed to fill a critical gap in the Nation's agro and biodefense plan. The NBAF would enhance the national biodefense complex by modernizing and integrating agriculture biocontainment laboratories for foreign animal disease, human pathogens, and zoonotic diseases through Biosafety Level (BSL) 3 Agricultural and BSL 4 laboratory spaces. It will also provide the additional infrastructure required for threat and vulnerability assessments and for testing and evaluating promising foreign animal disease countermeasures. Development of an integrated, national bio and agrodefense strategy has revealed that the current capabilities are inadequate to meet future research requirements supporting both agricultural and public health national security. Foreign animal disease studies, public health threats from emerging, high-consequence zoonotic pathogens, and the need for development and licensure of medical countermeasures, are generating additional demands for biocontainment laboratory space. Current laboratory space available in the United States is not sufficient to support the increasing levels of research, development, and testing needed to meet the growing concerns about accidental or intentional introduction of foreign animal diseases into this country. DHS issued an Expression of Interest (EOI) on January 19, 2006, to solicit interest for potential sites for the NBAF facility. The EOI will solicit input from organizations or consortia of federal agencies, State and local governments, industry, and academic institutions. In addition to the EOI, the S&T Directorate plans to release a request-for-proposals in February 2006 to procure architect-engineer services to conduct conceptual design studies for the NBAF.
- **Low Volatility Agent Warning System—**Develop the Low Volatility Agent (LVA) Warning System to serve as the basis for a warning and identification capability against a set of chemical threat agents whose vapor pressure is sufficiently low that detection by conventional approaches is exceptionally difficult. This set of low volatility agents includes some of the most toxic materials currently known. The Chemical Countermeasures Portfolio has initiated an effort to develop a transportable capability for the detection of these materials in a response and recovery mode—the LVA Surface Contamination Monitor. The FY 2006 funding is being used to develop a protection-mode capability to detect these materials upon release in specific environments. This detect-to-warn system will alert the response system of the imminent hazard thereby enabling protection of potential victims from exposure and permitting application of prompt medical countermeasures to minimize or eliminate casualties. This system will be a network of detectors to provide a protect-to-warn capability for specific venues, such as high-value buildings and transit systems. The LVA Warning System will both detect and identify the agent to ensure correct medical countermeasures are engaged.
- **Counter-MANPADS—**Based on the Phase II results in FY 2006, the Counter-MANPADS Program will initiate Phase III to conduct operational test and evaluation on Counter-MANPADS advanced prototype equipment installed on commercial aircraft operated by U.S. cargo carriers. The primary objective is to reduce the residual risk of operations in the commercial environment and lower the cost of ownership. To maintain competition between two different approaches to design and integration, the Counter-MANPADS Program will maintain two contractors in Phase III. In FY 2006, each contractor will update its designs to incorporate enhancements for reliability improvements, technology protection, and emergency ground notification. Operational testing and evaluation will be performed on multiple aircraft types to capture true operations and maintenance costs, as well as technical performance and reliability data. In FY 2006, eight operational test aircraft will be modified and nine Counter-MANPADS systems will be procured to support reliability developments, test data collection, and critical technology protection measures. Additionally, live fire test evaluations will provide insight into the overall effectiveness of the system installed on commercial aircraft. Finally, Federal Aviation Administration (FAA) certification will be completed

for additional relevant aircraft types, models and series not addressed in Phase II.

- **Research and Development Consolidation—**The consolidation of the Department's R&D efforts will continue to be an ongoing priority for the S&T Directorate. We will continue working with the Transportation Security Administration, CBP and others to solidify integration of their RDT&E activities into the S&T Directorate. This consolidation is bringing the scientific and engineering personnel and other RDT&E resources of the Department under a single accountable authority.

FY 2007 PLAN

In FY 2007, the S&T Directorate will maintain ongoing activities in science and technology research to detect and counter threats and attacks; protect the Nation's critical infrastructure, both physical and cyber; analyze and assess threats and vulnerabilities; and provide cutting edge technologies to operational end-users. We will support the Department's strategic goals and objectives by performing RDT&E while addressing the following criteria:

- *Risks facing the Nation* that are identified and weighed by the S&T Directorate and others, including DHS's Office of Intelligence Analysis;
- *Homeland security needs* that are identified through a systematic science and technology needs identification process that the S&T Directorate conducts with its partners;
- *Estimated costs, benefits, implementability, and potential effectiveness* of results of science and technology research and programs; and
- *DHS's overall priorities,* since the S&T Directorate supports and enables DHS's overall homeland security efforts.

To accomplish these goals, the S&T Directorate proposes a total budget of $1.0 billion and 383 full-time equivalent employees (FTEs). The "Management and Administration" request is for $195.9 million and provides the resources for the salaries and benefits of the S&T Directorate's employees in support of our homeland security R&D programs. The request for the "Research, Development, Acquisition and Operations" appropriation is $806.4 million.

The FY 2007 President's budget for the S&T Directorate provides the Department with the resources necessary to continue and advance our efforts to develop and deploy the technologies required to enhance the security of the homeland in the 21st century.

Program increases proposed in the FY 2007 President's budget include:

- $7.1 million is requested for the Cyber Security program to enhance efforts in the areas of Domain Name Infrastructure, Secure Protocols for Routing Infrastructure, Cyber Security Testbed development, Large-scale Network Datasets, and Highly Scalable Identity Management.
- $2.0 million is requested to establish a Joint Agro-Terror Defense Office (JADO). The Department's agrodefense responsibilities are defined in several public laws and Homeland Security Presidential Directives, including: the *Homeland Security Act of 2002; Critical Infrastructure Identification, Prioritization, and Protection* (HSPD–7); *Defense of United States Agriculture and Food* (HSPD–9); and *Bio-defense of the 21st Century* (HSPD–10). The JADO will be led by an executive director who will lead an interagency staff. The JADO will be responsible for coordinating development and deployment of the integrated government-wide agro-defense programs called for by these directives and law.
- $1.0 million to comply with the requirements of Public Law 108–330, the *DHS Financial Accountability Act* which requires the annual Performance and Accountability Report to include an assurance by the Secretary of the adequacy of financial reporting controls. These funds are a critical component of the Department's efforts to prevent waste, fraud and abuse and enhance its financial accountability.

In addition, the FY 2007 S&T Directorate budget proposes the realignment of approximately $110.0 million from the S&T Directorate's "Research and Development" appropriation account to the "Management and Administration" appropriation account. This realignment of funds is proposed to more accurately reflect the fact that in the past, these funds have been used to support the direct and indirect management, administration, and oversight costs associated with the Department's science

and technology enterprise. Furthermore, it will provide the Congress and other interested parties with a more transparent view into the S&T Directorate's operations, the distribution of planned and actual expenditures between research and development activities, and the direct and indirect costs associated with their delivery.

RDT&E PROCESS

As I stated one year ago, the S&T Directorate developed an RDT&E process to provide a clearly defined, replicable method for assessing needs and risk, planning, allocating resources and executing programs to produce high-impact, cost-effective and critically needed homeland security technology solutions. We are in the process of streamlining this process to address our programmatic needs. We will use this process to carry out risk-based planning.

SCIENCE AND TECHNOLOGY DIRECTORATE ORGANIZATION

The S&T Directorate is the research and development component of the Department of Homeland Security. The S&T Directorate organizes the vast scientific and technological resources of the United States to prevent or mitigate the effects of catastrophic terrorism against us or our allies. It unifies and coordinates much of the Federal Government's efforts to develop and implement scientific and technological countermeasures to terrorist threats. The S&T Directorate is a technically robust, agile, and responsive organization capable of meeting all of its current and future roles and responsibilities in the Department. The four elements of the S&T Directorate are:

- Office of Plans, Programs, and Requirements (PPR);
- Homeland Security Advanced Research Projects Agency (HSARPA);
- Office of Research and Development (ORD); and
- Office of Systems Engineering and Development (SED).

The S&T Directorate implements its science and technology activities through focused portfolios (organizationally within PPR) that address biological, chemical and explosive threats; support the research and development needs of the operational components of the Department; support federal, State, local and tribal preparedness and infrastructure protection; and cross-cut areas such as standards, threat awareness, and inter-operability that impact all aspects of the S&T Directorate's RDT&E process. These portfolios cut across the four elements of the S&T Directorate and integrate the innovative input from private industry and academia as well as national and federal laboratories. In particular, PPR provides the requirements and technical vision for the S&T Directorate and its RDT&E process. HSARPA has an essential role in meeting the goals and objectives of the Department and the S&T Directorate, through research and development, and technology maturation in industry and academia. ORD executes the S&T Directorate's RDT&E programs within the national and federal laboratories; establishes the University Centers of Excellence; and maintains the Nation's enduring research and development complex dedicated to homeland security. SED oversees the transition of large-scale and pilot systems to the field through program offices, which bring mature technologies from the laboratory to the user through a rapid, efficient, and disciplined project management process. In addition, the S&T Directorate houses the Office of Weapons of Mass Destruction Operations and Incident Management to offer scientific advice and support to meet operational needs. Through this office, the S&T Directorate exercises its scientific and technical leadership role under the *National Response Plan.*

Portfolios

Biological Countermeasures

The Biological Countermeasures Portfolio provides the understanding, technologies, and systems needed to anticipate, deter, protect against, detect, mitigate, and recover from biological attacks on this nation's population, agriculture or infrastructure. Biological threats can take many forms and be distributed in many ways, and we take an integrated systems approach to countering them. Our principal areas of interest include: vulnerability and risk analysis to identify the need for vaccines, therapeutics, and diagnostics; development and implementation of early detection and warning systems to characterize an attack and permit early prophylaxis and decontamination; and development of a national bioforensic analysis capability to support attribution of biological agent use. Simulation, modeling, and gaming form an important part of this effort. They help guide and prioritize technical developments, and they are invaluable in training decision makers before and during an event. The Directorate's partners include the Department of Health and Human

Services (HHS), the Department of Defense (DOD), the Department of Agriculture (USDA), the Environmental Protection Agency (EPA), the Department of Justice (DOJ), the Department of State (DOS), the United States Postal Service (USPS), and State and local operational end-users.

Chemical Countermeasures

The Chemical Countermeasures Portfolio enhances the Nation's capability to anticipate, prevent, protect from, respond to, and recover from chemical threat attacks through interagency leadership and innovative research, development, and technology transition.

Our objectives are to enable comprehensive understanding and analyses of chemical threats in the domestic domain; to develop pre-event assessment, discovery, and interdiction capabilities for chemical threats; to develop capability for warning, notification, and timely analysis of chemical attack; to optimize technology and process for recovery from chemical attacks; and to enhance the capability to identify chemical attack sources. Our work reflects our recognition of the need to prepare against a range of threats-classical chemical warfare agents (CWA), toxic industrial chemicals (TICs), and non-traditional agents (NTAs). Coordination with other agencies like the EPA, HHS, the Federal Bureau of Investigation (FBI), DOD, the interagency Technical Support Working Group (TSWG), and the Intelligence Community (IC) remains critical to support our national chemical preparedness goals. The DOD has developed a particularly strong chemical defense program over a number of decades, and is a key partner for moving new capabilities into the domain of homeland security.

Explosives Countermeasures

The Explosives Countermeasures Portfolio develops and coordinates technical capabilities to detect, interdict, and mitigate the consequences of the use of improvised explosives devices (IEDs) in terrorist attacks against U.S. citizens and critical infrastructure. RDT&E activities include prioritization of efforts among the many possible terrorist threats and targets, development of new detection technologies, and evaluation of integrated protective systems for high-value facilities. Our priorities focus on the detection of vehicle bombs, suicide bombers, and leave-behind bombs. As a result of the R&D consolidation in FY 2006, the Explosives Countermeasures Portfolio will also dedicate significant resources to continue the development of explosives detection and blast mitigation systems for civil aviation security. Consistent with this RDT&E leadership role, the Explosives Knowledge Center initiated in FY 2005, will provide guidance and information to ensure that preparedness capabilities at the federal, State, local, and tribal levels are updated over time to be consistent with new and emerging technologies and capabilities as well as with the changing and emerging threats.

Threat Awareness

Formerly known as the Threat and Vulnerability, Testing and Assessment Portfolio, the RDT&E activities funded through the Threat Awareness Portfolio primarily support two DHS strategic goals: awareness and prevention. These activities provide the tools and knowledge necessary to meet one of the Secretary's recently announced imperatives to increase preparedness, with particular emphasis on catastrophic events caused by weapons of mass effect, and the requirements delineated in the Department's National Preparedness Goal. Our efforts in this area focus on developing information about the two basic elements of terrorist threat—terrorist capabilties on the one hand, and terrorist motivations and intent on the other—and on providing the advanced information processing tools necessary to rapidly and accurately discover, use, and share such information. Such tools and methods are intended to enable and enhance federal, State, and local awareness of a broad range of threats through information fusion and information sharing.

Standards Portfolio

The development, adoption and implementation of standards—providing the basis for ensuring the effectiveness of scientific and technological tools—are critically important for homeland security. Measures of effectiveness for any critical technology or tool include basic function, appropriateness and adequacy for the task, inter-operability, efficiency and sustainability. With the mission to develop and coordinate the adoption of national standards and appropriate evaluation methods to meet homeland security needs, the Standards Portfolio cuts across all aspects of the S&T Directorate's mission. Homeland Security standards address metrics for products, services, and guidelines, performance specifications, testing and evaluation protocols, training, certification of equipment and personnel, as well as metrics and quality assurance for deployment of systems. Standards are also an essential component

of codes of practice and standard operating procedures. These standards will provide DHS the ability to provide guidance to federal, State, local, and tribal homeland security entities regarding purchase, deployment, and use of these tools.

Cyber Security

Our Cyber Security R&D investments will yield technologies that improve the security of information and information systems in two complementary ways: through the development of a new generation of cyber security technologies to increase the security of information and information systems, and through the development of tools and methodologies to develop more inherently secure systems. The portfolio also fosters technology transfer and diffusion of federally funded R&D into commercial products and services for private sector applications. This technology diffusion will result in broad-based benefits to the Information Technology (IT) sector and to users of IT among the other critical infrastructure sectors. We coordinate with other federal agencies through the National Science and Technology Council's (NSTC) Cyber Security and Information Assurance (CSIA) Interagency Working Group [co-chaired by DHS and the Office of Science and Technology Policy (OSTP)], and the InfoSec (Information Security) Research Council. We also collaborate informally with other agencies that share interests in the area of cyber security R&D, including the National Science Foundation (NSF), various organizations within DOD, and the National Institute of Standards and Technology (NIST). We actively pursue opportunities to catalyze additional private sector activity. Such opportunities include public-private partnerships as well as increased cooperation and communication among private sector companies and organizations. Finally, we participate in international efforts to develop common areas of collaboration in cyber security R&D.

Critical Infrastructure Protection

The Critical Infrastructure Protection (CIP) R&D Portfolio effort protects the Nation's critical infrastructure and key assets from acts of terrorism, natural disasters, and other emergencies by developing and deploying tools to anticipate, identify, and analyze risks, and systems to reduce those risks and the consequences of an event. Funded RDT&E and required coordination efforts in this portfolio have been categorized into four programs: Modeling, Simulation, and Analysis; Protective Security Technologies; the Kentucky Critical Infrastructure Protection Laboratory (KyCIPLab); and development of the annual National CIP R&D Plan, as required by HSPD–7, "Critical Infrastructure Identification, Prioritization, and Protection."

Emergent and Prototypical Technology

Our Emergent and Prototypical Technology Portfolio combines two formerly distinct efforts—Emerging Threats and Rapid Prototyping. The mission of the Emergent and Prototypical Technology Portfolio is to: address the dynamic nature of terrorist threats, as science and technology advancements enable new agents of harm and new ways to employ them; and accelerate, through rapid prototyping, the deployment of advanced technologies to address urgent user requirements. The Emergent Threat Program will anticipate and define potential threats arising from new scientific and technological advances or from terrorists using existing technologies in new or unexpected ways, and will jump-start countermeasures capabilities development. Innovative, crosscutting approaches to anticipating and responding to new and emerging threats will permit us to develop capabilities to thwart them before they are used. This Portfolio uses a four-phased process of Discovery, Analysis, Tests, and Potential Solution.

Since relevant R&D is underway at other agencies and organizations, partnerships with DOE, DOD, HHS, DOJ, USDA, and the Intelligence Community offer great benefits.

Supporting the DHS Components

We have programs dedicated to supporting four specific components within DHS: Border and Transportation, Preparedness and Response, the United States Coast Guard, and the United States Secret Service. I will address each of these below.

Border and Transportation

The Border and Transportation (B&T) Portfolio (formerly Border and Transportation Security Portfolio) develops and transitions capabilities that improve the security of our nation's borders and transportation systems without impeding the flow of commerce and travel. One of the Department's first priorities is to prevent the entry of terrorists and the instruments of terrorism into the United States while simultaneously ensuring the efficient flow of lawful traffic and commerce. Our Border and Transportation S&T Plan and Roadmap represents the combined work of the S&T Directorate and border and transportation agencies to identify new capabilities

needed and to plan how the Department will make technology investments in support of B&T mission objectives.

Preparedness and Response

The S&T Directorate's Preparedness and Response Portfolio (formerly Emergency Preparedness and Response) supports the Department's new Preparedness Directorate and FEMA, whose mission is to improve the ability of the Nation to prepare for, respond to, and recover from catastrophic emergencies both natural and manmade through development and deployment of enabling capabilities. We emphasize large-scale complex events, especially those involving terrorism. Our research areas include incident management, decision support, response and recovery, and technology integration. Our most important customers are State and local emergency responders, emergency managers, and the public they serve. The emergency response community consists of more than 49,000 separate agencies spread throughout the country. Of approximately 18,000 law enforcement agencies, the overwhelming majority have 24 or fewer sworn officers. Over 85 percent of our nation's firefighters are volunteers. Enhancing the capabilities of such a vast and diverse community, especially against terrorist threats, requires a rigorous and systematic approach to the development and transition of a broad range of technology solutions. Our work is dedicated to applying the best available science and technology for the safety and security our emergency responders and homeland security professionals so that they can effectively and efficiently perform their jobs—saving lives and restoring critical services.

United States Coast Guard

The United States Coast Guard protects the public, the environment, and U.S. economic interests in the Nation's ports and waterways, along the coast, on international waters, or in any maritime region as required to support national security. The Coast Guard research program supports this mission through the development of technologies and systems to enhance Maritime Domain Awareness (MDA), and to improve Operational Presence and Response. MDA includes all systems, sensors, and command and control systems necessary to detect, identify, and determine the threat potential of all vessel traffic. It also includes Port Security to protect important harbors. Operational Presence and Response involves safely and effectively stopping a vessel, boarding it, and finding or eliminating any threat or contraband. Research and development in this program aims to give the Coast Guard the means of neutralizing threats as far away from potential targets as possible, and of responding to emergencies as quickly and effectively as possible. Coast Guard R&D is characterized by its many partnerships with other federal agencies and international groups to share costs and expedite delivery of important products. This program also supports such unique and traditional Coast Guard missions as Search and Rescue, Maritime Regulations, and Marine Safety. Research into oil spill prevention and response, and Aquatic Nuisance Species prevention supports the Marine Environmental Protection Program. Development of advanced navigation systems to improve the flow of goods and services via our nation's waterways also serves a traditional Coast Guard mission.

United States Secret Service

The United States Secret Service (USSS) Portfolio develops and deploys advanced technologies to enhance that agency's protective and investigative capabilities. This portfolio supports the unique USSS mission by developing and deploying advanced technologies to enhance protective and investigative capabilities and has established its first direct-funded R&D program. The Portfolio focuses on input from threat-based models and the lessons learned from direct operational experience.

Programs and Offices

Office for Inter-operability and Compatibility

The Office for Inter-operability and Compatibility's (OIC) mission is to strengthen and integrate inter-operability and compatibility efforts to improve local, tribal, State, and federal public safety preparedness and response. Non-inter-operable, incompatible communications equipment and a lack of standardized operating procedures have plagued the public safety community for decades. Often public safety agencies cannot perform mission-critical duties because they cannot effectively cooperate with other agencies or operate in other jurisdictions. By coordinating and leveraging the Department's inter-operability programs and related efforts, OIC reduces unnecessary duplication of effort, identifies and promotes best practices, and coordinates activities related to inter-operability. OIC manages programs to address inter-operability and compatibility for public safety providers and the larger home-

land security community. Initial program areas include communications (including SAFECOM and Disaster Management programs), equipment, training, and other programs (including the Risk Assessment Policy Group).

Counter-MANPADS

The Counter-MANPADS Program focuses on demonstrating the viability, economic costs, and effectiveness of adapting existing military technology to protect commercial aircraft from the threat of shoulder-fired missiles, i.e., MANPADS. Its goal is to integrate and evaluate existing Counter-MANPADS technologies for potential use by the commercial airline industry, not to develop new technologies. The Program balances cost, suitability, and performance to meet the needs of commercial aviation community stakeholders. Suitable countermeasure systems must be capable of being implemented with minimal impact on air carrier and airport operations, maintenance, and support activities. After completing the second of three planned program phases, DHS will provide a report detailing the equipment performance, projected costs, and potential deployment options. The anticipated release date for the report is mid- to late-March 2006.

University Programs

University Programs coordinate, leverage, and use the academic community's immense intellectual capital to address current and future mission-critical homeland security needs, through both research and educational programs. Our goals are: 1) developing the scientific research base necessary to advancing knowledge in homeland security fields; 2) developing a cadre of technical experts within the Nation's workforce who are trained to address current and future challenges in securing the homeland; and 3) ensuring the results of their research are disseminated to DHS and its partners. The University Programs portfolio is invested largely in two areas: a university-based system of DHS University Research Centers, and a Scholars and Fellows Program intended to build and develop the next generation of academic researchers in disciplines that are relevant or essential to homeland security. University Programs is now a catalyst for mission-relevant research at more than 40 major research universities, and is building capacity worldwide by attracting over 150 faculty and their peers, hundreds of graduate and undergraduate researchers, as well as DHS Scholars and Fellows from more than 110 institutions, to focus on issues critical to homeland security.

SAFETY Act

In accordance with criteria set forth in the *SAFETY Act of 2002* and Interim Regulations the Office of SAFETY Act Implementation evaluates technologies. As part of the *Homeland Security Act of 2002,* Public Law 107–296, Congress enacted the SAFETY Act to provide "risk management" and "litigation management" protections for sellers of qualified anti-terrorism technologies. The Act's purpose is to encourage development and deployment of anti-terrorism technologies, particularly those aimed at preventing, detecting, identifying, or deterring acts of terrorism, or to limiting the harm that such acts might otherwise cause. The SAFETY Act creates certain liability limitations for "claims arising out of, relating to, or resulting from an act of terrorism" where qualified anti-terrorism technologies have been deployed. The office's evaluations are designed to advise DHS leadership on whether to grant SAFETY Act protections to technologies that applicants submit. In order to stimulate the development and adoption of valuable new technologies, the office seeks to raise public awareness of the benefits of the protections available under the SAFETY Act. The office also coordinates with other DHS elements and other federal agencies to support those offices' missions and minimize the burden on applicants for SAFETY Act protection. This advance coordination regularly occurs in cases where the SAFETY ACT could play a positive role in a pending federal procurement.

RDT&E CONSOLIDATION

To ensure strategic direction and avoid duplication, the S&T Directorate is charged with consolidating the Department's research and development activities. As I mentioned earlier, we have made significant steps by integrating the Transportation Security Laboratory into the S&T Directorate. We are continuing to further unify and coordinate efforts to develop and implement scientific and technological countermeasures.

In keeping with legislative intent of the *Homeland Security Act of 2002* and the *FY 2004 and 2005 Homeland Security Appropriations,* the S&T Directorate, through RDT&E consolidation, seeks to:

- Bring under a single accountable authority, the scientific and engineering personnel and most RDT&E resources of the Department;

- Maximize the efficiency and effectiveness of the Department's RDT&E capacity;
- Develop and expand synergistic RDT&E programs that cut across the Department's activities;
- Create a world class RDT&E capability; and
- Allow the other organizational elements within DHS to focus on their operational missions by eliminating within them the specialized management infrastructure required to manage organic RDT&E.

Major RDT&E consolidation measures in FY 2006:

- TSL in Atlantic City, New Jersey became part of the S&T Directorate in FY 2006. The S&T Directorate has been working closely with TSA to ensure the seamless transition of TSL's staff and research capabilities. A Memorandum of Understanding is guiding the transition of responsibility from TSA to the S&T Directorate for the assets, liabilities, and program capabilities of the TSL and defining a collaborative framework that will minimize the disruption of program work at TSL and prevent the duplication of effort during this transition. The S&T Directorate has been assessing and integrating existing TSL projects into its transportation security and high explosives portfolio strategies as appropriate.
- Funds originally requested by the CBP to support salaries for those assigned to its Research, Development, and Evaluation Branch were likewise integrated into the S&T Directorate mission.

In FY 2007, the S&T Directorate will continue to perform its role as the primary research, development, testing and evaluation arm of the Department.

TECHNOLOGY TRANSFER

Providing operational end-users with the technology and capabilities they need to detect and prevent terrorist attacks, the means of terrorism and other illegal activities is the capstone of the S&T Directorate's mission.

To successfully carry out this aspect of our mission, the S&T Directorate actively works to transition cutting-edge homeland security technologies to end-users within the Department, other federal agencies, State and local government entities, and the private sector. Some recent accomplishments in this area include:

- Regional Technology Integration Initiative (RTII)—In FY 2005, RTII completed integrated community-based vulnerability assessments in four pilot locations. We are currently working with these communities to identify appropriate homeland security technology solutions for the gaps identified. In FY 2006, we are focusing on technology deployments in these four regions and on the transfer of lessons learned to "peer cities." Additional locations may be added in the future as we identify gaps that have not been addressed through the pilot locations. RTII provides the basis for improved preparedness, mitigation, and response by regional authorities, including cities and counties that will result in lives saved and greater effectiveness of disaster management resources. This program is a fundamental transition path for technologies that will help regional authorities across the Nation counter emerging threats.
- DOD's 1401 Program—Pursuant to the direction of Congress to quickly deploy technology where it is needed, DHS is working with DOD and DOJ to identify and transfer current appropriate technology to federal, State, and local emergency responders for homeland security applications. The 1401 Technology Transfer Program is aimed at efficiently transitioning these technologies to the broader public safety community. As part of this effort, key interagency stakeholders selected five high-priority technologies from a field of 550 DOD technologies that matched a list of first responder needs. Through the 1401 Program, the S&T Directorate will ensure that technologies transferred to first responders meet standards of inter-operability and compatibility with existing public safety operations, and that they are tested and evaluated by first responders. In support of this role, the S&T Directorate OIC sponsored a series of focus groups with public safety practitioners in August 2005 in an effort to validate the function and application of these technologies in their respective environments.
- Technology Clearing House—The S&T Directorate has awarded a contract to the Public Safety and Security Institute for Technology (PSITEC) to provide these services, which will all be available through a Knowledge Portal. When complete, the Knowledge Portal will provide a one-stop-shop for access to rel-

evant information from a wide variety of sources, including the existing Responder Knowledge Base and the Lessons Learned Information Sharing (LLIS) created by the Memorial Institute for the Prevention of Terrorism (MIPT), under sponsorship from the DHS Office of Domestic Preparedness. Its architecture will be open, inter-operable, and non-proprietary to facilitate cost effective, long-term operations, maintenance and upgrades.

- Next-Generation Cyber Security Technologies Program—To stimulate transfer of DHS-funded technologies into mainstream commercial products and services, FY 2006 activities emphasize testing, evaluation, and piloting of the most promising technologies emerging from the now completed program that began in FY 2004.

While highlighting these successes, it is important to note that the transfer of technology often requires numerous intricate, incremental steps over many years. Although the basic scientific principles that underpin a particular technology may be leveraged, nevertheless significant re-engineering is required to make the technology suitable for homeland security purposes. In most cases, technology developed for one purpose, such as a military application, may not be able to be transferred in a straightforward manner to civil operations. The requirements for maintenance and support, for performance, and for total cost-of-ownership often must be re-engineered or otherwise resolved to permit such transfers.

During the next year, the S&T Directorate will work closely with its government, international and private sector partners to overcome these institutional and technical challenges. In FY 2007, the S&T Directorate plans to continue its technology transfer to end-users. Plans include:

- The Facility Restoration Technology Demonstration—This demonstration will focus on the transfer and application of the concepts developed in FY 2005 and FY 2006 for airports to other types of critical facilities such as subway systems and other transportation nodes. In addition, FY 2007 accomplishments will focus on filling data and technology gaps critical to the restoration of facilities such as the decontamination of sensitive equipment and the interactions of chemical agents on surfaces.
- Technology Clearing House—The Emergent and Prototypical Technology Portfolio will continue to support the Technology Clearinghouse in FY 2007. Development plans include: adding procurement decision support tools and advanced search mechanisms; expanding content to include topics such as public health information; forming communities of interest and professional discussion boards; and establishing a technology transfer community database.

STRATEGIC PARTNERSHIPS

The S&T Directorate places great importance on its interactions with the other federal departments and agencies that are contributing to the Nation's homeland security science and technology base. We are accustomed to working in an interagency working group mode, and have found this approach to be quite effective in addressing a variety of key areas. To proceed in this current effort, we must have a complete picture of all Federal Government components involved in research and development, and regularly utilize the collective wisdom that the interagency process brings to the table. We must understand one another's R&D capabilities and current activities and plans, both near- and long-term, because only when we have an accurate and comprehensive picture of the current state of the Nation will we be able to effectively develop a roadmap for success.

Only through increased communication and partnering are we able to leverage existing federal resources to sustain the science and technology advances essential to homeland security. These advances in turn provide security solutions that are technically, economically, and socially sustainable. This superior technical base continuously enables the United States to stay ahead of the changing threats and escalating abilities of our adversaries.

Research and development needed to enhance the Nation's capabilities to thwart terrorist acts and mitigate natural disasters is being conducted by the Department of Commerce (DOC), USDA, DOD, DOE, DOJ, HHS, DOS, and Veteran's Affairs as well as within the National Science Foundation (NSF), EPA, other federal agencies.

By bringing these organizations together through strategic partnerships, we are creating an enduring homeland security science and technology community. As directed by the *Homeland Security Act of 2002,* the S&T Directorate is continuing to solidify this community by coordinating the Federal Government's civilian efforts to identify and develop countermeasures against current and emerging threats. In support of these efforts during the last year, the S&T Directorate has:

- Worked with the OSTP, the Homeland Security Council, the National Security Council, the Office of Management and Budget and the Office of the Vice President in the effort to coordinate homeland security research and development across the entire United States Government.
- Led the development of the *National Plan for Homeland Security Science and Technology*. This strategic plan will establish R&D priorities within and across federal programs and identify opportunities to leverage the R&D efforts of other agencies.
- Established meaningful interagency interactions with Federal, State and local government and private sector entities to meet the high priority homeland security RDT&E needs of the Nation. This includes actively participating in or leading several interagency working groups. Such groups foster an active exchange of information and assist participating agencies in identifying related needs and requirements, conducting research and development of mutual benefit, and avoiding duplication of effort.

Through these and other interagency interactions, the S&T Directorate is bringing together the vast homeland security scientific and technology resources of the Nation. Significant accomplishments and ongoing collaborative efforts from across the S&T Directorate are listed below:

- Biodefense Collaboration—DHS and the S&T Directorate partner with, and support, other federal departments and agencies with lead responsibilities in biological threats—a major focus of our countermeasure R&D. We are working with the HHS on medical countermeasures and mass casualty response; USDA on agriculture biosecurity and food security; and EPA on decontamination and water security including a jointly funded center for microbial risk assessments. In a major initiative, S&T is collaborating with other federal partners to establish the National Interagency Biodefense Campus, which includes our partnership with the DOD on the National Biodefense Analysis and Countermeasures Center (NBACC). This Center will provide the Nation with cutting edge capabilities in bioforensics and biological threat characterization. S&T and DOD's Defense Threat Reduction Agency (DTRA) are collaborating on BioNet, a program to integrate military and civilian biomonitoring activities and establish a shared communications process to provide timely biothreat information. The S&T Directorate maintains a close liaison with the DOS on matters relating to the Biological Weapons Convention (BWC) which is essential to DHS biological countermeasure programs and compliance posture.
- Chemical Countermeasures Collaboration—The S&T Directorate is working with DOD to plan a Chemical Security Analysis Center (CSAC) that will serve as a knowledge management, threat characterization, and forensic analysis hub that will address a full range of chemical threats, particularly chemical warfare agents and non-traditional agents. We are also coordinating with HHS' Centers for Disease Control (CDC) and the EPA on the larger Chemical Laboratory Response Network (CLRN). In the aftermath of Hurricane Katrina, we have already seen how components of CLRN will produce a more coordinated, more effective laboratory response effort. The CDC activated the Laboratory Response Network to conduct sampling and analysis for identification of toxic chemicals and pathogens in Gulf Coast areas.
- Critical Infrastructure Protection—Under HSPD–7, *Critical Infrastructure Protection,* DHS is assigned the overall responsibility for coordinating the national effort to ensure the security of the Nation's critical infrastructure and key resource sectors. Per this directive, the S&T Directorate is working with the Chemical Sector Coordinating Council, comprised of 16 key stakeholders, to draft the Nation's strategic vision for better securing the chemical sector infrastructure. Our key federal partners in chemical security include DOD, HHS, the FBI, the EPA, and the interagency Technical Support Working Group (TSWG). In addition, we established the Process Control Systems Forum (PCSF) to develop new cross-industry guidelines, protocols and system architecture for provably secure, next-generation Supervisory Control and Data Acquisition (SCADA) and related types of process and distributed control systems. PCSF is comprised of government and private industry stakeholders, owners, and operators.
- Maritime—The Science and Technology Directorate's Coast Guard R&D program is characterized by its many partnerships with other federal agencies and international R&D groups. Beyond the program support for the Coast Guard's traditional missions, we have ongoing collaborations in the maritime

security domain. We are supporting the Department's participation in a broad maritime security program review looking at all current U.S. Government maritime policy initiatives and ensuring interagency alignment to guide a focused national effort to improve Maritime Domain Awareness. Maritime Domain Awareness includes all systems, sensors, and command and control systems necessary to detect, identify, and determine the threat potential of all vessel traffic. It also includes Port Security to protect important harbors. In accordance with National Security Presidential Directive 41 and HSPD–13, "Maritime Security Policy," issued last December, DOD and DHS are leading an interagency initiative to develop the National Strategy for Maritime Security. The S&T Directorate is supporting that effort as well as the ongoing comprehensive National Maritime Response Plan that clarifies lead agency roles and responsibilities regarding maritime threats.

- Transportation Security Partnerships—The S&T Directorate works in close cooperation and collaboration through a Cargo Security Integrated Planning Process Team (IPPT) process. The IPPT is co-chaired by S&T and the DHS Policy Office, and has representatives from within the Department as well as the Departments of State, Commerce, Defense, Transportation and Energy. Through this IPPT, DHS actively ensures coordination with existing government programs and leverages those relationships to foster a cohesive program strategy and avoid the duplication of effort. Other transportation security efforts focus on Freight Rail Security with the Federal Railroad Administration and the S&T Directorate's ongoing Counter-MANPADs program. In partnership with other federal agencies (FAA, DOD, DOS), the S&T Directorate initiated a Congressionally-directed aggressive System Development and Demonstration program to counter the threat of shoulder-fired missiles. The program demonstrates and evaluates the possible migration of existing military Counter-MANPADS technologies to the commercial airline industry.
- Border Security—Over the past three years, the S&T Directorate has coordinated extensively with DOD, the National Aeronautics and Space Administration (NASA), and FAA with respect to Unmanned Aerial Vehicle (UAV) operations and evaluations for the U.S. Border Patrol. The UAV Executive Steering Group was established to advise the Secretary of Homeland Security and provide a forum for communication, coordination and cooperation. The UAV Executive Steering Group is made up of representatives from DHS components, DOD and the FAA.

International Partnerships

The S&T Directorate recognizes the enormous benefits gained from working with the international community to seek technology solutions to our common homeland security problems. We have worked in concert with our Federal Government agency counterparts to both negotiate agreements with key foreign partners and to implement strategic programs under those agreements that meet our mutual high-priority needs.

The S&T Directorate is currently the United States' lead agency for umbrella S&T Agreements that have been created with Canada, the United Kingdom, and most recently with Australia. These instruments provide the mechanism for us to share resources, ideas, and information in order to leverage our individual investments, to benefit from each other's experiences and perspectives of others, and also importantly to create consistency in the tools and systems that we ultimately field. We are taking advantage of the opportunities presented by these partnerships across the entire suite of civil security mission requirements.

Cooperative research, development, testing and evaluation activities are being pursued with other countries as well. In particular, we are looking at ways to enhance an already robust collaboration with Israel, especially in testing of explosives detection and mitigation technologies in operational environments. As part of the Security and Prosperity Partnership initiative, we have reached out to Mexico to begin a dialog on technology to address agricultural security. We understand the need to engage foreign entities on technology issues around travel and trade security and have initiated interactions with Singapore, the Netherlands, Sweden and Japan in this arena.

CONCLUSION

In conclusion, I thank you for the opportunity to appear before you today. I can assure you that we are on-task, and that we are providing the planners, operators, and responders we serve with the best support our science can offer. Homeland security continues to benefit tremendously from the work of our nation's scientists and

engineers. The knowledge, the systems, the methods, and the tools they give us do much to make us safer and more prepared.

On behalf of all of us in the Science and Technology Directorate, I thank you for your continuing support and counsel. I am proud of what we have been able to accomplish in just a few years, and I trust we will continue to live up to the responsibility the Nation has given us. I will be happy to answer any questions that you may have.

BIOGRAPHY FOR CHARLES E. MCQUEARY

Dr. Charles E. McQueary was appointed by President Bush as Under Secretary for Science and Technology of the Department of Homeland Security and confirmed by the U.S. Senate in March of 2003.

Dr. McQueary leads the research and development arm of the Department, utilizing our nation's scientific and technological resources to provide federal, State, and local officials with the technology and capabilities to protect the homeland.

Prior to joining Homeland Security, Dr. McQueary served as President, General Dynamics Advanced Technology systems, in Greensboro, N.C. Earlier in his career, Dr. McQueary served as President and Vice President of business units for AT&T, Lucent Technologies, and as a Director for AT&T Bell Laboratories.

In addition to his professional experience, Dr. McQueary has served his community in many leadership roles as Chair of the Board, and Campaign Chair, of the United Way of Greensboro; Member of the Board of Trustees of North Carolina Agricultural and Technical State University; Member of the Guilford Technical Community College President's CEO Advisory Committee; Member of Board of World Trade Center North Carolina; Chair for Action Greensboro Public Education Initiative; and as a Member of the Board of Guilford County Education Network.

Dr. McQueary holds both a Ph.D. in Engineering Mechanics and an M.S. in Mechanical Engineering from the University of Texas, Austin. The University of Texas has named McQueary a Distinguished Engineering Graduate.

DISCUSSION

Chairman BOEHLERT. And once again let me thank you on behalf of the entire Committee for your outstanding public service.

Dr. MCQUEARY. Thank you.

Chairman BOEHLERT. We wish you well.

Dr. MCQUEARY. It's been a pleasure to serve in this role, I assure you.

Chairman BOEHLERT. You know, when you're charged up as you are within the Administration, and I am and we are and the majority up here, there's always a temptation to have this as a sort of cheerleading session and we high five each other and talk about all the good things and boy, there are a lot of good things to talk about, but that produces nothing of any real value as we go forward. So instead of focusing on all that's right in a budget that does much better by science, and instead of focusing on the vision that's coming into sharper focus because of the budget and the words and deeds from the Administration, I'm going to talk about some of the other things that are somewhat problematic, if you will.

Let me start out with one, Dr. Sampson, for you, because both Mr. Gordon and I and just about everybody we talk to are real believers in the Manufacturing Extension Partnership. In the budget submission from the Administration, requesting $46 million ain't going to fly, I'll tell you. I am determined to up that and so is he and I think the majority in Congress are. We're talking about, relatively speaking, nickels and dimes for a program that has proven its value. So tell me how you think the program would work if we

were dumb enough to only provide $46 million. Can you explain that to me?

Dr. SAMPSON. Certainly. First of all, I think what I would point out is that in the budget development process, our responsibility is to identify priorities that we believe address the most critical needs that we have. Secondly, MEP is just one method by which NIST supports manufacturing in America. Over half of all NIST core laboratory functions directly or indirectly benefit manufacturing. At NIST we have somewhere in excess of 1800 visiting scientists working from industry and from academia, and if the Congress decides to move forward with what we believe are the right set of priorities for NIST, what we would do would be several things. First of all, we will begin——

Chairman BOEHLERT. Doctor, well, I mean the time is limited and I'm going to hold myself to the same time. Just let me signal you so you can go back and——

Dr. SAMPSON. Okay.

Chairman BOEHLERT.—report to everybody that we're determined to do better by MEP and we're determined to do well by NIST, but this is something that really impacts on the small business manufacturer right on the front lines and they're oftentimes like one-armed paperhangers. They don't have research departments. They don't have all these other departments, but they need some help and it's a good program and it makes sense, so I hope you won't be unhappy if we force more money into this program on Commerce. That's it.

Now let me go to Dr. Bodman. As you know, this committee, particularly Chairman Biggert and I, have long been concerned about the lack of any plan for the Climate Change Technology Initiative. Now that, thanks to you and I want to give you high marks for this, a drafted strategic plan has finally been released, we're still kind of concerned. There doesn't seem to be much in there to help set priorities or milestones. Could you tell us how you see that plan moving forward from here and what you hope it will accomplish? And just let me say I think we're finally getting to the point where people no longer think that my concern about global climate change and the scientific community's concern about global climate change is just a figment of our imaginations. It's for real and we've got to deal with it in a responsible way. So I give the microphone to you, Mr. Secretary.

Secretary BODMAN. Well, without getting into a debate about climate change, I would observe that this Administration has been doing everything it can do with respect to both science, which I was intimately involved with during my days when I had Dr. Sampson's job and now at the Energy Department, where we are responsible for the technology program that really covers a wide range of things, each of those programs have very specific milestones and goals and objectives and so forth, and we lay those out each year in the budget, so I'm in receipt of a letter that you and Congresswoman Biggert sent and I'm in the final stages of responding to that, but I'm comfortable that we have adequate goals and objectives. And the hope here is to develop technologies that will, when they emerge, which they're starting to do, into the marketplace will

be able to make a significant contribution by reducing greenhouse gas emissions.

Chairman BOEHLERT. Mr. Secretary, I'm comfortable if you're comfortable because I have a very high regard for you and I'm very much looking forward to the response that is in the final stages of preparation, but we won't get into a debate about global climate change because I know that you know, and even the President knows, it's for real. It's not the figment of somebody's vivid imagination. And I know and you know and the President knows that humans have contributed to it, and I know and you know and I think the President realizes that we have to do something about it, so the discussion would be what that doing something should represent, not whether or not the problem exists is for real. So thank you very much for that answer. We very much look forward to your response.

And, Dr. Bement, as several of us have noted, we're not happy with the level of education commitment at NSF, which we think is critical to the Nation's future. Can you please tell us what you think the role of NSF is in education? What is the justification for reducing K through 12 programs just as the Nation is focusing increasingly on the inadequacies of science and math education?

Dr. BEMENT. Yes, Mr. Chairman. First of all, I would like to say that education, outreach, and diversity are core values throughout the Foundation, not just in the EHR Directorate. It permeates every directorate and every office within the Foundation. And the commitment right now in the 2007 budget is $816 million in the EHR Directorate, but it's $450 million in the Research and Related Activities account, and that includes activities at every level, from K to 12 to undergraduate to graduate and early career and also in broadening participation.

And just to give some examples, in K to 12 there's the GK–12 Program in the R&RA account, which brings mentors into the classroom. There are also Research Experiences for Teachers. Now these programs are well recognized by the National Science Board and they've encouraged us to put more commitment in our research directorates, because the kind of programs we can bring into the classroom gives more hands-on experience, creates more motivation, creates more enthusiasm and puts more bright minds into the pipeline for science and engineering, which is a critical need in the Nation at the present time.

Without belaboring that fact, I have eight pages of examples of programs within our R&RA——

Chairman BOEHLERT. I'm sure you have.

Dr. BEMENT.—which I'd like to present—

Chairman BOEHLERT. And I know from long experience that the Administration sends its witnesses up and boy oh boy, you've got volumes to tell us what great work you're doing, and you know what? I think you're doing great work and I am a cheerleader for the National Science Foundation, but I'm anxious to get to that area where I think we want to give you an opportunity to do even better than what you are doing. We have some dispute about how you come up with the bottom line, but the important point is that science and math education is in need of attention in this country.

Dr. BEMENT. Yes.

Chairman BOEHLERT. It's critical that we invest more in that and it's also important for everybody else in this town to recognize that you guys at NSF have a vital role to play. We just can't leave it to the Department of Education, and we've got to make darn sure you——

Dr. BEMENT. Right.

Chairman BOEHLERT.—at NSF and the Department of Education are working collaboratively and you're marching forward together, not like in the past. I can recall one time when I had to introduce the Secretary of Education to the Director of the National Science Foundation. They didn't know each other. I mean, that was really mind boggling, but we don't have that now.

Dr. BEMENT. Well, Mr. Chairman——

Chairman BOEHLERT. I can——

Dr. BEMENT.—we have a common mission and I——

Chairman BOEHLERT. That's super.

Dr. BEMENT.—appreciate your support. And I should add, I've met with the Secretary of Education at least twice.

Chairman BOEHLERT. Well, that's great and keep meeting. Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman. I will follow your admonition and try not to be a cheerleader here today. Let me—

Chairman BOEHLERT. But you will concede there is much to cheer about. Thank you.

Mr. GORDON. I want to, as always, or not always, but most of the time say that I am in such agreement with the Chairman. I understand, Dr. Bement, beside being a scholar, you're also a soldier but I know you can't do anything about this K to 12 situation. It's been cut 37 percent. You listed all the good things you're doing, but the funding has been cut by over one-third for those. I hope——

Dr. BEMENT. Are we talking about MSP or K to 12 education?

Mr. GORDON. K to 12.

Dr. BEMENT. That hasn't been cut.

Mr. GORDON. If you look at the budget, over the last—I think it was seven percent this year. It's been 37 percent, I think, from 2001 to 2004.

Dr. BEMENT. Well, again I would argue that in the EHR account, if that's the only account you're looking at, you'll see some cuts in K to 12, but you also ought to look at the total budget.

Mr. GORDON. Well, I think, if we look at the Augustine Commission Report, K to 12 science education was really a major thrust there. I have put their recommendations into legislation. Again, you've listed all the good things you're doing. Again, I'm just sorry that it's being cut by one-third. You are a soldier and so you can—you know, and if you can put on a grin on that one, you——

Dr. BEMENT. Well, I had.

Mr. GORDON.—you really are a good one. Let me also say, Mr. Chairman, that concerning the MEP Program, clearly I think it is a bipartisan program and it's distinguished by the Governors Association, saying it's important. And, Dr. Sampson, you pointed out a rosy picture, but the fact of the matter is that all of the surveys taken of our country's attitudes right now, say we're going in the wrong direction and the economy is one of those areas that they say is going in the wrong direction. And I think a part of that is

the fact that since 2001, we've lost 2.8 million manufacturing jobs. The MEP Program really is our only small, little effort to try to save those jobs and improve those jobs, and you talked about, what a good job NIST is doing. It's being cut by 23 percent. You know, we just need more help in these areas.

And, Mr. Chairman, you pointed out, rightfully so, that this is an important group of individuals with the panel. They are also dedicated public servants and I would say all have made personal sacrifices to do what they're doing and I congratulate them for that, but constitutionally, we are an equal branch of the government. We do have the responsibility of oversight. We are busy also, but part of being busy is trying to do our oversight, so I think we—we need to move forward with that.

And finally, Secretary Bodman, Jerry Costello couldn't be here today. He has another committee meeting, but he wanted me to thank you and the Administration for their commitment to the FutureGen issue and he'll be submitting questions to the record. I'm glad I could say something nice. I'm going to tell him—because I'm sure it's going to be news to him, as well as to the world, that you say that the Administration is doing all that it can on climate change. I'll let him know that.

And finally, let me say, Dr. Marburger, I had nominated you for the gold medal and now I would like to present that to you. You performed with grace. Once again this year it's just interesting how when you want to prove the commitment of the Administration on overall spending for science, you include earmarks. But then, if there are problems, you say bad things about the earmarks. One area you pointed out was that five percent of the budget was earmarks. That meant that 95 percent were your priorities. You know, I'll remind you that the entire Administration's budget is an earmark. You are earmarking what your priorities are. I don't think it's unreasonable that Congress, an equal branch of government, going through legislative hearings, having some bit of expertise, would also like to have some role in establishing that. You've got 95 percent of what you wanted. You know, I think to say that five percent were earmarks, that were legislative priorities, I think it came out pretty well. So, again, my congratulations at your gold medal performance and I appreciate you coming here and being with us today.

Chairman BOEHLERT. Thank you very much. Dr. Bartlett.

Mr. BARTLETT. Thank you very much, gentlemen. I appreciated your comments. We're talking today about the federal R&D budget, but this is being focused on our competitiveness agenda and that's very appropriate. Essential to that, of course, is the country turning out adequate numbers of well trained scientists, mathematicians and engineers, and do you know the statistics? China graduates more English speaking engineers than we do and a fair percentage of the English speaking engineers that we graduate are Chinese students. They're now graduating what? I hear various numbers. Six, eight times as many engineers as we're graduating. India, two, three times as many engineers as we're graduating. I would submit, gentlemen, that a culture gets what it appreciates.

When I was going to school, we were squares. That's about when you went to school, I guess. And now I guess bright young boys are

geeks and nerds, and pretty girls won't date them, and really bright girls have to play dumb to get a date. How smart is this of a society where our bright young people are clearly under-appreciated? Rarely is a scientific achiever invited to the White House to be acclaimed there, and I submit, gentlemen, that we're not going to turn this around. Money alone won't do it and the good intentions of your departments won't do it. This will turn around when we as a culture appreciate this kind of endeavor.

I'd like to start with Dr. Marburger and just go down the table. What can we do as a culture so that our bright young people—I talk to a lot of them and they are increasingly going into what I caution them could be destructive pursuits. They're becoming political scientists and lawyers. Now, we need a few of each of those, but I would submit that we've got more than a few of each of those and I'd like to see more of our bright young minds go into science, math and engineering, but that's not going to happen until we as a society appreciate them. How do we send that message?

Dr. MARBURGER. Well, Congressman, I think that one of the best ways is to have the leadership of the Nation raise the visibility of science as an important function for our society. The American Competitiveness Initiative was just an enormous stroke of publicity and positive visible leadership. The President, following his State of the Union speech, visited a number of sites around the country, one of which was a training site that had been established by Intel Corporation in Albuquerque for bringing teachers into contact with real-life scientists and engineers. A major part of the initiative is to create a much larger core of adjunct teachers who can come into the classroom and let students see a real live human being and how excited they are about their work and how they feel what they're contributing to the Nation's future competitiveness. I believe that leadership is really important and frankly, the enthusiasm that Congress has shown, including Members of this committee, for this initiative has simply added to a groundswell of recognition for the importance of these professions to the Nation. So I believe we're on our way to a new era of awareness, and I don't doubt it will have a major impact on the graduation rates in science, engineering, math professions.

Mr. BARTLETT. Dr. Bodman.

Secretary BODMAN. I think Dr. Marburger said it very well. I think it takes leadership. I think it takes Congress. I think it takes the President. The President has stepped up and made proposals, has made, I thought, a very definitive statement about the importance of this to this country and if you have the President talking about this, I don't know how you'd do much better than that, sir. So I do think that we have the potential, if we get the kind of support from Congress that I hope we will get for the proposals, I think we are embarking on a new era.

I am a product of the Sputnik generation. I used to go out in the backyard as a boy and a not so young boy, I guess, and look up in the sky and look for that light going across because the Russians had one-upped us and that led to a number of initiatives, legislative initiatives, and Presidents Eisenhower and Kennedy did a great job of, I think, capitalizing on that. We're at a point now where we're having a similar kind of experience and the impor-

tance of science research and development, particularly the physical sciences, and its impact on the economy, and I think it's starting to become better known throughout our society, and I'm hopeful. I don't know what more to say than that, sir.

Mr. BARTLETT. I remember a cartoon from that era, recognizing the increased interest in engineering science and math. It was a kid; a freckled faced, bucktooth kid who said that six months ago I couldn't even spell engineer and now I are one. Oh, we need that kind of——

Secretary BODMAN. I, too, saw that cartoon. I didn't like it a lot, because I was once, sir. Yes.

Chairman BOEHLERT. Thank you very much, Dr. Bartlett. Your time has expired. But I can't help making an observation. You guys get it and we get it, about the importance of the subject matter being discussed today, but it warms the cockles of my heart to see this attendance here, and one of the things we have to do, Dr. Bartlett, is to get the media to focus on this very important subject in a significant way.

For example, Mr. Secretary, you and I were down at the White House, and I don't mean to name drop, but Monday, when the President of the United States, in a highly visible ceremony, presented the National Medal of Science and the National Medal of Technology to some very distinguished Americans and to some companies who have made a major investment and produce something of broad-ranging implication that helps fuel our economy and keeps us in our number one position. And guess what? I picked up yesterday morning's papers. I didn't expect to see my picture with the President, but I expected to see some stories about these wonderful, wonderful deeds performed by these magnificent national treasures and it was almost ignored by the national media, and we've got to get them enlisted. We've finally got the attention of the business community. I keep telling them, you know, you got to lobby for something other than the latest tweaking in the tax policy necessary to ensure a better bottom line, or the adjustment in trade policy that's necessary to put you in a more favorable position. You've got to tell us, in the Congress and in the Executive Branch, the importance of investment by the United States Government in research, and the importance of training the workforce of tomorrow. You've got to start training them today.

So I hope all the media representatives in the room will take to heart what I'm saying. We want you to partner with us in getting this message out. With that I am pleased to recognize the distinguished gentlelady from Texas, Ms. Eddie Bernice Johnson.

Ms. JOHNSON. Thank you, Mr. Chairman, and I apologize for having to run to another meeting, but I will ask unanimous consent to submit my complete statement as well as my questions.

Chairman BOEHLERT. Without objection, so ordered.

Ms. JOHNSON. Thank you. And simply say that, to the distinguished panelists, your leadership will determine where we are in this world. From K through 12 to higher education, to research, all of that, you are very, very important leaders. And you know, I like and respect our President, but he is a slow learner when it comes to this, and it's going to be up to you to give him as much of your information as possible. We get comments about our attitude on

global warming. We are getting to the point where our science is being doubted by other countries. That's the worst we can get. We were told not to attend another meeting, after he came into office, on global weather change, and it's unfortunate because we see the results. I'm asking all of you to spend more time educating our leadership in this area. Nothing is more critical than to educate young people, to get our scientists out there and become a leader in the world again in this area. We are really not right now because we're not prepared, but we can retrieve our standing, but it's got to be with your help and your leadership. Thank you.

Chairman BOEHLERT. Thank you very much. Dr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman, and thank you to the panel. Dr. Bement commented that he's having trouble because he's constantly smiling ever since the announcement of the President. I've had that same problem. In fact, the Speaker appointed me Chairman of the House Administration Committee to try to get rid of that smile. And those who know the committee know why. At any rate, congratulations to all of you and I thank you for your good work. And as you know, I've been fighting for this for 12 years now and it's very, very heartwarming to see progress on this front.

I also have to agree with the comments made about education and I'm disappointed at the cuts in the National Science Foundation and parts of their education programs. I understand the reason; I simply don't agree with it and I want to state that on the record. And Dr. Bartlett was quite right in commenting that, you know, being a nerd is not socially acceptable in high school. You know, and he said, you know, pretty girls don't date nerds. I thought that was true when I was in high school. I, however, found out that was just because I was obnoxious, and once I solved that problem, I married a pretty girl.

The point he made about being accepted, and it's also the point that the Chairman made about the announcements about the winners, I don't know what it is about the public. They all admire scientists, but don't want to get too close to them and that carries over in high school. I'm particularly worried about the young women in elementary and secondary grades, where some are conveyed this cultural idea that girls can't do science or can't do math. That's just nonsense. We're the only country that has that culture and we have to get rid of it, and if you have any bright ideas of how to get rid of it, that's very important.

But every time I visit a high school and speak to the students, I point out to them that they're making very important decisions about their future by way of the courses they select. And I also tell them they shouldn't look down on nerds, because if they are not a nerd, they're going to end up working for one, and I think that's a very important truth that they have to recognize. That's the direction the world is going. What I'm trying to get at is the importance of conveying that taking math and science ensures a more stable economic future, and we're not communicating that to kids and that's what we have to do. It's not a matter of just being socially acceptable, that it affects their ability in the years ahead to take care of themselves and their family.

I also want to express my concern about what's done to the MEP Program and the ATP Program. We'll continue working on that. I

don't want to add to that. But getting back to the climate change research, a question for Dr. Marburger and then Dr. Sampson. The Administration, to its credit, sometime ago, I believe 2003, completed a strategic plan for the Climate Change Science Program and this was supposed to guide a coordinated strategic budget request for climate change research across the entire Federal Government. Yet every year it seems we see a shift in priorities and funding requests for the various climate change programs that are a part of the Climate Change Strategic Initiative, or Science Program. And I'm wondering, is this really working well? Is the program really coordinated? Have you settled on a strategic plan? Are you following that plan or are you still running into the problems that, because it's spread across many departments and agencies, many of them are just taking the money and running in their own direction without complete coordination?

I'm not trying to pin the donkey's tail on you. I'm just really concerned about that and whether you were having trouble getting a handle on that and keeping their nose to the grindstone in the direction that you have decided you should go. So Dr. Marburger first and then Dr. Sampson.

Dr. MARBURGER. Thank you, Congressman. The Climate Change Science Program is one of a very small number of federal interagency programs that has a fully staffed coordination office. The chairman or the director of that office has been Dr. James Mahoney, a——

Mr. EHLERS. And he did——

Dr. MARBURGER.—a prominent meteorologist.

Mr. EHLERS. And he did an excellent job.

Dr. MARBURGER. And he has led that office in a very vigorous and proactive way. And part of the function of that office is to review the climate change science programs in all the agencies every year, to make sure that the budget proposals requested from those agencies are consistent with the overall strategic plan, and I believe that some of the changes and motion that you see in the budgets for those programs is a direct result of vigorous oversight and not the result of chaotic drifting. So I would interpret the changes that are being made as a result of dedication to operating this program as well as possible.

The office has a system that they have adhered to of having their progress reviewed by external bodies, including the National Academy of Sciences. So I believe there is oversight there and I would interpret some of these changes that you referred to as not necessarily indicating weakness.

Mr. EHLERS. So you're saying this is really part of the annual review of the planning process and modification as you go along?

Dr. MARBURGER. Insofar as these changes are reflected in the President's requests for these programs, they are in fact a result of deliberate review by the coordinating office.

Chairman BOEHLERT. The gentleman's time has expired.

Mr. EHLERS. I wondered if Dr. Sampson could just——

Chairman BOEHLERT. Okay. Dr. Sampson.

Dr. SAMPSON. Well, I've chaired the Climate Change Science Program this past year. OMB sits in on those meetings. Dr. Mahoney

is, I think, a real national treasure and so yes, I believe there is very strong coordination among the agencies.

Mr. EHLERS. The next question—and I don't have time, but I just want to throw it out and you can reply in writing. What about the technology program? Is the same thing true there?

Chairman BOEHLERT. Thank you very much. Mr. Miller. Incidentally, Mr. Miller and I, just about 30 days ago, were down at the South Pole and I'm advised by our good friends in the National Science Foundation that they're going to initiate a new program making us members of the Royal Order of the Ice or something like that. But, Dr. Bement, you know what a wonderful job NSF does with that polar program and he's got firsthand testimony. Mr. Miller, you're recognized.

Mr. MILLER. Thank you, Mr. Chairman. It was wonderful to stand at the South Pole and realize that all the politicians of the world who thought the world was revolving around them were actually wrong. It was revolving around me, at least for that moment. I was also pleased when I heard the President, in his State of the Union, describe a new competitiveness initiative, emphasis on science and math education and emphasis on basic research, but this is my third, or that was my fourth State of the Union and the budget always comes a week later, and it has become apparent to me that the budget writers get one memo and the speech writers get a different memo. The speech writers get a memo entitled paying Paul, and the budget writes get a memo entitled robbing Peter.

I remember two years ago, and then again last year, the President praised community colleges for the important role they played in giving our workers the skills that they need. Two years ago the President announced a new $250 million job training program for community colleges. When his budget came out, you couldn't really find it. Now, Congress did fund that $250 million as a new initiative, but that year, half of that came dollar from dollar for a Displaced Workers Training Program that was doing pretty much exactly what the President said the new program was going to be doing. And then last year Congress funded the new initiative not at all, but the Displaced Workers Program didn't get their $125 million back. And in fact, over the last three appropriation cycles, programs in community colleges for training displaced and new workers have lost $120 million. So I was actually a little concerned when I heard the President talk about basic research and what that would actually mean in the longer run. Is praising it in the State of the Union actually the first step in cutting it?

And Dr. Marburger, I'm not persuaded by the argument that you need to back out the earmarks and that we really are spending more on science, not less. The earmarks were undoubtedly spent on research, just research at the direction of Congress instead of research at the direction of the Administration. But fundamentally, I agree that what we're doing in scientific research should not be guided by politics. But, Dr. Marburger, I am very concerned that reports that we have heard, that it is being guided by politics in the Administration. There was an article this morning in the *Washington Post,* and op-ed piece by Ann Applebaum, about a NASA-funded research project into the possible environmental effects of hydrogen fuel cell, the hydrogen fuel cell economy that the

President pushed two or three years ago, and that a press conference and a press released announcing the results of that study were killed by your office, apparently for political reasons. This was a favored project of the Administration and this report by NASA was critical of it.

Dr. Marburger, I know that you're going to say it didn't happen, but these were all unnamed, presumably national employees speaking and not for—speaking with the understanding that their names not be used. What assurances can you give us? What procedures are in place to make sure that politics does not intrude in what is being funded and what findings are acceptable coming out of scientific research, particularly on global warming?

Dr. MARBURGER. On the contrary, that is a case where my office did, in fact, ask NASA to hold up a press release on a study that indicated the impact of very large quantities of hydrogen in the atmosphere, and we did that specifically because another agency that had expertise in this area was aware of the conditions of the report were somewhat in question, and we wanted to make sure that the Department of Energy had an opportunity to say what it thought the case was before NASA put out its own press release. We did this in full awareness that the paper was about to be published and that the institution where the people were working was going to have its own press release. I was struck this morning, in the op-ed that you referred to, by the contrast between the title of the article and the concluding sentences of that commentator saying, I have nothing to report.

So I think this is a case where there's been an effort to make a mountain out of molehill, and I'm not at all defensive about the action that my office took in that instance. It took place three, three and a half years ago, I believe. So I'm very aware of the report and its implications and the problems with the study that was done, some of which were actually indicated in the op-ed article that you're referring to. So I don't think this is an indication that supports the contention that the Administration interferes with science or censors science in any way. I think that this was an appropriate action that we took in response to a situation that needed to be clarified to the American people.

Chairman BOEHLERT. Thank you very much. The gentleman's time has expired. Mr. Calvert.

Mr. CALVERT. Thank you, Mr. Chairman. I'm sorry, I was meeting with Dr. Sega here in the back and I don't know if the question that I'm going to have, whether it's been answered or not. If it has, let me know. Dr. Marburger, the Office of Science and Technology Policy, OSTP, is currently in the process of developing a national aeronautics policy, you're probably aware of, to guide research in years to come and the question I have, or two questions, one is, how will this policy ensure that the United States is competitive globally, in an industry that is one of the bright spots that we have left? And the other question is, why was aeronautics not included in the President's competitiveness initiative?

Dr. MARBURGER. Thank you, Congressman. The President's competitiveness initiative is an initiative about priorities. What are the areas that have the absolute highest impact on our future competitiveness? What are the areas that need to be tuned up and need

to be supported in response to studies that have taken place over the past few years? And what are the areas that are ready to use the funds that have plans in place and detailed spending plans and projects and roadmaps and so forth? And I believe that the initiative does accurately identify those priorities.

The civil aviation component of federal operations is clearly a very important component and one that is currently benefiting from an activity mandated by Congress on the next generation air transport system. As that planning for that program matures and develops its own roadmaps and strategic plans for the path forward, I have every confidence that the President will propose and the Congress will appropriate funds that are appropriate for that sector of our activities.

Mr. CALVERT. I have a number of questions specifically that I might send to you because of the limited time.

Dr. MARBURGER. I'd be glad to respond.

Mr. CALVERT. I also have a question that I won't ask for an answer, that as a nation we should be concerned about is the next generation air traffic system, which, seems to me, we're falling behind on and we just don't seem to have any closure on that, and the Europeans, as you know, with their own concept, that I would hate for us to see us lose that, which is extremely important to maintain, I think, an industry that's very important to this country. I would like to get a written response on that.

Dr. Bodman, you know, on the issue of energy independence—and I understand, with the price of oil being what it is, that oil companies probably—it isn't necessary for them to possibly get R&D money for oil sand research or oil shale research, but it seems to me that we need to do something that's immediate in order to get our supply up and in order for us to be competitive and to have better prices at the pump, quite frankly. And I know your ethanol initiatives and what's going on with finding better technologies and to use cheaper fuel stocks and the rest. Any comment about how we can help get more oil in the pipeline and have more immediacy in some of these solutions that we can go back home and talk to folks about? Because I'll tell you, in southern California, and I'm sure Dana's the same way, we hear a lot about that back home.

Secretary BODMAN. The efforts on drilling continue unabated. There is plenty of incentive to drill oil wells at $60 oil prices. And so we have seen a response. Part of the problem in looking at energy, at the energy system, the country has, the world is getting your constituents to appreciate the scale. We had a situation where starting a year ago, we had, right after I took this job, by the way, we had, for the first time in my memory, demonstrated the inability of the world producers to keep up with the demand and so we saw an escalating oil price. It started there; it was exacerbated by the hurricanes that occurred last fall. And I'm of the belief that we will see a response from the industry as they are getting geared up and working on the appropriate expansion of their activities. Certainly, that's happening abroad and I believe that it's also happening domestically.

We also have, you know, other things that have been real problems getting the natural gas pipeline from Alaska constructed. Part of the responsibility, at least at this point, of the Energy Depart-

ment getting that going and it's been a real issue trying to get the oil and gas companies to agree to the demands of the State government in Alaska, or vice versa. I'm not sure who's at fault, but we've got real issues there in trying to get that done, and then you are well aware of ANWR and the situation that emanates from there. So there are lots of ways. The Interior Department has proposals on increasing access to parts of the outer continental shelf in the Gulf of Mexico; that will help. And I know that Secretary Norton is working hard on expanding or accelerating the processing of applications for drilling federal land, so there are a lot of things that we can do and we are doing our best to try to deal with it and at the same time implementing the Energy Bill, which is basically looking for alternative sources.

Chairman BOEHLERT. Thank you very much. The gentleman's time has expired. Chair recognizes, for brief intervention, Chairman Biggert because she has a compelling need to be someplace else. She just gave me a little note, she said this is the most important hearing so far this year and I agree with her, but she's got another commitment that's equally important to her personal schedule, not to the Nation. Chairman Biggert.

Ms. BIGGERT. Thank you. I think not only the most important this year, so far, because I don't think we've had very many or any, but I think it is the most important hearing that we're going to have this year. I am just so excited about what's happened here and how the President's American Competitiveness Initiative and the prominent role that DOE's Office of Science will play in this visionary initiative and I really think that much of this credit for the high priority that this budget places on science is due to you, Dr. Bodman.

It balances researchers and facilities, it capitalizes on our investment in user facilities by maximizing their operations and it makes strategic investments to maintain U.S. dominance in material sciences, nanotechnology, biotechnology and high-speed computing and I haven't even mentioned the Global Nuclear Energy Partnership, which I strongly support. I had to be at another hearing earlier and I asked the questions of the new Federal Reserve Chairman Bernanke, who is testifying before Congress, it's the first time, and he reiterated the importance of R&D to this U.S. economy and U.S. competitiveness and he also endorsed one of the key components of the President's competitiveness initiatives, namely to make permanent the R&D tax credits, so the importance of research—but all of you have been working so hard on this that I—you know, I wish that I had had more time to be here, but I—but you know how much I appreciate what all of you have done, and Dr. Marburger, with working on this tirelessly, too, but Secretary Bodman, you've just, you know, been outstanding, I think, where we are really in a new revolution.

We have moved, you know, agriculture, industrial, manufacturing—we are in the high-tech era right now and I think—I don't know that we realize the place in history that this is going to be and I think we need to continue, you know, to develop this initiative and we're, all of us, I think, as the Congress, as the Administration, to really fulfill this and bring forward a really new economic era that we're going to see, so I thank you all for being here.

Chairman BOEHLERT. Thank you very much, and I can't help but be reminded it was technology and our wise investments that drove the dynamic 1990s and we soared to new heights and it's going to be technology that guarantees an even more promising future. And when I think of a more promising future, I think of Mr. Honda. The Chair recognizes you for five minutes, sir.

Mr. HONDA. Thank you, Mr. Chairman, and you're a silver-tongued devil. You're not a devil. But I'm pleased to be here and I also have a couple of questions and quite frankly, I'm not as enamored with what I heard from the State of the Union because I've been here six years and there's a difference between saying something and then following through with substantive kinds of programs that they're putting the money behind it. I'm reminded of the movie Jerry Maguire, where the football player said show me the money and I'm not quite sure that the money's going to be coming here. I have a question for Dr. Sampson, but a comment to the Secretary—to Secretary Bodman, and that's a comment about our inaction between the DOE and this committee.

Ranking Member Gordon submitted a series of questions to you in advance of this hearing so that you could be prepared to submit answers to those questions at this hearing, but from what I've been told, those answers were not available today because they're awaiting OMB approval. The problem I have with this is that I think I am still waiting for answers to questions I submitted at a hearing back in June on reprocessing. We only have a little bit of time to ask questions verbally, so I'd like a response offline afterwards, but it just seems that you won't be answering questions when we submit after the hearings and not responding to questions when they're submitted before our hearings and so if there's a problem with the OMB clearance, how long before the hearing do we need to give you questions so that answers can be cleared? I'll come back later for that response after this hearing, perhaps later.

Dr. Sampson, it's time for my annual question about Advanced Technology Program, ATP. The documents that came with the budget say that the program isn't needed "due to the growth of venture capital and other financing sources." *Red Herring* magazine published this recently based on data from their national venture capital association which has an interest in making VCs look good. According to the story, while VCs raised a lot more money in 2005, total VC investments only went up about two percent in 2005, from 2004. The biggest gains went to retailers and consumer services, meanwhile the semiconductor, pharmaceuticals, electronics and software all secured less funding in 2005 than in 2004, and during 2005, VCs cut their seed funding by 54 percent from the 2004 level, from $118.3 million down to $54.3 million. Based on the data, how can you possibly say that ATP isn't needed because ample VC funding is available? It appears that MEP is following the same route as ATP as far as our process is concerned and we're all concerned about MEP, as we were with ATP, and some comments were made about earmarks. It appears to me that ATP's only being funded through our good efforts, through our earmark process and that's the only way ATP seems to be surviving. So I'd like some sort of response to that comment.

Dr. SAMPSON. Well, let me respond to the ATP issue, first of all, in several ways. First of all, the budget that we submitted reflect what we believe are the highest priorities. Secondly——

Mr. HONDA. Well, it's been submitted as zero, I believe, if I'm not mistaken.

Dr. SAMPSON. That's what I'm getting to.

Mr. HONDA. Okay, so it's a high priority and it's—I'm sorry, go ahead.

Dr. SAMPSON. No. We have redirected that money in what we believe to be higher priority areas, which is the core mission of National Institute of Standards and Technology, which is basic research in the physical sciences and secondly, I think that without question, the United States has the most robust venture capital market anywhere in the world. The evidence of that is clearly demonstrated around the country, whether you're going to the 128 Corridor in Boston or Silicon Valley or other emerging innovation hotspots around the country and so——

Mr. HONDA. Perhaps you can share your stats with our office to substantiate your position because the article that I read in the Red Herring magazine has done some research in terms of funding, so go ahead. Thank you. If you could produce that.

Dr. SAMPSON. We'll be happy to get back with you.

Mr. HONDA. Yes, do you have a timeline for that?

Dr. SAMPSON. As soon as our staff can work on it, we'll be happy to get back to you.

Mr. HONDA. I've been waiting since June for the questions on reprocessing. It's about responsiveness.

Dr. SAMPSON. I can't answer that.

Secretary BODMAN. I am very puzzled by that and it will have my immediate attention when I get back to the extent that you sent a letter several months ago and have not been responded to, sir, I am unaware of it and——

Mr. HONDA. Well, the Ranking Member also has done that, too, so——

Secretary BODMAN. I know the Ranking Member sent material, sent that list of questions in, answers have been prepared, they are being processed through OMB and they will be forthcoming promptly. I was prepared to deal with his questions at this meeting if he wanted to ask questions at this meeting.

Mr. HONDA. I asked because——

Secretary BODMAN. But in terms of your situation, sir, I am completely unaware of it and it is exactly the sort of thing that I have been working hard to bring a halt to, to the extent that these issues existed and I will see to it promptly.

Mr. HONDA. I'd appreciate it.

Secretary BODMAN. You will have an answer, sir.

Mr. HONDA. Thank you very much and please forgive my adamancy.

Secretary BODMAN. Perfectly reasonable question.

Mr. HALL. [Presiding] Thanks, Gentleman. The Chair recognizes the gentleman from Minnesota, Mr. Gutknecht.

Mr. GUTKNECHT. Thank you, Mr. Chairman, and I hope I don't take the whole five minutes, but I probably, unfortunately, will. First of all, let me apologize on behalf of a lot of my colleagues for

these earmarks because I do believe that frankly, I think they're inappropriate in terms of science and research and I am a proud original cosponsor of Representative Jeff Flake's bill and hopefully, now more Members will join us in that. Let me say, though, on behalf, I think, of the overwhelming majority of Members of this committee, for the most part, we have avoided the temptations that other committees have fallen into in terms of those earmarks.

What I really want to talk about, though, just briefly with you, and I'm delighted, Secretary Bodman, we're delighted to have you here to talk a little bit about renewable energy, because I think you made a very important point. At $60 a barrel, I'm not sure how much we really need to subsidize a lot of that. But I want to come back to—one of my favorite expressions is that success leaves clues, and I think if there's one successful program in terms of advancing research that we have seen, at least on this committee and that we've worked with, it's one that's run by the Defense Department, it's called DARPA, and I'm wondering if any of you and particularly, Secretary Bodman, if you want to talk briefly about that, how much you know about DARPA and whether or not you have considered a similar type program in any of the other agencies.

And the reason I say that is in our work, both on this committee and in my work representing the people of southern Minnesota, I get to encounter a number of incredibly interesting ideas and entrepreneurs, and one of them I actually took out to the National Renewable Energy Labs out in Colorado, which is a very impressive facility. But on the way back he said something rather interesting; he said, you know, actually what we're doing right now is probably more advanced than what they're doing out in Colorado and I said why is it that it seems that private individuals, entrepreneurs and inventors seem to be able to move at a faster rate sometimes than the federal agencies and he gave a very interesting answer.

He said because we only eat what we kill, and if you think about it, that's why I really want to encourage you all to consider looking at that DARPA model because, you know, a few dollars invested, relatively small amounts of money invested in specialty projects have yielded enormous returns in terms of new ideas, new innovations. When you look at the success rate of DARPA, I think it's one that deserves to be studied and wherever possible, modeled. And Secretary Bodman, if you want to respond to that, or anybody else, I'd appreciate it.

Secretary BODMAN. I am very aware of DARPA and its predecessor, which was the Office of Naval Research, and that goes back to my days as a student, sir, so I am quite aware of what they've accomplished. The budget that is before you shows sizeable increases in funding for research in the Energy Department. I commented earlier, I believe before you arrived, that we are thrilled with the proposal that's there and we are very hopeful. There are a number of proposals in Congress, some of them involving a DARPA-like structure, and my answer on that is I am aware of it. We have a lot to do and we have a 14 percent increase. We have a half billion dollars to put to work in the science area. We have a quarter billion dollars to put to work in additional funds in the energy area and they had been prioritized and we worked on that,

and so I'm sure there are things that, in the DARPA model that make sense and we would be happy to explore that and work with you if that's something you're interested in. I just would observe, we have a lot to do to take the money that hopefully, will be granted by Congress and put it to work effectively. We have a big job and I would rather not distract this Department with additional priorities, at least right now. Hopefully, after we get this started and are more effective in operating in this sort of environment, we will be able to be more responsive to your suggestions and other suggestions about a DARPA program.

Mr. HALL. Gentleman's time is expired. The Chair recognizes the gentleman from Missouri, Mr. Carnahan.

Mr. CARNAHAN. Thank you, Mr. Chairman, and I'm glad to see us having this discussion here today. This is a big idea and I think it's a big deal for our country. We've had great bipartisan support with a lot of these initiatives and as they say, the old saying, politics makes strange bedfellows, and I'm going to talk about Bono and JFK in the same paragraph here, now. Bono was here in Washington a few weeks ago and talked about the dangers of incrementalism when you have big ideas. I think that's important to keep in mind. And you look at the example of JFK, and Secretary Bodman, you talked about those times when you really created this national challenge for us and I think we need to have that same great level of national challenge with where we are today.

But I think this big idea deserves a lot more than fuzzy math or counterproductive measures and I'm concerned about if we're just cutting science in some areas to fund science in other areas, we're really just reshuffling the chairs on the Titanic. We deserve better than that. And I want to make a point about Congressional earmarks; does anyone on the panel think that Congressionally earmarked dollars spends differently than an administration budgeted item?

Dr. MARBURGER. Yes, I do.

Mr. CARNAHAN. I'd be curious to know how.

Dr. MARBURGER. Yes, sir. The fact is that the Presidential requests are built on proposals from agencies that are developed in consultation with external committees of scientists and educators and engineers and they are part of a coherent plan. In many cases, earmarks are spent on activities that lie completely outside coherent plans and not infrequently, are completely outside the area of R&D for which the agencies are supposed to be responsible.

So I believe that the best possible way to spend taxpayer dollars in research is in consultation with the agencies that are responsible for providing oversight and their peer review merit based mechanisms. So we would be glad to work with Congress to determine mechanisms that would make it possible for Congressional concerns to be addressed in the areas of research that appear to be needed, but I think this practice of earmarking has grown out of control and we're very concerned about it.

Dr. SAMPSON. With respect to the Commerce Department, the majority of our funds and our construction account for the NIST laboratories are earmarked funds for activities that are not a part of NIST's core mission. All of this, at the time, when our lab in

Boulder, Colorado—we have Nobel Prize winning scientists doing work in labs where they have black plastic sheeting covering the roof and cardboard placed on ventilation systems to be able to try to control the temperature and the moisture in the room. I know Dr. Bodman has been there to see those facilities and so I think has Dr. Bement, who—former Director of NIST. And so the issue for us is there's money in the budget, but can it be spent on the priorities that we have to facilitate core basic research?

Secretary BODMAN. One of the big issues in the Energy Department is the production of ethanol using various biologically-based systems, goes out of the NREL out in Colorado and 57 percent of that budget has been earmarked, sir, and that has meant that we've had to lay off people at the NREL laboratory which we got criticized for and it was a direct result of Congressionally mandated programs that were not related to that which we wished to do.

Mr. CARNAHAN. Well, I would acknowledge that we may have a difference in the vetting process, but I think the vast majority of earmarks that have come through the Congress have been thought out and have been part of an important part of what we do here. Finally, I want to close—I talked about some counter-productive policies. I'm concerned about the K through 12 cuts. I'm concerned about the measures that have just passed through the Congress that have made historic cuts in the student loan programs. We've had several panels of distinguished business executives from around the country expressing concern about our education policy and I think we cannot succeed in this innovation initiative if we don't really take a hard look at our education policy in growing those young minds to meet the need, otherwise we're going to see the scientists and engineers from China and India and around the world being used to fill that gap, and I'd like to have some comment about that.

Dr. MARBURGER. I couldn't agree more. I believe that education is absolutely a high priority investment for this nation. Quality of teaching, the quality of experience that young people have in classroom and the standards to which we hold their performance are all important and they are all features of the American Competitiveness Initiative that the President announced and I hope that in further hearings and as people have the opportunity to speak about them, we can learn about plans for those areas, but the President is very concerned about the quality of education in this country and is looking for handles on it and ways to bring about improvements that we know are needed for continued American leadership in high technology.

Chairman BOEHLERT. Thank you. Gentleman's time——

Mr. CARNAHAN. Thank you, Mr. Chairman.

Chairman BOEHLERT. Gentleman's time has expired. I recognize, out of order for one minute, Dr. Ehlers because he has something pertinent to the discussion at hand.

Mr. EHLERS. Thank you, Mr. Chairman. I'm surprised to hear earmarks defended twice by the minority party. I want to give another example where, in a budget some years ago, because of the sorry state of the NIST laboratories in Boulder, we put in $40 million to help them prevent rainwater from falling on the world's best

time standard, for example. Out of that $40 million, in the Senate, all $40 million was diverted to the cause—it's the one that comes to mind immediately, was $10 million to build a law library in a college in the state from which that senator came. No correlation whatsoever with the original intent of that money and certainly not of general benefit to the Nation, as a whole. And that sort of behavior, that sort of process simply has to stop and I agree with the panel on that. Thank you very much.

Mr. SHERMAN. Mr. Chairman, if I could speak for 30 seconds out of turn?

Chairman BOEHLERT. All right, fair is fair. The gentleman is recognized for up to one minute, equal time.

Mr. SHERMAN. Clearly, there have been stupid earmarks or earmarks that are outside of good scientific policy, but I trust you, gentlemen, there are stupid decisions made by the Administration and to hear, in this room, it said that all the Administration earmarks made to de-fund this or that policy are results of an open process, are part of a logical plan, are intelligent decisions make in the interest of the American people and that those decisions made by Congress as to how to spend money are inherently flawed, not part of an open process, is, I think, insulting to the Congress. We make decisions, the Administration makes decisions, both make wise decisions, both make stupid decisions and to say that when Congress decides that a certain amount of money should be spent on a certain project, that that is interference, is really a declaration that Congress is an annoying interference in the Federal Government. I yield back.

Chairman BOEHLERT. Thank the gentleman for that intervention. Now the Chair is pleased to recognize the distinguished gentleman from California, Mr. Rohrabacher.

Mr. ROHRABACHER. Well, I will remind my friend from—and colleague from Missouri that cutting one program that's already in place and transferring the money to another program could well be the sign of prioritizing money so that it's going into programs that tend to work and out of programs that do not work. So it's not necessarily a bad sign that the Administration is trying to prioritize the spending that we do and transferring some money from programs that may be less effective, so that may be a plus. That may be something that the Administration's doing that deserves to be applauded and I would just like to say that I don't know whose decision making is more flawed. I've worked in the Executive Branch and the Legislative Branch.

I will just say that it is clear that there are certain political motivations that happen here in Congress that we should recognize before we throw rocks at the Administration. With that said, earlier on in the hearing we heard about how to get bright people, young people involved in science. I don't understand why the obvious is not ever mentioned and that is pay them more money. Why do people go into law? Because the lawyers have all of the fancy sports cars and live in the big homes, and if a kid who is very smart has to choose between driving in a jalopy and being a Ph.D. in physics versus going into law and living in a big mansion and having the good looking girlfriend, guess what he's going to choose?

So with that, that goes all the way back down, by the way, to education where we pay physical education instructors the same amount of money that we pay people to teach our young people science and math and engineering and every study that I've seen shows it's between fourth grade and ninth grade where we're losing the battle with our young people, yet in those middle schools we are unable, due to some political considerations, I might add, by some very strong unions, not to differentiate in pay between those people who can teach our kids the basics of math and science at that level and versus paying the same amount of money as you do for history or social sciences or physical education or dance class or basket weaving. This is ridiculous. So we need some reform in that area and making money is also something that will encourage people to get into the math and sciences when they're older.

I mean, we haven't heard anybody talk about royalties from patents or the protection of patents or the fact that people who are creative, how they get ripped off so often of their own creative instincts and their own in creating projects by big companies that are able to violate patent rights. Strengthening patent rights is a way to make sure America stays ahead and get people involved in the sciences. I, for example, believe that we should eliminate the taxes, if not, at least have some sort of tax advantage for people who are making their income on royalties from patents.

With that said, I would like to make one last point and that is—well, first of all, I applaud the Administration for making it a scientific and engineering priority for America to become energy self-sufficient by 2025. That's a bold, bold stroke by the President and I will be anxious—in fact, Dr. Marburger, if you'd come in to my office to have a discussion on that with some viable technologies right after this hearing, but I look forward to working with each and every one of you to achieve that goal. But let's make sure, when we talk about research, money and research, that we're doing, that when we put money in one end of the system that what comes out of the other end of the system is something of benefit to the people of the United States of America and uplifts the condition of humanity.

I am dismayed, and here again, I'm sorry, Mr. Chairman, that I'll have to be the skunk at the lawn party, so to speak, again, but I am dismayed to see that we are spending $1.7 billion on global warming research after billions and billions and billions and billions of dollars have already been spent trying to promote this idea versus $1.3 billion on nanotechnology, which I understand has tremendous potential of changing the human condition for the better. Let me note, for the record, at this point, Mr. Chairman, I would like to submit the names of thousands of scientists and other experts within the scientific community who are skeptical of global warming and I'd like to place it in the record at this point, in the record.

Chairman BOEHLERT. Without objection, so ordered.

[The information follows:]

GLOBAL WARMING PETITION

(http://www.oism.org/pproject/s33p37.htm, February 24, 2006)

We urge the United States Government to reject the global warming agreement that was written in Kyoto, Japan in December, 1997, and any other similar proposals. The proposed limits on greenhouse gases would harm the environment, hinder the advance of science and technology, and damage the health and welfare of mankind.

There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gasses is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate. Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produce many beneficial effects upon the natural plant and animal environments of the Earth.

2660 Physicists, Geophysicists, Climatologists, Meteorologists, Oceanographers, and Environmental Scientists Signers

(http://www.oism.org/pproject/a_sci.htm, February 24, 2006)

Category: A

Philip H Abelson, PhD, Gene Ackerman, Robert K Adair, PhD, John A Adam, PhD, Daniel B Adams Jr, Gail D Adams, PhD, Leonard C A Adams, PhD, Louis W Adams, PhD, Neil Adams, PhD, William M Adams, PhD, George Adcock, Lionel P Adda, PhD, Harry Adrounie, PhD, Stephen Affleck, PhD, Phillip Ahlberg, Mark Ahlert, Rafique Ahmed, PhD, S Aisenberg, PhD, Edward Albert, James C Albright, PhD, Allwyn Albuquerque, Ernest C Alcaraz, PhD, Ronald G Alderfer, PhD, Perry B Alers, PhD, John C Alexander, Moorad Alexanian, PhD, Roger C Alig, PhD, Clayton H Allen, PhD, David Allen, PhD, James Allen, PhD, Mike R Allen, PhD, Thomas H Allen, PhD, William Allen, John J Allport, PhD, Vincent O Altemose, Melvyn R Altman, PhD, Edward E Altshuler, PhD, Charles D Amata, PhD, Edward J Ames III, Pierre Saiut-Amond, PhD, Arthur G Anderson, PhD, Berard J Anderson, PhD, James R Anderson, James R Anderson, Ken Anderson, Orson L Anderson, PhD, P Jennings Anderson, Richard A Anderson, PhD, Richard C Anderson, Tom Anderson, Douglas Andress, James F Andrew, PhD, Bradley C Anthanaitis, PhD, Lee S Anthony, PhD, Lynn Apple, PhD, Alan Appleby, PhD, Herbert S Appleman, Morris H Aprison, PhD, Richard E Apuzzo Jr, Philip Archibald, Robert Archibald, John Archie, William Bryant Ard, PhD, Harold V Argo, PhD, Baxter H Armstrong, PhD, Robert Emile Arnal, PhD, Charles Arney, Casper J Aronson, Jose J D Arruda, PhD, James Arthur, PhD, Max Artusy, PhD, Edward V Ashburn, Randolph Ashby, PhD, Jerome P Ashman, Monroe Ashworth, Orv Askeland, Ronald Attig, Leonardo D Attorre, Luther Aull, PhD, John B Aultmann Jr, William Avera, Frank Averill, PhD, Kenneth Avicola, M Friedman Axler, William Aylor.

Category: B

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Category: D

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Category: E

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Erickson, PhD, Richard Erickson, PhD, Paul Erlandson, PhD, James L Erskine, PhD, Brenda Eskelson, Terry Ess, Edward R Estes, Albert Edwin Evans, PhD, James A Evans, Leonard Evans, PhD, Ralph A Evans, PhD, A Gordon Everett, PhD.

Category: F

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Category: G

Steven A Gaal, PhD, F Gabbard, PhD, L H Gabro, Gaffney, Richard Gaggioli, PhD, George Gal, PhD, Eugene Galanter, PhD, Frank P Gallagher III, Jack Gallagher, PhD, Paul Galli Jr, Charles Gallina, PhD, Charles Gallina, PhD, William A Gallus, Jr, PhD, Perry S Ganas, PhD, A K Ganguly, PhD, Carl Ganseivity, Floyd Wayne Garber, PhD, S Paul Garber, Edward E Gardner, PhD, Hessle F Garner, PhD, Jay M Garner, Alfred J Garrett, PhD, John C Garth, PhD, Jerrie W Gasch, Robert S Gaston, G R Gathers, PhD, Thomas Gatliffe, William E Gee, D A Gedcke, PhD, Elton W Geist, Charles Gelwall, Gary Gerardi, PhD, George S Gerlach, Ulrich H Gerlach, PhD, Robert L Geyer, PhD, L H Giacoletto, PhD, Umberto Gianola, PhD, Gordon Gibb, Lee Gibson, PhD, Peter F Giddings, W Allen Gilchrist, PhD, Claude M Gillespie, PhD, Bruce B Gillies, George T Gillies, PhD, William Gilmore Jr, H Scott Gingrich, Helen Ginzburg, James Given, Peter Glanz, PhD, Peter K Glanz, PhD, Jerome E Glass, Thomas A Gleeson, PhD, Thomas A Gleeson, PhD, Dale P Glover, Robert Glover, Will E Godbey, Terry L Godsey, David J Goerz, Malcolm Goldberg, PhD, Malcom Golderberg, PhD, Ronald B Goldfarb, PhD, Bruce Goldman, John P Goldsborough, PhD, Norman E Goldstein, PhD, Walter J Goldsworthy, Mark J Golol, William R Gommel, PhD, John R Gonano, PhD, Michel Gondouin, PhD, John B Goodenou, PhD, David Goodenough, PhD, Kent J Goodloe, Clifford Gordon, James W Gordon, PhD, Robert Gordon, Wilbur H Goss, PhD, Henry Gotsch, Gordon Gould, PhD, Robt G Gould, PhD, Robert G Graf, Leroy D Graff, Howard E Graham, Lewis O Grant, Lawrence Grauvogel, Joe C Gray, Kevin J Gray, PhD, Robert C Gray, Thoams Gray, Michael Grecco, Joseph Matthew Green, PhD, David Greene, Donald M Greene, PhD, Miles Greenland, Reynold Greenstone, Anton Greenwald, PhD, Gregory Greer, Howard Greger, David T Gregorich, PhD, J R Greig, PhD, Paul Greiman, Daniel Grieser, Doreen Grieve, J Tyler Griffin, J Tyler Griffin, James Edward Griffin, PhD, M Griffin, PhD, Brandon Griffith, Richard T Grinstead, B F Grossling, PhD, D J Grove, PhD, John C Grover, Timothy R Groves, PhD, William Groves, Richard Grow, PhD, Johathan R Gruchala, Mike Gruntman, PhD, Richard A Gudmundsen, PhD, Gareth E Guest, PhD, Thomas F Guetzloff, PhD, Peter H Guldberg, Peter H Guldberg, Guldenzopf, PhD, Charles W Gullikson, PhD, Darryl E Gunderson, Richard Gundry, Raj K Gupta, PhD, Philip F Gustafson, PhD, William Gustin, Donald T Guthrie, Steven L Gutsche, Jeng Yih Guu, PhD, Frank Guy, PhD.

Category: H

Gottfried Haacke, PhD, Benjamin C Hablutzel, George Hacken, PhD, Glenn A Hackwell, PhD, Lawrence Hadley, PhD, Frank A Hadsell, PhD, Jeffrey Haebrlin, Anton F Haffer, Erich Hafner, PhD, G Richard Hagee, PhD, Arno K Hagenlocher, PhD, Ismail B Haggag, PhD, Chuck R Haggett, Douglas C Hahn, John A Haiko, Mary Hakim, M H Halderson, Francis A Hale, R A Haley, R W Hall, Jr, PhD, Robert Halladay, Martin B Halpern, PhD, Matthew M Hammer, Scott E Hampel, How-

ard W Hanawalt, Lawrence Handley, PhD, Arthur L Handman, Sultan Haneed, PhD, N Bruce Hanes, PhD, David Haney, Sunil Hangal, PhD, William Hankins, Arthur D Hanna, PhD, Jeff Hanna, RW Hannemann, Martin Hanninen, Edward Hanrahan, PhD, E M Hansen, Robert C Hansen, PhD, Charles Hantzis, William Happer, PhD, Michael P Harasym, Allan W Harbaugh, PhD, John H Harble, Harry C Hardee, PhD, Harold C Harder, PhD, Clyde Hardin, James L Harding, PhD, Mary K Harding, Thomas Harding, Thomas W Harding, PhD, Wm Harding, PhD, Elwood Hardman, Henry R Hardy, PhD, Robert E Hardy, Mark Harjes, Eric A Harms, Lynn Harper, David Harriman, Franklin S Harris Jr, PhD, Richard A Harris, PhD, S P Harris, PhD, Marvin Harrison, James Hart, Robert D Hart, M Hartman, Peter Hartwick, Kenneth C Harvey, PhD, John A Hasdal, PhD, Neal Haskell, PhD, Jill Hasling, Floyd N Hasselrlis, Turner E Hasty, PhD, Ronald R Hatch, Larry Hatcher, Eric W Hatfield, Peter Hatgelakas, J Hauger, PhD, Henry Haughey, Ken Haught, PhD, Arthur Hausman, Peter Havanac, K Havenor, PhD, William Havens, PhD, Kerry M Hawkins, Robert Hawkins, PhD, William K Hawkins, Howard Hayden, PhD, Dennis Hayes, PhD, James L Hayes, Carl H Hayn, PhD, George L Hazelton, R N Hazelwood, PhD, William G Hazen, Harold E Headlee, G Herbert, David R Hedin, PhD, Todd Hedlund, Harold G Hedrick, PhD, John Hefti, Walter Heinrichs, William D Heinze, PhD, William D Heise, Thomas Helbing, Cecil Helfgott, PhD, Marvin W Heller, PhD, Carl Helmick, Ron Helms, Philip Hemmig, J Hemstreet, PhD, Dale Henderson, PhD, Gerald J Henderson, PhD, Richard G Hendl, PhD, John B Hendricks, PhD, Tom A Hendrickson, PhD, Raymond Henkel, PhD, Joseph Hennessey, Gregory W Henry, Malcolm Hepworth, PhD, John A Herb, PhD, Donlad Herlew Jr, PhD, Roger M Herman, PhD, Don Herriott, Tom R Herrmann, PhD, George Herzlinger, PhD, Cynthia Hess, PhD, George B Hess, PhD, Karl Hess, PhD, Ralph A Hewes, PhD, Frederick Hewitt, PhD, Paul G Hewitt, Walter Hickox, Joseph H Higginbotham, PhD, Archie C Hill, PhD, Harvey F Hill, J C Hill, PhD, Robert D Hill, PhD, Richard Hillger, PhD, Hilton F Hinderliter, PhD, Robert Hirsch, PhD, Sol Hirsch, Donald A Hirst, PhD, Mark Hladik, Wai Ching Ho, PhD, James L Hobart, PhD, George Hobbs, Lon Hocker, PhD, Sidney E Hodges, PhD, Gus L Hoehn, PhD, William B Hoeing, C S Hoff, Thomas E Hoffer, PhD, John R Hoffman, PhD, Marvin Morrison Hoffman, PhD, C Lester Hogan, PhD, David C Hogg, PhD, LE Hoisington, PhD, David A Holcomb, Richard Holcombe, J Keen Holland, Richard Holland, Kenneth Hollenbaugh, PhD, Charles L Hollenbeck, William A Hollerman, John T Holloway, PhD, Russell Holman, Johnny B Holmes, PhD, Edmond W Holroyd, PhD, Lowell H Holway, PhD, George Holzman, PhD, Philip E Hoover, Richard Hoover, Francis J Hopcroft, George William Hopkins, PhD, Terry Horn, John Horrenstine, Doc Horsley, PhD, William Horvath, PhD, James Hosgood, Charles R Hosler, Richard F Houde, House, Robert M House, Michael S Howard, PhD, Charles D Hoyle, PhD, Jam Hrabe, PhD, Bradford Hubbard, Harmon W Hubbard, PhD, Wilbert H Hubin, PhD, Colin Hudson, PhD, Brad Huffines, Woodie D Huffman, James W Hugg, PhD, John Hulm, PhD, John L Hult, PhD, Brian Humphrey, William E Humphrey, PhD, Robert D Hunsucker, PhD, Hubert B Hunt, J E Von Husen, John L Hubisz, PhD, Frank Hussey, Vivian K Hussey, Jerome G Hust, John F Hutzenlaub, PhD, Alan W Hyatt, PhD, Eric Hyatt, PhD, James M Hylko, Steven J Hynek.

Category: I

Rodney D Ice, PhD, Sherwood B Idso, PhD, Alex Ignatiev, PhD, Walter L Imm, Anton L Inderbitzen, PhD, Karl Ingard, PhD, J Charles Ingraham, PhD, Mitio Indkuti, PhD, Ronald H Isaac, PhD, Donald G Iselin, A Z Ismail, PhD.

Category: J

Bruce Jackson, Julius A Jackson Jr, K A Jackson, PhD, Warren Jackson, PhD, Bruce Jacobs, Jimmy J Jacobson, PhD, Holger M Jaenisch, PhD, Sherwin W Jamison, Kenneth S Jancaitis, PhD, Cole Janick, Norman Janke, PhD, Paul R Jann, John Jaquess, Fred Jarka, Robert Jastrow, PhD, John A Jaszczak, PhD, Seymour Jaye, Robert Jeanmaire, Keith Bartlett Jefferts, PhD, Thomas T Jeffries III, Jack D Jenkins, Vincent F Jennemann, PhD, Paul A Jennings, PhD, Clayton E Jensen, PhD, L Carl Jensen, Paul Edward T Jensen, Denzel Jenson, Robert Johannes, PhD, Emil S Johansen, Anthony Johnson, Anthony O Johnson, Arlo F Johnson, PhD, Charles M Johnson, PhD, Dale Johnson, Duane P Johnson, PhD, Gerald Johnson, PhD, Horace Johnson, PhD, James R Johnson, PhD, Jeffrey Johnson, L R Johnson, Laurence N Johnson, Leo F Johnson, PhD, Robert Johnson, PhD, Robt L Johnson, PhD, Ronald Gene Johnson, PhD, Walter E Johnson, Wendell Johnson, William P Johnson, David Johnston, Charles Jones, PhD, H M Jones, PhD, Kay H Jones, PhD, Merrell R Jones, PhD, Mitchell Jones, Ray P Jones, Larry Josbeno, Daniel Juliano, PhD.

Category: K

Morton T Kagan, PhD, Jon P Kahler, David A Kallin, Kamal, PhD, W Kane, PhD, Arthur R Kantrowitz, PhD, Bennett Kapp, PhD, Gabor Karadi, PhD, Francis W Karasek, PhD, W Bradford Karcher, Munawar Karim, PhD, James Karom Jr, Thomas W Karras, PhD, Ira Katz, PhD, Yale H Katz, David Kay, PhD, Marvin D Kays, PhD, Michael Keables, PhD, Philip D Kearney, PhD, Horst H Kedesdy, PhD, Richard A Keen, PhD, Ralph O Kehle, PhD, John E Keim, PhD, Karl Keim, D Steven Keller, PhD, Charles T Kelley, PhD, Fenton Crosland Kelley, PhD, Patrick R Kelly, Paul Kelly, Ronald G Kelsey, Mike Kendall, Robert C Kendall, Peter H Kendrick, Dallas C Kennedy II, PhD, Howard V Kennedy, PhD, J M Kennel, PhD, A R Kenny, Josef Kercso, Clifford D Kern, PhD, Quentin A Kerns, John Charles Kershenstein, PhD, Clement J Kevane, PhD, Elbert R Key, Frank Key, Riley Kiminer, PhD, J S King, PhD, P I Kingsbury, PhD, Tommy C Kinnaird, John J R Kinney, Gerald Lee Kinnison, PhD, Timothy P Kinsley, Roy H Kinslow, PhD, Thyl E Kint, Peter Kirwin, Hugh Kissell, Thomas A Kitchens, PhD, Terence M Kite, PhD, Geo S Klaiber, PhD, L T Klauder Jr, PhD, Klaus, PhD, Williad Kleckner, PhD, Thomas Klein, Paul G Klemens, PhD, Kenneth F Klenk, PhD, Edwin Kiingman, D A Klip, PhD, Duane V Kniebes, John Knight, PhD, Knightes, PhD, Richard H Knipe, PhD, David Knoble, PhD, Mark Knoderer, Mark Knoderer, James S Koehler, PhD, Robert A Kohl, PhD, Joshua O Kolawole, PhD, William Koldwyn, PhD, Lee R Koller, PhD, Kenneth K Konrad, Christopher Konz, Robert P Koob, PhD, Kevin D Kooistra, Jack I Kornfield, PhD, Theresa M Koscny, Fleetwood Koutz, PhD, William P Kovacik, PhD, Robert W Koza, Gregory A Kozera, Geoffrey A Krafft, PhD, Paul Krail, PhD, Roman J Kramarsic, PhD, Gary Kramer, PhD, George G Krapfel, Howard R Kratz, PhD, Lawrence C Kravitz, PhD, Robert F Kraye, William Kreiss, PhD, Richard Kremer, PhD, Peter A Krenkel, PhD, Warren C Kreye, PhD, Robt E Kribal, PhD, Jacqueline Krim, PhD, James G Krist, Louis G Kristjanson, Paul H Kronfield, Peter G Krueger, PhD, Paul Kubicek, Moyses Kuchnir, PhD, Antonin Kudrna, Peter Kuhn, PhD, Carl Kuhnen Jr, Matthew H Kulawiec, Andrew Kulchar, Gordon Kuntz, PhD, Edward Kurdziel, Chris E Kuyatt, PhD, Tung-Sing Kwong.

Category: L

Kenneth M Labas, Melvin Labitt, Paul Lacelle, MD, PhD, John J Lacey Jr, James Lafervers, PhD, John M Lafferty Jr, Eugene C Laford, PhD, Milton Laikin, William Laing, George W Lambroff, Robert G Lamontagne, PhD, Robert G Lamontagne, PhD, G D Lancaster, Paul Lancaster, H D Landahl, PhD, Richard L Lander, PhD, Arthur Lange, Robert C Langley, George Laperle, Gerald J Lapeyre, PhD, Vince Lara, James G Lareau, Ernest T Larson, Mark Larson, Reginald E Larson, Robert Larson, PhD, Stanley Laster, PhD, Mike Lauriente, PhD, Jerome Lavine, PhD, Albert G Iles Law, PhD, Joel S Lawson, PhD, Kent Lawson, PhD, John F Lawyer, Thomas W Layton, PhD, Paul D Lazay, MD, PhD, Susanne M Lea, PhD, Richard Leamer, PhD, Charles W Lear, Albert O Learned, Jozef Lebiedzik, PhD, Lynn L Leblanc, PhD, Jean-Pierre Leburton, PhD, Charles E Lee, J T Lee, Paul Lee, PhD, H William Leech, PhD, Gail Legate, Mark R Legg, PhD, Donald R Lehman, PhD, Troy Leingany, Eric E Lemke, Terry L Lemley, PhD, Leslie R Lemon, Andrew Lenard, PhD, Roger X Lenard, Roland E Lentz, Stephen K Lentz, John F Lescher, James D Lesikar, PhD, James Lessman, Nelson J Letourneau, PhD, Michael A Leuck, H A Leupold, PhD, Walter Frederick Leverton, PhD, Gilbert Levin, PhD, Stewart Levin, PhD, Arnold D Levine, PhD, Catherine Lewis, PhD, George R Lewis, Richard C Lewis, Huilin Li, PhD, James J Licari, PhD, T Lick, PhD, James A Liggett', PhD, Peter Liley, PhD, Jay Lilley, Jay Lindholm, Ralph Linsker, MD, PhD, Clarence D Lipscombe III, PhD, Chian Liu, PhD, W M Liu, PhD, Robert S Livingston, PhD, Thomas J Lockhart, Jaques Loes, H William Lollar, Julian H Lombard, PhD, G Lombardi, PhD, Leonard Lombardi, PhD, Bryan H Long, James A Long, James D Long, David Longinotti, H Jerry Longley, PhD, Wm Longley Jr, PhD, Ronald Lorenz, Monty Losee, Stuart Loucks, L Richard Louden, PhD, Robert I Louttit, PhD, Sadler Love, Robert Lovelace, Radon R Loveland, F Lowe, Thomas Lowinger, PhD, Brian Lubbert, Alan H Lubell, Martin S Lubell, Michael D Lubin, PhD, Brian Luckianow, Claus B Ludwig, PhD, Mark Ludwig, PhD, Mariann Lukan, Ronald Lukas, PhD, Robert A Luke, PhD, Robert Luke, PhD, Jack Marling, PhD, J Lund, Mark W Lund, PhD, Dennis L Lundberg, PhD, Theodore Lundquist, PhD, Jesse V Lunsford, Anthony Lupo, PhD, Mark J Lupo, PhD, William H Lupton, PhD, J W Luquire, PhD, Glenn R Lussky, John Lynch, PhD.

Category: M

Monte D Mabry, Howard Maccabee, MD, PhD, A MacDonald, Alexander Dainel MacDonald, PhD, Brian MacDonald, Richard Macdougal, Char L Mack, Patrick Mackey, Jay Mackie, Robert A Macrae, Peter Madaffari, Franklin D Maddox, R

Magno, PhD, John P Maher, Pat Mahon, Robert A Maier, Jeffrey E Malan, Robert Malouf, Gary M Malvin, PhD, James M Mandera, David J Maness, Kent M Mangold, T A Manhart, Robt C Mania, PhD, Harold Manley, Joseph Bird Mann, PhD, J Mannion, Charles Mansfield, PhD, John Mansfield, PhD, Samuel P March, Jack J Marcinek, Richard M Marino, PhD, William D Marino, George Marklin, PhD, Morris J Markovitz, Morris J Markovitz, William E Marlatt, PhD, Marsh, PhD, C T Martin, Daniel W Martin, PhD, Edward Martin, Jerry Martin, L A Martin, Lockhead Martin, PhD, Ronald L Martin, PhD, Ernest A Martinelli, PhD, Mario Martini, PhD, Philip X Masciantonio, PhD, James V Masi, PhD, Conrad J Mason, PhD, Conrad Mason, PhD, Wulf F Massell, PhD, Wulf F Massell, PhD, David S Masterman, Ronald F Mathis, PhD, Dilip Mathur, PhD, Ron J Matlock, J Matolyak, PhD, Harrison Matson, Paul R Matthews, Timothy V Mattson, Thomas E Mattus, Richard Matula, PhD, David C Matzke, Paul Mauer, J G Mavroides, PhD, John E May, PhD, John May, A Frank Mayadas, PhD, James Mayo, Robert McAdams, Robt E McAdams, PhD, John Hart Mcadoo, PhD, William Bruce McAlister, PhD, McAneny, PhD, Terry McArthur, Bruce R McAvoy, Michael F McCardle, William Mccarter, Robert P McCarthy, Shaun L McCarthy, PhD, John Mccauley, Thomas A McClelland, PhD, James O McClimans, R J McClure, M McCorcle, PhD, Billy M McCormac, PhD, Philip Thomas McCormick, PhD, John G McCue, PhD, Robert G McCuistion, Tim McDaniel, Dirk McDermott, James M Macdonald Jr, Malcolm W McDonald, PhD, Ralph R McDonough, Edward McDowell, Jr, William Nordell McElroy, PhD, Gerald N McEwen, PhD, Michael McGinn, Randall K McGivney, Stuart Mcgregor, John P McGuire, David F McIntosh, Robert J Mckay, John P McKelvey, PhD, Wm B McKnight, PhD, James A McLennan, PhD, Gregory R McNeill, Edward J McNiff, D Sean McPherson, Daniel E Mcpherson Jr, Reg Meaker, Walter Medding, Sidney S Medley, PhD, James Medlin, William L Medlin, PhD, Ralph D Meeker, PhD, Louis D Megehee, Karin Megerle, Leathem Mehaffey, PhD, John L Meisenheimer, PhD, Ivars Melingailis, PhD, Kenneth E Mellendorf, PhD, Gary Melvin, Arthur Mendonsa, Wm Menger, Samuel H Mentemeier, Micheal D Mentzel, Leo Menz, PhD, Erhard R Menzel, PhD, Charles R Merigold, James B Merkel, Marshal F Merriam, PhD, Dwight F Metzler, PhD, Donald I Meyer, PhD, Frank H Meyer, Harold Meyer, Howard Meyer, Stuart L Meyer, PhD, Walter D Meyer, PhD, Maurice A Meylan, PhD, Alesandru Mezincescu, PhD, Gerald J Miatech, PhD, Patrick Michael, PhD, Paul C Michaelis, Andre F Michaudon, PhD, C Michel, PhD, F Curtis Michel, PhD, John Medavaine, Marcus Middleton, John A Mikus, PhD, John G Miles, Kelley F Miles, Ralph F Miles, PhD, Frederick H Milford, PhD, William G Millan, PhD, James P Millard, A S Miller, PhD, Donadl B Miller, PhD, Donald P Miller, PhD, George R Miller, Herman L Miller, Howard Miller, PhD, James A Miller, Larry Miller, Lewis E Miller, Philip D Miller, PhD, Raymond E Miller, PhD, Robert Charles Miller, PhD, Robert J Miller, PhD, Roger Miller, L E Millet, PhD, Dan Millison, John J Mills, PhD, Paul Mills, Greg Millspaugh, George H Milly, PhD, Wm B Mims, PhD, Minkin, PhD, David Mintzer, PhD, Raymod Mires, PhD, Dale Mitchel, Robert H Mitchell, John B Mix, PhD, Jack Pitts Mize, PhD, James J Mizera, Raymond C Mjolsness, PhD, K L Moazed, PhD, Paul Mockett, PhD, Charles J Mode, PhD, Fersheed K Mody, PhD, Mary V Moggio, Philip Mohan, Gary A Molchan, D Mommsen, Ralph Monaghan, W Bryan Monosmith, PhD, Christopher Monroe, PhD, Charles J Montrose, PhD, Donald W Moon, Rickie D Moon, Young Moon, PhD, Richard T Mooney, Craig Moore, Michael S Moore, PhD, Robert D Moore, Jr, John W Moran, Kou-Yiong Y Moravan, PhD, Allan J Mord, PhD, William Moreland, Dena R Morford, Relbue M Morgan, PhD, Robert Morgan, PhD, W Lowell Morgan, PhD, Carl H Morley, Lawrence Morley, PhD, Edward G Morris, Dan Morrow, Thomas M Morse, Kenneth E Mortenson, PhD, Ray S Morton, Gary E Mosher, Malcolm Mossman, Jack Mott, PhD, Henry T Motz, PhD, Lloyd Motz, PhD, Eugene A Mueller, PhD, George E Mueller, PhD, George Mueller, PhD, William B Mueller, Barry B Muhoberac, PhD, J Mishtu A Mukerjee, Richard L Mullen, John Muller, PhD, Justus Muller, Edward S Murduck, PhD, George Murgel, PhD, Wayne K Murphey, PhD, Charles Murphy, PhD, John C Murphy, PhD, Murphy, PhD, Lawrence E Murr, PhD, Frank Murray, PhD, Raymond L Murray, PhD, X J Musacchia, PhD, John D Myers, Mark T Myers, Glen Myska.

Category: N

Misac Nabighian, PhD, Edward Nadgorny, PhD, James Nagode, Dennis B Nakamoto, Samuel J Nalley, PhD, Michael L Nance, Franklin Richard Nash, PhD, Harry C Nash, PhD, Ronald O Neaffer, PhD, Victor Thomas Neal, PhD, Hugh Neeson, Robert Neff, Robert Neff, John P Neglia, Leland K Neher, PhD, Charles A Nelson, PhD, David L Nelson, David Nelson, PhD, Genne Nelson, Loren D Nelson, PhD, Nelson A Perry, Robert Nerbun, PhD, Arthur H Nethercot, PhD, Charles H Neuman, PhD, Paul Nevins, Jerry S Newcomb, John T Newell, PhD, Richard E

Newell, Sam Newner, Richard S Newrock, PhD, Kerwin Ng, Liz Niccum, Chester E Nichols, PhD, Davis Betz Nichols, PhD, Mark E Nichols, PhD, Roberta Nichols, PhD, Eugene H Nicholson, PhD, George Nickas, PhD, Barry C Nielsen, Kurt Nielsen, Henry Nikkel, Thomas G Nilan, PhD, Harmon Nine, PhD, James Nitzschke, John D Noble, PhD, Michael L Noel, Raymond L Noel, Lasalle L Nolin, Jack Noll, Bertram Nolte, PhD, Eugene Nooker, Philip A Norby, Sherman B Nornes, PhD, William G Norrie, Clyde Northrup, PhD, Hallan C Notimier, PhD, Julian R P Nott, Edward F Novak, J D Novotny, Jerzy Nowakowski, PhD, Gary P Noyes, PhD, Hugh Nutley, PhD, Richard A Nyquist, PhD.

Category: O

Michael Oard, Deborah Jean O'Bannon, PhD, Richard L O'Connell, Frederick Kirk Odencrantz, PhD, Frederic C E Oder, PhD, Randy Oehling, Ordean S Oen, PhD, Robert A Oetjen, PhD, Calvin Ogburn, Norbert W Ohara, PhD, William Ohmstede, Steven E Olbrich, PhD, Fred Oliver, Kenneth Leo Oliver, PhD, Wm P Oliver, PhD, Merrill M Olson, Ted Olson, James Oltmans II, Joe R O'Neal, Russell O'Neal, PhD, George F Oneill, PhD, Robert E O'Neill, Marchall F Onellion, PhD, Gary L Oppliger, PhD, Drew R Van Orden, Johathan Orloff, PhD, Cornel G Ormsby, Harold Osborn, Oskoorouichi, PhD, Charles Osterberg, PhD, Wayne Ott, PhD, Wm J Otting, PhD, William Otto, Jacques Ovadia, PhD, Robert Ovellette, Albert W Overhauser, PhD, Robert F Overmyer, Mark Owens, William C Owens.

Category: P

Karle Packard, Jack Paden, Robert R Palik, Richard W Palladino, Thomas Y Palmer, John M Palms, PhD, Michael V Palvov, John A Pantelis, Francis Paolini, PhD, Carles Herach Papas, PhD, Sastry U Pappu, PhD, James L Park, PhD, Eugene Parker, PhD, Raymond G Parker, Edward M Parma, Albert Parr, PhD, Christopher Parry, PhD, H D Parry, Zohreh Parsa, PhD, David H Parsons, W H Parsons, PhD, David F Paskausky, PhD, David F Paskausky, PhD, James M Paterson, PhD, Sandra Patrick, Randy Patterson, Robert W Patterson, Gary M Patton, Robert Paul, PhD, Kermit Paulson, Arthur S Pavlovic, PhD, Charles H Paxton, Cyril J Payne, Daniel Payne, F R Payne, PhD, Michael A Payne, PhD, Daniel N Payton, Zoran Pazameta, PhD, Herry Peace, David Peacock, PhD, Durk Pearson, George J Pearson, PhD, David C Peaslee, PhD, Justin B Peatross, PhD, Michael J Pechan, PhD, E L Peck, PhD, Edson R Peck, PhD, Christopher Peek, Gary Pekarek, David G Pelka, PhD, Erik M Pell, PhD, M J Pellillo, Richard R Pemper, PhD, John Penn, Samuel Penner, PhD, Linda Pequegnat, PhD, Darlene A Periconi-Balling, Charles Perry, Nelson Perry, Kenneth F Persin, Persky, PhD, Heide Petermann, Calvin Peters, Jeffrey L Peters, Edward C Peterson, Jack E Peterson, PhD, Arthur Petraske, Andrey Petukhov, PhD, Raymond J Pfeiffer, PhD, Bill Phebe, Frederick Phelps, PhD, Herbert R Philipp, PhD, Richard A Phillips, PhD, James A Phillips, PhD, Jay W Phippen, PhD, William Pickett, George Piers, Alan Pike, PhD, David M Pike, Gordon E Pike, PhD, Arturs Piksis, PhD, Lester Pilcher, Valter E Pilcher, PhD, Robert A Piloquin, Pine, PhD, Ervin L Piper, Daniel J Pisano, PhD, Jack Piskura, Fred Pitman, James D Plimpton, PhD, David Pocengul, Steve C Poe, William Poley, Polinger, PhD, William J Polson, PhD, Walter L Pondrom, PhD, Kurt W Pontasch, PhD, G Albert Popson, PhD, Bonne Posma, Richard W Postma, PhD, James E Potzick, Edward T Powell, PhD, Mark L Powell, Michael Robert Powell, PhD, Daren Powers, PhD, Robert W Powitz, PhD, C Dan Preston, Kenneth Price, PhD, Donald W Pritchard, PhD, David G Proctor, PhD, Tso-Ping Ma, PhD, Jesus R Provencio, PhD, Frederick D Provenza, PhD, Anthony J Provenzano, PhD, L L Pruitt, Bruce Purcell, Cary C Purdy, James K Purpura, George Putman, PhD, Thomas H Putman, PhD, Abbott A Putnam, Erling Pytte, PhD.

Category: Q

Kathy Qin, James Qualey, PhD, Russell Qualls, PhD, John J Quinn, PhD, Shirley J Quinn, Phil Quire, Karl S Quisenberry, PhD, Patrick W Quist.

Category: R

Bernard Raab, PhD, Steven Rabe, Harold Raemer, PhD, Dejan Rajcic, James A Ralph, Frederick Rambow, PhD, Rafael G Ramirez, PhD, Simon Ramo, PhD, Benjamin F Ramsey, Madeline Ramsey, Charles A Randall, PhD, Joseph L Randall, PhD, William P Raney, PhD, C J Ransom, PhD, W R Ransone, James Rasor, Ned S Rasor, PhD, Howard Rast, PhD, Dennis Rathman, PhD, Hukum S Rathor, PhD, Andrew A Rathsack, Steven Ratliff, PhD, Alfred Ratz, PhD, Richard Rauch, PhD, Kyle Rawlings, PhD, David Thomas Read, PhD, Robert G Read, Andreas B Rechnitzer, PhD, Charles W Rector, PhD, Larry K Reddig, Noeman Redford, Robert H Rediker, PhD, C Reed, PhD, Emmett Van Reed, Max E Reed, PhD, WR Reeves, Carl J Regone, John Reichenbach, James Reid, PhD, Leonard Reiffel, PhD, William

Reifsnyder, PhD, Hugh Reilly, Thomas L Reinecke, PhD, John W Reinert, David Relihan, Marlin E Remley, PhD, Mack Remlinger, Nicholas A Renzetti, PhD, R H Reuter, PhD, Robert Walter Rex, PhD, Bruce Reynolds, PhD, Robert Ware Reynolds, PhD, John E Rhoads, PhD, John R Rhodes, J J Richard, Benjamin Richards, PhD, Bernard L Richards, PhD, Ralph J Richardson, PhD, Douglas W Ricks, PhD, R J Riddell, PhD, Robt W Riedel, Elliott A Riggs, PhD, James W Riggs, PhD, Robert Righter, Jim Riker, PhD, Gary T Riley, William Riley, Dan H Rimmer, Charles E Rinehart Jr, PhD, Roy Ringo, PhD, Winthrop Risk, MD, PhD, Allan Roberts, Kenneth Roberts, Norman Hailstone Roberts, PhD, Donald K Robertson, George H Robertson, PhD, Stanley L Robertson, PhD, Clark S Robinson, Michael J Robrecht, David A Roddy, Jonathan P Rode, PhD, Rocky Roden, Brian D Rodriguez, Robt C Roeder, PhD, Raylan Roetman, Robert C Rohr, PhD, John H Rohrbaugh, PhD, Neal Rohrbaugh, Oscar A Rondon, PhD, John Roscoe, PhD, Benny H Rose, PhD, David Rose, PhD, Kenneth L Rose, PhD, Frederick A Rosell, Alan Rosen, PhD, Richard Rosencrans, Robert Rosene, Allan Ross, Arthur Ross, Elliot Rothkopf, PhD, Wm S Rothwell, PhD, Lawrence J Rouse, PhD, W Jeffrey Row, James M Rowe, PhD, Stephen Rowley, G Roysdon, John Rozenbergs, PhD, Balaz F Rozsnyai, PhD, Arthur Rubin, Daniel Rubinstein, PhD, Douglas Rudenko, Raymond L Ruehle, Robert Reuss, Donald E Ruminer, George Rumney, PhD, Kim J Runk, Gerald Rupert, PhD, Louis J Rusconi, PhD, B Rush, PhD, Cynthia B Russell, Kenneth Russell, Mark Russell, PhD, Robert Rutherford, Patrick Rutty, Mary Ruwart, PhD, Bill C Ryan, PhD, Frederick M Ryan, PhD, Jean Ryan, PhD, John W Ryon, PhD.

Category: S

Patrick Saatzer, PhD, Edward S Sabisky, PhD, Julius Jay Sabo, Frank Sacco, Frederick Sachs, PhD, Thomas Dudley Sachs, PhD, James C Sadler, James C Sadler, Jerry F Sagendorf, Eugene Salamin, James A Salsgiver, George Albert Samara, PhD, Douglas Sampson, PhD, Douglas Sampson, PhD, John F Sandell, PhD, Wm Marion Sandefur, PhD, Eric Sanden, PhD, Jerrell L Sanders, Richard M Sanders, PhD, Andrew Sandorfi, PhD, Wayne M Sandstrom, PhD, G S Santi, Mykola Saporoschenko, PhD, Dalip K Sarin, Lynn Redmon Sarles, PhD, Ronald G Sarrat, Raymond Edmund Sarwinski, PhD, Richard Sasiela, PhD, Edward A Saunders, PhD, Jason Saunderson, PhD, David P Sauter, S C Saxena, PhD, Vinod K Saxena, PhD, Vinod K Saxena, PhD, George P Saxon, PhD, Razi Saydjari, MD, Thomas S Scanlon Jr, Marc A Scarchilli, James R Scarlett, Lawrence A Schaal, Thomas S Schalk, Hans Schantz, PhD, Darrell R Scharf, Richard Scharf, John F Schatz, PhD, Harvey Schau, PhD, Larry Schecter, PhD, Frank Schell, MD, Keith J Schiager, PhD, Walter Schimmerling, PhD, Guenter Martin Schindler, PhD, Hassel Charles Schjelderup, PhD, Jeffrey Schleher, Robert A Schluter, PhD, Frederick Schmidlin, PhD, Philip L Schmitz, Marcel R Schmorak, PhD, Douglas G Schneider, John Schneider, PhD, Michael Schneider, PhD, George L Schofield Jr, PhD, James G Schofield, Paul Schrade, Robert Schrader, John L Schrag, PhD, Martin Wm Schramm, PhD, Ethan J Schreier, PhD, Donald Schuder, Steve Schulte, PE, James J Schultheis, Frederick Schultz, PhD, Thomas A Schultz, Michael Schulz, Scofield, PhD, James F Scoggin, PhD, Theodore T Scolman, PhD, Stylianos P Scordilis, PhD, Clive R Scorey, PhD, Charles N Scott, Scott Scrupski, James B Seaborn, PhD, John D Seagrave, PhD, Chris L Seaman, PhD, Robert D Sears, Paul A Sease, George A Seaver, PhD, Sederholm, Fred Seeber, PhD, Warren G Segelken, PhD, Fritz A Seiler, PhD, Jerold A Seitchik, PhD, James A Selasky, Harner Selvidge, PhD, Mark Semon, PhD, Richard G Semonin, William Sens, Karl A Sense, Nicholas S Sereno, PhD, Byron R Sever, PhD, Harry Sewell, PhD, James Sewell, Richard U Shafer, Wayne Shaffer, Michael L Shand, PhD, Anatole Shapiro, PhD, Edward K Shapiro, PhD, Ralph Shapiro, PhD, James Sharp, Francis Sharpton, PhD, Glenn E Shaw, PhD, Lawrence H Shaw, Steven Shaw, Roy W Shawcroft, PhD, Thomas Sheahen, PhD, James Shelton, PhD, Hao Ming Shen, PhD, Shen, Moses M Sheppard, PhD, B Sherrill, Frank Shinneman, Calvin Shipbaugh, PhD, Scott T Shipley, PhD, George A Shirn, PhD, Kandiah Shivanandan, PhD, Andrew Shkolnik, William Shockley, M A Short, PhD, Martin Shotzberger, Curtis A Shuman, PhD, Edwin Shykind, PhD, Kurt Sickles, Richard W Siegel, PhD, Richard Ernest Siemens, Arnold J Sierk, PhD, Wayne Sievers, PhD, Henno Siismets, Lt Col Henry W Silk, Joseph D Silverstein, PhD, E Lee Simmons, MD, Ralph O Simmons, PhD, Wm W Simmons, PhD, Albert Simon, PhD, Jack Simonton, Chirstopher Simpson, Robert S Simpson, S Fred Singer, PhD, Lal P S Singh, PhD, Raj N Singh, Norman Sissenwine, Michael Sitko, PhD, Andrew Sivak, PhD, Michael Sivertsen, Gary W Sjolander, PhD, Riley Skeen, Damir S Skerl, Skluzacek, PhD, Frederick W Slee, PhD, Faye Slift, Michele E Slinkard, Anthony R Slotwinski, Harold S Slusher, PhD, Peter J Van Slyke, Alexander G Smith, PhD, Bruce W Smith P E, Donald R Smith, PhD, Earl W Smith, PhD, Frederick W Smith, PhD, James R Smith, John R Smith, PhD, Michael Smith, Neil M

Smith, Richard Lloyd Smith, PhD, Rick Smith, Thane Smith, PhD, William Smith, Gilbert Snell, Walter L Snell, Leonard W Snellman, PhD, C R Snider, James J Snodgrass, William R Snow, PhD, Donald P Snowden, PhD, Fred F C Snyder, Robert Soberman, PhD, Jon Sollid, PhD, Wanda C Soo Young, Brent A Sorensen, James A Sorenson, PhD, Norman Sossong, PhD, Wallace W Souder, PhD, Frank E South, PhD, Robert R Speers, PhD, Edward L Spence, PhD, Charles Spencer, Daniel Spencer, Charles L Spiegel, Andrew Spiessbach, PhD, Joel S Spira, John G Spitzley, Robert H Springer, PhD, James Kent Sprinkle, Julien C Sprott, PhD, D Sprowl, PhD, Eve S Sprunt, PhD, Charles F Squire, PhD, Robert M St John, PhD, Kim W Stahnke, Drago Stankovic, Glenn Stanwick, Harvey J Stapleton, PhD, Fred Starheim, PhD, Chauncey Starr, PhD, Gene Start, Jennifer Staszel, Herman Statz, PhD, Harold F Staunton, PhD, John Staunton, Michael A Steinberg, Kenneth B Steinbruegge, Ray L Steinmetz, Frank R Steldt, PhD, Jesse J Stephens, PhD, Lou Stephens, Robert D Stephens, Stephen M Sterbenz, PhD, Howard O Stevens, Lewis A Stevens, Robert Stevenson, PhD, William Stewart, PhD, Carleton C Stewart, Glenn A Stewart, PhD, Harris B Stewart, PhD, Homer J Stewart, PhD, William A Stewart, William L Stewart, Bernard Stiff, Regan Stinnett, PhD, Norman D Stockwell, PhD, W Ross Stone, PhD, James R Storey, William T Storey, Charles L Storrs, PhD, Gregory J Story, Glenn E Stout, PhD, David Stowell, David Strand, Thomas F Stratton, PhD, W R Stratton, PhD, Joe M Straus, PhD, Edward A Streed, Sharon R Streight, PhD, George Strella, James S Strickland, PhD, Geo L Strobel, PhD, David H Strome, PhD, Forrest C Strome, PhD, Alan E Strong, PhD, Alan Strong, PhD, William J Strong, PhD, Mark W Strovink, PhD, Roger D Stuck, Robert Stupp, G Sturges, Victor F Sturm, Eric Stusnick, PhD, Bill Styer, Daniel Subach, PhD, Subraman, John T Suggs Jr, Richrad Sullivan, Thomas J Sullivan, PhD, Donald L Summers, Donald Supkow, PhD, Earl C Sutherland, PhD, Jordan L Sutton, Todd W Sutton, Jon R Swanson, PhD, Robert N Swanson, Hilmar Swenson, PhD, Don E Swets, Donald M Swingle, PhD, Burton L Sylvern, Ronald J Szaider, Edwin Szymanski, PhD.

Category: T

Keith A Taggart, PhD, Saeed Taherian, PhD, Samuel Taimuty, PhD, Gerald Tait, Willard L Talbert, PhD, Jim Tallon, Daniel J Tambasco, PhD, Louis A Tamburino, PhD, Lukas Tamm, PhD, Peter E Tannenwald, PhD, Daniel Tao, PhD, Frederick D Tappert, PhD, Suren A Tatulian, PhD, Byron Taylor, Eugene W Taylor, James Taylor, PhD, Michael K Taylor, Edward Teller, PhD, Lee C Teng, PhD, Jeffrey Tennant, PhD, Steven Terwilliger, Eugene Theios, James Thissell, Gordon A Thomas, PhD, Martin J Thomas, PhD, Richard Thomas, PhD, William H Thomason, PhD, Richard Thompson, Richard Thompson, Warren Thompson, PhD, Wm B Thompson, PhD, Walter W Thomsen, Ker C Thomson, Craige Thorn, PhD, James A Thornhill, T Thornton, Arnold W Thorton, PhD, Eugene D Tidwell, Calvin O Tiller, Jennifer L Tillman, Clarence N Tinker, Merlin Tipton, Robert W Titus, Arthur R Tobey, PhD, Joseph J Tobias, Joseph D Tobiason, PhD, Norman Tolk, PhD, John Toman, Kurt Toman, PhD, James Tomberlin, Randy Tomkins, Daniel Tonn, PhD, Brian P Tonner, PhD, Steven A Tonsfeldt, PhD, George Tope, Carlos Toroes, Charles J Touhill, PhD, Roger Townsend, Joseph C Tracy, PhD, George T Trammell, PhD, Rex Trammell, Felix Rodriguez Trelles, PhD, D H Trenscell, J Trevino, Roy A Tucker, Daniel Tudor, PhD, J Paul Tullis, PhD, Richard Turiczek, Alvis G Turner, PhD, Robert E Turner, PhD, Thomas Turner, William Turner, PhD, Joseph Tutak, Kenneth L Tuttle, PhD, Ben Tuval, David Tweedy, Arthur G Tweet, PhD, Somdev Tyagi, PhD.

Category: U

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Category: V

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Category: W

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Category: Y

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Category: Z

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Category: B

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PhD, John Behun, PhD, Rudi Beichel, Arthur B Reindorff, PhD, Walter F Beineke, PhD, Ihor Bekersky, PhD, Gregory Bell, Robert Bell, Daniel T Belmont, PhD, Stephen Belmont, PhD, James Noble Bemiller, PhD, John Ben, Raymond L Bendure, PhD, James H Benedict, PhD, David Benforado, Ashley Bengali, PhD, Ford Benham, John Benjamin, PhD, William Benne, PhD, Donald W Bennett, G Bennett, PhD, RS Bennett, Sharon Beniot, Andrew A Benson, PhD, Sidney W Benson, PhD, William Benson, Ray Bentall, Kenton E Bentley, PhD, Allen W Benton, PhD, Wesley G Bentrude, PhD, Ray A Berard, PhD, Hugh Berckmueller, MD, J Berg, PhD, Ronald Berg, Alan Berger, MD, T F Berger, Arne Bergh, PhD, C B Bergin, Oswald R Bergmann, PhD, John J Berky, PhD, Elliot Berman, PhD, Louis Bernath, PhD, Julius R Berreth, Lester P Berriman, Dan Berry, James W Berry, PhD, Robert W Berry, PhD, Roy A Berry, PhD, William Berry, Charles F Bersch, Robert L Bertram, B Rodney Bertramson, PhD, Nedavia Bethlahmy, PhD, George W Bettge, Rowland S 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Lamar D Bowles, Robert E Bowling, PhD, John K Bowman, Lewis W Bowman, PhD, Robert S Bowman, PhD, Samuel Bowser, PhD, James E Box, PhD, Kevin Boyack, PhD, James Boyd, Jimmy W Boyd, Philip A Boyd, PhD, Ralph L Boyes, Bozlee, PhD, Robert G Brackett, PhD, Lawrence G Bradford, PhD, Bruce Bradley, Michael Bradley, Robert F Bradley, PhD, Robert S Bradley, George Bradshaw, W Newman Bradshaw, PhD, R Bradt, PhD, Robert Brady, J C Brakensieck, Cynthia R Branch, William Brandt, PhD, Stanton Braude, PhD, Richard H Braumlich, David Braun, Jennifer Braun, Kenneth Martin Brauner, PhD, Allan Brause, PhD, Ben Bray, PhD, Bruce G Bray, PhD, William Breach, Lee Brecher, PhD, Claude E Breed, Ted Breitmayer, A C Breller, Bart J Bremmer, William Breneman, Harold Brennan, John P Brennan, Abner Brenner, PhD, J Allen Brent, PhD, John H Bress, Joseph Breston, PhD, William A Brett, Randolph H Bretton, PhD, Harold W Bretz, PhD, Charles B Breuer, PhD, James Brewbaker, PhD, Doug Brewer, Gregory J Brewer, PhD, J R Brewer, Ken N Brewer, Robert N Brey, Robt N Brey, PhD, Edward Breyere, PhD, Darlene R Brezinski, PhD, P L Thibaut Brian, PhD, Alan G Bridge, PhD, P M Bridges, Andrew Briedenbach, Claudia Briell, James A Brierley, PhD, Edward M Briggs, James E Briggs, PhD, Robert B Brigham, Mont J Bright Jr, Karen Brignac, Tom Brignac, Frank Brimelow, Robert Bringer, PhD, Raymond S Brinkmey, PhD, James Brinks, PhD, Anne M Briscoe, PhD, Mike Briscoe, Paul Brittain, Michael Brittan, PhD, Michael W Britton, Alfred C Broad, PhD, Hyrum S Broadbent, PhD, Rainer Brocke, PhD, F S Broerman, Robert W Broge, PhD, Richard K Bronder, Fred A Brooks, Gordon Brooks, ND Brooks, Robert R Brooks, PhD, Charles O Brostrom, PhD, Robert J Brotherton, PhD, Rick A Brower, Albert L Brown, PhD, Billings Brown, PhD, Bruce L Brown, Charles Brown, PhD, Christopher J Brown, MD, David Brown, Gerald R Brown, PhD, Henry BR Brown, Henry S Brown, PhD, Herbert Brown, PhD, James Brown, James M Brown, PhD, Jeremy J Brown, Larry Brown, Lloyd L Brown, Melvin H Brown, PhD, Murray A Brown, PhD, Olen Brown, PhD, P T Brown, Richard Brown, Robert B Brown, Robert Brown, PhD, Robert E Brown, PhD, Roderick B Brown, MD, Ronald Brown, PhD,

Roy W Brown, William M Brown, PhD, Don Brownfield, Paul Eugene Brubaker, PhD, Paul L Bruce, Carl W Bruch, PhD, Thomas Bruno, PhD, Kelly W Bruns, Lester G Bruns, PhD, Robert F Burns, PhD, Merlyn A Brusven, PhD, Frederick V Brutcher, Jr, PhD, Samuel R M Burton, Gary G Bryan, John D Bryan, Tom Bryan, John M Bryant, Ken Brzozowski, PhD, Russell A Buchanan, Carl Buck, PhD, Edward H Buckley, PhD, Stuart Buckmaster, Donald Buckner, Edsel T Bucovaz, PhD, Victor Buhrke, PhD, Daniel Bullard, PhD, Ervin T Bullard, PhD, David Bullock, Walter T Bulson, David Wm Bunch, PhD, Harry D Bunch, PhD, Hallie Flowers Bundy, PhD, Martin Bunton, James J Burchall, PhD, Daivd Burdeaux, Robert Burger, Roger C Burggraf, Leonard F Burkart, PhD, E A Burke, Marty Burke, Richard L Burke, PhD, Harold E Burkhart, PhD, David R Burley, PhD, Bryan Burnett, John N Burnett, PhD, Robert W Burnop, Frank B Burns, PhD, Robt D Burns, PhD, Mike Burnson, Michael Burrell, Richard S Burrows, PhD, Eddie Burt, PhD, Calvin C Burwell, John Burwell, Neal Busch, PhD, Rick Buschini, Robert Bush, T Bush, Edwin F Bushman, David Butler, George B Butler, PhD, James Butler, James L Butler, PhD, Philip Alan Butler, PhD, Rhendal C Butler, Stan Butt, Thomas A Butterworth, PhD, Sidney E Buttrill, PhD, Rodney G Butts, P D Bybee, Jr.

Category: C

Wm P Cadogan, PhD, Howard H Cady, PhD, Edward George Caflisch, PhD, Charles E Cain, PhD, David W Caird, Daniel L Calahan, PhD, Leonard J Calbo, PhD, A G Caldwell, PhD, Robert E Calhoo, PhD, John Calhoun, Mike Callahan, Chris Calvert, PhD, William Camerer, Mike Cameron, Frederick W Camp, PhD, Ernest Campaigne, PhD, John D Campanella, Douglas J Campbell, George Campbell, PhD, Larry Campbell, Milton Hugh Campbell, Warren E Campbell, PhD, Robt D Campo, PhD, Daniel T Canavan, Zoe Canellakis, PhD, Paul Canevaro, Peter Cannon, PhD, Peter J Canterino, PhD, Manfred Cantow, PhD, Walter Canzonier, Michael E Caplis, PhD, Thomas D Carder, William Thomas Cardwell, Darrel E Cardy, Harold E Carley, PhD, Dave Carlson, Edward C Carlson, PhD, Lawrence O Carlson, David W Carnell, E Louis Caron, PhD, Lyle L Carpenter, Robert Carpenter, Thomas Carpenter, Will D Carpenter, PhD, Brenda L Carr, Edward M Carr, Laura H Carreira, PhD, Marion M Carrion, PhD, Gilbert C Carroll, MD, J Randall Carroll, James A Carroll, PhD, John Carroll, PhD, Keith T Carron, PhD, Charles Carson, PhD, Richard M Carson, Mary E Carsten, PhD, Lynn K Carta, PhD, David L Carter, PhD, John P Carter, Louise Carter, Mason C Carter, PhD, William Carter, Louis B Caruana, PhD, Hugh W Carver, James Clark Carver, PhD, Chris Cash, Armano Casola, PhD, Patrick E Cassidy, PhD, J K Cassil, Stan J Casswell, Neal Castagoli, PhD, Billy R Catherwood, Renata E Cathou, PhD, Thomas E Catlett, Robert Lee Caudill, MD, John A Caughlan, Jerry Caulder, PhD, Steven L Cazad, Rosemary L Centner, Arthur V Chadwick, PhD, Pamela Chaffee, Rowand Chaffee, PhD, Charles T Chaffin, PhD, Paritosh M Chakrabarti, PhD, Bruce Chamberlain, David L Chamberlain, PhD, Dilworth W Chamberlain, PhD, Roger S Chamberlin, RS Chamberlin, Doyle Chambers, PhD, Glen D Chambers, Carroll W Chambiss, PhD, Sham-Yuen Chan, PhD, Shu F Chan, PhD, Sunney L Chan, PhD, Leonard B Chandler, PhD, Chung Jam Chang, PhD, Yung Feng Chang, PhD, Bruce R Charlton, Edward Charney, Andrew J Chase, Thomas J Chastant, Norman Chatterton, PhD, Brad N Chazotte, PhD, Lynn Chcoran, E Cheatham, Zafarullah K Cheema, PhD, John Chehaske, Craig F Cheng, K L Cheng, PhD, Thomas C Cheng, PhD, Wade Cheng, PhD, Kenneth P Chepenick, PhD, Roy Cherris, Arthur Chester, PhD, Alfred P Chestnut, PhD, Dhan Chevli, PhD, William Chewning, Long Chi Lee, PhD, Yuen S Chiang, PhD, R Chiarenzelli, David Chilcote, PhD, Ronald B Child, David T Chin, PhD, Shyamala Chitaley, PhD, John G Chittick, David Chleck, Ye C Choi, PhD, Frank W Chorpenning, PhD, Robert J Chorvat, PhD, Peter S Chrapliwy, PhD, Geo A Christenberry, PhD, Alan Christensen, Charles R Christensen, PhD, Duane Christensen, Kent Christensen, Richard Christensen, James B Christiansen, PhD, Richard Christiansen, PhD, Robert M Christiansen, PhD, Warner Howard Christie, PhD, Dennis Christopherson, Alfred L Christy, PhD, Kenneth G Christy, Jack C Chroy, Donald J Ciappenelli, PhD, Ja Cifonelli, PhD, Marc Cimolino, PhD, Joseph R Cissell, Edwin Claassen, PhD, Gregory S Claine, Leroy Clardy, Howard G Clark, PhD, Hugh Clark, PhD, Ian Clark, James Clark, PhD, Kent Clark, Paul B Clark, Thomas Clark, Duane G Clarke, PhD, John F Gates Clarke, PhD, Joseph W Clarke, Larry Clarke, Richard H Clarke, PhD, Richard P Clarke, PhD, Karen Clausen, Don Clauson, Harris Clay, CK Claycomb, PhD, David Clayton, PhD, Fred Clayton, PhD, Wallace Cleland, PhD, Wm L Cleland, William M Clement, PhD, W Clift, David Cline, Dennis Cline, Warren K Cline, PhD, David N Clum, Mike Clumper, Mary Coakley, PhD, Keith H Coats, PhD, W Frank Cobb Jr, Elmer Lendell Cockrum, PhD, James Codding, Charles W Coe Ii, William D Coe, Michael Coffman, PhD, Anthony Cofrancesco, PhD, David B Coghlan, Lawrence

Cohen, Ernst M Cohn, C E Coke, PhD, Gene Louis Colborn, PhD, Edward E Colby, Avean W Cole, PhD, Clarence R Cole, PhD, Randall K Cole, PhD, Philip J Colella, Robert Coleman, PhD, William E Coleman, Robt Coley, J R Colgan, MD, Summer Colgan, Hans Coll, PhD, Donald W Collier, James Collier, PhD, Thomas F Collier, MD, PhD, Wm B Collier, PhD, Alan Collins, PhD, Frederick C Collins, PhD, Jane E Collins, William Henry Collins, Wm F Collins, PhD, Carlos A Colmenares, PhD, Andre Coltrin, Clair R Colvin, PhD, Robert Neil Colwell, PhD, William T Colwell, PhD, E Keith Colyer, Leon Combs, PhD, John Comeaux, Jack Comeford, PhD, John Commerford, PhD, Wayne M Compton, John Conconnan, Norman I Condit, F Dee Conerly Jr, John Conlan, Carter B Conlin, Paul K Conn, PhD, James Connell, John J Connelly, Wm J Connick, Jr, Roddy Conrad, PhD, Walter E Conrad, PhD, David L Constans, Thomas W Conway, PhD, Mark Cook, PhD, Addison G Cook, PhD, Charels Cook, Donald J Cook, PhD, Glenn C Cook, MD, Maurice G Cook, PhD, Melvin A Cook, PhD, Anson R Cooke, PhD, Bingham Cool, PhD, William E Cooley, PhD, Marguerite W Coomes, PhD, Anne M Cooney, Edward Cooney, George P Cooper, Harry C Cooper, Robert C Cooper, PhD, Thomas Cooper, PhD, A D Copeland, Harry B Copelin, Frederick A Copes, PhD, Carl Corbit, Stephen Corcoran, Christopher Cordle, PhD, Walter H Corkern, PhD, Kenneth C Corkum, PhD, William E Cormier, Creighton N Cornell, Stephen W Cornell, PhD, Arlen C Cornett, Holley Cornette, David G Cornwell, PhD, Deborah A Corridon, Allen Costoff, PhD, Kevin Cotchen, Wilfred A Cote, PhD, Grant Cottam, Ronald A Coulson, PhD, William H Courtney III, PhD, Raymond C Cousins, PhD, Fred Covelli, Wm A Cowan, PhD, John B Cowden, Ronald R Cowden, PhD, Brian Cox, Clifford H Cox, PhD, Donald J Cox, PhD, Edwin Cox, Frederick Cox, Neil D Cox, PhD, Alan Coykendall, Kenneth R Coyne, C H Cracauer, John Merrill Craig, R E Craigie Jr, Donald Lee Crain, PhD, Donald J Cram, PhD, John R Crandall, PhD, Frederick L Crane, PhD, Chris L Craney, PhD, Richard A Craven, Clara D Craver, PhD, Jonathan Crawford, David Craymes, Ron Creamer, Buford Creech, Anne E Cress, PhD, Phillip O Crews, PhD, Diana Creyes, Donald F Crie, Harry N Cripps, PhD, Joseph P Crisler, PhD, Robert Crist, J L Crittenden, Thomas Bernard Croat, PhD, Charlie Crocker, Luanne S Crockett, Michael Croft, Robert K Crookston, PhD, Edward Crosby, David Crosley, Tom Crossman, Kenneth A Crossner, PhD, Gene Autrey Crowder, PhD, Curtis Crowe, Edwin P Crowell, C Richard Crowther, PhD, Robert H Crowther, Frank C Croxton, PhD, Richard Cruce, William J Cruice, Edward H Crum, PhD, Cris Cruz, Richard L Cryberg, PhD, Billy Crynes, Donald F Cue, John R Culbert, Chris Cull, John S Cullen, Floyd Culler, A S Cullick, PhD, Richard W Cummins, PhD, Lawrence E Cunnick, Howard Cunningham, PhD, Thomas J Curphey, PhD, Ira B Current, William W Currier, PhD, Janet C Curry, John Curry, Maria A Curtin, PhD, Fred W Curtis, Jr, Chopin Cusachs, PhD, Herman C Custard, PhD, Thomas P Czepiel, PhD, James Oziomek, PhD, Shannon Czysz.

Category: D

Charles H Daggs, Robert S Dahlin, PhD, Donald Dahlstrom, PhD, Alfred Dakrig, Glenn I Dale, Harry Dalton, PhD, Michael Daly, George Damon, PhD, Jess Donald Daniels, PhD, Wayne Daniels, Jerry Danni, S Dantiki, PhD, Morris J Danzig, PhD, Josephe E Darsey, MD, PhD, Dean Daryani, Hriday Das, PhD, Theodore Dashman, PhD, Gregory W Daues, T C Dauphine, PhD, Dennis Dautreuil, Moses M David, PhD, Clayton L Davidson, James Davidson, Thomas Davidson, Harold W Davies, PhD, Julian A Davies, PhD, Bruce W Davis, PhD, Frances M Davis, PhD, H Turia Davis, Harriett Davis, Harry Davis, PhD, Kent R Davis, Paul Davis, Ralph Davis, Raymond Davis, PhD, S Davis, Thomas Davis, PhD, W Kenneth Davis, Wallace Davis, PhD, John A Davis Jr, PhD, Arthur D Dawson, PhD, David Dawson, Donald F Day, PhD, Harry G Day, PhD, Michael Day, PhD, R A Day, PhD, William Day, PhD, Donald W De Jong, PhD, Eugene De Rose, PhD, John Deacon, David L Dean, PhD, Sheldon W Dean, PhD, Warren E Dean, PhD, Donald Deardorff, PhD, David W Deberry, PhD, Edward Dale Deboer, Charles Deboisblanc, Francis Debons, PhD, Wayne Deckert, PhD, Paul Decusati, PhD, Gary Defoti, PhD, Rosalie F Degiovanni-Donnelly, PhD, John Dehn, PhD, Eugene Wm Dehner, PhD, Susan Deines, Phillip Delassus, PhD, William M Delaware, Joe D Delay, PhD, Robert M Delcamp, PhD, E F Delitala, Jon Delong, Anthony J Delucca, Winston R Demonsabert, PhD, David Denhardt, PhD, Frank W Denison, PhD, Robert Dennett, Richard Denney, Richard S Dennis, William E Dennis, PhD, Norman C Deno, PhD, Edmond J Derderian, PhD, Charles Desbordes, Wm Deskin, PhD, Raymond E Dessy, PhD, R P Destefano, PhD, William D Detlefsen, PhD, R Deufel, PhD, Marshall E Deutsch, PhD, Robert M Devlin, PhD, Frederick W Devries, Mel Dewsnup, Jerry J Dewulf, Alan Dexter, PhD, Cecil M Dinunno, Arthur S Diamond, Marian C Diamond, PhD, John K Dibitz, Phillip Dick, Richard J Dick, Charlesworth L Dickerson, PhD, Winifred Dickinson, PhD, Wm B Dickinson, PhD, Dave Dicksor, Henry A Diederichs, MD, Kenneth

Diesburg, PhD, Jerry A Dieter, PhD, John Dieterman, Alm Dietz, Armand Digiacomo, PhD, Joseph B Digiorgio, PhD, Ken Dillard, Robert G Dillard, Daniel Dillon, Ray Dillon, Raymond Dillon, PhD, Raymond Dimartini, PhD, Robert Hudson Dinegar, PhD, Howard L Dinsmore, PhD, Ronald J Dinus, PhD, William Dinusson, PhD, R W Dirks, James D Dixon, PhD, Marvin P Dixon, PhD, Elliott Doane, PhD, Harry D Dobbs, PhD, Carroll Dobratz, PhD, Donald C Dobson, PhD, Gerard Dobson, PhD, Martin L Dobson, Nama Doddi, PhD, George C Doderer, Richard A Dodge, PhD, Gerald E Doeden, PhD, Eugene Doering, William A Doerner, PhD, J W Dohr, Michael F Dolan, Geoffrey E Dolbear, PhD, Wm Read Dolbier, PhD, Bruce J Dolnick, PhD, John M Domagala, PhD, John M Domagala, PhD, William Donald, PhD, Gary B Donart, PhD, Henry Donato, PhD, Wenju Dong, PhD, James E Donham, Susanne Donovan, David Dooley, Thomas P Dooley, PhD, Barbara Doonan, PhD, Harold E Doorenbos, PhD, Guy H Dority, PhD, Kenneth J Dormer, PhD, Joe Dotzlaf, Jocelyn Douglas, PhD, Kathleen Douglas, Michael G Douglas, PhD, Westmoreland J Douglas, PhD, Robert W Douglass, PhD, Spencer Douglass, John Doull, PhD, Arthur Ostantinos Doumas, PhD, Sandra Dowdell, Roland Downing, PhD, Tom Downs, PhD, William F Downs, PhD, David J Drahos, PhD, Bruce D Drake, PhD, Michael C Drake, PhD, Jean Draper, Edward A Dratz, PhD, James Drew, PhD, Larry A Drew, PhD, Harry J Driedger, MD, Albert John Driesch, Gary L Driscoll, PhD, Margaret Driscoll, Don A Sibley, PhD, James E Drummond, PhD, Harry V Drushel, PhD, G L Dryden, PhD, Gil Dryden, PhD, C F Duane, Del R M Dubbs, PhD, E H Dubois, S C Dubios, Leonard Duda, PhD, Patricia M Duda, Thomas J Dudek, PhD, Howard Dudley, Thomas Dudley, Dudt, PhD, Donald J Dudziak, PhD, C J Duet, Leroy Dugan, PhD, Harold R Duke, PhD, Gary R Dukes, PhD, Peter P Dukes, PhD, Philip Gordon Dunbar, PhD, Charles L Duncan, PhD, Warren Dunkel, Larry Dunn, Frederick C Durant III, Mary Durick, James Durig, PhD, John Durig, Gordon B Durnbaugh, Sophie Dutch, James Duvall, Paul B Duvall, MD, Ernest J Duwell, PhD, James P Dux, PhD, Roger L Van Duyne, PhD, Isaac Dvoretzky, PhD, Dushan Dvornik, PhD, Francis G Dwyer, PhD, Michael Dwyer, Alan C Dyar, Clifford Dykstra, PhD, J Robert Dynes, PhD, Philip J Dziuk, PhD.

Category: E

Bertram E Eakin, PhD, James Earle, Thomas Earles, D B Easty, PhD, Philip E Eaton, PhD, Kenneth Ebel, PhD, Gary Eberly, Floyd Eberts, PhD, DP Ebright, Lawrence T Eby, PhD, Bernard Ecanow, PhD, Carrie Eddy, Charles K Edge, PhD, Janes M Edgecombe, Robt Edgerton, PhD, John Edgington, Paul Edmiston, PhD, Charlie Edwards, J Gordon Edwards, PhD, Wm F Egelhoff, PhD, Donald A Eggert, PhD, Peter Egli, Richard Egly, PhD, William Ehringer, PhD, Dion R Ehrlich, MD, H P Ehrlich, PhD, Robert Eichelberger, PhD, Paul Eichenberger, Jacob Eichhorn, PhD, Kendrick R Eliar, PhD, Gary L Eilrich, PhD, Dean W Einspahr, PhD, Kurt F Eise, J David Ekstrum, Guindy Mahmoud Ismail El, PhD, Dennis Eland, Richard E Elden, Jack R Elenbaas, James Eley, PhD, Gabriel Elgavish, PhD, Hans Elias, PhD, Michael J Elkind, Arthur Eller, PhD, Douglas G Elliot, PhD, Alice E Elliott, PhD, Alice Elliott, PhD, Gary Elliott, Howard C Elliott, PhD, W S Elliott, David A Ellis, PhD, Everett L Ellis, PhD, Richard J Ellis, PhD, K Donald Ellsworth, Andy Elms, Sandy Elms, Howard G Elrlich, PhD, Shaker El-Sherbini, PhD, Donald W Emerich, PhD, Edward Emery, PhD, Philip H Emery Jr, PhD, Matt Emison, John L Emmerson, PhD, Alvin Engelke, Franz Engelmann, PhD, Charles F Engles, John Joseph Ennever, DDS, Leonard E Ensminger, PhD, Bruce Enyeart, Richard A Eppler, PhD, J Michael Epps, MD, Robert Allan Erb, PhD, John K Erbacher, PhD, William Erby, PhD, John Erdmann, John G Erickson, PhD, Joshua A Erickson, Klaas Eriks, PhD, Jack Eriksen, Jan Erikson, PhD, Jay A Erikson, PhD, R W Erwin, Theodore W Esders, PhD, Ramon Espino, PhD, Robert H Essenhigh, PhD, Daniel Esterline, PhD, John H Estes, PhD, Frances C Esteve, S Etter, Wm Henry Eustis, PhD, Charles A Evans, PhD, Claudia T Evans, PhD, Howard E Evans, PhD, Marjorie W Evans, PhD, R Evans, Thomas Walter Evans, PhD, Wm Evans, F Monte Evens, PhD, Martin E Everhard, MD, PhD, Eugene Eyster, PhD.

Category: F

David R Fagerburg, PhD, Stephen R Fahnestock, PhD, Richard B Lai Fatt, PhD, James R Fair, Jr, PhD, Dennis A Falgout, PhD, Donald Fancher, PhD, Don Fanslow, PhD, Farber, Earl Faria, Robert H Fariss, PhD, Charles Farley, Ollie Farnam, Wells Fransworth, PhD, Michael Farona, PhD, Charles Farrell, PhD, Eugene P Farrell, David Fashimpaur, Gerald Fassell, Arlo W Fast, PhD, Homer D Fausch, PhD, John R Favorite, Henry A Feddern, PhD, James Fedrich, PhD, Abraham S Feigenbaum, PhD, Harvey L Fein, PhD, Louis Feinstein, PhD, Robert Feisel, D Feller, PhD, Ronald L Felsted, PhD, Lorie M Felton, Steve Fenderson, Robert W Fenn, PhD, Donald Fenton, PhD, John Fenton, PhD, WJ Fergerson, Dave D Fer-

guson, David Ferguson, PhD, John Ferguson, Robert Ferguson, Richard L Ferm, PhD, William James Ferrell, PhD, Jorge Ferrer, Wm A Fessler, PhD, Dale A Fester, Edward M Fettes, PhD, H Richard Fevold, PhD, John A Feyk, Herbert J Fick, Byron D Field, Jack Field, PhD, Ray Field, PhD, Thomas Field, PhD, Tim Figgie, Prof Roy H Filby, PhD, Theodore H Filer, PhD, Tom Filesi, Warren FilleyFilley, MD, Charles Richard Finch, PhD, Paul Finkelstein, PhD, Charles Finkl, PhD, Peter S Finlay, PhD, Frances M Finn, PhD, John M Finn, PhD, James Fiordalisi, PhD, Bryant C Fischback, Dwayne Fischer, PhD, John Fischley, GL Fish, Wayne W Fish, PhD, J W Fishback II, Geo H Fisher, PhD, William H Fishman, PhD, Klaus Flach, PhD, John F Flagg, PhD, Eugene Flaumenhaft, PhD, Charles W Fleischmann, PhD, Alison Fleming, PhD, Bruce Ingram Fleming, PhD, Julius Fleming, Thomas H Fletcher, PhD, William Flis, Harold W Flood, David Flowers, G Flowers, PhD, Edward Gotthard Foehr, PhD, Robert R Foil, PhD, John E Folk, PhD, Paul V Fonnesbeck, PhD, Marc E Fontaine, PhD, Herman Fonteyne, John T Foorley, PhD, Wilford Foote, PhD, Michael S Forbes, PhD, George E Ford, PhD, J Ford, PhD, Thoams Ford, PhD, Edmund H Fording, Jr, President, Edward Forest, PhD, Eugene J Fornefeld, PhD, Albert J Forney, R C Forrester III, PhD, Denis Forster, PhD, Michael Forster, PhD, John Forsyth, PhD, Dennis Fost, PhD, Cy E Foster, D R E M Foster, PhD, Donald M Foster, PhD, Gerald Foster, PhD, John A Foster, Mac Foster, PhD, Norman C Foster, PhD, Walter E Foster, PhD, Chris Fountain, PhD, Eric B Fowler, PhD, Frank C Fowler, PhD, Gary D Fowler Jr, Dwaine Fowlkes, Gerald Fox, J Fox, Michael R Fox, PhD, Neil S Fox, PhD, James J Foy, PhD, Walter J Frajola, PhD, Roger Frampton, PhD, Guy J Del Franco, Charles E Frank, PhD, Clifford Frank, R S Frank, Gordon Franke, PhD, Julian Frankenberg, PhD, Neal E Franks, PhD, Martin S Frant, PhD, Bruce Frantz, Warren L Franz, PhD, Daniel W Frascella, PhD, Margaret S Fraser, PhD, Nile N Frawley, PhD, R Thomas Frazee, Randy Frazier, Roger Frazier, Stephen E Frazier, PhD, William R Frazier, Raymond Frederici, Lloyd R Frederick, PhD, Max Freeland, PhD, James F Freeman, PhD, Reola L Freeman, Kenneth French, PhD, Scott French, Melvin Frenzel, Arthur L Fricke, PhD, Joe Fiedlander, Raymond Friedman, PhD, H Friedmann, Herbert C Friedmann, PhD, Dwayne T Friesen, PhD, Charles R Frink, PhD, Fripiat, PhD, Harry K Fritchman, PhD, Alfred K Fritzche, PhD, Herbert Farley Frolander, PhD, David Fromson, PhD, U George Frondorf, H R Froning, PhD, Arthur A Frost, PhD, John Frost, PhD, Si Frumkin, Alfred E Fuehs, Robert S Fulghum, PhD, Forst D Fuller, PhD, Ron Fuller, Robert Fulton, PhD, Dennis L Funck, PhD, B L Funt, PhD, Francis S Furbish, PhD, R W Furner, Gabriel Fusco, PhD, John Fuzek, PhD.

Category: G

Sabit Gabay, PhD, Morris Gabel, Richard A Gabel, PhD, Jim Gadwood, Lanelle G Gafford, PhD, Frederick W Gage, A Gahr, PhD, Tinsley P Gaines, Robt G Galazin, Louis Galie, James Gallagher, PhD, Joan S Gallagher, PhD, Donald L Gallaher, Ethan C Galloway, PhD, Darrell Gallup, PhD, Yakob Galperin, PhD, David Gambal, PhD, James J Gambino, Bernard Wm Gamson, PhD, Harendra S Gandhi, PhD, Mary C Gannon, PhD, Richard H Garber, PhD, George F Garcelon, C M Garcia, Wayne Scott Gardner, PhD, Jerry Gargulak, PhD, Clyde H Garman, Ronald G Garmon, PhD, H Richard Garner, Robt J Garner, Jeanette Garr, PhD, Thomas M Garrett, PhD, Robert G Garrison, PhD, John E Garst, PhD, Daniel L Graver, Justine S Garvey, PhD, Todd Garvin, MD, Douglas L Garwood, PhD, Gary J Gascho, PhD, Jerry Gass, Jay B Gassel, Edward Wm Gassie, PhD, R H Gassner, A D Gate, George L Gates, Gerald O Gates, PhD, Anthony R Gatti, PhD, Eugene R Gaughran, PhD, Donald W Gauntlett, Henry T Gawrylowicz, David Gay, Richard L Gay, PhD, Joseph Gaynor, PhD, Rick D Gdanski, PhD, Roy L Gealer, PhD, Richard Geesey, PhD, Colin V Gegg, PhD, D C Gehri, PhD, Robert F Gehrig, PhD, Perry J Gehring, PhD, James E Geiger, Paul J Geiger, PhD, Philip Geis, PhD, Celine Gelinas, PhD, Gennaro, PhD, Joseph C Gentry, Boyd A George, PhD, Raymond George, PhD, W H Dreme George, Gerard Allen Geppert, Robert Gerger, Earl Robert Gerhard, PhD, George W Gerhardt, PhD, Henry D Gerhold, PhD, TC Gerhold, Michael Gerkin, Richard P Germann, PhD, Peter J Gerone, PhD, Mark Gerstein, PhD, Eric Gerstenberger, Joseph E Gervay, PhD, Forrest E Getzen, PhD, Alex Gezzy, Camillo Ghiron, PhD, Louis Charles Gibbons, PhD, Thomas G Gibian, PhD, Ken Giebe, Leo Giegzelmann, Frederic A Giere, PhD, Dewayne E Gilbert, PhD, Garrell Gilbert, Joel Gilbert, Peter Gilbert, William Gilbert, PhD, William Gill, PhD, Wm R Gillen, Bob Gillespie, Jeff Gillespie, William H Gillespie, Nicholas W Gillham, PhD, Travis H Gillham, George A Gillies, PhD, T Ja Gilligan, PhD, Jacques Gilloteaux, PhD, James R Gilman, Ernest R Gilmont, PhD, John Gilmore, PhD, John H Gilmore, Mark Gindling, Thomas H Giordano, PhD, Georgina Gipson, Johanna Glacy-Araos, Marvin Glass, Werner Glass, PhD, Clifford Glenn, Donald

Glenn, John Glissmeyer, John W Glomb, PhD, Richard H Gnaedinger, PhD, Matthew Gnezda, PhD, William Godaif, Ludwig E Godycki, PhD, Frederick A Goellner, Grayce Goertz, PhD, Thomas Goettge, Eugene Goldberg, PhD, Randy Golding, PhD, William T Golding, Lionel S Goldring, PhD, Theodore P Goldstein, PhD, Patrick Goldsworthy, PhD, William Gong, PhD, Ely Gonick, PhD, Tim Good, William Good, Robert Goodman, Byron Goodrich, John Goodrich, Louie A Goodson, Korwin J Goodwin, John C Goon, V L Goppelt, Martin L Gorbaty, PhD, Milton Gorham, Joseph Gorsic, PhD, Timothy N Gorski, MD, PhD, Waldemar Gorski, PhD, Howard Gorsuch, Christopher Gosling, George R Goss, PhD, John R Goss, Albert Gotch, PhD, George Gott, John Gottschling, Thomas L Gould, PhD, Alan Goulet, John Graf, Bob Graham, Dee McDonald Graham, PhD, Gary G Graham, PhD, Joseph W Grahame, Robert E Gramera, PhD, Robert Gramera, PhD, Alphonse P Granatek, Clark A Granger, PhD, Donald J Grantham, Jurgen M Grasshoff, PhD, Kenneth Graues, Robert J Graves, Lewis Gray, Michael Gray, PhD, Steven Gray, Frank Graziano, PhD, Randolph K Greaves, Marvin L Green, Saul Green, PhD, George M Greene II, PhD, Harold Greenfield, PhD, Gerald A Greenhouse, PhD, Howard E Greenwell, Robert Griffith, Mike Greger, Charles T Gregg, PhD, David Gregg, David H Gregg, PhD, Everett D Greinke, David R Gress, Edward L Griffin, Gordon W Gribble, PhD, Ray H Griesbach, Edward Griest, PhD, Harold L Griffin, Leland Griffin, Durward R Griffith, Roy Griffiths, PhD, Tom Griffiths, Mark Grigsby, PhD, Paul E Grindrod, PhD, Teddy H Grindstaff, PhD, Ernest E Grisdale, Robert Dwight Grisso, PhD, Alfred W Grohe, Alan B Grosbach, MD, Joseph F Gross, PhD, Fred Grosz, PhD, Morris P Grotheer, PhD, Henry M Grotta, PhD, Leonard C Grotz, PhD, James Robb Grover, PhD, Frank Groves, PhD, Alfred Gruber, David P Gruber, Gerald Wm Gruber, PhD, Gerry Gruber, PhD, Geza Gruenwald, PhD, Paul M Gruzensky, PhD, Harold J Gryting, PhD, Robert F Guardino, PhD, Terry Guckes, PhD, Elaine Guenther, Charles G Guffey, PhD, Arnold J Gully, Kenneth H Gum, Robert C Gunness, PhD, Wolfgang H H Gunther, PhD, Earl S Gurley, Robert J Gussman, Lyle Gust, Dwight F Gustafson, David L Gustine, PhD, Gerald Gutowski, PhD, Alvin Guttag, Kelleen Gutzmann, John V Guy-Bray, PhD, Allan Guymon, PhD.

Category: H

Frederick C Haas, PhD, David S Olomon Hacker, PhD, Elard Haden, Rodney N Hader, Mark Hagadone, PhD, James Hagan, PhD, C Troy Haggard, Gerow R Hagstrom, PhD, Anthony Haines, Thomas Haines, PhD, Ben Hajek, PhD, Reino Hakala, PhD, Arnold Hakkila, PhD, Martha Hale, PhD, Charles Hall, PhD, Ken Hall, Kenneth L Hall, PhD, Nathan A Hall, PhD, Norm Hall, Phillip Hall, Rebecca Hall, Sieglinde Haller, John H Hallman, PhD, Donal W Halloran, Kevin Halstead, Edward E Hamel, PhD, William A Hamill, Gordon A Hamilton, PhD, James W Hamilton, PhD, Priscilla O Hamilton, PhD, John Hamaker, PhD, Robert M Hammaker, PhD, Jack A Hammond, Raymond E Hammond, Charles E Hamner, PhD, Linda C Hamphill, MD, Adrian J Hampshire, Richard O Hampton, PhD, Suleiman M Hamway, PhD, Diane K Hancock, PhD, Cadet Hand, PhD, John W Hand, John B Haney, MD, Dallas Hanks, Bill M Hann, George C Hann, Robert B Hanna, Samuel L Hansard, PhD, Joann B Hansen, PhD, Joann B Hansen, PhD, R Thomas Hansen, PhD, Steve Hansen, PhD, Rowland Hansford, Harry R Hanson, E W Hanszen, Michael L Haraczy, James E Hardcastle, PhD, Bryant Hardy, Edgar Erwin Hardy, PhD, P L Hardy Jr, Sandra Hardy, William Hardy, George B Hares, PhD, O W Hargrove, Wendell Harkey, Thomas Harkins, Mary L Harmon, Grant H Harnest, PhD, Paul M Harnsberger, Dean O Harper, PhD, Helen Harper, John D Harper, John E Harper, Todd Harper, B L Harris, PhD, Ben G Harris, PhD, Joseph B Harris, PhD, Burton Harrison, Ernest A Harrison, PhD, Francis L Harrison, Elbert N Harshman, PhD, Melissa Hart, Paul Hart, Randall E Hart, Robt D Harter, PhD, Robert R Hartsough, Nathan L Hartwig, PhD, Nicholas Hartwig, PhD, Charles R Hartzell, PhD, Clarence C Harvey, Kim L Harvey, John Harville, PhD, Eldert C Hartwig, PhD, Wm H Harwood, PhD, William L Hase, PhD, Caryl Haskins, PhD, William J Haslem, James R Hass, PhD, Kirk Hastings, Roger C Hatch, Herbert J Hatcher, PhD, Robert Haubrich, PhD, James Hauff, Arthur Haug, PhD, Victor Hauser, PhD, Rudolf M Hausler, PhD, Warren M Haussler, Helga F Havas, PhD, Robert Havens, Gerald B Havenstein, PhD, Anton J Havlik, PhD, Robert Hawthorne, Fred Hayduk, W P Hayduk, Douglas Hayes, PhD, Michael Hayes, PhD, Robertm Hayes, PhD, Frank L Haynes, PhD, Kenneth Heacock, Ronald A Head, PhD, Harold Franklin Heady, PhD, Robert S Hearon, Phillip C Hebert, John Heckman, PhD, Gregory Hedden, PhD, James H Hedges, PhD, Ross M Hedrick, PhD, Carl J Heffelfinger, PhD, Roger Heiland, J Heilman, PhD, Ron Heisner, Roger Heitland, James R Helbert, PhD, Stephen Helbing, Duane Helderlein, David Helfand, Henry Hellmers, PhD, John Helwig, Bruce C Hemming, PhD, Klaus H

Hemsath, PhD, Charles A Hen, David E Henderson, PhD, James Henderson, PhD, Jeannine L Henderson, Jerry Henderson, Kenneth P Henderson, Lavell M Henderson, PhD, Charles Hendricks, Deloy G Hendricks, PhD, John P Hendrickson, Malcolm Hendry, PhD, Shawn Heneghan, PhD, Ernest J Henley, PhD, Jim Hennessy, Henry W Hennigan, William A Hannigan, Lester A Henning, Gustav Henrich, Jonathan F Henry, PhD, William Henry Jr, Wiley H Henson, Jr, PhD, James Hentges, PhD, John Frederick Herber, PhD, Lloyd E Herdle, PhD, William L Hergenrother, PhD, Ronald C Herman, PhD, Robert W Hermsen, PhD, Robert Hern, Sandy Herndon, Ernest C Herrmann, MD, PhD, Zvi Herschman, MD, J Wilson Hershey, PhD, John William Baker Hershey, PhD, Irwin Herskowitz, PhD, Fred Hertlein III, Charles H Herty III, PhD, John Herweh, Robert A Herzog, Robert P Heslop, MD, Eugene Hess, PhD, David A Hessinger, PhD, Norman E Hester, PhD, James V Hewett, PhD, Robert E Heyden, Heyen, PhD, Ken Hucke, Jack Hickey, Kenneth Hickey, PhD, David K Hickle, Howard M Hickman, James L Hickman, Karen Hickman, PhD, Donald Hicks, PhD, Harold E Hicks, Michael Hicks, Clarence E Hieserman, Margaret A Hight, Thomas M Hilderbrand, Robt E Hileman, PhD, Hilgenberg, Bob Hill, Jack F Hill, PhD, Robert F Hill, Robt M Hill, PhD, W B Hill, PhD, Carol C Hilton, Larry Hinderager, Barton L Hinkle, PhD, Jack Hinman, PhD, Roger R Hinshaw, B Hinton, PhD, Tod Hinton, Todd O Hinton, Wiillie L Hinze, PhD, Arthur Hirsch, PhD, Robt W Hisey, PhD, Donald O Hitzman, Jonathan Hoadley, Brian G Hoal, PhD, Farrell D Hobbs, Melvin C Hobson, PhD, Robert C Hochel, PhD, Frederick A Hodge, PhD, Lawrence H Hodges, Albert B Hoefelmeyer, PhD, Arthur Hoeft, Roger A Hoffman, PhD, Theodore P Hoffman, PhD, Thomas Hoffman, Edward Hoffmann, Christopher J Hogan, PhD, D Hoiness, PhD, David L Holcomb, Palmer J Holden, PhD, James Holder, MD, Tammy Holder, Glenn Springs Holdings Inc, Russell Holland, PhD, David Henry Hollenberg, PhD, David V Holli, John C Holliman, John H Hollis, Harry L Holloway, PhD, Frank Joseph Holly, PhD, R W Holman, PhD, Eric Holmes, PhD, Howard Holmes, PhD, William Holmes, H Duane Holsapple, Don H Holzhei, PhD, Otto A Homberg, PhD, Franklin I Honea, PhD, John Honeycutt, PhD, Arie L Hoogendoorn, PhD, Kenneth E Hoogs, MD, James P Van Hook, PhD, Harold H Hopfe, Mike Horan, Sylvester P Horkowitz, Edwin Hornbaker, PhD, Ewin W Hornung, PhD, Myer G Horowitz, PhD, Lloyd A Horrocks, PhD, M Duane Horton, PhD, Steve Horton, Donald P Hoster, PhD, Allan Houanson, Joel Oliver Hougen, PhD, Ralph L Hough, Walter A Hough, PhD, Rodney T Houlihan, PhD, Wm B House, PhD, James O Houseweart, Riley Housewright, PhD, Eric Houze, Dwight D Howard, K B Howard, Stephen K Howard, Walter Egner Howard, PhD, Wm L Howard, Sr, PhD, John Howatson, PhD, George Howe, PhD, John Howe, PhD, Terry A Howell, PhD, Wesley R Howell, PhD, Fritz Howes, Ward Howland, David R Howton, PhD, William Hoychuk, Paul J Hoyer, PhD, C Hoyt, Roger Hrudy, Sung L Hsia, PhD, Hsien-Gieh Sie, PhD, T E Hsiu, PhD, Kuo Hom Lee Hsu, PhD, Robert Y Hsu, PhD, Calvin Huber, PhD, Don M Huber, PhD, Arthur E Hubscher, Charlie Huddleston, P M Hudnall, PhD, Larry Hudson, Robt B Hudson, Fred R Huege, PhD, B Jerry L Huff, PhD, Norman T Huff, PhD, Dennis Huffaker, James Hufham, PhD, Barry Hugghins, Donald Hughes, PhD, Kenneth H Hughes, Kenneth J Hughes, Michael Hughes, PhD, Travis Hughes, PhD, Robert Hughey, Augustine Hull, Philip W Humer, PhD, Allan Humpherys, Ray Eicken Humphrey, PhD, John G Hundley, PhD, Joseph W Hundley Jr, Douglas Hunt, George C Hunt, Mack Hunt, Arvel H Hunter, PhD, May Anne Hunter, Dave Hurt, Samir Hussamy, PhD, Robert Huston, David Hutcheson, PhD, William Hutchins, James H Hutchinson, PhD, F B Hutto, PhD, Monte L Hyder, PhD, Caryl H Hyland, PhD, J Walter Hylin, PhD, Wm E Hymans, PhD, Arnold G Hyndman, PhD.

Category: I

Mike Ibarguen, Andrew Iezzi, Donald J Ifshin, Harold Igdaloff, Jon M Igleman, MD, D Igou, PhD, Donald K Igou, PhD, Charles A Ihrke, PhD, Robert M Ikeda, PhD, Phillip M Iloff, PhD, Samuel J Ing, MD, Criton S Inglessis, PhD, Criton C S Inglessis, PhD, Alvin R Ingram, PhD, Alfred Ingulli, Charles G Inman, Ronald S Inman, William B Innes, PhD, Kaoru Inouye, Lucy Ionas, Roar L Irgens, PhD, David Irvin, James B Irvine, Philip George Irwin, PhD, Sheldon E Isakoff, PhD, Martin Isaks, PhD, Teri Isakson, Don L Isenberg, PhD, Robt W Isensee, PhD, E W Itell, Olga Ivanilova, PhD, James A Ives II, Edwin H Ivey, Kenneth M Izumi, PhD, Robert A Izydore, PhD, Patrick T Izzo, PhD, Theodore Izzo.

Category: J

Mitchell J Jablons, MD, Bill G Jackson, PhD, Harold L Jackson, PhD, Kingbury Jackson, Rick L Jackson, MD, Wm John Jacober, PhD, William Jacobi, PhD, Francis A Jacobs, PhD, Francis A Jacobs, PhD, John C Jacobs, PhD, M L Jacobs, PhD, Richard G Jacobs, Elaine L Jacobson, PhD, Irven Allan Jacobson, Donald F Jacques,

PhD, Jonah Jaffe, PhD, Mordecai Jaffe, PhD, Kenneth I Rwin Jagel, PhD, Ray Jaglowski, Albert A Jagnow, Kenneth S Jago, MD, Richard J Jambor, David E James, PhD, Douglas E James, HS James, Virgil E James, PhD, 154 Johnson Hall, PhD, Everett Williams Jameso, PhD, Leon Jameton, Jiri Janata, PhD, Donald Janes, Borek Janik, PhD, Maximo Jante, Frank H Jarke, Kenneth Jarrell, Neldon Lynn Jarvis, PhD, John P Jastrzembski, Augus W Jaussi, PhD, Lynn Jaussi, Max Jellinek, PhD, Carol Jenkins, Sean Jenkins, Vernon K Jenkins, PhD, Alfred S Jennings, PhD, Creighton Jensen, PhD, Leeann Jensen, PhD, Marcus M Jensen, PhD, Randolph A Jensen, Randolph Jensen, Randolph Jensen, Robert Jensen, Thomas Jensen, PhD, Timothy B Jensen, PhD, Stewart C Jepson, Anthony E Jernigan, Michael W Jezercak, PhD, Charles Joanedis, Joerz, Eileen D Johann, PhD, Timothy Johans, MD, H William Johansen, PhD, Karl Richard Johansson, PhD, Sune Johansson, Charles W Johnson, Delmar R Johnson, Donald C Johnson, PhD, Donald D Johnson, PhD, Donald Johnson, PhD, Frank J Johnson, Fred Johnson, PhD, Frederic A Johnson, PhD, Glenn R Johnson, PhD, I Johnson, PhD, James W Johnson, PhD, M W Johnson, PhD, Mark A Johnson, Mark Johsnon, Melvin Johnson, PhD, Ray E Johnson, PhD, Richard D Johnson, PhD, Robert V Johnson, PhD, Rodney B Johnson, Ronald Johnson, Terrance Johnson, PhD, Terrell K Johnson, Todd Johnson, PhD, William Johnson, Bonnie Johnston, H D Johnston, PhD, Johnston, MD, PhD, Marshall Johnston, PhD, Matt Johnston, Stephan E Johnston, Stephen A Johnston, PhD, William D Johnston, PhD, John E Jolley, PhD, Von D Jolley, PhD, AD Jones, Alan R Jones, PhD, Bill Jones, PhD, Chrisopher Jones, Christopher H Jones, Frank N Jones, PhD, Jack Jones, PhD, John D Jones, MD, Richard H Jones, PhD, Taylor B Jones, PhD, Wesley M Jones, PhD, Wilbur C Jones, PhD, Peter E Jonker, Richard Joos, PhD, Gary Jordan, Robt K Jordan, Richard D Jorgenson, PhD, Raymond P Joseph, Edward S Josephson, PhD, David Jowett, PhD, D Joye, PhD, R E Juday, PhD, Joseph M Judge, PhD, Hiram P Julien, PhD, Frederick J Julyan, PhD, John A Jung, PhD, Eric Jungermann, PhD, Wm A Junk, PhD, D E Junker, PhD, M L Junker, PhD, James Junkin, Richard Jurgensen, MD, Richard S Juvet, PhD.

Category: K

Matti Kaaranakari, Joe Kahn, John Kalafut, Norman W Kalenda, PhD, Robert J Kallal, PhD, Lisa Kalman, PhD, Beth Kalmes, Moses Kaloustain, PhD, Brian D Kaluzny, Margaret A Kaluzny, Victor V Kaminski, PhD, James M Kampfer, Ronald R Kamyniski, Antony Kanakkanatt, PhD, Joseph M Kanamueller, PhD, Stanley M Kanarowski, Bernard J Kane, Noel Andrew Patrick Kane, PhD, William Kane, PhD, Paul Thomas Kantz, PhD, James H Kanzelmeyer, PhD, Hillel R Kaplan, George Kapusta, PhD, Larry Kapustka, PhD, Richard D Karkkainen, Paul Karr, PhD, Kenneth S Karsten, PhD, Mark Kaschmitter, John D Kaser, PhD, Charles B Kasper, PhD, Robert J Kassal, Fellow, PhD, Raymond Kastendiek, Rosalind Kasunick, Williams S Kather, Herbert Katz, Joseph J Katz, PhD, Marvin L Katz, PhD, George B Kauffman, PhD, Jeffrey M Kauffman, Joel Kauffman, PhD, Thomas Kauffman, R G Kaufman, PhD, Robert Eugene Kay, PhD, Robert L Kay, PhD, Kazakevich, PhD, Armen R Kazanjian, PhD, Robt A Keeler, Iris Keeling, Harold M Keener, PhD, Robert D Keenum, Gerson Kegeles, PhD, Hubert Keily, PhD, Carroll Keim, Jerome B Keister, PhD, Morris Keith, Ed Kekec, Frederick Keller, PhD, Kenneth F Keller, PhD, Wm E Keller, PhD, Glen E Kellerhals, PhD, Craig T Kelley, Joseph Kelley, PhD, John Kellgren, PhD, Craig Kellogg, PhD, Colin M Kelly, PhD, Patrick Kelly, Raymond Kelly, PhD, W J Kelly, PhD, Frank N Kemmer, George Kemp, John D Kemp, PhD, Thomas Kenat, PhD, Shawn Kendall, L N Kendrick, Albert J Kennedy, PhD, John E Kennedy, PhD, William Kennedy, James Kennelley, PhD, Harris Kenner, Francis T Kenney, PhD, Geo C Kent, PhD, Jim Kent, Michael J Keogh, PhD, Joyce E Kephart, Donald L Kerr, PhD, Anna M Kerrins, Jesse Keville, Mel Keyes, PhD, Naaman H Keyser, Donald A Keyworth, PhD, Gregory B Kharas, PhD, Harold Kidd, PhD, Vincent J Kidd, PhD, Rodney Kiel, Terry Kienitz, Charles Kilgore, Dennis D Kilkenny, Theo D Kimbrough, PhD, Charles O King, PhD, F King, H H King, PhD, John W King, PhD, Joseph E King, Sanford King, PhD, Charles Kingrea, PhD, C Louis Kingsbaker, Jerome W Kinnison, Norma A Kinsel, PhD, Stephen C Kinsky, PhD, Ralph C Kirby, Earl Kirk, Clyde A Kirkbride, PhD, Hugh R Kirkpatrick, Ravi Kiron, PhD, Janet M Kirsch, Paul R Kirsch, Edgar W Kivela, PhD, Lassi Kivioja, PhD, Bruce H Klanderman, PhD, Amy G Klann, PhD, Miro Klecka, PhD, Vasilios Kleftis, RR Klein, PhD, W S Klein, Walter B Kleiner, PhD, Robert E Klenck, MD, Ronald W Klenk, PhD, John Kleyn, PhD, Gary Kline, Robert Kline, PhD, Roger C Klockziem, PhD, Melvin Klotzman, Anatole A Klyosov, PhD, Kent Knaebel, PhD, Edward A Knaggs, Stephen Knapp, Terence E C Knee, PhD, Wiliam Kneebone, PhD, B Kneeland, Tom Knetsley, Maurice Kniceley, James Knight, Jere D Knight, PhD, James Otis Knobloch, PhD, Charles P Knop, PhD,

Charles P Knop, PhD, Floyd Marion Knowlton, Gregory D Knowlton, PhD, Christian W Knudsen Dr, PhD, Chung-Yu Ko, Ian Koblick, Henry Kobsa, PhD, Henry Kobsa, PhD, Arthur T Koch, PhD, D Koch, PhD, Robert Koch, Tyson Koch, William Koehl, PhD, Carol R Koehler, F Theodore Koehler, Janice Koehler, Gina L Koenig, Lee E Koepke, George O Kohler, PhD, James P Kohn, PhD, Frederick C Kohout, PhD, Randall Kok, PhD, Juha P Kokko, MD, PhD, Kurtis Koll, PhD, Bernard J Kolp, PhD, Stanley P Koltun, Roger W Kolvoord, PhD, Sam Kongpricha, PhD, Virgil Konopinski, Anthony Konopka, Dusan Konrad, PhD, David Kooyman, PhD, Charles B Koons, PhD, Frank Koontz, PhD, John T Kopfle, Bruce D Korant, PhD, Joseph Korch, Howard Kordes, John Kordosh, N Korens, Edmund C Kornfeld, PhD, Charles H Korns, PhD, Mary B Korpi, Mary Korpi, Daniel R Kory, PhD, Mark J Koslicki, Aaron D Kossoy, PhD, Robert Kostelniki, PhD, Robt A Koster, PhD, Eugene George Kovach, PhD, J L Kovach, PhD, Joseph E Kovacic, Nagy H Kovacs, PhD, Thomas F Kowalczyk Jr, Paul C Kowallis, Richard A Kowalsky, John N Kraeuter, PhD, E H Krafft, Richard Kraft, Jerry Kraim, PhD, John J Krajewski, PhD, Deborah J Krajicek, Karl J Kramer, PhD, Karl W Krantz, PhD, Jan Krason, PhD, Clyde H Kratochvil, MD, PhD, Robert Krauss, PhD, Arthur A Krawetz, PhD, Arthur Krawetz, PhD, Herman F Kraybill, PhD, John Krc Jr, Lawrence Krebaum, PhD, Ron Kreis, PhD, Carl Krespan, PhD, Joseph Z Krezandski, PhD, Roy Krill, Kevin Krist, PhD, Steve Kristoff, PhD, Mark S Kristy, MD, William G Krochta, PhD, Lillian A Kroenke, William J Kroenke, PhD, Rober Lee Kroodsma, PhD, John L Kropp, PhD, Julius R Kroschewsky, PhD, Philip M Krueger, PhD, Paul H Krumrine, PhD, Lorin R Krusberg, PhD, David J Kubicek, Donald Gene Kubler, PhD, Mitsuru Kubota, PhD, S Kubow, PhD, John F Read Kuc, PhD, James E Kuder, PhD, Marc Kudla, Donald Kuehl, Adelheid Kuehnle, PhD, George Kugler, PhD, Eugene J Kuhajek, PhD, Moira Kuhl, Michael Kuhlmann, Raymond E Kuhn, PhD, Kenneth Kuiken, PhD, Eugene Kulesza, Rudolph K Kulling, PhD, Samar Kundu, PhD, George W Kunze, PhD, Jing-Wen Kuo, PhD, James R Kuppers, PhD, David W Kurtz, PhD, Henry Kurusz, Peter Kusel, PhD, Andrew Kuzmission, Lydiane Kyte.

Category: L

Peter Labosky, PhD, R G Lacallade, Rosemary Lacher, Sanford Lacks, PhD, Joseph T Laemmle, PhD, Franklin Laemmlen, PhD, Robert J Laffin, PhD, Evan D Laganis, PhD, Thomas W Lagrelius, MD, B D Lagrone, Michael L Laird, Jerry Laman, Allen B Lamb, Allen Lamb, Donald J Lamb, PhD, Roger Lamb, John P Lambert, Andrew Lambie, John P Lambooy, PhD, Trevor G Lamond, PhD, David L Lamp, Richard J Landborg, PhD, Wm C Landgraf, PhD, Jerome Lando, PhD, L Landry, William G Landry, Carl L Lane, PhD, Charles J Lane, George Lane, Robert Lane, PhD, Robt Lane, PhD, Scott Lane, Conrad M Lang, PhD, Robert Carl Lange, PhD, Paul B Langford, PhD, Philip G Langley, PhD, H Norbert Lanners, PhD, Edward Lanser, Frank M Lanzafame, PhD, Lanzafame, PhD, Evelyn P Lapin, PhD, Daivd Larsen, Elisabeth Larsen, Eric B Larsen, PhD, Eric Russell Larsen, PhD, Howland A Larsen, PhD, Lloyd Larsen, PhD, Robert P Larsen, PhD, Ashley Larson, Bruce L Larson, PhD, Charles Conrad Larson, PhD, Dana E Larson, Kenneth Larson, Philip Larson, PhD, Reginald M Lasater, Jack S Lasky, PhD, Andrew Lasslo, PhD, Alan R Latham, PhD, P R Latour, PhD, Robert P Lattimer, PhD, Duane E Lau, Lloyd H Lauerman, PhD, Robert J Laufer, PhD, Wm E Laupus, MD, Robert Laurence, PhD, Jim Lauria, Thomas Lauterio, PhD, Marcel E Lavoie, PhD, Layle Lawrence, PhD, Eugene J Lawrie, Richard Lawson, Jeffrey C Lawyer, William A Laycock, PhD, Norman Lazaroff, PhD, Gerald R Leather, PhD, Bill Lech, Richard V Lechowich, PhD, Harvey D Ledbetter, PhD, Joseph Ledbetter, PhD, Brian W Lee, PhD, D M Lee, David J Lee, Donald Lee, PhD, William Lee, PhD, Clark Leedy, PhD, James L Leef, PhD, Keith Leese, Bob Lefelar, Robert A Lefever, PhD, Harold Legate, Jim Lehmann, David Leibman, Richard Leicht, Algird G Leiga, PhD, Joshua M Leise, PhD, Paul Leithart, MD, Vicoria M Leitz, PhD, W L Lemon, MD, Ronald C Lenox, PhD, Ronald S Lenox, PhD, Joseph W Leone, Bruno Leonelli, Joseph Leonelli, PhD, Gregory S Leppert, PhD, Dennis Leppin, David M Lesak, Jim Leslie, Howard Lessoff, Gregory S Lester, Elma Laterman, PhD, Benjamin S Leung, PhD, Allan L Levey, Karen N Levin, S Benedict Levin, PhD, Bernard Levine, PhD, Sidney B Levinson, Louis Leviticus, PhD, Seymour Levy, Stanley S Levy, PhD, Robert M Lewert, PhD, Gordon D Lewis, PhD, Milton Lewis, PhD, Peter A Lewis, PhD, Robert Lewis, Russell J Lewis, PhD, William Lewis, PhD, Chia-Yu Li, PhD, Wei Li, David Licht, Irwin A Lichtman, PhD, Charles G Liddle, DVM, William Liddle, Timothy E Lien, Steven C Limke, James C Lin, PhD, Merlin Lindemann, PhD, Henry R Linden, PhD, Wm T Lindsay, PhD, Lindeman, Milton J Linevsky, PhD, Bernard A Link, PhD, Donald Linn, PhD, Glenn Liolios, William G Lipke, PhD, Michael Lipton, PhD, Emil P Lira, PhD, Adam Lis, PhD, Wm E Liss, Ellen K Lissant, PhD, Kenneth J Lissant, PhD, Bruce A Lister, Mark Lister, PhD, Jim Litchfield, Arthur

Litheredge, Frank Little, Frank Little, Fred Liu, PhD, John Liutkus, PhD, Harold Lloyd, Vern Lloyd, Fred P Lobban, Gene M Lobrecht, Charles Lochmuller, PhD, Royce Z Lockart, PhD, Krystyna Locke, PhD, Raymond K Locke, William Lockett, Eric Lodewijk, Eric Lodewyk, Alfred R Loeblich III, PhD, Robert Loffredo, PhD, R Loftfield, John T Loftus, Charles B Loggie, Thomas J Loginess, Francis M Logullo, PhD, H Y Loken, PhD, Stanley J Lokken, PhD, Earl E Long, John Long, PhD, Joyce M Long, Justin T Long, PhD, William H Long, PhD, John B Longenecker, PhD, Martin S Longmire, PhD, Ian S Longmuir, Paul A Lan Longwell, PhD, Ruskin Longworth, PhD, Jerome J Looker, PhD, Herb Lopatka, W F Loranger, PhD, Thomas A Loredo, Jerry A Lorenzen, PhD, Larry Lortscher, Robert A Loscher, Edward T Losin, PhD, Mark J Losset, Peter F Lott, PhD, Doug Loudin, Gerard A Loughran, L Hh Louis, PhD, Jerry Loupee, Ben Lovell, Harold L Lovell, PhD, John R Lovett, PhD, Jan Lovy, PhD, Mark Lowell, PhD, Umass Lowell, PhD, Douglas Lowenhaupt, JM Lowenstein, PhD, G A Lowerts, PhD, Charles B Lowrey, PhD, Justin Lowry, Kenneth J Little, Kathleen M Lucas, Wm R Lucas, PhD, Donald H Lucast, PhD, Peter J Lucchesi, PhD, William Luce, PhD, George W Luckey, PhD, TD Luckey, PhD, Richard R Ludlam, C T Ludwig, H Ludwig, Oliver G Ludwig, PhD, Ralph E Luebs, PhD, C Luger, Scott Lugibihl, Caroline N Luhta, Carl A Lukach, PhD, Thomas J Lukas, PhD, Forrest Luke, Robert M Lukes, PhD, Rufus Lumry, PhD, Douglas E Lund, PhD, R Dwayne Lunsford, PhD, Owen R Lunt, PhD, John H Lupinski, PhD, Channing Lushbough, PhD, Carol J Lusty, PhD, Walter Wilhelm G Lwowsk, PhD, Arthur Lyall, A Lvin H Lybeck, John Lydic, Thomas L Lye, Sidney Lyford Jr, PhD, W R Lyman, Rodney G Lyn, PhD, Keith D Lynch, PhD, William S Lyon, Harold Lyons, PhD.

Category: M

E Jerome Maas, PhD, Brian W Macarthur, PhD, Howard Maccabee, PhD, Bruce Macdonald, Digby D Macdonald, PhD, Michael J MacDonald, MD, PhD, P MacDougall, PhD, Robert M MacFarlane, Robert J Macher, Roy P Mackal, PhD, Bruce Macke, Joseph E MacMillan, PhD, Patrick K Macy, David A Madden, Scott E Maddox, Steve Maddox, Kenneth O Madsen, PhD, Raymond A Madson, Robert E Mady, John M Maerker, PhD, Charles A Magarian, Jules J Magda, PhD, John L Magee, Thomas Magee, Wm T Magee, PhD, Jerry Magloughlin, PhD, Om Prakash Mahajan, PhD, Kent Ira Mahan, PhD, Hugh D Maillie, PhD, Robert D Mair, PhD, J Malcom, Robert T Maleeny, Hans Weil-Malherbe, PhD, Jim Gorden Malik, PhD, Irving Malkin, James L Maller, PhD, D James J O Malley, PhD, Frank B Mallory, PhD, Joseph D Mallory, MD, Norman Malm, PhD, Tom Maloney, Joseph T Maloy, PhD, Robert Malstrom, PhD, Eugene Maltzeff, Edward Mancilla, Dorinda Mancini, Naga B Mandava, PhD, Baldev S Mangat, PhD, Frank D Mango, PhD, J David Manley, John D Manley IV, Warren O Manley, Kenneth G Mann, PhD, Francis Manning, PhD, Terry Manning, Sven Peter Mannsfield, PhD, Robt Mansell, PhD, Lee A Mansfield, Richard Mansfield, Greayer Mansfield-Jones, PhD, John R Manspeaker, John Manthey, Ronald Manus, PhD, Karl Maramorosch, PhD, L Frank Maranville, PhD, Gladys M Marcelli, PhD, Robert P Marchant, R Marcotte, PhD, Herman L Marder, PhD, Anthony Maresca, PhD, Brian Maridon, Michael J Marinak, Dan Marinello, Andrew C Marinucci, PhD, Michael Markels Jr, PhD, Jay G Marks, PhD, Paul Marnell, PhD, Dennis N Marple, PhD, Anthony D Marques, David Marquis, PhD, Marilyn Marquis, PhD, Thomas Marrero, PhD, Henry L Marschall, Sullivan Marsden, PhD, Wm Michael Marsh, A E Marshall Jr, Christopher R Marshall, PhD, Eugene Marshall, Harold G Marshall, PhD, Thomas E Marshall, PhD, David E Marshburn, MD, Roger W Marsters, PhD, Richard G Martella, Edward S Martin, PhD, Jack Martin, PhD, James W Martin, Michael Martin, PhD, Neils Martin, PhD, Peter M Martin, Ralph Martin, Richard Martin, PhD, Robert Martin, PhD, Scott Martin, Stanley Martin, T Scott Martin, Willard Martin, PhD, Francisco J Martinez, Robert A Martinez, Eric Martz, PhD, Carmine Mascoli, PhD, Jerzy Maselko, PhD, Louis T Mashburn, PhD, Thompson A Mashburn, PhD, Charles E Mason, PhD, Donald F Mason, PhD, Perry S Mason, PhD, Richard R Mason, PhD, Williams Mason, Lenita C Massey, MD, John L Massingill Jr, PhD, M Masthay, PhD, R Mastracchio, Joseph J Matarelli, William H Matchett, PhD, Robert Matejka, Walter K Mathews, PhD, Thomas W Mathewson, Robert J Mathieu, Mike Matis, David Mattthew, Charles Sedwick Matthews, PhD, Donald Matthews, Kenneth D Matthews, Charles Mattina, PhD, Guy C Mattson, PhD, Samuel A Matz, PhD, George T Matzko, PhD, Augustin D Matzo, Ralph W Maughan, Margaret N Maxey, MD, PhD, M J Maximovich, PhD, Arthur R Maxwell, PhD, Marion S Mayer, PhD, Theodor Mayer, PhD, Greg Mayes, Roger Mayhew, David F Maynard, PhD, Donald R Mayo, PhD, Ernst Mayr, PhD, Siegfried T Mayr, PhD, James Mayrath, PhD, David Mays, PhD, Larry Mayton, Robert R Mazer, S Mazil, PhD, G Mazis, John R McBride, PhD, Joseph J McBride, PhD, Ed Mccabbe,

William D McCain Jr, PhD, Russell F McCann, Wm M McCardell, Danny W McCarthy, PhD, Glenn J McCarthy, Joseph F McCarthy, Niel McCarthy, PhD, Richard McCarthy, Richard McCarthy, Morley G McCartney, PhD, Clark W McCarty, PhD, Daniel G McChesney, PhD, James K McClanahan, Neil McClellan, Thomas McClelland, Chester M McCloskey, PhD, Marvin McClung, PhD, Jack L McClure, William Owen McClure, PhD, J R McCord, PhD, Joe M McCord, PhD, Rayford L McCoy, Philip G McCracken, PhD, K E McCready, Terry W McCreary, PhD, Donald A McCrimmon, PhD, Kevin Mccrory, George McCullars, MD, PhD, John Price McCullough, PhD, Kilmer S McCully, MD, PhD, John Dennis McCurdy, PhD, Harry C McDaniel, Ivan N McDaniel, PhD, Max Paul McDaniel, PhD, William D McDaniel, C McDaniels, David A McDevitt, Floyd McDonald, John McDonald, PhD, Lynn D Mcdonald, PhD, Mickey McDonald, Ted McDonald, PhD, Leslie M McDonough, PhD, Robert I McDougall, PhD, Edward McDowell, PhD, Thomas D Mcdowell, PhD, Wilbur B McDowell, PhD, Jennifer McDuffie, PhD, Paul McElfresh, PhD, Paul McElligott, PhD, Robert McElroy, J W Mcfarland, PhD, Omer H McGee Jr, Bill Mcgowan, PhD, Daniel McGuire, Mark McGuire, PhD, Stephen E McGuire, PhD, Lawrence Mchargue, PhD, Kenneth L McHugh, PhD, Charles G McKay, Roy McKay, William D McKee, PhD, Curus Milo McKell, PhD, William J McKenna, John J Mcketta Jr, PhD, Floyd McKinnerney, Michael Mckinney, PhD, Jerry McKnight, Stephen McKown, D McLain, PhD, Jerry D Mcmahon, Curtis J McMinn, Bryce H McMullen, PhD, Wilfred Mcmurphy, PhD, Ruth D McNair, PhD, Steve McNeely, PhD, William McNeill, PhD, Jasper L McPhail, MD, Clinton M McPherson, PhD, Richard McPherson, Robert Mcpherson, L D Mcqueen, PhD, Larry G McRae, PhD, Fred McSavis, PhD, C L McSpadden, Harry A McVeigh, PhD, David McVey, PhD, George W Mead, Robert C Meaders, Dean Meadows, Susan L Mearns, PhD, Alan J Mechtenberg, Richard Y Meelheim, PhD, E K Megerle, George H Megerle, Lester Meidenbauer, Dale J Meier, PhD, Jimmy Meier, Walter T Meinert, 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Morrison, PhD, O Charles Morrison, Morrow, PhD, Wm S Morrow, PhD, George Morse, Jerome G Morse, PhD, Joe Mortensen, Richard F Mortensen, PhD,

Raymond L Morter, DVM, PhD, Perry Morton, PhD, Susan Morton, T R Morton, Wayne Morton, Jacob Mortvedt, PhD, Thomas Moseley, Melvyn W Mosher, PhD, John R Mosley, PhD, Ronald J Mosso, Eldridge M Mount, PhD, Eldridge M Mount III, PhD, Charles F Mowry, Lee W Mozes, PhD, Walter J Mozgala, Barbara Mroczkowski, PhD, Richard C Much, Rosa M C Muchovej, PhD, Gordon M Muchow, PhD, Wim L Mueller, Robert Z Muggli, PhD, Francis Mulcahy, PhD, Jim Mullen, L Muller, Dennis M Mulvey, PhD, Dennis Mulvey, PhD, Karen E Mumm, T Munasinghe, PhD, David Munn, PhD, Dan Muno, Emil Moise Murad, Craig B Murchinson, PhD, Pamela W Murchinson, PhD, Fenoi Murdock, PhD, Stephen K Murdock, Richard C Murgittroyd, Robert S Murphey, PhD, Alexander J Murphy, PhD, Daniel B Murphy, PhD, John Murphy, PhD, Francis J Murray, PhD, James T Murrell, PhD, J Muse, PhD, James R Musick, PhD, R Musselman, PhD, Walter F Muzacz, Thomas J Muzik, PhD, John Mycroft, PhD, Clifford A Myers, Earl E Myers, PhD, Gerald B Myers, MD, Lyle L Myers, PhD, Ronald F Myers, PhD, Victor Mylroie, Thomas L Myron, Norbert R Myslins, PhD, Charles H Myslinsky.

Category: N

Robert Naegele, PhD, Danny Naegle, Kenneth A Nagy, PhD, Yathi Naidu, PhD, Gangadharan V M Nair, PhD, John D Nalewaja, PhD, Eugene Malinowksi, PhD, Robert K Nance, Richard Narske, PhD, Ruth Naser, Roger D Nass, John Nasser, Roger Natzke, PhD, James K Neathery, PhD, Kenneth H Nebel, John E Nebergall, Daniel W Nebert, MD, Dana Neely, James W Nehls, PhD, Thomas Neil, PhD, Robert Overman Nellums, George Nelms, PhD, Charles A Nelson, PhD, Errol Nelson, George D Nelson, R T Nelson, Richard D Nelson, Ronald Nelson, Stephen Nelson, Melodee Nemeth, Jerry E Nendon, A David Nesbitt, Ray B Nesbitt, Stanley Nesheim, Lowell E Netherton, PhD, Arthur Nethery, PhD, Joseph Navin Neucere, Harry J Neumiller Jr, PhD, Edward F Neuzil, PhD, Martin Newcomb, PhD, Roger Newell, PhD, John M Newey, Marlyn Newhouse, PhD, H Newsom, PhD, Geo S Nichols, PhD, Marcella Nichols, Richard A Nichols, PhD, Robert Fletcher Nickerson, PhD, Michael Nicol, Paula W Nicola, Dennis A Nie, James Niebaum, Edmund L Niedzielski, PhD, R Nieffenegger, Donald R Nielsen, PhD, John Merle Nielsen, PhD, Ronald A Nielsen, DDS, Joseph A Nieroski, John Tse Tso Ning, PhD, George Niznik, PhD, Christopher P Nizzi, Ella Mae Noffsinger, Jim Noffsinger, PhD, Daniel Nogales, PhD, Edward J Nolan, PhD, Martin Nolan, Wayland Noland, PhD, Leo A Noll, PhD, James A Nollet, Henry F Nolting, Henry F Nolting, David B Norby, Peter J Nord, PhD, Carroll R Norden, PhD, Ivan Nordin, PhD, Randy Noriyuki, Edward D North, PhD, L D Northcott, Dexter B Northrop, PhD, Scott H Northrup, PhD, Lilburn L Norton, PhD, Robert Norton, S H Norton, PhD, Wm T Norton, PhD, Susan Norwood, Thomas E Noseworthy, James A Novitsky, PhD, Robert Novy, PhD, Leonard James Nugent, PhD, Wm R Nummy, PhD, Ann T Nunnemaker, Frank Q Nuttall, MD, PhD, William E Nutter, PhD.

Category: O

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Category: P

Gilbert Pacey, PhD, C Subah Packer, PhD, Richard Milton Paddison, MD, Algred Pagano, PhD, David S Page, PhD, Joseph R Pagnozzi, Ruth Painter, Felice Charles Palermo, Jay Palmer, PhD, John D Palmer, PhD, Timothy T Palmer, PhD, Muriel S Palmgren, PhD, Gyan S Pande, PhD, V N Pandey, PhD, Jack S Panze, Andreas M Papas, PhD, Joseph Papenfuss, PhD, James Pappas, Hemant B Parikh, Edward James Parish, PhD, Richard L Parish, PhD, Gerald M Park, Robert Park, PhD, William Park, Cyril Parkanyi, PhD, David Parker, George Parker, Nina Parker, PhD, T Parker, Thomas Parker, R M Parkhurst, Robert Parkhurst, Arthur Parks Sr, H L Parks, Lloyd M Parks, PhD, James Floud Parr, PhD, Stephen L Parrott, PhD,

Robert W Parry, PhD, Michael L Parsons, PhD, Alice B Parsons, Stuart Parsons, Ralph E Pasceri, PhD, Mark Pastore, Robert Patarcity, Charlie Patchett, H Richard Pate, Mitchell Pate, Kirit Patel, Mangal Patel, Natu C Patel, P V Patel, PhD, Richard Paterson-Jones, James H Patrick, Gaylord P Patten, PhD, James C Patterson, James H Patterson, PhD, Roe Patterson, Sharon Patterson, Timothy Patterson, Wilbur I Patterson, PhD, James W Patton, PhD, Rolf Paul, PhD, Craig L Paulsen, Patricia Paulson-Ehrhardt, Albert Pavlic, PhD, Paul Pawlisch, PhD, Barry Payne, Dewitt A Payne, PhD, James Payne, PhD, Raymond A Paynter, PhD, Andy Peabody, Val E Peacock, PhD, Albert M Pearson, PhD, Anthony Pearson, PhD, Earl Pearson, PhD, F G Pearson, PhD, Doug Pease, Richard S Peckham, PhD, Richard Pedersen, Floy Pelletier, PhD, Floy Pelletier, PhD, Hugo Gabriel Pena, PhD, David Pendery, Stanley J Penkala, PhD, Mary A Penland, Robert Pennak, PhD, Charles R Penquite, Jeffrey G Penta, Wendell Pepperdine, PhD, Armand B Pepperman, PhD, J Percha, Luzviminda K Peredo, MD, James M Perel, PhD, Arthur S Perkins, FM Perkins, Thomas Perkins, PhD, Bill Perry, George Perry, PhD, John E Perry, Mikhail I Petaev, PhD, Douglas Peters, Elroy Peters, PhD, Raymond Peters, Joseph C Petersen, PhD, Al Peterson, Arthur W Peterson, David Peterson, PhD, Raymond W Peterson, Peter P Petro, PhD, George Petrosky, Thomas G Petrulas, Heriberto Petschek, Lawrence M Pfeffer, PhD, Douglas R Pfeiffer, PhD, Glenn Pfendt, Donald Pfittsiher, Robert Phalen, PhD, Tuan Duc Pham, PhD, Raj Phansalkar, PhD, George C Phelps, B Phillips, PhD, C Eric Phillips, Calvin Phillips, Dwayne Phillips, Ernest Phillips, John Phillips, John Phillips, Keith Phillips, Mitchel Phillips, MD, Steven J Phillips, MD, Wendell F Phillips, Wallae C Philoon, PhD, Cu Phung, PhD, George J Piazza, PhD, Perry T Piccard, Max Pickerill, PhD, Sean Piecuch, Matthew Lee Pierce, PhD, Susan K Prierce, PhD, Edwin T Pieski, PhD, Charles E Pietri, William J Pietrusiak, Arthur J Pignocco, PhD, D Pigott, PhD, Charles Pike, Paul E Pilkington, Vincent J Pileggi, PhD, Laurence O Pilgeram, PhD, Hyman Ira Pilgrim, PhD, David Pimentel, PhD, Bob Pinner, Anton J Pintar, PhD, William R Pioli, Michael R Piotrowski, PhD, Bernard Wallace Pipkin, PhD, Anthony W Pircio, PhD, Ed Piszynski, William Pitt, PhD, John P Pittman, PhD, Peter Pityk, Michael Piznar, James C Plagge, PhD, Ronald Plakke, PhD, Alan Edward Platt, PhD, Larry Plonsker, PhD, Karl W Plumlee, PhD, William A Plummer, PhD, Joseph S Plunkett, Wendy K Pogozelski, PhD, B Poling, PhD, Jack J Polise, Charles B Pollock, Karl Hallman Pool, PhD, George Poole, H K Poole, David D Porter, MD, Edward S Porter, Frederic E Porter, PhD, William W Porterfield, PhD, Denzil Poston, PhD, Harvey W Posvic, PhD, Louis Potash, PhD, Dale Potter, PhD, George Potter, PhD, Kenneth Potter, Rainer Potthast, PhD, Daniel B Pourreau, PhD, Joseph J Poveromo, PhD, Susan Powell, Kendall G Powers, PhD, Ernest Ppospischil, David Pramer, PhD, Hullahalli Prasan, PhD, Eugene Praschan, Ronald Prebys, Frank M Precopio, PhD, Prendegast, PhD, Richard S Prentice, William Preston, Martin Preus, PhD, Casey Jo Price, George W Price, Harold Anthony Price, PhD, R E Price, Steven Price, PhD, J Prieditis, PhD, Char W Prince, PhD, David Prinzing, Ronald L Prior, PhD, James E Pritchard, PhD, Barry Profeta, B Prokai, PhD, William H Prokop, Gary Proksch, PhD, Leon Prosky, PhD, Alan L Prouty, Michael Pruchnicki, MD, Zenon C Prusas, Michael J Pryor, PhD, William Pryor, PhD, Andrezej Przyjazny, PhD, Ronald J Pugmire, PhD, T O Purcell, PhD, E Dale Purkhiser, PhD, Charles Putnam, J W Putt, David Puzan, Albert Pye, PhD, Orrea F Pye, PhD, Eugene Pyrcioch, Louis Pytlewski, PhD.

Category: Q

Forrest Quackenbush, PhD, Earl R Quandt, PhD, James Quandt, James R Quinan, PhD, William Quisenberry.

Category: R

Daryl Raabe, Mj Rabinonitz, PhD, Joseph Rachlin, PhD, Jeff Racho, Charles Raczowski, PhD, Frederick J Radd, PhD, Richard Radeka, David R Raden, Rodney W Radke, PhD, Michael T Radvan, Keen Rafferty, PhD, Ronald O Rahn, PhD, Elliott Raisen, PhD, Charles Raley, PhD, C L Rambo, Harmon H Ramey, PhD, Alvin O Ramsley, Paul Ramstad, PhD, Philip G Rand, PhD, Charles C Randall, MD, Wm J Randall, PhD, Ann Randolph, PhD, Margene G Ranieri, PhD, Tom Rank, PhD, Stephen C Raper, Henry Rapoport, PhD, James B Rasmussen, Lowell Rasmussen, PhD, Lee Ratcliff, Mike Ratcliff, Egan J Rattin, Donald O Rausch, PhD, Gerald W Rausch, PhD, Michael Rawley, Stanley R Rawn Jr, Richard L Raymond, PhD, Stuart Raynolds, PhD, Gary D Rayson, PhD, Fred Reader, D L Reasons, Theodore L Rebstock, PhD, K Redig, Erick L Redmon, Jory Redo, PhD, Redwine, PhD, Allan H Reed, PhD, Sherman Kennedy Reed, PhD, Thomas Reed, PhD, Norman V Rees, Homer E Reeves, PhD, Terry A Reeves, MD, John Reffner, PhD, Thomas R Rehm, PhD, Claude V Reich, PhD, Alfred D Reichle, PhD, George Reid, PhD, William Reid,

PhD, Anthony A Reidlinger, PhD, Richard Reinhardt, David Reiser, PhD, Richard Reising, PhD, Harold B Reisman, PhD, Paul Reiter, PhD, Richard H Reitz, PhD, Joseph F Remar, PhD, George Remmenga, Susan Rempe, PhD, Harris B Renfroe, PhD, Edward G Rennels, PhD, Hans H Rennhard, PhD, Kermit Reppond, F E Resch, Robert Resnik, PhD, William B Retallick, PhD, Melvin Rettig, George H Reussner, William R Rex, Walter L Reyland, Charles A Reynolds, PhD, Gary Reynolds, Joe E Reynolds, Max J Reynolds, James Rhoades, PhD, Richard G Rhoades, PhD, James D Rhodes, Kevin Rhodes, Robert A Rhodes, PhD, Mary Rhyne, James K Rice, Richard Rice, PhD, Dennis Rich, Bill Richards, Charles D Richards, PhD, Joseph D Richards, Gerald Laverne Richardson, Stephen G Richardson, PhD, Verlin H Richardson, PhD, Nancy D Richert, PhD, Frank Richey, PhD, Ed Richman, PhD, Selma Richaman, James M Richmond, PhD, Timothy Richmond, Thomas Richter, Robert Ricker, PhD, Nr Ricks, Ralph E Ricksecker, David Riddle, PhD, Susan Riebe, Martin Max Rieger, PhD, Paul E Rieke, PhD, Bernard J Riley, Cody Riley, J Herbert Riley, John T Riley, PhD, Michael Riley, Jerry F Rimmer, Beverly Riordan, Harold C Ripley, David Ririe, PhD, David Rislove, PhD, Harold W Ritchey, PhD, William Ritchey, PhD, Gary Alan Ritchie, PhD, Harlan Ritchie, PhD, Martin Ritchie, PhD, James S Ritscher, PhD, Robert B Ritter, Steven J Titter, PhD, Paul Rivers, PhD, John V Roach, Kenneth Roane, Ernest A Robbins, PhD, George W Robbins, Samuel E Roberts, F H Robertson, James A Robertson, PhD, Jerry Lewis Robertson, PhD, John S Robertson, PhD, Wilbert J Robertson, PhD, Gordon W Robertstad, PhD, Albert Robinson, PhD, Arthur B Robinson, PhD, Geor H Robinson, M Robinson, PhD, R E Robinson, PhD, Robert Robinson, PhD, T F Robinson, PhD, Terence L Robinson, PhD, Zachary W Robinson, Ken Robirds, John M Roblin, PhD, J La Rochelle, PhD, Peter A Rock, PhD, Robert M Roecker, PhD, Morris Rockstein, PhD, David Rockstraw, PhD, Theodore Rockwell, PhD, James W Rodde, Billy R Rodgers, PhD, Michael Rodgers, PhD, Harold V Rodriguez, PhD, Arthur P Roeh, Bruce A Rogers, Gordon H Rogers, Gwenda Rogers, Randy Rogers, Robert W Rogers, PhD, Tom Rogers, PhD, Charles R Rohde, PhD, Oliver Roholt, PhD, Dwayne Rohweder, PhD, Robert G Rohwer, Louis D Rollmann, PhD, Louis Rombach, PhD, Thomas Ronay, PhD, Wendell Hofma Rooks, Robt L Rooney, Simpson Roper, Robert Rorschach, Christopher La Rosa, Eugene J Rosa, PhD, John S Roscoe, PhD, Allan B Rose, Milton J Rosen, PhD, Ward Rosen, Richard A Rosenberg, PhD, Steven L Rosenberg, PhD, William E Rosenberg, Lawrence Rosendale, Leonard Rosenfeld, Bruce D Rosenquist, PhD, Harold L Rosential, PhD, Joseph Rosi, Randy Rosiere, PhD, James Ross, John P Ross, PhD, John Ross, William F Ross, Charlie Rossman, George Rothrock, PhD, Gaylord E Rough, PhD, George E Rouse, PhD, Verald K Row, Dighton F Rowan, PhD, James Lincoln Rowe, PhD, Melinda Rowe, Rex Rowell, Neil W Rowland, PhD, Brian Rowles, Ibrahim Rubeiz, PhD, Mae K Rubin, PhD, David D Rubis, PhD, Jim R Rucker, Thomas A Ruddin, MD, Charles F Rudershausen, PhD, Thomas Rudy, PhD, Rolland Rue, PhD, Robert H Ruf, PhD, Sue Ruff, John Ruhl, T H Ruland, Melvin D Rumbaugh, PhD, J H Rumely, PhD, Rosmarie Von Rumker, PhD, Paul Runge, Kelli Runnels, PhD, Olaf Runquist, PhD, Charles V Runyon, A L Ruoff, PhD, Robert Rupert, John A Rupley, PhD, George Rushton, Louis Rusoff, PhD, David Russell, Robert R Russell, PhD, Ross F Russell, PhD, Daberath Ryan, James M Ryan, PhD, James Ryan, James W Ryan, PhD, Julian Gilbert Ryan, Michele M Ryan, Timothy M Ryan, Wayne Ryan, PhD, Charles J Ryant, Jr, PhD, John Rybicki, David F Ryder, Alicja M Kirkien Rzeszotarsk, PhD, Waclaw J Rzeszotarski, PhD.

Category: S

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Jay Ruffner Schenck, PhD, Timothy Wm Schenz, PhD, Robert J Scheuplein, PhD, Alexander Schilling, PhD, F P Schilling, PhD, Keith Schimmel, PhD, Ray Schindler, Chester Schink, PhD, Schlichting, PhD, Clifford L Schmidt, PhD, Justin O Schmidt, PhD, Werner H Schmidt, Edward A Schmitt, Alvin Schmucker, Charles D Schmulbach, PhD, Robert C Schnabel, Charles F Schneider, Jr, Edward P Schneider, Howard A Schneider, PhD, J Schneller III, PhD, Arthur W Schnizer, PhD, Donald Schoenberg, Helem Schols, Melvin Schonhorst, PhD, Rex Schorzman, Robert Joseph Schramel, William Schrand, Mary G Schreckenberg, PhD, Robert A Schreiber, PhD, William Schreiber, PhD, Felix Schreiner, PhD, Alan D Schroeder, Alan Schroeder, Donald Schroeder, Hartmut Schroeder, PhD, James W Schroeder, Robert G Schroeder, Robert S Schroeder, PhD, Robert Schubring, Richard J Schuerger, PhD, Joseph Schufle, PhD, Charles M Schultz, Gerald Schultz, Roland Schultz, PhD, Robert Schumacher, Robert Schumacher, Garmond G Schurr, Mark 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S Shoemaker, Merle D Shogren, Robert L Shone, PhD, John J Shore III, James Edward Shottafer, PhD, Adolph C Shotts, Loy William Shreve, PhD, Craig E Shuler, Patrick J Shuler, PhD, John B Shumaker, PhD, Cornwell Shuman, PhD, Eunice C Shuytema, PhD, Barbara Shykoff, PhD, Ronald E Siatkowski, PhD, Kent Sickmeyer, Dave Seibel, Merlin R Siefken, Steve Seifried, PhD, Arthur Siegel, John P Siegel, MD, Wm C Siegel, William Siegfried, James Ernest Siggins, PhD, Charles Signorino, PhD, John W Sij, PhD, Michael P Siklosi, PhD, Leonard S Silbert, PhD, Claude W Sill, Lucila Silva, Herbert Silverman, PhD, J Silverman, PhD, Walter Lawrence Silvernail, PhD, L Simerl, PhD, John Simion, Karl L Simkins, PhD, Joseph H Simmons, Carl Simms, Dorothy M Simon, PhD, Edward Simon, PhD, RJ Simon, Walter Simons, A Craig Simpson, John Simpson, Lynn Simpson, Michael B Simpson, Donald E Sims, Suman Priyadarshi Harain Sin, PhD, G Gail Singh, Vernon L Singleton, PhD, Kenneth Sinks, Lou Di Sioudi, Richard H Sioui, PhD, 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STATEMENT BY ATMOSPHERIC SCIENTISTS ON GREENHOUSE WARMING

(http://www.sepp.org/statment.html, February 24, 2006)

WASHINGTON, D.C., FEBRUARY 27, 1992—As independent scientists, researching atmospheric and climate problems, we are concerned by the agenda for UNCED, the United Nations Conference on Environment and Development, being developed by environmental activist groups and certain political leaders. This so-called Earth Summit is scheduled to convene in Brazil in June 1992 and aims to impose a system of global environmental regulations, including onerous taxes on energy fuels, on the population of the United States and other industrialized nations.

Such policy initiatives derive from highly uncertain scientific theories. They are based on the unsupported assumption that catastrophic global warming follows from the burning of fossil fuels and requires immediate action. We do not agree.

A survey of U.S. atmospheric scientists, conducted in the summer of 1991, confirms that there is no consensus about the cause of the slight warming observed during the past century. A recently published research paper even suggests that sunspot variability, rather than a rise in greenhouse gases, is responsible for the global temperature increases and decreases recorded since about 1880.

Furthermore, the majority of scientific participants in the survey agreed that the theoretical climate models used to predict a future warming cannot be relied upon and are not validated by the existing climate record. Yet all predictions are based on such theoretical models.

Finally, agriculturalists generally agree that any increase in carbon dioxide levels from fossil fuel burning has beneficial effects on most crops and on world food supply.

We are disturbed that activists, anxious to stop energy and economic growth, are pushing ahead with drastic policies without taking notice of recent changes in the underlying science. We fear that the rush to impose global regulations will have catastrophic impacts on the world economy, on jobs, standards of living, and health care, with the most severe consequences falling upon developing countries and the poor.

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THE LEIPZIG DECLARATION ON GLOBAL CLIMATE CHANGE

(http://www.sepp.org/leipzig.html, February 24, 2006)

As independent scientists concerned with atmospheric and climate problems, we—along with many of our fellow citizens—are apprehensive about emission targets and timetables adopted at the Climate Conference held in Kyoto, Japan, in December 1997. This gathering of politicians from some 160 signatory nations aims to impose on citizens of the industrialized nations—but not on others—a system of global environmental regulations that include quotas and punitive taxes on energy fuels to force substantial cuts in energy use within 10 years, with further cuts to follow. Stabilizing atmospheric carbon dioxide—the announced goal of the Climate Treaty—would require that fuel use be cut by as much as 60 to 80 percent—worldwide!

Energy is essential for economic growth. In a world in which poverty is the greatest social pollutant, any restriction on energy use that inhibits economic growth should be viewed with caution. We understand the motivation to eliminate what are perceived to be the driving forces behind a potential climate change; but we believe the Kyoto Protocol—to curtail carbon dioxide emissions from only part of the world community—is dangerously simplistic, quite ineffective, and economically destructive to jobs and standards-of-living.

More to the point, we consider the scientific basis of the 1992 Global Climate Treaty to be flawed and its goal to be unrealistic. The policies to implement the Treaty are, as of now, based solely on unproven scientific theories, imperfect com-

puter models—and the unsupported assumption that catastrophic global warming follows from an increase in greenhouse gases, requiring immediate action. We do not agree. We believe that the dire predictions of a future warming have not been validated by the historic climate record, which appears to be dominated by natural fluctuations, showing both warming and cooling. These predictions are based on nothing more than theoretical models and cannot be relied on to construct far-reaching policies.

As the debate unfolds, it has become increasingly clear that—contrary to the conventional wisdom—there does not exist today a general scientific consensus about the importance of greenhouse warming from rising levels of carbon dioxide. In fact, most climate specialists now agree that actual observations from both weather satellites and balloon-borne radiosondes show no current warming whatsoever—in direct contradiction to computer model results.

Historically, climate has always been a factor in human affairs—with warmer periods, such as the medieval "climate optimum," playing an important role in economic expansion and in the welfare of nations that depend primarily on agriculture. Colder periods have caused crop failures, and led to famines, disease, and other documented human misery. We must, therefore, remain sensitive to any and all human activities that could affect future climate.

However, based on all the evidence available to us, we cannot subscribe to the politically inspired world view that envisages climate catastrophes and calls for hasty actions. For this reason, we consider the drastic emission control policies deriving from the Kyoto conference—lacking credible support from the underlying science—to be ill-advised and premature.

This statement is based on the International Symposium on the Greenhouse Controversy, held in Leipzig, Germany on Nov. 9–10, 1995, and in Bonn, Germany on Nov. 10–11, 1997. For further information, contact the Europaeische Akademie fuer Umweltfragen or The Science and Environmental Policy Project in Arlington, Virginia.<*singer@sepp.org*>

SIGNATORIES TO THE LEIPZIG DECLARATION

(http://www.sepp.org/LDsigs.html, February 24, 2006)

The following is a partial list only. Following the Kyoto Conference on global warming, the original Declaration was slightly amended. The posting of 33 additional signatories is pending verification that the scientists still agree with the statement. The list will be updated as these verifications come in.

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Dr. David Aubrey, Senior Scientist, Marine Policy Center, Woods Hole Oceanographic Institute, Massachusetts.

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Dr. Robert Balling, Professor and Director of the Office of Climatology, Arizona State University; more than 80 research articles published in scientific journals; author of *The Heated Debate: Greenhouse Predictions vs. Climate Reality* (1992); co-author, *Interactions of Desertifications and Climate,* a report for the UN Environmental Program and the World Meteorological Organization; contributor/reviewer, IPCC.

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Dr. Arthur Bourne, Professor, University of London, UK.

Larry H. Brace, physicist, former Director of the Planetary Atmospheres Branch, NASA Goddard Space Flight Center; recipient NASA Medal for Exceptional Scientific Achievement.

Dr. Norman M.D. Brown, FRSC, Professor, University of Ulster.

Dr. R.A.D. Byron-Scott, meteorologist, formerly senior lecturer in meteorology, Flinders Institute for Atmospheric and Marine Science, Flinders University, Adelaide, Australia.
Dr. Joseph Cain, Professor of planetary physics and geophysics, Geophysical Fluid Dynamics Institute, Florida State University; elected Fellow, American Geophysical Union; formerly with NASA Goddard Space Flight Center (scientific satellites) and the U.S. Geological Survey.
Dr. Gabriel T. Csanady, meteorologist, Eminent Professor, Old Dominion University, Norfolk, Virginia.
Robert Cunningham, consulting meteorologist, Fellow, American Meteorological Society.
Dr. Fred W. Decker, Professor of meteorology, Oregon State University, Corvalis, Oregon; elected Fellow, AAAS; member, RMS, NWA, AWA, AMS.
Lee W. Eddington, meteorologist, Naval Air Warfare Center.
Dr. Hugh Ellsaesser, atmospheric scientist, Lawrence Livermore National Laboratory (1963–1986); Participating Guest Scientist, Lawrence Livermore Natl. Lab. (1986–1996), more than 40 refereed research papers and major reports in the scientific literature.
Dr. John Emsley, Imperial College, London, UK.
Dr. Otto Franzle, Professor, University of Kiel, Germany.
Dr. C.R. de Freitas, climate scientist, University of Auckland, New Zealand, Editor of the international journal *Climate Research.*
Dr. John E. Gaynor, Senior Meteorologist, Environmental Technology Laboratory, National Oceanic and Atmospheric Administration, Boulder, Colorado.
Dr. Tor Ragnar Gerholm, Professor Emeritus of Physics, University of Stockholm, member of Nobel Prize selection committee for physics; member, Royal Swedish Academy of Sciences and Royal Swedish Academy of Engineering Sciences, author of several books on science and technology.
Dr. Gerhard Gerlich, Professor, Technical University of Braunschweig.
Dr. Thomas Gold, Professor of astrophysics, Cornell University, Ithaca, New York.
Dr. H.G. Goodell, Professor, University of Virginia, Charlottesville.
James D. Goodridge, climatologist, formerly with California Dept. of Water Resources.
Dr. Adrian Gordon, meteorologist, University of South Australia.
Prof. Dr. Eckhard Grimmel, Professor, University Hamburg, Germany.
Dr. Nathaniel B. Guttman, Research Physical Scientist, National Climatic Data Center, Asheville, North Carolina; former Professor of atmospheric sciences/climatology; former Chairman, AMS Committee on Applied Climatology.
Dr. Paul Handler, Professor of chemistry, University of Illinois.
Dr. Vern Harnapp, Professor, University of Akron, Ohio.
Dr. Howard C. Hayden, Professor of physics, University of Connecticut.
Dr. Michael J. Higatsberger, Professor and former Director, Institute for Experimental Physics, University of Vienna, Austria; former Director, Seibersdorf Research Center of the Austrian Atomic Energy Agency; former President, Austrian Physical Society.
Dr. Austin W. Hogan, meteorologist, co-editor of the journal *Atmospheric Research.*
Dr. William Hubbard, Professor, University of Arizona, Dept. of Planetary Sciences; elected Fellow of the American Geophysical Union.
Dr. Heinz Hug, lecturer, Wiesbaden, Germany.
Dr. Zbigniew Jaworski, University of Warsaw, Poland.
Dr. Kelvin Kemm, nuclear physicist, Director, Technology Strategy Consultants, Pretoria, South Africa; columnist, Engineering News; author, *Techtrack: A Winding Path of South African Development.*
Dr. Robert L. Kovach, Professor of geophysics, Stanford University, Palo Alto, California.
Dr. David R. Legates, Professor of meteorology, University of Oklahoma.
Dr. Heinz H. Lettau, geophysicist, Increase A. Lapham Professor Emeritus, University of Wisconsin.
Dr. Henry R. Linden, Max McGraw Professor of Energy and Power Engineering and Management, Director, Energy and Power Center, Illinois Institute of Technology; elected Fellow, American Institute of Chemical Engineers; former member, Energy Engineering Board of the National Research Council; member, Green Technology Committee, National Academy of Engineering.
Dr. Richard S. Lindzen, Sloane Professor of Meteorology, Center for Meteorology and Physical Meteorology, Massachusetts Institute of Technology, Cambridge, Massachusetts.
Dr. J. P. Lodge, atmospheric chemist, Boulder, Colorado.

Dr. Anthony R. Lupo, atmospheric scientist, Professor, University of Missouri at Columbia, reviewer/contributing author, IPCC.
Dr. George E. McVehil, meteorologist, Englewood, Colorado.
Dr. Helmut Metzner, Professor, Tubingen, Germany.
Dr. Patrick J. Michaels, Professor and Director of the State Office of Climatology, University of Virginia; more than 50 research articles published in scientific journals; past President, American Association of State Climatologists; author, *Sound and Fury: The Science and Politics of Global Warming* (1992); reviewer/contributing author, IPCC.
Sir William Mitchell, physicist, University of Oxford, U.K.
Dr. Asmunn Moene, former chief of Meteorology, Oslo, Norway.
Laim Nagle, energy/engineering specialist, Cornfield University, UK.
Robert A. Neff, former U.S. Air Force meteorologist: member, AMS, AAAS.
Dr. William A. Nierenberg, Director Emeritus, Scripps Institute of Oceanography, La Jolla, California; Professor Emeritus of oceanography, University of California at San Diego; former member, Council of the U.S. National Academy of Science; former Chairman, National Research Council's Carbon Dioxide Assessment Committee; former member, U.S. EPA Global Climate Change Committee; former Assistant Secretary General of NATO for scientific affairs; former Chairman, National Advisory Committee on Oceans and Atmospheres.
Dr. William Porch, atmospheric physicist, Los Alamos National Laboratory, New Mexico.
Dr. Harry Priem, Professor of geology, University of Utrecht.
Dr. William E. Reifsnyder, Professor Emeritus of biometeorology, Yale University; elected Fellow, American Association for the Advancement of Science; former Chairman, National Academy of Science/National Research Council Committee on Climatology; AMS Award for Outstanding Achievement in Biometeorology.
Dr. Alexander Robertson, meteorologist, Adjunct Professor, Memorial University of Newfoundland, Canada; author of more than 200 scientific and technical publications in biometeorology and climatology, forestry, forest ecology, urban environmental forestry, and engineering technology.
Dr. Thomas Schmidlin, CCM, Professor of meteorology/climatology, Kent State University, Ohio; Editor, *Ohio Journal of Science;* elected Fellow, Ohio Academy of Science; member, AMS.
Dr. Frederick Seitz, physicist, former President, Rockefeller University, former President, U.S. National Academy of Sciences; former member, President's Science Advisory Committee; recipient, U.S. National Medal of Science.
Dr. Gary D. Sharp, Executive Director, Center for Climate/Ocean Resources Study and the Cooperative Institute for Research in the Integrated Ocean Sciences; contributed to the initial development of the Climate Change Program of the National Oceanic And Atmospheric Administration; investigated climate-related resource variabilities, sustainable development, and basic environmental climatology for the UN, World Bank, and USAID.
Dr. S. Fred Singer, atmospheric physicist; President, The Science & Environmental Policy Project; former Director, U.S. Weather Satellite Service; Professor Emeritus of environmental science, University of Virginia; former Chairman, federal panel investigating effects of the SST on stratospheric ozone; author or editor of 16 books, including *Global Climate Change* (1989) and *Hot Talk, Cold Science: Global Warming's Unfinished Debate* (1997).
Dr. A. F. Smith, chemical engineer (ret.), Jacksonville, Florida.
Dr. Fred J. Starheim, Professor, Kent State University.
Dr. Chauncey Starr, President Emeritus, Electric Power Research Institute; winner, 1992 National Medal of Engineering.
Dr. Robert E. Stevenson, Secretary General Emeritus, International Association for the Physical Sciences of the Oceans, and a leading world authority on space oceanography; more than 100 research articles published in scientific journals; author of seven books; advisor to NASA, NATO, U.S. National Academy of Science, and the European Geophysical Society.
Dr. George Stroke, Professor, Max Planck Institute for Meteorology, Munich, Germany.
Dr. Heinz Sundermann, University of Vienna, Austria.
Dr. George H. Sutton, Professor Emeritus, University of Hawaii.
Dr. Arlen Super, meteorologist, U.S. Bureau of Reclamation, Lakewood, Colorado.
Dr. Vladimir Svidersky, Professor, Sechenoc Institute, Moscow, Russia.
Dr. M. Talwani, geophysicist, Rice University, Houston, Texas.
Dr. W. F. Tanner, Professor, Florida State University.
Peter Arnold Toynbee, chemical engineer, F. Institute of Energy, London, England.
Dr. Christiaan Van Sumere, Professor, University of Gent, Belgium.

Dr. Robin Vaugh, physicist, University of Dundee, UK.
Dr. Robert C. Wentworth, geophysicist, Oakland, California, formerly with Lochheed Reseach Laboratory.
Dr. Robert C. Whitten, physicist, formerly with NASA.
Dr. Klaus Wyrtki, Professor Emeritus, University of Hawaii Sea Level Center.

TELEVISION NEWS METEOROLOGISTS

(affiliation for identification purposes only)

Elliot Abrams, meteorologist, Senior Vice President, Accuweather, Inc.
Richard Apuzzo, meteorologist, WXIX–TV (FOX), Cincinnati, Ohio; member, AMS, NWA, SKYWARN; recipient of "Best Weathercast" awards from Associated Press and United Press International.
Andre Bernier, meteorologist, WJW–TV (FOX), Cleveland, Ohio.
Sallie Bernier, meteorologist, WJW–TV (FOX), Cleveland, Ohio.
Bob Breck, meteorologist, WVUE–TV (ABC), New Orleans, Louisiana.
Matthew Bye, meteorologist, KPIX–TV (CBS) San Francisco, California.
A. J. Colby, meteorologist, WICU–TV (NBC), Erie, Pennsylvania.
Dr. Neil L. Frank, meteorologist, HOU–TV (CBS), Houston, Texas, former Director, National Hurricane Center.
Dick Gance, meteorologist, Weather Forecasting, Inc., Concord, Ohio.
Dick Goddard, meteorologist, WJW–TV (FOX), Cleveland, Ohio.
Shane Hollett, meteorologist, WJW–TV (FOX), Cleveland, Ohio.
Mark Johnson, meteorologist, WEWS–TV (ABC), Cleveland, Ohio.
Roy Leep, meteorologist, WTVT–TV (CBS), recently retired; Director, Gillette Weather Data Services, Tampa, Florida; elected Fellow, American Meteorological Society; former member, AMS Executive Council; among the group of TV meteorologists invited to the White House for a briefing on global warming.
Mark Koontz, meteorologist, WJW–TV (FOX), Cleveland, Ohio.
Jon Loufman, meteorologist, WKYC–TV (NBC), Cleveland, Ohio.
Dan Maly, meteorologist, WOIO–TV (FOX), Cleveland, Ohio.
Ryan McPike, atmospheric scientist, WICU–TV (NBC), Erie, Pennsylvania.
James T. Moore, meteorologist, KSWO–TV (ABC) Lawton, Oklahoma.
Scott R. Sabol, meteorologist, WBOY–TV (NBC), Clarksburg, West Virginia.
Dr. Joseph Sobel, meteorologist, Pennsylvania Public Television Network; Senior Vice President, Accu-Weather, Inc., State College, Pennsylvania; co-author, *Changing Weather: Facts and Fallacies About Climate Change and Weather Extremes.*
Brad Sussman, meteorologist, WEWS–TV (ABC), Cleveland, Ohio, AMS, NWA, Broadcast Seal Committee Chair NWA.
Brian Sussman, meteorologist, KPIX–TV (CBS) San Francisco, California; member, American Meteorological Society (served on AMS Education Committee), 12-time recipient of the "Best Weathercast" award from the Radio and Television News Directors Association and Associated Press.
Anthony Watts, meteorologist, KHSL–TV (CBS), Chico, California.
Don Webster, meteorologist, WEWS–TV 9 (ABC), Cleveland, Ohio.
Brian Westfall, meteorologist, Weather Forecasting, Inc., Akron, Ohio.

Mr. ROHRABACHER. Thank you very much and with that, thank you very much. I look forward to working with you to making sure we get the most out of our research dollars and that we become energy sufficient, self-sufficient in the years ahead. Thank you very much.

Chairman BOEHLERT. And let the Chair note that he looks forward to our continued working partnership and I don't consider you a skunk at the lawn party. First of all, this is not a lawn party and secondly, you referred to yourself in that manner. I refer to you as a valid colleague and hope springs eternal. One day we might succeed in convincing you that global climate change is for real. With that, the Chair——

Mr. ROHRABACHER. It's only who causes it that's the real debate here.

Chairman BOEHLERT. With that, the Chair is pleased to recognize the gentleman from Illinois, Mr. Lipinski.

Mr. LIPINSKI. Thank you, Mr. Chairman. I want to start out by echoing one of the things that Mr. Rohrabacher had said in applauding the President for coming forward in the State of the Union Address and talking about a vision or making it a priority that we do improve technology, we improve education in math and science, produce more engineers and also energy independence. These are fantastic ideas and these are things that we need to be working on. I'm afraid that what we really are at here now is where the rubber meets the road and there are some places where already it seems to be slipping, that there isn't the commitment to this vision from the Administration. But before I get into that, I want to start by—unfortunately, Dr. Bartlett's not here. Earlier on, he spoke about the importance of training engineers—and sometimes I feel guilty.

I used to be an engineer; got degrees in actually, a Bachelor's and a Master's in engineering and I don't practice engineering, but I sometimes feel guilty for doing that, come here and talk about the importance of engineers and having more engineers and I left all that behind, but Dr. Bartlett even made it worse when he was talking about going from—we have too many lawyers and too many political scientists, not enough engineers. I went from being an engineer, I got my Ph.D. in political science and therefore I went apparently to the dark side, but I try to redeem myself here and I think the engineering background helps me tremendously, engineering about problem solving. That's what we are here to do in Congress, we're all here, is to solve problems. Now, I look back at what inspired me to become an engineer and it was really my education before I got to college.

And I'm very disappointed that the Math and Science Partnership Program is being cut drastically. The amount proposed this year will only fund those existing grants. I just think it's a tremendous way to get—I was also a college professor. I think it's great to be able to get those at the college level involved with the high school levels, other levels, elementary education, in order to inspire kids to go ahead and go into science, math, engineering. Dr. Bement, what's the reason—is there some reason for cutting that? Is the Administration not seeing it as effective or what is the purpose of that?

Dr. BEMENT. My answer to that, Mr. Lipinski, is that the Math and Science Partnership came subsequent to Systemic Initiative support from the Foundation and those test beds provided a tremendous amount of understanding of good practice and also the importance of getting community involvement, as well as business sector involvement in education to go from commitment to involvement. Those lessons have been learned, but they've been learned in a program that could only reach a few dozen school districts. The time has come now to take those lessons learned and to implement them and propagate them more broadly among the 15,000 school districts that we have in the country and one can't really argue that the Administration is not paying attention to education when really, they're focused on implementation and propagation——

Mr. LIPINSKI. Okay, my time's very short. I don't think that we've figured out all the answers. Yes, I agree we need to propa-

gate it, but I think there's more to learn. I think we could put more of that—I have to move on quickly. I just want to add I'm very glad, happy that the Chairman is committed to MEP. In my district, manufacturing has declined tremendously. Manufacturers are coming to me and saying we need some kind of help in order to compete and this is one way that's been proven—one program that's proven to help the American manufacturers compete. One last thing, Mr. Gutknecht mentioned—talking about DARPA—if Dr. Marburger maybe would comment on a bill that Ranking Member Gordon introduced to create ARPA–E, which is ARPA for Energy. If you're familiar with that and what your thoughts are on it?

Dr. MARBURGER. First of all, I want to declare I am familiar with DARPA because when I was doing active science, I got a lot of my research support from the early DARPA. At that time it was called ARPA and I was doing very basic research, by the way. Similar programs were also funded by the National Science Foundation and other agencies at that time. My view about these types of organizations that we can imagine can be effective in agencies, my view is that we should listen to the Cabinet officials and administrators and directors of those agencies to see—whom we rely on to guide the agency, manage it to get the maximum benefit of our taxpayer dollars. We should rely on their judgment and so in the American Competitiveness Initiative, we did not put in a lot of requirements on these high-priority agencies that are testifying here today.

We decided that we would propose to increase their budgets and then let them decide if they needed to propose additional mechanisms and reorganizations within their agencies and they may well do that, either now or later on in the program after all—we have a commitment to continue to increase their budgets over a period of years. It may well be that in subsequent budgets or even in the near future agencies may decide that they need to change their organization to spend these funds more effectively. We're going to rely on the Presidentially appointed leadership of those agencies to tell us what the most important thing to do with those funds is.

Chairman BOEHLERT. Thank you very much.

Mr. LIPINSKI. Thank you. I thank all of you for the work that you're doing and Doctor, I'm very happy that NSF is getting an increase in funding this year.

Dr. MARBURGER. Thank you.

Chairman BOEHLERT. Thank you very much. Dr. Schwarz.

Mr. SCHWARZ. Thank you, Mr. Chairman. Very briefly. I'm not going to cut into anybody's lunch time here. I know better. First, thank you very much to the American Competitiveness Initiative, think big, please, think big whether it's nuclear or nano or bio, think big and go get them. And there are people out there who would set up barriers in this country. There are Luddites among us and we know that, you know that. I can think of several. The trial bar comes to mind, but who's thinking? Question. What has happened with the rare isotope accelerator? What's going on, Secretary Bodman, Dr. Bement, perhaps can tell me. My interest is because I don't quite, but represent everything around Michigan State University which has one of the largest accelerators in the country and is ready, willing and able and then, in the Midwest,

as well, Argonne, I know, was in the mix, so what's happened, what's going on, when is this going to move forward? The research community, at least the nuclear research community feels this is a very important project.

Secretary BODMAN. I'm aware of the interest in Michigan and Illinois. We look very hard at the importance of the RIA program. It is important. As we allocated the funds and looked at the potential increases that we're dealing with, this is a billion to a billion and a half dollar project, to build it and operate it and we simply couldn't afford it with everything else that we're doing. We think it's important, so we have a program in place that over the next five years will be spending funds in significant amounts, $5, $6 million a year to fund this activity and to work with foreign-based partners who are already in this business, both in Germany and in Canada, I know are two of the three that are being considered. In the year 2011, that's when we are planning, at least as we look forward to the flow of funds in this department, we would be looking forward to doing preliminary engineering design and so in effect, it's going to be put off five years; that's at least as we see it. And I know that's not happy news for you, nor will it be happy news for Congresswoman Biggert, who has departed, but those are the facts as we see it.

Mr. SCHWARZ. I just wanted to assure you, Mr. Secretary, that Michigan State University is ready and willing whenever you are. Thank you, sir.

Secretary BODMAN. Thank you, sir.

Chairman BOEHLERT. Ready to go, huh? Mr. Matheson.

Mr. MATHESON. Thanks, Mr. Chairman. Thanks, everybody, for being here today and Secretary Bodman, I appreciate your being here. We had a discussion last year, at this very hearing—it was right after you became Secretary—about the uranium mill tailings pile near Moab, Utah and a lot has happened since we had that discussion a year ago. As you know, the environmental impact statement process was completed and the record of decision decided that the pile should be moved, which is, of course, as you may recall what I was hoping would happen and I'm glad that it has and that that decision has been made to move forward.

I wanted to discuss with you, though, what the next step's going to be because it's going to be, roughly speaking, a $450 million project to move this pile. It's the largest of all the mill tailings piles the DOE's been in charge of that they've had to move. This is much bigger in scale than the others. And the reason I want to talk to you about it is I was concerned with the budget that was submitted last week where we see a reduction in the recommended amount to be spent on removal of this pile. The budget rates for this year is $22.8 million, which is actually almost 20 percent less than what was appropriated in the current fiscal year for this project and I'm concerned that we may be getting into a circumstance where this is going to drag out not over eight years to move this pile, but 22 years or longer and wanted to know if you had any insight into what the decision making was about dropping the budgeting down and stretching this program out or if you had any information you could share with me on that?

Secretary BODMAN. First of all, I'm happy that you seem to be happy that we made a decision to move forward with this, sir. Secondly, I think it's an error, which often seems to happen in the government where there is a correlation between the amount of money spent in a particular year and the physical process or the things that must be done. I do know I don't have all the details. I would be happy to give them to you in writing, but I do believe that there's an environmental impact statement that has to be done and that there is work that will be done in 2007 preparing the place where the tailings will be placed and so there is quite a rigorous program that has been laid out and that we expect to make the schedules that, you know, as advertised. If you think that it's going to be 22 years——

Mr. MATHESON. I hope not.

Secretary BODMAN.—I would be happy to investigate that and see to it that that's not the case.

Mr. MATHESON. I hope it's not and I hope that just in the name of short-term savings we don't get into a longer term as I'm sure you know where I'm coming from. In the long run sometimes, you're better off spending more money up front than letting something get stretched out over time. At the end of the day, we end up spending more taxpayer money when we let things get stretched out for a long period of time.

Secretary BODMAN. Well, you are quite right about that and we're seeing that in a number of different areas. On the other hand, I am satisfied that this Department, in the past, has not distinguished itself at times, particularly in the environmental management area, in having rushed into something without adequate planning and without an adequate discussion of exactly what it's going to cost and how long it will take. And I—we're trying to do this in a rigorous fashion.

Mr. MATHESON. Understood.

Secretary BODMAN. I hope you appreciate that.

Mr. MATHESON. I do, and if I could just—I may send you just a quick written question, if we can just get a sense of what the Department views the schedule over the next few years for doing that, I'd really appreciate that.

Secretary BODMAN. Be happy to do it, sir.

Mr. MATHESON. Okay, thank you. And with that, I'll yield back, Mr. Chairman.

Chairman BOEHLERT. The gentleman from Texas, Mr. Hall.

Mr. HALL. Chairman, I thank you and I'm looking for some happy news. I'm looking for better news than I expect. I think all of us agree with Mr. Rohrabacher and the other gentlemen and ladies that have discussed here today about economic growth in our country and how we depend on knowledge based industries and resources. To that end, I don't think there's any question that this year's budget proposal seeks to bolster math and science education. The President mentioned it in his speech the other evening. I've heard it from almost every podium how important it is and I agree with it. It provides jobs for citizens and solutions to their problems. One of the most important, though, and one of the greatest challenges today, I think, is energy and all of us agree that we need to move toward what they call energy independence and I've heard,

Mr. Bodman, you speak about the 60 percent reliability we have on people that maybe don't trust us totally or we don't trust them or we're fearful of it.

I've heard the President make similar statements and I certainly agree with him. And I'm pleased to see that the budget highlights alternative fuel technology; solar, biomass, nuclear, hydrogen and clean coal and all of these are going to help us, but I must say that I'm a little distressed to see that the Administration has also chosen to zero out some very important oil and gas research programs. If we want to become energy independent from foreign sources, then we need to support innovation in this area, I think, to the hilt and Secretary Bodman, as you know, independent producers drill about 90 percent of the Nation's wells and produce 85 percent of the Nation's oil and gas, so this isn't something that we're pitching to the majors that report huge profits every year and something that maybe the people feel that they ought to be having to put some of that back in the refineries or helping us with their energy problems.

Now, I'll subscribe to most of that, but troubling to me is the Administration's proposal to end a program that we've all passed here, this committee's passed them for the last four years. I passed the budget, the ultra-deep arrangement three times as a Democrat and once as a Republican. It survived the conference committee each time and I think it's the will of this Congress. And I won't get into the royalty waivers because ultra-deep program doesn't have any such waivers. We excluded those waivers from this. We knew it would be objectionable. We didn't put that in there.

But the program's designed for independent producers, not the majors. They help out by taking it over afterwards, and dozens of universities, companies all across this country and research labs everywhere are ready to move in and carry out this energy bill that we just proposed, but I think the thing that concerns me most and maybe you can explain it a little bit better to me, I sure hope you can, because I'm really concerned about it and the Department of Energy, FY 2007 Presidential budget request and the budget highlights on page 50, where it lays out their fossil energy research and development and under natural gas technologies and petroleum/oil technologies, for FY 2007 request is zeroed out. Is that correct? Is that the recommendation of the Department of Energy?

Secretary BODMAN. It is the recommendation of the Administration, yes, Mr. Hall.

Mr. HALL. Then I won't ask you to express your opinion on it at this time, but I'm going to want to talk to you about it later and maybe ask you to give us some more information on it.

Secretary BODMAN. Well, I'd be happy to provide any information, sir, as I can.

Mr. HALL. You always have been and I'm very hopeful that we can work something out on this, but at page 52 of the report it says, "The FY 2007 budget proposed to terminate the oil technology and natural gas technologies' research and development programs. Federal staff paid from the program direction account will continue to work toward an orderly termination of this program." What federal staff would that have been?

Secretary BODMAN. This is the staff that is working on the research and development programs in the laboratories—as well as in the Energy Department.

Mr. HALL. And you have access to that?

Secretary BODMAN. Do I have access to that?

Mr. HALL. Do you have access to it?

Secretary BODMAN. Yes, sir.

Mr. HALL. Let me be more specific. We get to the ultra-deep water and unconventional natural gas and other petroleum research fund that we've created; for 10 years we've been trying to pass an energy bill. For four years we've had these provisions in it and the request, it states that "ultra-deep water and unconventional natural gas and other petroleum research fund was created by the *Energy Policy Act of 2005* as a mandatory program beginning in FY 2007. The program would be funded for mandatory federal revenues from oil and gas leases. The budget proposes to repeal the program through a future legislative proposal consistent with the decision to terminate the discretionary oil and gas programs." And FY 2005 shows the current appropriation and goes on through the FY 2007, that they're zeroed out. Are you aware of that?

Secretary BODMAN. Yes, sir, I'm aware of it.

Mr. HALL. All right, then, might I ask you if you intend to try to repeal the program through a future legislative proposal, what type proposal would that be?

Secretary BODMAN. Well, I think you'll find that the Congress will receive from the Administration a proposal to rescind that portion of the Energy Bill that deals with this particular program. My further understanding, sir, is that Congress, in passing the bill and the President, in signing the bill and creating the bill, has provided for the funding of this particular program starting in the year 2007 and that to the extent that Congress does not respond favorably to the proposal from the Administration, this Department will obey the law and we'll just——

Mr. HALL. Well, I know you'll do that. My argument's not directly with you, it's with the decision that's been made somewhere.

Secretary BODMAN. I understand, but I'm just telling you that my understanding is that there is funding provided, that it's mandatory and we will pursue the matter. We have already done that which the law requires us to do. We have conducted the solicitation, the responses to the solicitation have been submitted and we are in the process of evaluating those at the current time.

Chairman BOEHLERT. Thank you very much. Gentleman's time has expired. Chair recognizes Mr. Wu.

Mr. HALL. In that case, I yield back my time.

Chairman BOEHLERT. Mr. Wu.

Mr. WU. Thank you very much, Mr. Chairman. I fully support the President's initiative to increase funding for greater competitiveness and innovation in America, but our budget, as passed, is simply not consistent with these goals. Immediately after the President made these proposals in the State of the Union Address, we cut college student financial aid by $12 billion and that was an Administration proposal to cut college financial aid by $12 billion. We've got to walk the walk as well as talk the talk. Competitive-

ness is, in large part, about job creation and I can see nothing more important than a college education. It is also about job retention and we must work to make the President's competitiveness initiative more than just words and rhetoric; our citizens deserve that. Research and development funding should be increased overall and not just for the favorite few programs at the expense of the rest. Again, we've got to walk the walk as well as talk the talk.

The Administration seeks to completely gut the Advanced Technology Program and to decrease funding for the Manufacturing Extension Partnership, two programs with a proven record of creating and retaining manufacturing jobs today and into the future. We need results, not just empty promises and faulty reasoning. We in Congress have consistently stood our ground and increased overall science and technology investment above and beyond the Administration's request and I encourage my colleagues to continue to do so.

Dr. Marburger, I have a couple of questions for you. It has been two years since allegations of scientific manipulation and censorship were first made against this Administration. Despite your assurances that these claims had no validity whatsoever and that you were looking into this very important matter, allegations have continued to surface. They are not confined to a single office or agency. The recent incidents concerning Dr. Hansen at NASA, the reports about problems at NOAA, the mysterious transformation of the Technology Administration's report on off-shoring, and the suspension of a forest research grant at Oregon State University suggest that these problems are continuing in the Federal Government.

Despite your assurances to the contrary, it appears that this Administration continues to confuse the roles of science policy and politics. It seems to many that information inconsistent with a favored political message is being suppressed and I submit to you, sir, that it is not just in science. That's exactly what happened in the Intelligence Committee and that's why we are stuck in a situation in the Middle East. It is time to stop politicizing science and muzzling scientists. This incident involving the publication of *Science,* in my home State, of a forest regeneration study by a student from Oregon State University is truly, truly troubling.

The Bureau of Land Management suspended the federal research grant that funded this work, suspended it based on trumped up charges that the authors had violated a grant agreement. BLM almost immediately reversed itself in a firestorm of controversy and the grant suspension has been lifted, but the chilling effect of the BLM action continues to reverberate in the academic community. Dr. Marburger, this is a very serious problem. Why are we still learning about these incidents of scientific suppression two years after you wrote to this committee and this Congress assuring us that scientific integrity was not a problem in this Administration? For an Administration that takes more than a dozen hours to report a shooting, two years is a very, very long time and we still have this problem. Why is that so?

Dr. MARBURGER. Congressman, I couldn't agree more with the undesirability of politicizing science. Unfortunately, science does have a credibility that stands by itself and everyone who has an opinion or an idea wants to grab a little of that credibility to bol-

ster their own opinion. I'm not familiar with the case in Oregon State University and I'd be glad to look into it and respond to you and to any other specific incidents that you would like to direct me to. I personally believe, based on my own observation and interviews with leadership in the agencies, that there is not, in fact, an effort by this Administration to censor science or politicize it in any way.

Mr. WU. Dr. Marburger, what has your office done specifically to investigate the many, many allegations?

Dr. MARBURGER. Whenever I hear of an allegation of this sort, I ask for a briefing on it either through my staff or directly from the agency where the incident occurred. I get all of the information——

Mr. WU. Since my time is expiring, maybe we could have another answer in writing addressing each of the specific incidents and we would appreciate receiving that.

Dr. MARBURGER. I would be glad to do so.

Mr. WU. And perhaps we could further bolster your efforts by asking for a GAO report on the same topic, investigating whether these incidents are real and perhaps we could also get the National Academy of Sciences involved at some point.

Chairman BOEHLERT. The gentleman's time has expired. Gentleman from South Carolina, Mr. Inglis.

Mr. INGLIS. Thank you, Mr. Chairman. I apologize for being late to this hearing. Ms. Jackson Lee and I were just finished at the mark up in Judiciary, so we're happy to be here now talking about these topics. And Dr. Bement, you have talked and the National Academy of Sciences has, I think, suggested that the icebreakers in the Antarctic Program be owned by the Coast Guard rather than charged to the NSF. This budget this year, again, has the money coming from the NSF. Any hope that we're going to get to implement that recommendation that we get those back to the responsibility of the Coast Guard?

Dr. BEMENT. I don't recall actually making that statement. We have established an MOU with the Coast Guard, in which case the Coast Guard retains operational responsibility for the icebreakers and we have the responsibility for tasking the Coast Guard for the use of icebreakers. Based on that tasking, they then present us with a plan and then we negotiate the price and sometimes those negotiations are tough.

Mr. INGLIS. Let me make sure, I didn't mean to indicate that you had said anything about the icebreakers being transferred back to Coast Guard; the National Academy of Sciences has recommended that and I'm inclined to agree with that recommendation, so is a way of freeing up funds in your budget would be my main goal in transferring back to Coast Guard.

Dr. BEMENT. We certainly appreciate your interest in that and we're also looking forward to the final report by the National Research Council on the issue.

Mr. INGLIS. It's helpful. I guess it's a question that has a direction to it. In other words, some hope that we can move back to a situation where the NSF budget is not taxed by those doing the icebreaking operations.

And for all of the witnesses, one of the challenges, I suppose, in running your agencies is identifying the truly innovative projects and devoting resources to those, and these are the high-risk kind of breakthrough technologies. If you could give us a couple of lines on how it is in your agency you attempt to focus some resources on the truly innovative realizing that you've got to balance that with the things that will be yielding practical results soon and anybody that wants to start, I'd be happy to——

Secretary BODMAN. I'd be happy to start and we are working on broadening the types of feedstock that can be used to manufacture ethanol from corn or sugar cane to less valuable materials to so-called switch grass or corn stover or other materials and the President has asked for and provided for roughly, a $50 million increase from roughly $100 million to $150 million that will enable us. Before, I think, we were focusing entirely on the corn stover. We will now be able to work on a variety of feedstock. So that's one area.

And the second one is in the solar energy and we are quite optimistic that by using also an additional $50 million approximately that has been indicated for that program. We will do a solicitation and be looking at the improvement of the efficiency of affordable cells that are currently making electricity at a price of roughly 20 to 25 cents. We need to cut that in half and there are some approaches that we have talked about that we believe have the potential. It's not certainty, but the potential of substantially reducing that, maybe cutting it in half, so those would be two suggestions.

Dr. SAMPSON. At Commerce, we're focusing, in this budget increase, on nanotechnology, moving from just a pure art; research on the lab bench from nanotechnology to application in the manufacturing context. Secondly, hydrogen; the hydrogen economy, the safe manufacture, storage, sale of hydrogen. And then thirdly, quantum information science. If we're successful in moving down the road toward quantum computing, it will result in computers that can solve the most complex cases in seconds that today's most advanced supercomputers could not solve in years and so those are the areas that are identified for R&D funding at NIST.

Chairman BOEHLERT. Gentleman's time—all right. Go to it. The wrong part, the end of the table.

Mr. INGLIS. No, I say you're at the beginning of the table.

Chairman BOEHLERT. Yes.

Dr. BEMENT. Let me say, Mr. Inglis, that the number one priority at the Foundation is moving the frontier forward, advancing the frontier, so that it would take a very long time to go through examples, but beyond that, let me say that we are trying to promote high-risk research. We do that by giving our program officers up to five percent of their budget to invest in new ideas that are scientifically feasible but also entail high risk. Each of our directors have part of their budget set aside, peer reviewed activities, but they are also oriented toward high-risk research. And finally, I could mention the LIGO experiment, which is Laser Interferometer Gravitational Wave Observatory, to measure gravitational waves. That is really an example of very high-risk research in terms of the level of investment, but also the precision of measurement required. As a result of that investment, we have advanced optics technology, we've advanced laser technology and we've advanced

active and passive damping technology beyond anyone's imagination.

Mr. INGLIS. Thank you, Mr. Chairman.

Chairman BOEHLERT. Thank you and the gentleman's time is expired. Earlier in an exchange with Secretary Bodman, Mr. Honda asked some very important questions and it's our understanding now, in checking with the staff, that you did include in your testimony answers to the questions from Mr. Honda. We're going to bring those to his attention and so we hope he will be satisfied that you have been responsive in a timely fashion. If he's not satisfied, then we'll hold his hand and call you up and say we want more.

Secretary BODMAN. Here they are, sir.

Chairman BOEHLERT. Okay, thank you.

Secretary BODMAN. They were delivered on October 26, 2005 and——

Chairman BOEHLERT. Fine, and I think that was not brought to Mr. Honda's attention and it will be, so thank you very much, Mr. Secretary, for your responsiveness. Chair recognizes Ms. Jackson Lee.

Ms. JACKSON LEE. Thank you, Mr. Chairman, for this very important hearing. I'm delighted my colleague shared with you that we were unavoidably detained in a mark up in Judiciary. Needless to say, this is a crucial hearing for America. As we sit here today, I think we can be very confident that China now graduates more scientists in the multiple disciplines than we do in a year. So we know that there are challenges that we have to confront together and you all present in a wonderful array of disciplines. But as we have made the very complementary, if you will, support statements as relates to the President's American Competitiveness Initiative, might I, for the record, restate which I know has already been restated, that despite these increases, the overall federal Science and Technology budget has been cut by one percent.

Even in the face of the tragedy of the tsunami, we find that NOAA, indeed, for oceanic and atmospheric research has declined by eight percent even though NASA and NIH are, in fact, flat. We also see that DOE sustains major cuts throughout energy efficiency and for the second year, DOE would have to eliminate the Gas and Oil Technologies Program. On the other hand, I think there are some opportunities that we have if we can shed ourselves of the partisanship that seems to plague this terrible shortage and question of science and technology proudness in American. For example, the President's budget would double basic R&D in physical sciences at some of our agency in 10 years, frankly, many of us who are Democrats believe it should be done in five years. We cannot wait. Some would say that we cannot fall behind on our clock.

In addition, I think it is important to note, for those of us who live in the inner city and rural districts, broadband access is paltry. There are no new federal investment in broadband access. That speaks poorly of a nation who is at the cutting edge of research. And then, as I said earlier, this particular budget fails to provide adequate funding to invest in the development of clean, sustainable energy alternatives such as bio-based fuels, as well as new engine technologies for flexible fuel vehicles. Of course, I come from the energy capital of the world and I am certainly not going to step

away from that. We're proud, in Houston, Texas, to have a number of major oil companies and gas companies who are on the cutting edge of technology, but as we well know, the Internet was created by the wisdom of government scientists, no matter what anyone might articulate, and therefore, I know that we can do a better job in alternative fuel.

So I have a number of questions that I hope I can have reasonable time for you to respond. First of all, Secretary of Energy, Dr. Bodman, might I say to you we need to see you more. In these months of crisis with energy prices soaring, the question of the environment versus energy, the question of the whole issue of, as I said, gas technology, oil technology and alternative fuels, frankly, I don't know how the energy policy of America has been articulated. I frankly don't believe it should be articulated from the Administration with closed door meetings. You're the Secretary of Energy. We need to see you more. And I think there needs to be policies that are progressive and innovative that are bipartisan.

I was not sure of the line of questioning that my good friend and colleague, Mr. Hall, was approaching you with, but I know very well the details of the royalty provisions because they were passed under the Clinton Administration and at the time, I supported them, coming from Houston, Texas. I frankly thought there was reason, in order to encourage the domestic development here in the United States. But I believe this Administration owes a responsibility to this nation to look at those royalties and assess whether they are viable at this time when we are struggling economically, particularly in the sciences and looking at alternative sources of fuel. Why not use those dollars, why not waive those royalties as we speak and provide those dollars to be invested back in science and alternative fuel?

So let me start, Dr. Marburger, and Dr. Bement can answer these, as well. To the good graces of this committee, we passed legislation signed by the President that established the Dr. Mae Jemison Grant Program—you may be familiar with her math and science outreach. I'd like to know your sense of whether those kinds of programs should be funded. When I say math and science outreach to minorities and others and women to avoid statements to encourage young people to be engaged in the sciences. The bill was passed through the authorization and signed by the President. Do you believe those kinds of programs should be supported? Dr. Bement, if you would comment on that, as well. Secretary Bodman, if you would comment on why you don't have enough money for federal funding of alternative fuels and why you continue with Yucca Mountain.

Chairman BOEHLERT. Just let the Chair observe that you used the entire five minutes to ask a series of questions and to answer all of the questions adequately, I think it would take another 10 to 15 minutes and so the panelists will have your questions and I would ask the panelists to respond in writing to the specific questions made by Ms. Jackson Lee.

Ms. JACKSON LEE. Well, Mr. Chairman, I beg your——

Chairman BOEHLERT. The Chair has——

Ms. JACKSON LEE. If they can ask for one—If they can answer the question each in one minute, I think that would be appropriate and then they can answer the rest——

Chairman BOEHLERT. But the Chair would observe, and I've been in the Chair a long time and you've been a valued Member of the Committee for a long time, but that when you use all the time allotted to you just to ask a series of questions and then have every right to expect answers to them, but that is going to be very time consuming. There are other members of the panel who also have an interest in picking the brains of these very distinguished gentlemen and we want answer to our questions, too. The Chair has always been generous and I will be generous now and I will give them an opportunity to respond, but I also want them to respond to the last question specifically and the other questions in writing because quite frankly, I'm not prepared to sit here until this evening to get all the answers to all the questions.

Ms. JACKSON LEE. Well, Mr. Chairman, if the gentleman would yield——

Chairman BOEHLERT. I'll be glad to yield.

Ms. JACKSON LEE. Dr. Marburger and Dr. Bement—is it—how do you pronounce your name, sir? What is it?

Dr. BEMENT. Bement.

Ms. JACKSON LEE. Bement.

Chairman BOEHLERT. And Dr. Marburger?

Ms. JACKSON LEE. Yes, to answer——

Chairman BOEHLERT. Dr. Bement?

Ms. JACKSON LEE.—the question on the Dr. Mae Jamison Program and I'd like the Secretary to answer in one minute about the royalties. If there are other questions that they can answer in writing——

Chairman BOEHLERT. Gentlemen, the Floor is yours.

Ms. JACKSON LEE.—I would appreciate——

Chairman BOEHLERT. We'll start with Dr. Marburger.

Ms. JACKSON LEE. This is a serious hearing, Mr. Chairman. I thank the——

Chairman BOEHLERT. This is a serious hearing and as you've observed, you were forced out of the hearing because you had a very serious hearing in Judiciary Committee——

Ms. JACKSON LEE. Thank you, Mr. Chairman.

Chairman BOEHLERT.—and all of us have a lot of serious business that don't relate directly to this committee, but we all have to be considerate of the time constraints on our colleagues and our very distinguished witnesses. So with that, Dr.

Marburger——

Ms. JACKSON LEE. I appreciate that.

Chairman BOEHLERT.—please respond specifically.

Ms. JACKSON LEE. I'm always considerate.

Dr. BEMENT. Thank you, Congresswoman. In fact, I do believe that programs to encourage young people from all classes and socioeconomic levels and under-represented groups to study science, technology, engineering, mathematics fields, the so-called STEM fields, are very important. I think that scholarship programs like that are good and I advocate these types of programs because they have an important impact on all of young people, not just under-

represented minorities. Let me state that this is one of our highest priorities. If you look at a cluster of programs that have very high impact, like TCUP, HBCU–UP, CREST, AGEP, LSAMP, and Noyce Program, collectively, we have increased those budgets on the average of 22.4 percent in '07 budget and these programs are joined and they're cooperative collaborations both from our EHR directorate as well as our Research and Related Activities directorate, so we have a full court press in this area.

Chairman BOEHLERT. Mr. Secretary, would you respond?

Secretary BODMAN. First of all, the Interior Department is the department that deals with the matters of royalties. Secondly, my understanding is that President Clinton, under his leadership in the late '90s passed a law that would relieve the oil companies, as a part of their program, from paying royalties in order to stimulate more oil and gas drilling. That was the object. Apparently, he was successful.

Ms. JACKSON LEE. We don't need it now.

Secretary BODMAN. I'm sorry?

Ms. JACKSON LEE. We don't need it now.

Secretary BODMAN. I understand that. On the other hand, a deal was made and a contract was drawn. I have spent a lot of my time since I came to this Administration traveling the world, visiting with other countries, talking about the sanctity of contracts and making an agreement and I think that if the deal were changed at this point in time, even in the face of the profitability that the oil and gas companies have, in my judgment, that would be an error. Could they live with it? I would imagine that they could. Could I live with it? I certainly could. But it's not something that I would advocate.

Chairman BOEHLERT. I would hope that when we revise and extend our remarks, we talk about commitments or arrangements. Too many deals made in Washington that offend a lot of people, but I must admit, Ms. Jackson Lee has touched on a subject that hits all of us right here and she's got some merit to what she's saying and I'm really concerned about that and so that's something you're going to be hearing more about from us on a bipartisan basis. With that, the Chair will recognize, and I would note, Ms. Jackson Lee, that I've given you double the amount of time accorded some other Members——

Ms. JACKSON LEE. Thank you, Mr. Chairman.

Chairman BOEHLERT.—because they're thoughtful questions and I appreciate them. Mr. Miller.

Mr. MILLER. Thank you. Dr. Marburger, I know that you're in a hurry this morning, but I really urge you to go back and read this article again. It is apparent, based upon your summary of the article that you read it entirely too quickly. The last paragraph that says, "I am thus left with nothing to report," only refers to that portion of the column that begins here, and that is a discussion of how five research scientists at Caltech, and I assume research scientists at Caltech are the real deal. I mean, that's a pretty good school, right? That since that report that had found such disfavor, they had never gotten a federal research grant again.

Now, the reason that this whole matter came to this columnist's attention was that there was an article just a couple, three weeks

ago, there was some press coverage two or three weeks ago that one of the world's leading preeminent climate scientists, Jim Hansen of NASA, was being urged to soften what he had to say by a NASA spokesman and the NASA spokesman had resigned and that she said she'd gotten many calls of other instances that the columnist said, how does she describe it? All were from people with similar tales of government funded scientists intimidated by heavy handed public relations departments, and she pursued one of the stories, which was this one. What she says is that all of that part of the story is confirmed, referring to the part above, how they've never gotten a grant and they believed it was—another grant—they believed it was in retribution for what they'd done in that research report.

And what was confirmed was that your office had killed a press conference and a press release just as Secretary Abraham was about to speak on the hydrogen cell research in Europe as evidence that it was the Bush Administration's concern for the environment. Your spokesman does say pretty much the same thing in this article that you said this morning, that that was so that you could talk to the Department of Energy. Nobody at NASA, all of them were speaking without attribution, seemed to buy that at all. They thought it was political.

So please read this article again and Dr. Marburger, also, please read the report of about two and a half years ago by the Union of Concerned Scientists, that were multiple reports of intimidation of scientists, of scientists having their grants revoked, which is Mr. Wu's tale earlier of the scientists from his district that you said you hadn't heard about, reports being edited, revised, censored because their findings were unpalatable, of advisory panels being stacked with scientists whose views were not necessarily in the mainstream of the scientific community, but were very compatible with what the Administration believed. Please read that article again this morning and that report by the Union of Concerned Scientists.

Chairman BOEHLERT. Thank you, Mr. Miller. I'd like to make this point to Mr. Miller. This committee is vitally concerned with scientific inquiry. We want to be informed by scientists. We don't want to intimidate them. And when matters are brought to the attention of the Chair that question the process, that would indicate that perhaps the process is not working as desired, the Chair is very active. I would point out that I am most familiar with the Hansen case, as it's now known, around this town. I want to point out that NASA took immediate action. Mike Griffin, the Administrator of NASA, took immediate action to advise one and all within that agency that scientific inquiry is not to be stifled, scientific opinion is not to be stifled. I applauded him for that.

I want to point out that this committee took to task another committee because we thought that other committee, in this instance, Energy and Commerce, in dealing with Dr. Mann and his associates on the so-called hockey stick theory involving global climate change, we thought that the Energy and Commerce Committee was not proceeding in an appropriate manner. Rather than conducting public hearings, discuss the subject and to question the science, they launched an investigation to intimidate the scientists and I made that very public. In this instance, there are a lot of questions

to be asked and I am convinced that Dr. Marburger, in his capacity, and I am convinced that each of the gentlemen before me in their capacity, would agree with the basic premise that science should inform us, we should not engage in trying to intimidate scientists who happen to have an opinion different from the political orthodoxy of the day.

I like to point out to people that you and I, Mr. Miller, both work in a town where everyone likes to say they're for science-based decision making until the scientific consensus leads to a politically inconvenient conclusion, then some people want to go to Plan B. But I am convinced, after all the effort and energy of my staff and I in looking into these matters, that's there's no secret plot hatched on high to intimidate science, but there are some people who get off the reservation and this 24-year-old rogue assistant in the Public Affairs Department is a case in point, thinking that he was, you know, aiding the cause and did something that was totally unappropriate. I would further point out that that young rogue is no longer on the payroll of the United States Government and that swift, prompt, decisive, crystal-clear action was taken by the Administrator of NASA. The word went out to the scientific community, as the word should go out from this Chair and from all of you very distinguished gentlemen that we want to be informed by science. We don't want to intimidate scientists. Thank you very much, Mr. Miller.

Mr. MILLER. Mr. Chair, may I point back, since you pointed out a few things?

Chairman BOEHLERT. Yes, sir, I'd be glad to do it, Mr. Miller.

Mr. MILLER. First of all, I readily can say the Democratic Party is also plagued by 24-year-olds who are remarkably self-important and get us all into trouble. I do not want to disagree with my Chairman. He is certainly one of the fairest chairmen here and does preside over this committee in a very nonpartisan way, certainly a bipartisan way. However, the Democrats on this committee have tried to make this question a subject of committee hearings. We did that two and a half years ago when the Union of Concerned Scientists issued their report and Mr. Chairman, you would not agree to conduct committee hearings on that point. We now have the issue of Jim Hansen, one of the world's preeminent climate scientists who has been told by a 24-year-old to keep quiet. We have Mr. Wu's specific instance in Oregon. Dr. Marburger says he'll look at this on a case-by-case basis, but we have heard from many others that this is not a case-by-case matter, this is something that crosses all the scientific research agencies. We have the instance in this morning's paper of five Caltech research scientists who have not gotten a single grant since they issued an unpalatable report. Mr. Chairman, will you agree to hold hearings on this topic?

Chairman BOEHLERT. Wait to get an answer from Dr. Marburger after he has had an opportunity to look into the matter and report back. I'm not reluctant to have hearings on anything. My job is not to be a cheerleader for the Administration even though it's the Administration that I gladly identify with and proudly identify with, I stand up to the Administration when I don't agree with the Administration and there are occasions when I don't. Secretary Bodman knows, for example, that on the Energy Policy the Admin-

istration advanced, I didn't think it handled the challenge in the correct way and I was a leader of the opposition, trying to make something better.

But the point is, I'd be glad to hold hearings when I think they are in the jurisdiction of this committee and when they involve something where there is compelling evidence that indicates that this committee has to take its time and energy to hold hearings and right now, we're talking about the American Competitiveness Initiative, we're talking about the American Energy Initiative. Those are vitally important subjects. We have very distinguished Americans before us that are giving us their time, they're sharing with us their wisdom and we're learning from that process.

This committee's going to have a whole series of Subcommittee hearings over the ensuing weeks and months to try to bring all of this to a logical conclusion where we establish responsible public policy that's responding to the national need in the proper way. So with that, let me tell you I will be glad to entertain any request from any Member of the Committee, Republican or Democrat, for hearings. I want those requests backed up by supporting documentation that the hearings are warranted or justified.

And quite frankly, it's my sincere feeling, from the heart, from the gut, from the head, that this institution, the Congress of the United States, in which we proudly serve, is far too partisan, far too partisan. The election is over. Let's get on with identifying, with shaping responsive public policy in a responsible way. With that, let me have one last question for Dr. McQueary because you've been sitting here all this time so patient and I want to give you an opportunity before you leave to address one question.

The President's budget contains strong new support—wait a minute. I want to make sure I got the right question. All right, there you go. How are DHS—this is very important because it's relevant to you and it's also relevant to Commerce. How are DHS and NIST working together with industry to ensure that high quality standards are being developed for homeland security related technologies such as biometrics and cyber security and inter-operable communications and how would the proposed reduction in funding for standards within DHS S&T affect the future of DHS' internal program, its relationship with NIST and its relationship with the makers and users of homeland security technologies? That's a big question, but it's also very important.

Dr. MCQUEARY. It's a very important question. The—I need to emphasize that the relationship that we have with NIST, in my judgment, could not be better, starting with when Dr. Bement was there. We worked out that relationship. We have a NIST person on detail to Science and Technology that actually heads up the standards work that we do. All of the work that we deal with in standards is a consensus standard approach in which we engage not only NIST but ANSI and any other standards agency around the country to try to make sure that what we propose to do in either draft standards or in final standards represent a point of view that those who would be most affected by it could use.

We also have a NIST person that is working with us in our critical infrastructure protection area. Now, with that said, the issue on the budget, a part of that reduction, there are two things you

see in the number; one, is we made a substantial move of monies into the management and administrative account, which we needed to do in order to properly account for how our funds are being spent. That is one issue. The other is the DNDO, or the radiation standards. That will be paid for out of the DNDO budget. We will assist them, but fundamentally the budget, for what they have to do in developing standards there. So the accommodation of those two things represent the primary change in that number. I'm not concerned that we're about to start sliding standards at all with that, with the budget level we have.

Chairman BOEHLERT. And how about the relationship with NIST? I mean, do you feel that's solid?

Dr. MCQUEARY. The relationship is excellent. I knew Bill Jeffrey. It was good there when we were with Dr. Bement. Bill Jeffrey I knew when he was working for Dr. Marburger, and so we have a very good relationship with them and look forward to continue it. It's an excellent organization.

Mr. BOEHLERT. Dr. Sampson, do you want to give us your take on that?

Dr. SAMPSON. Well, I would concur. We have worked very closely with Homeland Security on biometric standards. Dr. Jeffrey is a true leader. He is a excellent scientist. He's a good manager. He's a good colleague with partner agencies, and so we have a very strong relationship.

Mr. BOEHLERT. We promised to get you gentlemen out before the sun sets today, but as a famous talk show host used to say, for the last word, I will recognize Ms. Jackson Lee for a short intervention.

Ms. JACKSON LEE. Thank you, Mr. Chairman, and it is an intervention to you, please. Thank you for your kind remarks regarding the royalty payments. I do want to say that, hopefully, in a bipartisan manner, we can have hearings. I indicated that Houston still considers itself the energy capital of the world and I represent it proudly, but that language and contract were passed during a time when there was a necessity to encourage development and the energy industry was, of course, experiencing some difficult times. I hope we'll have the opportunity to consider it and reconsider it, not on breaking contract, but on the progressive or forward-thinking of what we can do to enhance alternative fuels.

Chairman BOEHLERT. Thank you very much and I agree——

Ms. JACKSON LEE. And I hope we can have hearings was my question.

Chairman BOEHLERT. And I thank you very much. I would like to claim jurisdiction over the whole wide world. Unfortunately, this committee does not have jurisdiction. It's in the Resources Committee.

Ms. JACKSON LEE. Waive it.

Chairman BOEHLERT. And we'll go hand in hand to the Resources Committee and then make the case. But thank you very much. I appreciate all the time you've given us in your very busy schedules. I know you will be responsive in a timely manner to the written questions we submit. I also know from personal experience, and it's not just because I'm the Chairman, my colleagues reported the same thing, all of you gentlemen have had dialogue over the telephone, in person, in office meetings with various Members of

this committee. I commend you for your great work for the Nation. And, Dr. Bement, I'm glad to see you smiling. This hearing is adjourned.

[Whereupon, at 1:15 p.m., the Committee was adjourned.]

Appendix:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by John H. Marburger III, Director, Office of Science and Technology Policy

Questions submitted by Chairman Sherwood L. Boehlert

Q1. What level of funding is proposed in the Fiscal Year 2007 (FY07) budget request specifically for studying potential environmental and safety implications associated with nanotechnology? Please provide agency-specific budget levels and describe for each agency the research that it plans to focus upon. How is nanotechnology environmental and safety research coordinated with R&D on potential new nanotechnology products? How is it coordinated with the needs of regulatory agencies?

A1. In accordance with the *21st Century Nanotechnology Research and Development Act of 2003* (P.L. 108–153), information regarding the spending for environmental, health, and safety (EHS) research related to nanotechnology will be provided in the National Nanotechnology Initiative (NNI) Supplement to the President's FY 2007 Budget. The Supplement will be delivered to the Committee after it is reviewed and approved by the 25 NNI agencies. (As called for under P.L. 108–153, the supplement will include a description of the amount of Small Business Innovative Research and Small Business Technology Transfer Research funds directed at nanotechnology research and development. Collection of these data from all of the NNI agencies has delayed completion of the report, but publication is imminent.)

Although the Government generally does not perform safety testing or research on specific products, environment and safety research (whether on nanotechnology-enabled materials or otherwise) is performed on classes of compounds or materials based on a number of criteria, including the likelihood of exposure and potential for toxicity (based on preliminary data or similarities with other compounds). Such research falls within the jurisdiction of several agencies, including the National Science Foundation, the Environmental Protection Agency, the National Institute for Occupational Safety and Health, and the National Institutes of Health's National Toxicology Program.

Within the National Science and Technology Council's Nanoscale Science, Engineering, and Technology Subcommittee, the Nanotechnology Environmental and Health Implications (NEHI) Working Group provides for coordination among the research agencies and those agencies with regulatory responsibilities. A document is in preparation that identifies the research needed to support risk assessment and regulatory decision-making.

Q2. In his testimony to the Science Committee on February 15, Dr. Sampson mentioned that in April 2005, the Office of Science and Technology Policy completed a Strategic Plan for a U.S. Integrated Earth Observing System. How did the strategic plan guide development of the Administration's FY07 budget request for activities related to the earth observing technologies? What is the Administration's FY07 request for the activities that are identified as contributing to, or are a part of, the strategic plan for earth observing systems? Of that amount, how much is for new initiatives created to support the strategic plan and how much is for previously existing programs?

A2. The 15-agency U.S. Group on Earth Observations (USGEO), as a Subcommittee of the National Science and Technology Council's Committee on Environment and Natural Resources, develops plans and guidance for an Integrated Earth Observing System (IEOS). The primary goal of IEOS is to fully utilize and optimize our existing (substantial) investments in Earth observing systems through improved prioritization, integration and coordination. Many of the Earth observation programs throughout the Federal Government are beginning to voluntarily align themselves with the goals and processes of the USGEO.

With the publication of the U.S. Strategic Plan for IEOS in April, 2005, the USGEO has been focusing on the development of plans to implement the IEOS. Near-term Opportunity Plans have been developed and will be released in the next several weeks. These plans address a wide range of societal benefit areas, from reducing loss of life and property from disasters to supporting sustainable agriculture, to improving public health. The plans will be factored into the agency and OMB for the FY 2008 planning activities and budget request. The USGEO has also begun mid- and long-term planning for these and some additional areas.

With the FY 2007 budget request, agencies are beginning to address the priorities outlined by USGEO and the IEOS Strategic Plan. In addition, many of the Earth

observation programs throughout the Federal Government are beginning to voluntarily align themselves with the goals and processes of the USGEO.

Some examples of increases (over 2006 estimate) in the President's Request in the areas of the six Near-Term Opportunities include:

- **An Air Quality Assessment and Forecast System:** $2.5M increase at NOAA.
- **Improved Observations for Disaster Reduction:** $12.36M increase at NOAA for Tsunami observation and warning programs at NOAA; $2.8M increase at USGS for National Streamflow Information Program; $27.4 million for EarthScope at NSF.
- **A Global Land Observation System:** $98 million at NASA to procure a next-generation Landsat instrument to continue the 30-year record of land imagery. In addition, the $16M increase in Landsat funding at USGS in FY 2006 is also requested for FY 2007. The Administration has directed the USGEO to develop a long-term plan to meet U.S. operational land observing needs for decades to come, but there is no immediate budget implication for FY 2007.
- **National Integrated Drought Information System:** $4M increase at NOAA.
- **A Sea Level Observation System:** $13.5 million increase at NSF for the Ocean Observatories Initiative and $56.0 million for the Alaska Region Research Vessel.
- **An Architecture and Data Management System for the U.S. integrated system:** $6.8M increase for NOAA data centers that provide access to environmental records.

Q3. In the National Windstorm Impact Reduction Act of 2004, *the Office of Science and Technology Policy was directed to submit to Congress by October 25, 2005 an implementation plan for the National Windstorm Impact Reduction Program (NWIRP) which would include a designation of the lead agency for the program. Has a lead agency been designated? When will the implementation plan be delivered to Congress? What do the four agencies involved in NWIRP propose to spend on these programs in FY07?*

A3. The National Windstorm Impact Reduction Program implementation plan has been completed and was delivered to Congress on April 5, 2006. The plan recommends that a coordinated, comprehensive multi-agency, multi-disciplinary group be established as a working group of the National Science and Technology Council's Committee on Environment and Natural Resources, Subcommittee on Disaster Reduction. The charter of the working group is to reduce the impact of wind hazards by facilitating better communication among agencies, effectively allocating collective resources and operating within a common framework. This working group shall meet at least quarterly, report to the Subcommittee on Disaster Reduction annually and work with State, local officials and non-government organizations as appropriate. All federal agencies contributing to the plan shall be members of the working group and the chair of the working group will rotate between NIST, NSF, NOAA and FEMA with each agency serving a two-year term as chair. Existing research and development activities contain components that are relevant to wind research. However, the lack of common criteria to identify wind hazard reduction programs in different agencies makes identifying budgets across agencies relevant to wind impossible or meaningless at this time. An early action of the working group will be to inventory and analyze wind-related research programs to assess current investments in the different aspects of wind hazards and to optimize the portfolio to address the highest priority wind research.

Question submitted by Representative Eddie Bernice Johnson

Q1. Improvement of math and science education is a major longstanding responsibility of NSF. The President's proposed competitiveness initiative provides a funding increase for NSF of nearly eight percent. Unfortunately, this same budget proposal actually cuts NSF's K–12 education programs by seven percent.

Dr. Marburger, why is NSF not an important participant in the part of the President's competitiveness initiative that calls for grants to implement research-based math curricula and interventions, to provide professional development for in-service teachers so they can effectively teach advanced placement courses in

science and math, and to attract more qualified individuals to science and math teaching?

A1. The Department of Education is the focus of the ACI education component because of its close and direct connection to local school districts and State education agencies. While NSF funds a number of programs that seek to develop better teaching practices and materials, it does not provide funding to disseminate the products of that work to teachers across the country. It is the Department of Education that is best able to take projects and materials developed (often by NSF-funded projects), evaluate those materials for their efficacy, and disseminate them across the country. NSF programs provide unique tools and capabilities that are complementary to the education component of ACI, and I can assure you that NSF and the Department of Education will be working together to ensure that these new programs are coordinated with similar NSF programs.

NSF support for K–12 math and science education is still a very important component of our overall efforts, and these programs will also benefit from the President's American Competitiveness Initiative. The FY 2007 Budget proposes an increase in funding for NSF's Education and Human Resources Division (HER) of $19.53 million, or 2.5 percent, to a total of $816 million. Although the percentage increase for EHR is smaller than it is for some of the research directorates, it should be recognized that the Research and Related Activities account includes support for K–12 activities. Also, because of the scheduled transition of the Math and Science Partnerships program to the Department of Education, as well as the end of a one-year pilot program for Young Scholars, the overall budget does not accurately depict the general trend which is to increase funding for the majority of education programs.

EHR is realigning its K–12 programs over FY 2006 and FY 2007, resulting in the consolidation of several programs. During FY06, two EHR divisions—Elementary, Secondary and Informal Education (ESIE) and Research, Evaluation and Communication (REC), will be combined into the Division of Research on Learning in Formal and Informal Settings. This realignment includes the consolidation of a number of programs in order to meet current needs in education research, development and evaluation. In addition, during FY06, three programs—Research on Learning and Education (ROLE), Evaluative Research and Evaluation Capacity (EREC), and Interagency Education Research Initiative (IERI)—will be combined into the Research and Evaluation on Education in Science and Engineering (REESE) program. The consolidation effort will continue in FY07 with the three additional programs—Instructional Materials Development (IMD), Teacher Professional Continuum (TPC), and Centers for Learning and Teaching (CTL)—being merged into the new Discovery Research K–12 program. The Math and Science Partnerships program has also been moved to the Division for Undergraduate Education.

Within the new Division of Research on Learning in Formal and Informal Settings, funding for Discovery Research K–12 and for Informal Science education is increased by $10.71 million or 11.5 percent, and $2.94 million or 4.7 percent, respectively. Funding for long-term, high-risk education research within REESE program goes down by $6.87 million due to the phase out of IERI. The Discovery Research K–12 program grows to move research results into the classroom on a shorter-term.

To fully appreciate the level of funding that NSF directs toward improving K–12 education, one must look beyond the Division of Research on Learning in Formal and Informal Settings, the new division that is the primary center for K–12-focused activities. Numerous programs in other divisions within EHR also provide funding to improve K–12 education. For example, while the Advanced Technological Education (ATE) program is funded through the Division of Undergraduate Education primarily to improve two- and four-year programs in technological education, many projects and centers funded through this program have strong links to high school students who frequently begin college level work while still in secondary school. The ATE budget increases in FY07 by $990,000 to $45.92 million. Similarly, the Robert Noyce Scholarship Program, a program aimed at helping individuals with degrees in STEM fields to transition to careers in K–12 teaching, enjoys a budget increase of over 11 percent in FY07. Funding for the National STEM Digital Library, an online resource for educators and students, also increases by $500,000 in FY07.

Within the Division of Graduate Education, the budget for the Graduate Teaching Fellows in K–12 Education program, a program that puts STEM graduate students into K–12 schools where they improve communication and teaching, increases by 8.7 percent to $46.8 million.

Beyond the EHR directorate, there are a number of programs in the Research and Related Activities Account that devote significant resources to the goal of improving K–12 education. For example, the new Middle and High School Geosciences Program, administered by the Geosciences Directorate, will provide $3 million to im-

prove geosciences education in grades 6–12. Additionally, the Geosciences Directorate will expand support for the network of Centers for Ocean Science Education. Within the Integrative Activities Directorate, funding for the Science of Learning Centers increases by $4.29 million to $27.0 million. And within the Engineering Directorate, funding for the Research Experiences for Teachers increases by $100,000 to $4.10 million and for GK–12 fellowship support increases by $180,000 to $3.37 million. Beyond that, Engineering Research Centers are required to include K–12 education and outreach activities in their work plan. And much of the work funded by the Social, Behavioral and Economics Directorate is targeted advancing our understanding of education and workforce development.

Additionally, NSF is an important member of the American Competitiveness Council. Created by Congress in the Deficit Reduction Act, this Council aims to look across the Federal Government at all the money spent in STEM education programs and align our efforts around shared, strategic goals. The various types of education programs housed at NSF will provide valuable insight into the process as we look to evaluate how well all federal math and science programs are working and work to improve coordination between them.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Samuel W. Bodman, Secretary, Department of Energy

Questions submitted by Chairman Sherwood L. Boehlert

Advanced Fuel Cycle Facility

Q1. The Fiscal Year 2007 (FY07) budget request contains dedicated funding for a detailed systems analysis of the advanced nuclear fuel cycle. When will the systems analysis be completed? Will that be early enough to affect the decision on whether and how to move ahead with new facilities, including the Advanced Fuel Cycle Facility, the demonstration reprocessing facility, and the demonstration sodium-cooled fast reactor?

A1. The Advanced Fuel Cycle Initiative (AFCI) has been conducting systems analysis for several years and that work, which is an evolutionary process, has been key to the development of the new Global Nuclear Energy Partnership (GNEP) initiative and the associated proposed demonstration facilities. While systems analysis will continue to refine the overall programmatic goals, it does not replace the need for the development of conceptual designs of facilities. We anticipate that the next steps that will determine whether and how to move ahead with new facilities include development of conceptual designs of the various facilities and their associated cost and schedule. We believe that this process, and additional systems analysis, will be completed by mid-2008.

Q2. The FY07 budget request proposes to undertake at least three new major demonstration facilities—the sodium-cooled fast reactor, the gas-cooled reactor, and the demonstration reprocessing facility—in addition to the research-oriented Advanced Fuel Cycle Facility. Each of these projects will involve substantial outyear financial commitments. What is the total cost of each of these items, and the projected spending profile? What other programs are you expecting to cut to fit these facilities into the budget, or will they require new money?

A2. Early, pre-conceptual estimates of the cost to bring these three integrated recycle demonstration facilities to the point of initial operation range from $4 billion to $9 billion. The Department will develop a baseline cost and schedule for the proposed GNEP technology demonstration facilities over the next two years in conjunction with completion of conceptual design studies. The Department has requested $250 million in FY 2007 to accelerate the planning and research needed to proceed with the demonstration effort. While we anticipate making additional investments in fiscal years 2008 and 2009, the efforts over the next two years are critical to refining these cost estimates. The Department has made no decisions about outyear funding for these projects. As noted in the Department's Five Year Plan for FY 2007–FY 2011 (March 2006), the Administration determines the details of its appropriations request one year at a time. Each year, the Administration works to develop the detailed estimates for the budget year for individual programs. The FY 2008 and subsequent years' requests will be made in the future.

University Reactor Infrastructure and Education Program

Q3. The explanation given in the FY07 budget submission for the cancellation of the University Reactor Infrastructure and Education program is that the program's goals have been met in terms of the numbers of students enrolled in nuclear science and engineering disciplines. What are the consequences of a $23 million dollar drop in Department of Energy (DOE) funding to current students and faculty in these disciplines? What specific plans does DOE have to help attract top students and faculty into nuclear disciplines?

A3. Over the last decade, university nuclear engineering schools leveraged funding provided by DOE and industry partners to strengthen the nuclear engineering education infrastructure and attract students to careers in nuclear engineering. With enrollments at their highest levels in over a decade and four new university nuclear engineering programs launched over the last five years, the Department believes that the objectives of the government's support to nuclear engineering programs have been achieved and funding has not been requested in FY 2007.

That said, the Department will continue to fund university participation in the Department's nuclear energy research programs, through the Generation IV nuclear energy systems initiative, the Nuclear Hydrogen Initiative, and the Advanced Fuel Cycle Initiative. Under the Nuclear Energy Research Initiative, the Department

awarded 24 new research grants to universities in FY 2006, totaling $12 million over the next three years. With the funding requested for nuclear energy research in FY 2007, the Department would continue to fund ongoing research grants as well as award $4 million in new research. Additionally, as part of the Advanced Fuel Cycle Initiative, the Department will continue efforts to attract students to the field of transmutation and spent fuel recycling. The Department will continue to engage faculty and students in AFCI research and development through NERI, through the University of Nevada-Las Vegas, the University of Nevada-Reno, the Idaho State University Accelerator Center, and through the AFCI Fellowship Program. Over the last four years, the Department has sponsored AFCI fellowships for 25 students seeking post-graduate degrees in study related to advanced fuel cycles, including fuels, recycling and transmutation engineering. The Generation IV program is also planning to start a university fellowship program in FY 2006 for post-graduate study related to advanced reactor systems.

Q4. While the FY07 budget request purposes to increase funding significantly for solar, wind, biofuels, and hydrogen, it also proposes to decrease funding for energy efficiency technology development and deployment by more than eight percent. What is the rationale for these proposed cuts? What role do you see energy efficiency playing in meeting the President's goal of reducing the U.S. "addiction" to oil? What role do you see for DOE in advancing the role of energy efficiency?

A4. Reducing America's growing dependence on foreign oil and changing how we power our homes and businesses are among the Department's highest priorities, as outlined in the President's Advanced Energy Initiative. The FY 2007 Budget directs resources to those programs with the greatest potential to contribute to that goal.

The FY 2007 DOE budget requests $2.1 billion for program included in the Advanced Energy Initiative, an increase of $381 million over FY 2006. Funding will help develop clean, affordable sources of energy that will help reduce the use of fossil fuels and lead to changes in the way we power our homes, businesses and cars. Efficiency improvements pursued by the Vehicle Technologies program can significantly reduce the Nation's growing demand for oil.

The Advanced Energy Initiative includes a broad mix of oil displacement and clean energy R&D initiatives, including nuclear (up 56 percent to $392M), solar (up 78 percent to $148M), and biomass (up 65 percent to $150M). Specific goals include reducing the cost of cellulosic ethanol to $1.07/gallon by 2012, and reducing the cost of solar PV to less than 10 cents/kilowatt hour by 2015.

Q5. Your testimony notes that the Climate Change Technology Program was authorized in the Energy Policy Act of 2005. *This program has been operating primarily with personnel temporarily assigned from other programs. Do you expect to have a full time staff for this effort or will the program continue to be staffed as it has been with temporary assignments?*

A5. The Department does have dedicated staff for CCTP within the Office of Policy and International Affairs (PI). Because of the nature of the CCTP work (interagency coordination, advice, strategic planning), we expect DOE program staff and staff from other agencies will continue to dedicate some time to CCTP as part of their regular responsibilities. The Fiscal Year 2006 Energy and Water Development Appropriation reduced funding for the Departmental Administration account, of which a portion (PI) supports CCTP. The FY 2007 Budget requests $1 million within PI to support CCTP.

ITER

Q6. There is a perception in the fusion research community that funding for ITER will reduce funding for the domestic research program, yet there is a $19.5 million increase in enabling research and development (R&D) for ITER. According to DOE budget documents, these research "activities are directly associated with the ongoing base program." It sounds like these activities involve the research and design, by the domestic fusion program, of the high tech components of ITER. Will these increased funds for enabling R&D for ITER be spent in the United States by scientists and technologists in our existing fusion laboratories and university programs?

A6. The $19.5 million increase in enabling research and development for ITER is, in large measure, for activities to be carried out within the domestic fusion program by scientists and engineers in our existing fusion laboratories and universities. About $11.6 million of the increase will be for R&D by these scientists and engineers in support of the components to be provided by the U.S. to the ITER site. The

remaining $7.9 million will be spent in industry for manufacturing R&D and process demonstration at a production scale in order to show that the components can be manufactured accurately and efficiently.

Participation of the National Institute of Standards and Technology at the National Synchrotron Light Source

Q7. The FY07 budget request includes plans to enhance the National Institute of Standards and Technology (NIST) presence at the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory. DOE is planning to build NSLS–II, ultimately as a replacement for the current Brookhaven light source. How will DOE coordinate NIST's new investments at the existing NSLS with Brookhaven's plans for a newer facility? How will DOE coordinate its instrumentation plans for its entire suite of light sources with NIST's light source investments?

A7. In the near-term, NIST's FY 2007 investment at NSLS will build on current capabilities there by providing an expanded set of scientific instruments and attracting additional top scientific talent. Because the NSLS–II project will not be operational until FY 2013 at the earliest, enhancing the NIST instrument suite will enable these instruments to remain at the forefront during the years of design and construction of NSLS–II. New instruments developed for NSLS will be designed with the possibility of transfer to NSLS–II when that new facility becomes operational.

The method of development of the entire suite of instruments at the new NSLS–II facility will be similar to the model developed for the Spallation Neutron Source (SNS). That is, a majority of the beamlines will be built. and operated by the facility itself acting in collaboration with user groups that are strongly involved with all aspects of instrument scientific justification, development of technical specifications, and production of instrument conceptual designs. Other beamlines will be built and operated by external entities such as NIST. Advisory Committees for NSLS–II are now being established to provide advice and guidance on all aspects of the NSLS–II project, including the development of an optimized instrument suite and a standardized user access policy. Because NIST is a leading user of the NSLS, researchers from this institution will be actively involved with these Advisory Committees.

Questions submitted by Representative Bart Gordon

New Domestic Fusion Facilities

Q1. Secretary Bodman, my understanding is that in addition to their participation in the ITER Project, China, Japan, South Korea and India are all constructing major new domestic facilities. When is the last time that the U.S. constructed a major new domestic facility? Do you envision a time in the foreseeable future that the U.S. might build a major new facility at home? If so, what would be the purpose of that facility?

A1. We are currently building the National Compact Stellarator Experiment (NCSX) at Princeton Plasma Physics Laboratory, with operations scheduled to begin in FY 2009. Similar to a tokamak, and therefore able to make use of the results from ITER, the compact stellarator concept offers the possibility of a fusion power plant that is more attractive than one based on the simple tokamak. In addition, the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory, funded by the DOE's National Nuclear Security Administration (NNSA), is scheduled to begin fusion ignition experiments in 2010, with a primary mission of ensuring that the Nation's nuclear stockpile remains safe, secure, and reliable.

With regard to building another major new facility at home and its purpose, Dr. Orbach, the Director of the DOE Office of Science, has recently issued a charge to the Fusion Energy Sciences Advisory Committee (FESAC) requesting a 10-year plan for how the Office of Fusion Energy Sciences program should evolve over the coming decade to take into account new and upgraded international experiments, and how the program should prepare to make the transition to ITER. FESAC will be examining the productive lifetime of existing facilities and whether reconfigurations, replacements with new facilities, or additional participation in foreign facilities would be more appropriate to fill important gaps in fusion research in the years to come. This report is due by the end of February, 2007.

Effect of Domestic Fusion Cuts on Workforce

Q2. Secretary Bodman, I am pleased to see that your budget request for fusion energy sciences maintains the U.S. Commitment to the ITER project and provides some additional funding for the major fusion user facilities. However, I am concerned that several of the smaller elements of the fusion program suffer significant cuts, including fusion materials research, small innovative experiments, high energy density physics, and fusion theory. Given concerns that have been voiced about the aging fusion research community, and the need to maintain U.S. expertise in these fields to maximize our return from international partnerships, does it make sense to cut these programs?

A2. With this budget, we strove to maintain a balanced domestic program while reorienting it to support ITER to the maximum extent possible. With regard to the programs that have been reduced or redirected, we believe some of the reductions will be alleviated by other programs. For example, some materials research will be conducted as part of our contribution to ITER, and the increased budget for the SciDAC (Scientific Discovery through Advanced Computing) program will offset reductions in the fusion theory program. Active research in High Energy Density Physics (HEDP) is also being conducted by DOE's National Nuclear Security Administration (NNSA), helping to limit the programmatic impact of the reductions within the Office of Science-funded piece of DOE's HEDP program.

Q3. The President signed EPACT 2005 just six months ago. This budget requests falls short of EPACT 2005 by 23 percent in Energy R&D, with many programs less than half of what is authorized. In light of the need for this R&D, why did the Department not seek funding for these programs despite widespread Congressional and Presidential support?

A3. The Energy Policy Act contains authorizations for a variety of initiatives and programs. As the Administration noted in a July 15, 2005, letter to the conference committee on H.R. 6, "The House and Senate versions of H.R. 6 also include authorization levels that in many cases significantly exceed the President's Budget. These authorizations set unrealistic targets and expectations for future program-funding decisions." The President's Fiscal Year 2007 Budget proposal reflects the Administration's programmatic and fiscal priorities. Those priorities took into account the spending opportunities presented by the Energy Policy Act.

Q4. Last fall the President and you announced a major energy efficiency initiative, and just a month ago the White House signed an interagency MOU calling for energy efficiency measures throughout the Federal Government. Then we get a budget that slashes that the exact programs that will accomplish this. Please tell the Committee how we are supposed to take seriously the Administration's commitment to energy efficiency when you give us a request that makes a mockery of it?

A4. Facing greater uncertainty over the price of petroleum, as well as tightening federal budgets, the Department made very difficult choices in developing its FY 2007 budget request. We concluded that reducing America's growing dependence on foreign oil is the highest priority for the Office of Energy Efficiency and Renewable Energy in FY 2007 and have directed our resources to those programs with the greatest potential to contribute to that goal.

The Department's FY 2007 budget request maintains robust funding levels in a variety of energy efficiency programs. Funding for energy efficient vehicle technologies, exclusive of earmarks, is up $4.2 million compared to the FY 2006 appropriation. Funding for the Building Technologies program is up $8.1 million, with significant increases for the Solid-State Lighting Initiative and appliance standards and equipment standards and analysis. While funding for FEMP is down slightly compared to FY 2006 appropriations, that decrease reflects the contribution of new efficiencies within the program that will allow the Department to achieve the same or even better results with less money.

Q5. Why do cuts to the Federal Energy Management Program (FEMP) continue when you and the President personally called for more efficiency in the government?

A5. The Energy Efficiency and Renewable Energy budget request for the Federal Energy Management Program shows a decrease of $2.1 million in FY 2007 due to streamlining the Program's management, training and communications efforts. We expect to be able to achieve the same, or better, results.

Q6. The Industries of the Future program at DOE has a long history of supporting R&D that improves energy efficiency in some of our most valued core domestic industries, the same industries that are rapidly heading overseas. Yet, this administration continues to decrease support of this program at a time when it is most needed. Please explain how 30 percent decrease in funding will affect our core domestic industrial sections.

A6. While industry remains a major energy end-use sector of the Nation's economy, significant gains in energy efficiency have already been achieved (output since the 1970s has more than doubled for essentially the same energy consumption). Since significant economic incentives exist for industry to continue on its own to invest in new, more efficient technologies, the Department is shifting some of its limited resources toward higher-priority R&D areas, such as reducing our national dependence on foreign oil. At the same time, we are refocusing our activities in the Industrial Program to promote more effectively energy savings in the industrial sector.

Q7. Please be prepared to discuss at the hearing the status and implementation of the following sections of the Energy Policy Act of 2005 *and submit a report detailing the status of implementation of all other sections of Title IX of the Act:*

Section 912—Next Generation Lighting Initiative

Q7a. Did DOE seek funding for this program in its request to OMB? If not, why not? What is the status of discussions with the National Academy of Sciences to conduct the periodic review of the program required under section 912(i)?

A7a. DOE's 2007 budget requests increased funding for Solid-State Lighting.

Funding Summary (dollars in thousands)

Program/Activity	FY 2005 Approp. (comp.)	FY 2006 Request (comp.)	FY 2006 Approp. (comp.)	FY 2007 Request	FY 2007 Request vs. FY 2006 Approp.
Solid-State Lighting	$11,800	$11,000	$17,000	$19,283	+$2,283

The amounts shown in the table above are the Solid-State Lighting (SSL) portion of the lighting R&D sub-program in FY 2005 and FY 2006. The non-SSL portion of the program was about $2 million for each FY. In the FY 2007 request, the total funding for lighting R&D is for SSL.

We have not begun discussions with NAS for a period review since we have just completed an extensive peer review with strong industry participation.

Section 914—Building Standards

Q7b. The need for sustainable buildings that are energy efficient has been made abundantly clear over the last year both by the damage from Hurricane Katrina and the record energy bills we are all experiencing even though this has been a very mild winter. Did DOE seek funding for this program in its request to OMB? If not, why not? Section 914(b) requires the DOE to enter into an agreement with the National Institute of Building Sciences to conduct certain assessments and other activities for the program within a 120 days after date of enactment. Has DOE entered into an agreement with National Institute of Building Sciences to begin this work? If not, why not?

A7b. The Department has requested a significant level of funding to provide needed research, development, validation, and market introduction of energy-efficient building technologies. The request for commercial building integration, including research and development, analysis, modeling, and best practices development, is $4,699,000. However, no funding for Section 914 was included in the *2006 Energy and Water Development Appropriations Act,* and the Department has not requested funding for Section 914 in FY 2007. DOE continues to work with the National Institute of Building Sciences and other stakeholder organizations to promote energy-efficient building technologies, but has not entered into a financial agreement with the Institute because the activities described in Section 914 will not contribute to the program goals of achieving 30–50 percent energy efficiency improvement in commercial buildings.

Section 917—Advanced Energy Technology Centers

Q7c. Did DOE seek funding for this program in its request to OMB? If not, why not? What progress has DOE made in organizing the Committee required under section 917 to advise DOE on the establishment of the centers?

A7c. The Department's 2007 budget does not include funding for this program. Section 917(a) instructs DOE to make grants available to State and local governments, or universities, to establish a geographically dispersed network of Advanced Energy Efficiency Technology Transfer Centers. The centers are to focus on needs for increased energy efficiency for manufactured and site-built housing, encourage demonstration and commercial application of advanced energy efficient technologies, including distributed generation technologies. Section 917(f) instructs DOE to establish an advisory committee to advise the Secretary on the establishment of the centers. The section provides authorizations for "such sums as may be appropriated."

The Office of Energy Efficiency and Renewable Energy (EERE) provides grants support to States, communities, and other partners, to achieve the goals of Section 917. Specifically, the EERE Building Technologies Program provides grants to support the adoption of energy efficient technologies in new and existing homes, use of ENERGY STAR appliances, and expanded energy efficient efforts in schools and commercial buildings. Furthermore, the Office of Electricity Delivery and Energy Reliability operates eight (8) regional centers for the express purpose of encouraging the adoption of distributed generation technologies. These Combined Heat and Power (CHP) Regional Application Centers (RACs) have been established in selected parts of the country to facilitate deployment of CHP technologies. CHP is one of the most energy efficient distributed generation technologies with numerous commercial applications. The centers operate by educating regional players on benefits of CHP technologies, providing project-specific support; providing feedback to DOE and industry regarding future R&D program needs; and interacting with states to encourage a favorable policy environment for CHP.

Section 983—Science Education and Pilot Program

Q7d. What progress has DOE made in awarding the grant required under the Act to a university consortium? If the grant has not been awarded, what is the current timetable for such an award? If there are no plans for such an award, what are the DOE's reasons for not making the grant?

A7d. The Energy Policy Act authorizes appropriations for Section 983 for FY 2007, 2008 and 2009 under the Energy Enhancement Fund. Office of Science staff have met with representatives of the university consortia regarding their initial proposals and have begun investigating how we would work towards ensuring a productive end. There is no funding in the 2007 budget for this pilot program. The DOE has not yet formulated a response to the 0.3 percent budget assessment called for under the Energy Enhancement Fund.

This issue has been somewhat overtaken by events including the President's American Competitiveness Initiative, which could have a significant effect on the DOE education and workforce development plans. DOE staff has met with their counterparts in the Department of Education and plan to work together in their efforts in teacher professional development.

Q8. The President in his State of the Union address showed a change of direction from heavy reliance on oil and gas to broadening the energy supply base and he called for replacing 75 percent of Middle East energy imports by 2025. How difficult a goal is this to achieve?

A8. Diversification of our energy supply has always been a priority of this Administration. Since 2001, the Administration has spent nearly $10 billion to develop cleaner, cheaper and more reliable energy sources. This is not a change in policy, but the acceleration of a priority. In order to achieve this goal, we must fundamentally transform how we produce and consume energy.

The President's Advanced Energy Initiative proposes aggressive research in technologies that hold the greatest potential in helping America achieve this goal, primarily by changing how we power our transportation sector. The achievement of this goal is dependent on the successful commercialization of these technologies. For example, the commercialization of cellulosic ethanol and improved batteries for hybrid and "plug-in hybrid" vehicles can fundamentally change the way we fuel our transportation sector. The development and market penetration of hydrogen-powered fuel cell vehicles will also contribute.

Q9. The Administration, through its first five years, has stated that we do not know if global warming is the threat that most of the other nations of the world believe it to be. We have been spending money over the past five years on global warming research. Has this research brought us any closer to deciding one way or other what our policy should be? Do we have adequate contingency plans if it turns out by 2025 that we have to reduce our use of fossil fuels?

A9. The President has regularly stated his view that global climate change is a serious problem that must be addressed with a global, long-term approach that is consistent with the long-term goal of stabilizing greenhouse gas concentrations in the atmosphere.

The Bush Administration's policy on climate change is designed to harness the power of markets and innovation to enable rapid development and deployment of cleaner, more efficient energy technologies. We recognize that climate change is a long-term issue that cannot be addressed in isolation from other needs, such energy security and pollution abatement. Growing economies are in the best position to finance investment in advanced, clean energy technologies. Major elements of the Administration's approach include near-term policies and measures to slow the growth in greenhouse gas emissions, investing in climate change science and technology, and international collaboration.

By 2025, many low- or zero-emissions technologies—such as carbon sequestration, hydrogen, advanced nuclear, and biofuels—could be available for widespread deployment, while others—such as fusion—may be still be further away. Through our technology research programs, the U.S. will be poised to capitalize on technical breakthroughs that can achieve real emission reductions at reasonable cost.

Nuclear Energy Outlook

Q10. How do you believe nuclear energy will be a factor by 2025 in reducing dependence on imported oil? There has been a flurry of interest in recent months in licensing sites for new reactors. Do we have the licensing policies in place to have significant numbers of new reactors on line by that date? Will we have the workforce to run the reactors? Does the sale of Westinghouse and decline of U.S. nuclear plant component manufacturers affect this capability?

A10. Nuclear energy is used to generate electricity and it is generally not considered a substitute for oil which is primarily used for transportation purposes. Nonetheless, there are two avenues through which nuclear energy could potentially help to reduce U.S. dependence on imported oil. To the extent that nuclear energy replaces natural gas in electricity production, more natural gas would be available which may be used to replace oil in some transportation, home heating and industrial processing applications. The other possible alternative for using nuclear energy to reduce oil imports is to generate large quantities of hydrogen using advanced nuclear reactor technologies. The Department recognizes the potential of this approach and has pursued such research and development (R&D) under our Nuclear Hydrogen Initiative and Generation IV program. While further R&D is required, our efforts in these areas are expected to help to offset oil imports.

Licensing policies are currently in place to bring a significant number of new nuclear power plants on line by 2025. In the early 1990's, the Nuclear Regulatory Commission (NRC) put new rules in place to allow efficient licensing of new nuclear power plants. These rules were specifically designed to streamline the licensing process and permit resolution of all public health and safety issues associated with siting, construction, and operation of a new nuclear power plant before a power generation company makes a significant financial investment and begins construction of the plant. Under these rules, reactor designers are successfully working to obtain NRC certification of their advanced reactor designs, which will allow deployment of a large number of new nuclear plants through development of standardized power plant designs. The Department is working with industry through our Nuclear Power 2010 program to demonstrate the untested licensing processes and develop standardized advanced light water reactor plants. It is anticipated that the new licensing processes will be fully vetted and any associated policy issues fully resolved around 2015 when the first new nuclear power plant comes on line.

The United States will have the workforce to run its reactors. Over the past few years, there has been a resurgence of enrollments in college nuclear programs, as well as an increase in the number of universities offering nuclear engineering and technology courses. The continuation of this trend is expected to result in a sufficient workforce needed to run future reactors. The nuclear industry will also continue to invest in nuclear programs, thus ensuring the adequacy of the future workforce.

Nuclear energy is a global industry. The sale of Westinghouse to Toshiba should not affect the plans for deployment of new nuclear power plants in the U.S. U.S. manufacturers and fabricators are currently providing equipment and prefabricated modules for the nuclear plants under construction in Asia. Recent studies showed that the necessary manufacturing, fabrication, labor, and construction equipment infrastructure is available today or can be easily developed to support the construction and commissioning of new nuclear power plants expected in the coming years. The U.S. has substantial capabilities for producing mechanical equipment modules, piping modules, piping spools, structural and electrical modules. Although there is only one supplier for forgings used for reactor pressure vessels (Japan Steel Works, Ltd.), U.S. and international manufacturers have the capacity to produce steam turbine generators, condensers, pumps, valves and other components necessary to build nuclear power plants.

Q11. What do you expect to be the state of U.S. oil and gas reserves in 2025 in areas that are not environmentally sensitive?

A11. As of 2004, proved reserves of crude oil and natural gas in the United States, all of which are located in areas where production is possible including some areas that are environmentally sensitive, are estimated at 21.4 billion barrels and 192.5 trillion cubic feet, respectively. The United States Geological Survey (USGS) and Minerals Management Service estimate that total recoverable resources for oil and gas, which include resources in areas currently under moratoria or otherwise restricted areas, are 174.8 billion barrels and 1430.6 trillion cubic feet, respectively. There is no standard interpretation of the term "environmentally sensitive" nor are there any consistently developed estimates of the oil and gas resources that might be covered by it.

As of January 1, 2003, the regional distribution of the technically recoverable resources under federal moratoria (including Presidential withdrawal) is:

	Oil (billion barrels)	Gas (trillion cubic feet)
Atlantic	3.82	37
Pacific	10.37	18
Eastern Gulf of Mexico	3.98	22
North Aleutian Basin	0.75	9
Total	18.92	86

In most recent years, additions to proved reserves have been roughly equivalent to U.S. production of oil and gas, so the overall level of proved reserves has been relatively stable. The Energy Information Administration's *Annual Energy Outlook 2006* Reference Case projections for lower-48 end-of-year proved reserves in 2025 in non-moratoria areas is 226.9 trillion cubic feet of natural gas and 18.7 billion barrels of crude oil.

Q12. If we become highly dependent on Biomass, how do we avoid depleting the soil on which these fuels are being grown?

A12. As with all agricultural crops, biomass crops will need to be produced sustainably; and USDA is helping to support these efforts through the promotion of practices such as no-till cultivation (which inherently protects the soil). In some cases biomass crops have advantages over row crops such as corn and soybeans, because they have perennial roots that further protect the soil. Switchgrass, mentioned by President Bush in the State of the Union, is a perennial grass with a deep root structure that has been planted on Conservation Reserve Program lands as a means to thwart soil erosion, thus avoiding the depletion of soils.

FutureGen Project

Q13. Is the Administration completely committed to the FutureGen Coal program? When do you expect the first plant to be on line and, assuming these technologies can be developed and integrated into a working power plant in the time contemplated, what will be the state of readiness of these types of plants to contribute to electric energy supply in 2025?

Funding Summary (dollars in thousands)

Program/Activity	FY 2005 Approp.	FY 2006 Request	FY 2006 Approp.	FY 2007 Request	Request vs. Approp.
FutureGen	17,258	18,000	17,820	54,000	36,180

A13. FutureGen is a key component of the President's commitment to research and development of clean coal technologies. Our FY 2007 budget request funds FutureGen at $54 million, in accord with the planned funding profile in FutureGen report to Congress, and includes an advance appropriation of $203 million for FY 2008.

We anticipate that the FutureGen plant will begin operations in FY 2012 and continue operations for four years into FY 2016, followed by a monitoring period of two to three years. Assuming the plant achieves its performance goals of technical feasibility and economic viability, we expect the industry will have the technology and data to design and build the first commercial versions of near-zero atmospheric emission coal plants based on the FutureGen concept within 10 years of FutureGen start up. This would provide the engineering basis to enable FutureGen type plant deployment in the energy market place by 2025–2030 time frame.

Q14. Buildings consume an estimated 20 percent of domestic energy supply. Reducing energy consumption in existing buildings seems like a fertile area to find energy savings, particularly in existing buildings stock. Why aren't we hearing more about conservation and sustainability with these potential energy savings in sight?

A14. The Department of Energy has several activities aimed at reducing energy consumption in the existing buildings stock, including:

- The appliance standards program, which is focused on increasing the efficiency of many residential energy-using products sold to existing homeowners;
- A variety of consumer tools and informational brochures, such as the Energy Savers Guide, fact sheets based on DOE building-science research, and the Home Energy Saver Web Tool;
- The Energy Star program (administered jointly with EPA), which identifies for consumers those products in the market place that are most energy efficient;
- Home Performance with Energy Star, a joint program with the EPA and HUD that offers a comprehensive, whole-house approach to making energy-efficiency improvements to the more than 80 million existing homes; and
- Numerous efforts to encourage incorporation of energy-efficiency technologies and practices in the Gulf Coast rebuilding effort.

In addition, the *Energy Policy Act of 2005* offers consumers and businesses federal tax credits beginning in January 2006 for energy-efficient appliances and products. Most of these tax credits remain in effect through 2007.

Q15. In light of the President's increased interest in science education in the State of the Union Address, will the administration use the requirement to spend 0.3 percent of its energy research and development budget on science education to get a jump start on these programs in FY06, including the SEEPP project in Section 914?

A15. The Office of Science has reviewed the DOE investments in the areas spelled out in the relevant section of the bill, but has not yet formalized a response. The recently introduced PACE-Energy Act has influenced the nature of our internal deliberations since, if it were enacted as currently written, it would have a significant impact on our workforce and education development plans. DOE staff has met with SEEPP representatives to explore how they might work towards the common goals of the SEEPP and the DOE.

Q16a. The President has spoken about the need for the U.S. to become more competitive in the world through innovation and research and development. He emphasized the particular importance of the physical sciences in his State of the Union message. Since our economic competitiveness is expressed ultimately through the efforts of industry (as opposed to national labs or universities),

what is the Department doing to ensure that U.S. industry is included in and benefits from the research done at the labs and universities?

A16a. The DOE's Office of Science (SC) has a number of direct and indirect ways of transferring the technology derived from DOE research or DOE-funded university research, to industry. The direct route is for industry to use, or to partner with universities and other research institution to use, DOE SC facilities at the national labs. Industry has used our light sources and high-end computation facilities, for example, to perform both proprietary and non-proprietary research. The indirect path is carried out either through technology transfer programs, which are largely run by the labs, or through the publication of non-proprietary research results in journals.

DOE is always looking for ways to improve the transfer of technologies from the lab floor to the factory floor, and there is room for improvement. The timely dissemination of useful technologies is a cornerstone of the President's American Competitiveness Initiative.

Nuclear Energy Outlook

Q16b. Please give us specific examples as to how the Offices of Nuclear Energy, Energy Efficiency and Renewable Energy and Fossil Energy and/or their labs are partnering with industry to ensure that their efforts have an economic impact? In dealing with industry, does the Department make any distinction between U.S.-owned companies and those with foreign ownership? Does DOE need additional authority to facilitate government-industry partnerships? If so, what are DOE's recommendations?

A16b. Several companies are actively engaged in research and development efforts under the Generation IV Nuclear Initiative and the Nuclear Hydrogen Initiative. In addition to the short-term economic impact observed via research personnel salaries and equipment procurements, long-term economic impact will also be realized through continued industrial partnering to develop commercial products or processes which industry endorses as being needed. From a broader nuclear power industry perspective, through cost-shared demonstration projects under the Nuclear Power 2010 Program, the Department is working to reduce the regulatory and financial uncertainty and achieve the near-term deployment of new nuclear power plants. Also, the Department is developing a standby support program intended to protect sponsors of the first new nuclear power plants against the financial impact of certain delays during construction or in gaining approval for operation that are beyond the sponsors' control.

Regarding the Department's Nuclear Power 2010 program, no distinction was made between U.S.-owned companies and those with foreign ownership in the awards made to Dominion and NuStart to develop and submit to the Nuclear Regulatory Commission combined construction and operating license applications for new nuclear power plants within the United States. However, through administrative reviews of the proposals, the Department determined that all of the U.S. Government cost share under the Cooperative Agreements would be spent within the United States.

The Department has sufficient authority within the Code of Federal Regulations, Part 600, Financial Assistance Rules, to enter into government-industry partnerships. A cooperative agreement is the typical method used by the Office of Nuclear Energy, Science and Technology on joint, cost-shared projects with industry.

Energy Efficiency and Renewable Energy

The Office of Energy Efficiency and Renewable Energy (EERE) is conducting a number of activities in partnership with industry. One important example is EERE's hydrogen technology activities, which, in conjunction with private sector research and development, reduced the cost of automotive fuel cell high-volume systems from $200/kW in 2004 to $125/kW in 2005, and is on target to achieving its $45/kW goal in 2010. Similarly, EERE's Office of FreedomCAR and Vehicle Technologies has partnered with the automotive and material industries to develop magnesium casting technology that provides a 30 percent weight savings relative to the aluminum components it replaces; the technology has been adopted by General Motors for its 2006 model year.

EERE follows applicable laws and Departmental guidelines when establishing partnerships with industry.

EERE does not need any additional authority to facilitate government-industry partnerships.

Fossil Energy

In 2001, President Bush challenged the Federal Government to make itself more results-oriented, and more accountable to the citizens who pay taxes and benefit from the programs and services government provides.

The Office of Fossil Energy's ultimate success comes when the advanced technologies emerging from our research activities are commercialized by the private sector. Presented here is solid evidence that the taxpayers' investment has paid real and measurable dividends. These are just a few examples of the technological innovations introduced through the Office of Fossil Energy R&D Program that now provide consumers cost-effective, clean, fossil fuel-based energy.

NETL Licenses Mercury Removal Method

FE's National Energy Technology Laboratory has issued an exclusive license to Powerspan Corporation for a patented method to remove mercury from flue gas streams using irradiation with ultraviolet light. The potential market for the licensed invention is estimated to be between $3 billion and $7.5 billion. NETL is pursuing opportunities to license the patent for applications in fields other than fossil-fueled power generation.

DOE Celebrates Success of Regional Carbon Sequestration Partnerships

A report released by DOE's Office of Fossil Energy details the success of the Regional Carbon Sequestration Partnerships in laying the groundwork for field testing and verifying carbon sequestration technologies in the near-term.

Development of Turbine Blade Monitor Makes Major Progress

Researchers at Siemens Power Generation, with funding from the U.S. Department of Energy, have produced high-speed infrared images of the first row of blades in a Westinghouse 501FD gas turbine under full operation. Once perfected, online monitoring will detect the integrity of thermal barrier coatings as they operate within the gas turbine. This technological breakthrough could help keep electricity rates down by saving gas turbine utility operators an estimated $600 million per year.

Direct FuelCell® Technology Advances

FuelCell Energy of Danbury, CT, developed its patented Direct FuelCell® technology in a research partnership with DOE that began more than 25 years ago. By October 2004, more than 50 million kilowatt hours of electricity had been generated from power plants incorporating Direct FuelCell® technology.

Weyburn Project Demonstrates Safety and Permanence of Sequestration

A multi-national project that includes DOE's Office of Fossil Energy has injected more than 100 billion cubic feet of 95 percent pure carbon dioxide into the Weyburn oil field in Saskatchewan, near the North Dakota border, demonstrating the safety and permanence of sequestration while producing more than six mullion barrels of oil.

Clean Coal Project Continues to Pay Back Taxpayer Investment

The Advanced Flue Gas Desulfurization Demonstration Project, selected as part of the DOE Clean Coal Technology Demonstration Program, is the first clean coal technology project to accumulate over $1 million in repayments, and represents more than half of all repayment funds collected under the Clean Coal Technology Demonstration Program. The project's advanced desulfurization unit continues to operate commercially, scrubbing approximately 70,000 tons of sulfur dioxide annually at the Northern Indiana Public Service Company's Bailly Generating Stations near Chesterton, IN.

Florida Demo Tames High Sulfur Coal

Recent tests with one of the Nation's mid- to high-sulfur coals have further verified that a new electric generation technology in its first large-scale utility demonstration at JEA's Northside Generating Station in Jacksonville, FL, is one of the world's cleanest coal-based power plants.

Questions submitted by Representative Jerry F. Costello

FutureGen

Q1. I am pleased to see the Administration's continued support for the FutureGen Initiative with a $54 million budget request for FY07. This funding request keeps the program on schedule as outlined in the FutureGen Report to Congress. My question pertains to the $203 million balance that has been set aside for

FutureGen for FY08 and beyond. Is $203 million enough to fund FutureGen beyond FY08?

A1. The $203 million will provide sufficient funding for the government cost-share for FY 2008 and most of FY 2009. As indicated in the funding profile (in unescalated 2003 dollars) outlined in the FutureGen Program Plan submitted to Congress on March 4, 2004, additional funding would be required to complete the planned FY 2009 expenditures and for subsequent years for the government cost-share. In addition, funding is also required from the private sector partners and from international partners.

Advanced Energy Initiative

Q2. The President's Advanced Energy Initiative provides a 22 percent increase for research that can help reduce America's dependence on foreign oil and advance clean energy technologies. Can you please indicate what types of research and give the percentage they will receive to equal the 22 percent increase?

A2. The attached table provides the types of research and details the percentages they will receive to equal 22 percent.

Advanced Energy Initiative
Department of Energy
($ in millions)

Program	FY 2006 Enacted	FY 2007 Budget	FY 2007 vs. FY 2006 ($)	FY 2007 vs. FY 2006 (%)
Energy Efficiency and Renewable Energy (EERE) Programs				
Hydrogen Technology	80	114	34	43%
Fuel Cell Technology	75	82	7	9%
Vehicle Technology	182	166	-16	-9%
Biomass	91	150	59	65%
Solar	83	148	65	78%
Wind	39	44	5	13%
Geothermal	23	0	-23	-100%
Program Management (pro-rata)	58	67	9	16%
Subtotal, EERE	**631**	**771**	**140**	**22%**
Fossil Energy (FE) Programs				
Clean Coal - Fossil Energy R&D (Coal Research Initiative)	314	281	-33	-11%
Other Power Generation/Stationary Fuel Cells	62	64	2	3%
Program Management (pro-rata)	86	99	13	15%
Subtotal, FE Programs	**462**	**444**	**-18**	**-4%**
Nuclear Energy (NE) Programs				
Global Nuclear Energy Partnership/Advanced Fuel Cycle Init.	79	250	171	216%
Generation IV	54	31	-23	-43%
Nuclear Power 2010	65	54	-11	-17%
Nuclear Hydrogen Initiative	25	19	-6	-24%
Program Management (pro-rata)	28	38	10	36%
Subtotal, NE Programs	**251**	**392**	**141**	**56%**
Science (SC) Programs				
ITER Fusion Project	25	60	35	140%
Fusion Energy (not including ITER)	263	259	-4	-2%
Solar	28	62	34	121%
Biomass	28	35	7	25%
Hydrogen	58	101	43	74%
Program Management (pro-rata)	19	22	3	16%
Subtotal, SC Programs	**421**	**539**	**118**	**28%**
Total, Advanced Energy Initiative	**1,765**	**2,146**	**381**	**22%**

Primarily helps generate cleaner electricity
Primarily helps reduce oil use

Final--March 2, 2006

Questions submitted by Representative Eddie Bernice Johnson

Q1. Last fall the President and you announced a major energy efficiency initiative, and two weeks ago the White House signed an interagency MOU calling for energy efficiency measure throughout the Federal Government. Then we get a budget that slashes the exact program that will accomplish this. Please tell the Committee how we are supposed to take seriously the Administration's commit-

ment to energy efficiency when you give us a request that makes a mockery of it?

A1. The Department's FY 2007 budget request maintains robust funding levels in a variety of energy efficiency programs. While funding for the Federal Energy Management Program is down $2 million compared to FY 2006 appropriations; the decrease reflects the contribution of new efficiencies within the program that will allow the Department to achieve the same or even better results with less money. In addition, the Department requests a $2 million increase for an enhanced Technology Advancement and Outreach effort that will build upon FEMP outreach efforts. Finally, it is important to note that FEMP merely facilitates energy efficiency improvements. Agencies are responsible for improving energy management, making cost effective energy efficiency investments, and procuring energy efficient products (such as Energy Star products) that will help them achieve their energy efficiency goals.

Q2. The Industries of the Future program at DOE has a long history of supporting R&D that improves energy efficiency in some of our most valued core domestic industries, the same industries that are rapidly heading overseas. Yet, this administration continues to decrease support of this program at a time when it is most needed. Please explain how 30 percent decrease in funding will affect our core domestic industrial sections.

A2. While industry remains a major energy end-use sector of the Nation's economy, significant gains in energy efficiency have already been achieved (output since the 1970s has more than doubled for essentially the same energy consumption). Since significant economic incentives exist for industry to continue on its own to invest in new, more efficient technologies, the Department is shifting some of its limited resources toward higher-priority R&D areas, such as reducing our growing national dependence on foreign oil. At the same time, the Industrial Technologies Program is refocusing its activities for maximum benefits from its appropriations.

Question submitted by Representative Michael M. Honda

Q1. I was hoping you could help me to understand the rationale behind the planned termination of the Industrial Assessment Centers over the next two years. My understanding of the program is that it funds a network of universities which send graduate engineering students out to small and medium sized manufacturers, conducting energy audits that identify a range of low and modest cost efficiency improvements. It seems like this program is right in line with the Administration's goal of training more engineers and scientists in the energy field, and it provides real help to U.S. manufacturers struggling to cope with energy prices. Alumni are very much in demand by the top firms as energy managers who can come in with real-world knowledge and experience to work on projects immediately and improve the bottom line. Can you explain why DOE would want to eliminate this program, given the President's stated commitment to competitiveness, energy efficiency, and energy independence?

A1. With rare exception, the Administration has not made budget decisions beyond FY 2007. The Department's five-year budget profiles represent scenarios or options that could be considered during budget development in future years.

That said, while industry remains a major energy end-use sector of the Nation's economy, significant gains in energy efficiency have already been achieved (output since the 1970s has more than doubled for essentially the same energy consumption, in large part because of improved efficiency). Significant economic incentives exist for industry to continue on its own to invest in new, more efficient technologies. In the FY 2007 Budget, the Department focuses its resources toward higher-priority R&D areas outlined in the President's Advanced Energy Initiative.

Questions submitted by Representative Brian Baird

BPA Debt Prepayment Proposal

Q1. As stated in the President's Budget, the Bonneville Power Authority provides about 40 percent of the Pacific NW region's electric energy supply and three-fourths of the regions' electric power transmission capacity. Clearly, BPA plays a vital role in keeping the lights on in the Pacific NW region. Knowing of BPA's importance to the Pacific NW region, why is it that the Administration did not consult with any Members of the Pacific NW before moving forward with the

BPA secondary revenue proposal? Knowing of the Pacific NW delegation's disapproval of the process, will you commit to meeting with the delegation to discuss the proposal?

A1. The President's Budget is developed inside the Executive Branch. Following the release of the President's budget on February 6, 2006, I have remained committed to meet with members of the region's congressional delegation to address concerns and ensure that an undue burden is not placed on the Pacific Northwest rate payers. I respect and welcome your desire to discuss these issues further with the Administration.

Q2. According to a February 8, 2006, analysis by the non-partisan Northwest Power and Conservation Council, the OMB proposal will result in a rate increase of at least 6.6 percent, raising power rates by $145 million a year, costing retail consumers an additional $26.13 a year (energy intensive industries, such as pulp and paper mills, will suffer even more), decreasing personal income in the Northwest by $109 million, and resulting in the loss of 1,120 jobs. Did OMB conduct any sort of analysis of the macro-economic impact of this proposal prior to its release? Does the OMB have any data to refute the aforementioned study?

A2. Although to our knowledge OMB did not conduct a detailed macro-economic analysis of the budget proposal we believe it is sound business practice to use higher-than-historical revenues to pay down debt, which will allow for additional flexibility and ability to make necessary future investments in energy infrastructure for the benefit of the Northwest economy. The Administration's intent is to capture the unique potential opportunities offered in the short-term by high natural gas prices to derive a long-term benefit for Pacific Northwest rate payers. This proposal will be more fully assessed in an expedited BPA rate case to implement the policy of advance payments on Treasury bonds with net secondary revenues that exceed $500 million annually.

Q3. The budget states that the reason for the secondary revenue initiative is so that BPA can "pay down debt" and "invest back into energy infrastructure." However, BPA is not in jeopardy of missing a Treasury payment. In fact, they have made their Treasury payment on time and in full for more than 20 years running. In addition, Bonneville has voluntarily made more than $1.46 billion in early payments on its federal debt over the last couple of years. Contrary to OMB's current proposal, this was done without raising rates. If this secondary revenue proposal moves forward, how can you ensure that payments would, in fact, be used to pay down BPA's debt or invested in infrastructure, instead of redirected by the Administration to fulfill a different purpose?

A3. BPA's payments to the Treasury are used to pay down BPA's federal debt consistent with the sound business practices required under the law including the *Federal Columbia River Transmission System Act of 1974,* and consistent with statutory priority of payment requirements. This Administration's proposal does not change that current law. Moreover, and just as with BPA's past early payments on its bonded debt, the proposal in the budget would free up available borrowing authority that BPA will be able to use. Recent debt optimization early prepayments have not resulted in higher rates because we structured the bonds to avoid upward rate pressure and we amortized debt with on-average higher interest rates.

Additionally, from a technical perspective, BPA has a mandate to operate on a "self-financing basis" and all receipts and expenditures are processed through the BPA Fund, a public enterprise revolving fund account within Treasury. Therefore, through established Treasury collection mechanisms, all secondary revenue receipts would be directed to the BPA Fund and accordingly, BPA would, initiate intragovernmental repayment transactions with Treasury's Bureau of the Public Debt to pay down BPA's debt. The Bureau of Public Debt maintains the detailed records of the debt securities transactions between the Department of the Treasury and other federal agencies such as BPA. (Prepared by: Roger Seifert)

Q4. How does the Administration justify demanding BPA pay the Treasury an arbitrary "surplus" above $500 million in revenue-producing years (when BPA is keeping rates level or possibly lowering rates), when the Administration has not been willing to offer any additional assistance in years with a loss of revenue, such as the energy crisis, when rates skyrocketed? Does the Administration have a plan in place under this proposal to assist BPA in times of revenue loss as they take away BPA's flexibility to level out energy rates?

A4. The Administration's intent is to capture the potential unique opportunities offered in the short-term by high natural gas prices to derive long-term benefit for

rate payers. I remain committed to meet with members of the region's Congressional delegation to address concerns and ensure that an undue burden is not placed on the Northwest rate payers.

Q5. If funding for Hanford nuclear reservation clean-up was held "level" with 2005 funding, it would be $2.221 Billion, which is $376 million higher than the President's Budget Request for 2007, adjusted for inflation. Instead, the request is $1.845 billion, including using $78 million for security, rather than cleanup. The President's budget request for Hanford Clean-Up cuts funds for cleanup of contaminated soil and groundwater; and, reduces funding for the safe storage, monitoring and retrieval of High-Level Nuclear Wastes by $44 million in 2007. How does the Administration plan on making up this shortfall now and in future years as Hanford, the largest nuclear waste dump in the Western Hemisphere, continues to be under-funded by the Administration and pose a public health and environmental risk to our nation?

A5. The 2007 Budget requests $1.9 billion for the Hanford site, an increase of $135 million above the 2006 enacted level. We remain committed to completing the Environmental Management (EM) mission in a manner that is protective of the environment and public.

Questions submitted by Representative Jim Matheson

Q1. DOE estimated that the cleanup costs for the Moab uranium mill tailings site is $420 million. The groundwater cleanup is an estimated $70 million in addition. The Administration's FY 2007 budget request provides $22.8 million. As we discussed during your recent appearance before the Committee, please provide a project schedule that identifies estimated annual expenditures and activities that will take place each year.

A1. On August 25, 2005, the Deputy Secretary approved Critical Decision (CD) 0, which approves mission need for the Uranium Mill Tailings Remedial Action Project at Moab, Utah. The outyear funding profile and activities to be performed will be established as the Department moves through the CD–1, approval of preliminary baseline range, and CD–2, approval of performance baseline, decision processes. The approval memorandum on the CD–0 decision directed the Office of Environmental Management to develop an Acquisition Strategy in accordance with Department of Energy (DOE) Order 413.3, *Project Management for the Acquisition of Capital Assets.* The CD–1, Major System Project Acquisition Strategy, details the project schedule, major work activities, estimated annual expenditures for the life-cycle of the project, and the various acquisition alternatives. The CD–1 package has been developed and is being reviewed within DOE Headquarters, approval is expected next month. Once approved, the selected acquisition alternative will be executed to procure contractors who have the responsibility of developing a project baseline and cost estimate that can be validated and approved by the DOE, as part of the CD–2 decision process.

Q2. Does the budget for this year include funding to continue monitoring nine wells installed in 2003 as part of research conducted by the University of Utah which led to the Investigation of the Hydrologic Connection between the Moab Mill Tailings and the Matheson Wetlands Preserve *(Gardener and Solomon, December 2003) report? It is my understanding that since 2003, there has been no systematic sampling of these wells on the part of the Department of Energy. Do any projections for future years include funding for monitoring? If not, why not?*

A2. Yes. The Department of Energy (DOE) understands your concern regarding potential migration beneath the Colorado River to the Matheson Wetlands Preserve located across the Colorado River from the Moab Remedial Action Project site. The DOE sampled the subject wells in 2003 to establish a baseline in order to determine whether there was any contamination migrating to or on the Matheson Wetlands Preserve and found no evidence of contamination. The wells were sampled again in late 2005, confirming the statement contained in the 2005 Final Environmental Impact Statement that groundwater discharge and potential contaminates do not migrate from the Moab site, beneath the river, to the Matheson Wetlands Preserve. On November 16, 2005, DOE committed to continue to sample the subject wells, plus 25 additional existing monitoring wells, and three surface water locations in the Matheson Wetlands Preserve. In FY 2006, DOE plans to spend more than $1 million to sample all of these locations three times during the year, concurrent with the routine sampling DOE is performing at the Moab Remedial Action Project site, and to expand the interim ground water cleanup action, which has been expanded

each year for the last four years. Expansion of the interim ground water actions continues to reduce the amount of contaminants that may migrate to the Colorado River. The results of this additional sampling should provide further support to DOE's environmental assessment, thus alleviating any concerns regarding potential contaminant migration to the Matheson Wetlands Preserve. The results of all of the sampling data and analysis, and environmental performance evaluations of our ground water cleanup to date can be obtained on the Moab Remedial Action Project web site (*http://gj.em.doe.gov/moab*). DOE's 2007 budget provides funding to continue monitoring, as appropriate.

Q3. Does the estimated cleanup cost for the project include what is commonly known as "community impact funding" (i.e., funding to assist local counties and municipalities inform residents and visitors of cleanup efforts which may affect them)? If not, why not? How will DOE ensure that locally affected residents and visitors are safeguarded throughout the remediation of the site and the relocation of the tailings? What are the responsibilities of the not-yet selected contractor in terms of working with the local community?

A3. The estimated cleanup cost for Moab does not specifically include "community impact funding." Currently, the federal project staff at the Moab site promotes community outreach through participation in Cooperative Agency (12 State and federal agencies) Meetings, led by the Executive Director of Environmental Quality for the State of Utah (no regulatory role), which happens roughly quarterly. Typically, concurrent with these meetings, the Moab Federal Project Director conducts public meetings at the cities of Moab and Thompson Spring to update the public on site activities, to present and discuss results of current monitoring data, to provide status relative to the ongoing interim ground water remediation activities, to provide an update on characterization results at Crescent Junction Site (the uranium mill tailings off-site disposal location) and vicinity properties, and as part of the project planning process to inform the public about overall project progress. The Department of Energy (DOE) has a detailed Moab Project Public Participation Plan that can be obtained on the Moab Remedial Action Project web site (*http://gj.em.doe.gov/moab*). In addition, the federal project staff has implemented emergency response plans in coordination with local and State officials and has presented the necessary information at the public meetings. The federal project staff is frequently in contact with the appropriate local officials on all matters pertaining to public safety, including coordinating future work activities that involve use of public roadways. The DOE would expect any future contractors to build upon the efforts made to date by DOE to work with the local community, State and federal agencies, and stakeholders.

ANSWERS TO POST-HEARING QUESTIONS

Responses by David A. Sampson, Deputy Secretary, Department of Commerce

Questions submitted by Chairman Sherwood L. Boehlert

Q1. The Fiscal Year 2007 (FY07) budget request includes plans to enhance the National Institute of Standards and Technology (NIST) presence at the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory, a Department of Energy research facility. The Department of Energy is planning to build NSLS–II, ultimately as a replacement for the current Brookhaven light source. How will NIST coordinate its proposed investments at the existing NSLS with Brookhaven's plans for a newer facility? How will NIST coordinate its proposed investments with DOE's instrumentation plans for their entire suite of light sources?

A1. The National Institute of Standards and Technology (NIST) has been a respected and valued on-site partner with the Department of Energy (DOE) for over twenty years in the joint operation of synchrotron beamlines at the National Synchrotron Light Source (NSLS). NIST management is coordinating with Dr. Steven Dierker, the Brookhaven National Laboratory Associate Director responsible for the NSLS–II Project, on the development of novel, advanced measurement capabilities for both the existing NSLS and the planned NSLS–II. The entire suite of NIST endstation measurement instrumentation will be migrated to the NSLS–II in a manner that assures that the NIST capabilities complement Brookhaven's proposed investments at the new facility. On a broader level, NIST will coordinate its planned investments through Dr. Dierker and the DOE Office of Science, and via its own representative, Dr. Patrick Gallagher, on the Office of Science and Technology Policy interagency working group established to report on the Nation's synchrotron facilities.

Q2. NIST sent teams to hurricane-affected areas last year to study some of the damage and learn about the impacts of the storms on buildings and other structures. NIST chose not to invoke the National Construction Safety Team Act *(NCST), which would have given it subpoena power over documents and other evidence to contribute to its investigation. Another team assembled by the National Science Foundation encountered problems accessing sites and could have used subpoena authority during its investigation of levee failure in the area. Did NIST encounter problems accessing sites during its hurricane assessments? Does NIST plan to invoke the NCST more routinely during future investigations of building failures?*

A2. NIST assembled a team of 26 experts from federal agencies, academia, and private industry to conduct reconnaissance of damage to major buildings, physical infrastructure, and residential structures in areas affected by Hurricane Katrina and Hurricane Rita. During its deployments to the field, NIST coordinated with local authorities, building and facility owners and operators, and federal agencies to obtain access to sites and, as a result, NIST encountered few problems accessing sites during its field reconnaissance. The one exception was petrochemical plants in Texas as these plants were in the process of restarting operations and there were legitimate safety concerns involved. However, damage to these facilities was limited and NIST determined through visual observation and discussions with company personnel that access was not essential to the reconnaissance.

NIST has several authorities under which it can conduct an investigation. The NIST Director selects the most appropriate authority to get the job done. NIST will invoke the NCST whenever it is the appropriate authority to use, i.e., in the wake of any building failure that has resulted in a substantial loss of life or that posed significant potential of substantial loss of life. The building failure must also meet the additional requirements set out in the procedures for the establishment and deployment of teams that have been developed by NIST which were called for in the NCST Act.

Q3. NIST is the coordinating agency for the National Earthquake Hazard Reduction Program (NEHRP), but only has approximately $1 million in its FY06 budget for both program management and research activities. Please explain what NEHRP activities NIST will undertake in FY06, and how the approximately $700,000 in new funding requested in FY07 for NEHRP will be used.

A3. For FY 2006, NIST has redirected $750,000 of its approximately $914,000 in NEHRP-related base research funding to support the NEHRP Lead Agency manage-

ment function. This funding is being supplemented by $85,000 of support from each of the other NEHRP agencies (FEMA, NSF, and the U.S. Geological Survey), providing approximately $1 million of total support for the Lead Agency management function. The new "NEHRP Secretariat" became active in early February 2006, with NIST's hiring of the first formal program Director, who comes to his new assignment after almost 18 years of research in the U.S. Army Corps of Engineers, including 15 years of seismic engineering research.

Initial NEHRP Secretariat activities center on addressing high-priority requirements identified in the *NEHRP Reauthorization Act of 2004,* including:

- Establishing the Interagency Coordinating Committee
- Establishing the Advisory Committee for Earthquake Hazards Reduction
- Developing an updated NEHRP Strategic Plan
- Developing a NEHRP Management Plan
- Developing a coordinated Interagency Budget for FY08 and beyond.

Beyond the $750,000 that was redirected to the NEHRP Secretariat function, approximately $160,000 of FY 2006 NEHRP research funding is being used to partially support a much larger multi-year project addressing the prevention of progressive collapse in buildings that are subject to catastrophic events, such as earthquakes, fires, or explosions.

For FY 2007, the NEHRP base funding would be applied similarly as it is in FY 2006. In addition, approximately $800,000 of the new funding requested in the President's FY 2007 budget will be used to begin implementation of the R&D roadmap developed by industry through the Applied Technology Council to close the research-to-practice gap and accelerate the use of new earthquake risk mitigation technologies. This effort will initiate several projects that address critical topics supporting the development of Performance-Based Seismic Engineering (PBSE) and will assist industry in improving building codes and standards, advance seismic engineering practice, and facilitate technology transfer for efforts that have been undertaken by NEHRP. All of these research efforts will be undertaken in close cooperation with practitioners and with standards and codes development bodies.

Q4. Many of the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service's automated surface observing stations and its NOAA Weather Radio antennas do not have backup electrical power and become inoperable during hurricanes and other sever weather events. To fix this problem, in the FY06 hurricane supplemental, NOAA received $5 million to provide backup power for those two systems in coastal areas. Will all the systems in hurricane-prone coastal areas be upgraded in time for the 2006 hurricane season? If not, what percentage of upgrades do you anticipate will be complete in time for the 2006 hurricane season, and what are the criteria for selecting which areas to upgrade first?

A4. The *Department of Defense, Emergency Supplemental Appropriations to Address Hurricanes in the Gulf of Mexico, and Pandemic Influenza Act of 2006* (P.L. 109–148) included $4.9 million to provide backup emergency power for hurricane-prone coastal Automated Surface Observing Systems and coastal NOAA Weather Radio All-Hazards transmitters. NOAA will work as quickly as possible to upgrade the equipment. The National Weather Service has begun engineering development (including site surveys and assessment of existing site power infrastructure requirements) and equipment procurement (generators and ancillary cables) for this effort. We anticipate procurement of hardware for backup power to be completed by September 2006, with installations to commence in October/November. Initially, we will focus on installations in Florida and the Gulf Coast region; we will then shift our focus to the Atlantic Coast.

Q5. When asked last October, Max Mayfield (Director of the National Hurricane Center) indicated that the five highest priority areas for improving hurricane forecasts are improved computational capacity, research to improve hurricane models, an expanded buoy network, improved satellite sensors, and additional flight hours on hurricane hunters. Please explain where each of these priorities is funded in NOAA's FY07 budget request, and the amount of funding provided in the request. Please also describe what level of funding was provided for each of these priorities in FY06, including which line office at NOAA received the funding.

A5. Please see the attached table for the response to Question 5.

"Priority areas for improving hurricane forecasts"

($ in K)

Priority	FY05 Enacted	FY06 (incl. supplementals)	FY07 Request	Budget lines which contain referenced funding
Computational capacity				
NWS	$26,367	$26,070	$26,169	Weather & Climate Supercomputing
OAR	$525	$525	$487	Research Supercomputing*
NESDIS	$5,630	$6,552	$6,554	NPOESS Data Expl.; Product Processing & Distribution;
TOTAL	**$32,522**	**$33,147**	**$33,210**	CIP Single Point of Failure
Research to improve models				
NWS	$3,057	$3,730	$1,635	HWRF Improvements*; USWRP Joint Hurricane Testbed
OAR	$3,239	$2,809	$2,615	Laboratories & Cooperative Institutes, GFDL and AOML*
NESDIS	$3,613	$3,881	$3,871	Product Dev., Readiness & Application; Joint Center
TOTAL	**$9,909**	**$10,420**	**$8,121**	
Expanded buoy network				
NWS	$1,800	$2,780	$1,400	Local Forecasts & Warnings*
Improved satellite sensors				
OAR	$249	$247	$150	Laboratories & Cooperative Institutes, GFDL and AOML*
NESDIS	$139,414	$148,648	$171,719	GOES; POES; NPOESS; Satellite Operations & Control
TOTAL	**$139,663**	**$148,895**	**$171,869**	
Flight Hours** (OMAO)				
Hurricane Research (incl. model improvement)	297 hours	245 hours	320 hours	
Validation of Sensor data	140 hours	140 hours	140 hours	
Hurricane Recon & Surveilance	290 hours	330 hours	400 hours	
Total (NWS)	**$31,224**	**$32,580**	**$29,204**	
Total (OAR)	**$4,013**	**$3,581**	**$3,252**	
Total (NESDIS)	**$148,657**	**$159,081**	**$182,144**	
TOTAL NOAA	**$183,894**	**$195,242**	**$214,600**	

*Budget Line shown is effectively level-funded. Apparent decreases in FY07 are largely attributable to one-time supplemental and reimbursable program funding included in FY05 and FY06 Enacted amounts.

**Planned/Estimated hours

Question: In Max Mayfield's QFR's from the hurricane hearing, he indicated that the five highest priority areas for improving hurricane forecasts are improved computational capacity, research to improve hurricane models, an expanded buoy network, improved satellite sensors, and additional flight hours on hurricane hunters. Can you have the budget shop prepare a table for us that shows how much funding each of these priority areas has received in FY05, FY06 and in the FY07 request, including information about which line office the funding is part of?

Questions submitted by Representative Bart Gordon

Q1. For five years the Administration has either proposed eliminating or cutting MEP funding by 50 percent. However, MEP is a partnership between State and the Federal governments. What meetings have you had with State officials regarding your past or proposed budget cuts—and by this I don't mean MEP Center Directors, but with the State officials which are responsible for allocating the one-third matching funds? Why haven't you consulted with the States?

A1. The FY 2007 budget request for the Hollings MEP is similar to previous years and as such NIST is able to rely on responses provided by our stakeholders from the three web cast and two regional meetings held during 2004. NIST will also actively engage our State partners in dialogue this year through a series of roundtables. The first roundtable was held on March 15th in Columbus, OH. In addition, these meetings are designed to look at the future of manufacturing and how the MEP partnership with the States can best address those needs.

Q2. What was the Department's analysis that shows that $47 million is enough funding to maintain an effective network of national centers?

A2. The $47 million for the FY07 budget is consistent with the President's FY06 request. This year the Administration had to make tough budget decisions and set priorities in a tight budget year. MEP is one part of the Administration's broader plan to support small manufacturers. The President remains committed to strengthening the competitiveness of the Nation's manufacturing industry and is focusing efforts on the American Competitiveness Initiative to support innovation.

Q3. You have justified the MEP cut because the program has evolved to a stage where less funding is required—this is different from past year's justifications for funding cuts. What is the analysis and criteria that you used to make this determination? You have also justified the MEP cut because the program offers services that are also provided by the private sector. Could you provide us with the analysis that backs this assertion. The reason that I ask these questions, is that the Department commissioned the National Academy of Public Administration (NAPA) to do a study on the MEP. One of their findings was: "The small manufacturing market is under-served in terms of assistance with productivity and performance measures." The NAPA study also found that MEP did not displace private companies offering services to small manufacturers.

A3. Since taking office, the President has worked to improve the competitiveness of the manufacturing industry in numerous ways, including providing tax relief that benefits manufacturers of all sizes, and proposing an aggressive job training initiative.

The small manufacturing base is critical to the U.S. economy and integral to U.S.-based supply chains. Accordingly, NIST supports the small manufacturing community not only through the Hollings MEP, but also through laboratory activity across the Institute. More than half of the NIST lab activities are either directly or indirectly geared to enhancing manufacturing. The President has demonstrated his strong commitment to the NIST laboratory programs by including them in the American Competitiveness Initiative (ACI) for FY 2007. ACI increases funding for the NIST laboratory and construction programs above the base level by 24 percent to $535 million.

Q4. You justify eliminating the ATP because of the growth of venture capital funds and other financial services for high-risk technology. This Committee has heard repeatedly during the past four years that venture capital funds for high-risk technology development are scarce. Could you provide us with the documentation that supports your claims? Also, if venture capital funds are so plentiful for high-risk, high tech projects, why is the Administration requesting funds for Red Planet Fund at NASA which will be an ATP-like program at NASA?

A4. Data shows that there have been significant private equity funding available and that the level of funding continues to be strong. A 2002 study by Lewis Branscomb et al. at Harvard University that analyzed data from 1998 estimates that between $5.4 billion (conservative estimate) and $35.5 billion (inclusive estimate) was invested in early stage technology development (Branscomb and Auerswald, *Between Invention and Innovation*). These estimates include $1.4 billion to $7.3 billion in investments from the Federal Government.

In 2005, venture capitalists invested $21.7 billion in 2,939 deals, which matched the level invested in 2004. Funding for start-up and early stage companies slipped slightly for the year to $4.1 billion in 922 deals compared to $4.4 billion in 2004. Anecdotal evidence shows that 2006 will see an increase in early stage investing

both in number of companies funded and amount of money invested, negating the need for governmental support. (Source: National Venture Capital Association)

The Department of Commerce's knowledge of the Red Planet Capital is limited; therefore it would be inappropriate to comment on NASA's reasoning for requesting its establishment.

Q5. You justify abolishing ATP because it only benefits a single company and not industry at large and that American Competitiveness Initiative will not impact individual company but be broadly based. The ATP's mandate is that it can fund projects that will only have broad industry impacts far beyond private profit. I'll cite just a few examples such as the two milli-meter project, the Affymetrix DNA diagnostics project and the Integrated Circuit project; these were successful APT projects which had broad industry impacts. Why doesn't the ATP fit within the scope of the Administration's Initiative?

A5. The FY 2007 budget reflects the Administration's policy and funding priorities to address the Nation's most pressing needs. In contrast to ATP, the President's American Competitiveness Initiative invests in broad basic research that will benefit entire industries. The request continues the orderly ATP phase-out that was initiated with recent appropriations and will meet all existing grant obligations.

Q6a. An article appeared in the February 11 issue of the St. Petersburg Times *about NOAA's proposal to offer early retirement to 1,000 employees of the weather service. The article indicates a number of these positions may be permanently cut and others will be filled through promotion of junior staff.*

We are very concerned about the implications of this type of buy-out from the perspective of public safety and continuity of service at the weather service.

What implications does this plan have for the future of 24/7 coverage that is now provided through all of the weather forecasting offices (WFO)?

A6a. The Voluntary Early Retirement Authority is no longer under consideration as it is too late in the fiscal year to achieve significant savings.

Q6b. Is the Administration planning to reduce the routine hours of service delivery from some or all of the WFOs?

A6b. There are currently no plans to reduce the routine hours of service delivery at any Weather Forecast Offices.

Q7. Mr. Sampson, your testimony highlights the requested increases for the new satellite systems—GOES–R and NPOESS. Well, as you know we cannot really evaluate the request for the NPOESS program because there have been so many schedule delays and cost overruns that it is now under complete review within the Department of Defense's Nunn-McCurdy process.

At this point, NPOESS—its cost and schedule—are both very uncertain and the risk of a data gap is very high. What commitment is the Administration prepared to make—in dollars and actions—to ensure this new system is delivered in time to ensure the continuity of weather forecasting data? Is the Administration prepared to amend the FY07 request and ask for additional funds to ensure the continuity of our weather forecasting enterprise? If additional funds are required should we expect cuts to other NOAA programs to offset the NPOESS increases?

A7. The Administration remains committed to polar satellite data continuity. These data are the foundation for our global weather models, which are critical to our mid- to long-range forecasts. The Administration is aggressively addressing the issues related to the NPOESS Program. Pursuant to Title 10 USC § 2433, the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) has directed a full Nunn-McCurdy review that requires a written certification to be presented to Congress with supporting explanation that:

1. the acquisition program is essential to national security;
2. there are no alternatives to such acquisition program which will provide equal or greater military capability at less cost;
3. the new estimates of the program acquisition unit cost or procurement unit cost are reasonable; and
4. the management structure for the acquisition program is adequate to manage and control program acquisition unit cost or procurement unit cost.

Under the leadership of USD(AT&L), the Department of Defense has convened four working groups to address these criteria and has invited NOAA and the Na-

tional Aeronautics and Space Administration (NASA) to participate as full partners in all four working groups. A decision is expected no earlier than June 5, 2006. Until that decision has been made, it would be premature for the Administration to amend the FY 2007 President's budget to request additional funds. There are currently no plans to cut other NOAA programs to offset any possible NPOESS increases. The Administration will conduct a full briefing for the House Science Committee soon after the final Nunn-McCurdy decision is reached in June 2006.

Q8a. Your written testimony indicates that NOAA's FY 2007 request includes an increase for the tsunami warning system of $12 million bringing the total funding for the tsunami warning system to about $20 million per year. We are all pleased to have the system expanded to cover both of our coasts and the budget request appears to contain sufficient funds to operate and maintain the system.

However, the request for the Tsunami Hazard Mitigation Program receives no increase for FY 2007 and the TsunamiReady Program is reduced by $1 million—an 80 percent reduction from the FY 2006 enacted levels. The budget request for these two programs confirms concerns raised by Members of this committee when the expansion of the system was proposed—that we would have the technology in place, but would not have the funds to enable State and local governments to prepare themselves to heed the warnings the system delivers. The utility of the warning network is dependent upon the work done to prepare coastal communities through the Mitigation Program and TsunamiReady program.

Why were these funds not increased to accommodate the increased number of State and local communities that will now be served by the network?

A8a. Prior to the Administration's commitment to accelerate its U.S. Tsunami Warning System (FY 2005–2006), the National Tsunami Hazard Mitigation Program (NTHMP) was NOAA's primarily vehicle to test many of the improvements made to the existing U.S. Tsunami Warning Program. NOAA's development, deployment and initial maintenance and operation of its Deep-ocean Assessment and Reporting of Tsunami stations were funded by the NTHMP. Similarly, NOAA tsunami inundation mapping and modeling efforts were also tested and funded by the NTHMP. Finally, the NTHMP funded many of the improvements made by the USGS in upgrading and expanding its network of real-time reporting seismometers along the West Coast and Alaska.

During the past ten years of the NTHMP, over 60 percent of the NTHMP funding supported these hazard detection efforts. Under the Administration's plan to strengthen the U.S. Tsunami Warning Program (which began with the FY 2005 supplemental request), these key programs initially developed and funded by the NTHMP are fully funded by the new program. Consequently, in FY 2007, NTHMP funding will be used only to fund State and local tsunami awareness and tsunami mitigation efforts—and not tsunami detection efforts. This shift in funding requirements allows NOAA to more than double NTHMP funding support for State and local tsunami awareness and tsunami mitigation efforts.

Q8b. Will the west coast states involved in the Mitigation Program have their funds reduced or will there be no funds for the east coast states and Caribbean territories? How does NOAA intend to allocate the limited funds available to the states and territories?

A8b. As stated above, in FY 2007 NOAA expects to use 100 percent of available NTHMP funding to support State and local tsunami awareness and tsunami mitigation efforts. The NTHMP steering committee, comprised of representatives from NOAA, the Federal Emergency Management Agency, the U.S. Geological Survey and the States of Hawaii, Alaska, Washington, Oregon, and California endorsed the concept of forming regions, which would receive and distribute funds. All coastal states and U.S. Territories at-risk from a tsunami are invited to participate in this process. In FY 2006, NOAA plans to schedule a series of NTHMP meetings involving (1) the original five states (HI, AK, WA, OR, and CA), (2) southern U.S. coastal states and territories with tsunami vulnerabilities, and (3) east coast states with tsunami vulnerabilities. At these meetings, discussions will be held regarding the future of the NTHMP.

Q9. Mr. Sampson, the President requested and the Congress agreed to provide a pay raise for federal employees. However, over the past few years the extra funds for the pay raise have not been fully budgeted for in either the appropriations bills or the President's request for NOAA. As you know, when this happens the funds

to meet the pay raise are acquired by other means including drawing from the programs and imposing hiring freezes.

Q9a. How much funding will be diverted from program activities in FY 2006 to cover the cost of the pay raise?

A9a. The FY 2006 President's Budget included funding for a 2.3 percent pay raise. Congress enacted a 3.1 percent pay raise in legislation, but did not provide the funding to cover the full raise. NOAA absorbed $6.2 million in FY 2006.

Q9b. The FY 2007 request includes a request for funds to cover the pay raise. How much of the total cost of the pay raise is covered by the request?

A9b. In the FY 2007 President's Budget, the Administration proposes a 2.2 percent standard pay raise for most federal employees. This raise is covered completely within the request, totaling $17.423 million.

Q9c. Does the FY 2007 request for these funds recover the deficit from previous years or are these funds only to cover the pay raise for FY 2007?

A9c. The FY 2007 President's Budget funds only the 2.2 percent pay raise associated with the FY 2007 request. There is no provision in the request to recover the pay raise differential from previous years; however, $4.662 million is included to annualize the January 2006 pay raise.

Q10. The Administration is requesting $3.5 million in additional funds above the FY 2006 enacted level to ensure the wind profiler information remains available to weather forecasters. We realize the transmission frequency for the profilers must be converted to avoid a conflict with new search and rescue satellites. How many profilers will be converted to the new frequency with the proposed FY 2007 funds? What is the estimate for the total cost to complete the conversion of all profilers?

A10. The FY 2007 request includes a $3.5 million increase to begin the required development and re-engineering to convert the existing Wind Profilers in order to avoid frequency conflicts with the planned European Space Administration's (ESA) 30-satellite Galileo Global Positioning System network. No wind profilers will be converted to the new frequency with FY 2007 funds. FY 2007 funds are for re-engineering design and production of the prototype unit. Contingent upon the availability of funding, NOAA projects to complete the conversion of the 32 existing Wind Profilers that operate on conflicting frequencies (404 MHZ) by the end of FY 2010. The projected total cost to convert these 32 wind profilers is estimated at $13.2 million. There are five additional profilers in the network which already operate on a non-interfering frequency.

Q11. The Administration is requesting a restoration of funding for the Space Environment Center (SEC) of $3.2 million above the FY 2006 enacted levels. Our understanding from the hearing we held in this committee during the last Congress is that even the $7 million range of funding is not going to permit much, if any, upgrade to space weather forecasting services. Is that the case? The SEC relies upon data collected from instruments on several satellite systems, including a NASA research satellite (ACE). What is the anticipated life-span of the current ACE satellite? What plans does NOAA have to replace the data stream from the ACE sensors once the current ACE satellite mission has ended?

A11. The FY 2007 requests restoration of $3.2 million to the Space Environment Center's (SEC) operating budget. This $3.2 million will allow the SEC to be funded at the $7.347 million level. At this $7.347 million level, the SEC will have sufficient funding to continue its improved suite of space weather forecasts and products. The funds requested are necessary to operate and perform critical research at the SEC. SEC warnings and forecasts are relied upon by NASA, the DOD, power industries, private satellite operators, and the airlines and communications industries for real-time forecasts and warnings of high-frequency radio blackouts caused by solar flares, solar radiation storms, and geomagnetic storms.

The NASA ACE satellite is a research satellite that the SEC has used for observing solar activity. The SEC also uses capabilities from NOAA GEOS, NOAA POES, and DOD's DMSP for space weather forecasting. While the ACE satellite has outlived its scheduled research life-span, its unique orbit (one million miles) requires minimal fuel to maintain. NASA projects sufficient ACE fuel reserves to maintain its orbit for many years. In anticipation of potential future ACE data loss, the SEC is planning to hold a stakeholder meeting to assure understanding of the situation and ensure users know the impact and any loss of certain products and efforts.

Questions submitted by Representative Vernon J. Ehlers

Q1. In October 2005, the Science Committee held a hearing on the final report of the NIST investigation into the collapse of World Trade Centers 1, 2, and 7. At this hearing, the Committee learned that, based on the recommendations contained in this report, NIST would be working with codes and standards groups to submit proposed changes to the International Building Code, the deadline for which is March 24th, 2006. Where is NIST in this process? What specific changes will be proposed, and does NIST have supporters who will champion these proposals in the ICC?

A1. After issuing the final report, NIST assigned top priority to work vigorously with the building and fire safety communities to assure that there is a complete understanding of the recommendations and to provide needed technical assistance in getting them implemented. NIST has implemented a web-based system (*http://wtc.nist.gov/recommendations/recommendations.htm*) so that the public can track the progress on implementing the recommendations. The web site lists each of the recommendations, the specific organizations (e.g., standards and code developers, professional groups, State and local authorities) responsible for its implementation, the status of the implementation by organization, and the plans or work in progress to implement the recommendations. The status of the implementation of the recommendations is current as of January 31, 2006. The status will be updated periodically to report progress.

NIST has been working vigorously with the building code experts who were convened pursuant to a contract to the National Institute of Building Sciences (NIBS) to translate the NIST WTC recommendations into code change proposals. Key representatives of the International Code Council (ICC) (as well as other standards and code organizations) are actively engaged in this effort and submitted code change proposals for the International Building Code. The NIBS building code experts and the ICC representatives are expected to champion these proposals in the ICC.

Q2. The President's fiscal year 2007 budget request includes $2 million for a project to increase the resilience of structures and communities to hurricanes, fires, and earthquakes. Some of this funding would be used to conduct research on multi-hazard failure analysis and the role of fire in the progressive collapse of structures. That kind of research was recommended in NIST's Report on the Collapse of the World Trade Center Towers. *This report recommended several other areas where further research was needed (such as testing protocols for wind loads on tall building or improving test methods for fireproofing materials) but those areas are not funded in the FY07 budget request. What was the rationale behind selecting multi-hazard and fire failures for funding?*

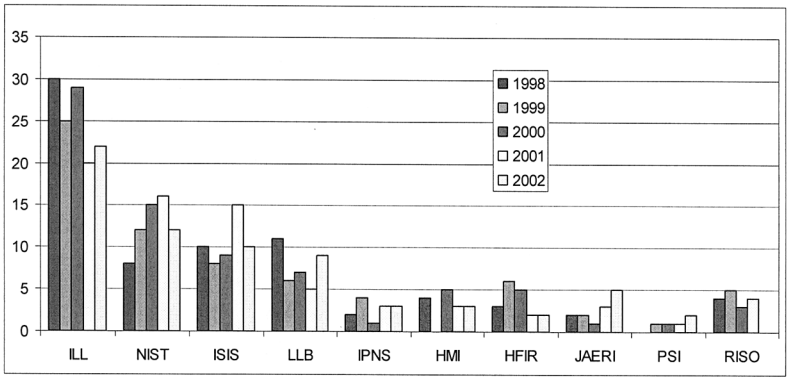
A2. The decision-making rationale for selecting the program elements of the "Structural Safety in Hurricanes, Fires, and Earthquakes" was based on consideration of several factors. First, this request will permit NIST to carry out critical R&D to reduce the vulnerability of citizens and the built environment to these natural disasters. Each year the United States suffers an estimated $52 billion in property damage, disruption of commerce, and lost lives due to natural disasters.

Another factor is that this proposed program is focused directly on providing some of the solutions demanded by four of the six Grand Challenges outlined by the President's National Science and Technology Council's Subcommittee on Disaster Reduction.

Finally, the initiative complements existing efforts from previous appropriations. In addition to redirected internal base funds, the Congress has appropriated $3 million in FY 2003 and $2 million in FY 2005 for research related to our World Trade Center research effort.

Q3. And finally, how many Neutron facilities in the world would be considered world class, and where are they?

NUMBERS OF PAPERS PUBLISHED BY ORGANIZATIONS OVER A FIVE-YEAR PERIOD[1]



[1] Organizations: ILL (Institute Laue-Langevin); NIST (National Institute of Standards and Technology); ISIS (actual name; not an acronym); LLB (Laboratoire Leon Brillouin); IPNS (Intense Pulsed Neutron Source); HMI (Hahn-Meitner Institute); HFIR (High Flux Isotope Reactor); JAERI (Japan Atomic Energy Research Institute); PSI (the Swiss Spallation Neutron Source of the Paul Scherrer Institute); RISO (Riso National Laboratory); and FRM-II (research reactor project of the Technical University of Munich).

In terms of *impact,* the NCNR consistently ranks in the top three facilities worldwide. The preceding graph shows the results of an analysis from Christian Vettier from the Institute Laue-Langevin (ILL) which is widely regarded as the leading neutron facility in the world. It shows the number of papers published in high-impact journals over a five-year period.

In terms of *capability* (intensity plus number of instruments) the leading world wide facilities include the following facilities (taken from Table 3 of the OSTP report on the *Status and Needs of Major Neutron Scattering Facilities and Instruments in the United States*). Top three indicated above line:

ILL	**Institute Laue-Langevin**	**France**	**Reactor-based source**
ISIS	**Rutherford Appleton Lab**	**England**	**Spallation source**
NCNR	**NIST**	**United States**	**Reactor-based source**
JAERI	**Japan Atomic Energy**	**Japan**	**Reactor-based**
HMI	**Hahn-Meitner Institute**	**Germany**	**Reactor-based**
LLB	**Laboratoire Leon Brillouin**	**France**	**Reactor-based**
SINQ	**Paul Scherrer Institute**	**Switzerland**	**Spallation source**
FRM-II	**Technical Unv. of Munich**	**Germany**	**Reactor-based (new)**

Questions submitted by Representative Eddie Bernice Johnson

Q1. You justify eliminating the Advanced Technology Program because of the growth of venture capital funds and other financial services for high-risk technology. This committee has heard repeatedly during the past four years that venture capital funds for high-risk technology development are scarce. Could you provide us with the documentation that supports your claims?

A1. Data shows that there have been significant private equity funding available and that the level of funding continues to be strong. A 2002 study by Lewis Branscomb et al. at Harvard University that analyzed data from 1998 estimates that between $5.4 billion (conservative estimate) and $35.5 billion (inclusive estimate) was invested in early stage technology development (Branscomb and Auerswald, *Between Invention and Innovation*). These estimates include $1.4 billion to $7.3 billion in investments from the Federal Government.

In 2005, venture capitalists invested $21.7 billion in 2,939 deals, which matched the level invested in 2004. Funding for start-up and early stage companies slipped slightly for the year to $4.1 billion in 922 deals compared to $4.4 billion in 2004. Anecdotal evidence shows that 2006 will see an increase in early stage investing both in number of companies funded and amount of money invested, negating the need for governmental support. (Source: National Venture Capital Association)

Q2. Since 2001, we have lost 2.8 million manufacturing jobs; last year alone we lost another 55,000 manufacturing jobs. These jobs are high-skill, high-wage jobs that on average pay 23 percent more than the national average.

I would like for you to explain to our constituents why the Administration proposes to gut the Manufacturing Extension Program that has a proven track record in creating and retaining good jobs.

A2. The budget constraints have forced the Administration to make some difficult budget decisions—in this case reducing the Hollings MEP. MEP is just one method by which NIST supports small manufacturers. More than half of the NIST lab activities are either directly or indirectly geared to enhancing manufacturing.

The President has demonstrated his strong commitment to the NIST laboratory programs by including them in the American Competitiveness Initiative (ACI) for FY 2007. ACI increases funding for the NIST laboratory and construction programs above the base level by 24 percent to $535 million.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Arden L. Bement, Jr., Director, National Science Foundation

Questions submitted by Chairman Sherwood L. Boehlert

Q1. The Fiscal Year 2007 (FY07) budget request includes an eight percent increase in funding for nanotechnology R&D at the National Science Foundation (NSF). What level of funding will NSF be devoting to studying potential environmental and safety implications associated with nanotechnology? How does this compare to FY06, in terms of funding and subject matter? How is NSF's nanotechnology environmental and safety research coordinated with R&D supported by other agencies on potential new nanotechnology products? How is it coordinated with the needs of regulatory agencies?

A1. The FY 2007 Budget Request includes $59 million in funding for the societal implications of nanotechnology research and development—this is a 7.6 percent ($7.55 million) increase over FY 2006.

A portion of this investment—$25.65 million—will be directed toward studying the potential environmental and safety implications associated with nanotechnology. This is a 16 percent ($3.55 million) increase from FY 2006. This research will be directed at the impact of nanoparticles and nanostructured materials in the environment, including air, water, soil, biosystems, and the work environment. It also will study the non-clinical biological implications of nanoparticles. In 2007, however, research will expand beyond passive nanostructures to include the implications of active nanostructures and nanosystems.

NSF collaborates with other agencies on environmental and safety research through the National Nanotechnology Initiative (NNI). One example of this collaboration is the joint program solicitation on "Nanotechnology Research Grants Investigating Environmental and Human Health Effects of Manufactured Nanomaterials." This collaboration is with the Environmental Protection Agency, the National Institute for Occupational Safety and Health, and NIH's National Institute of Environmental Health Sciences (NIEHS). The Nanomaterials Environmental and Health Implications (NEHI) working group facilitates the coordination with other research and regulatory agencies.

Q2. How will the new Research and Evaluation on Education in Science and Engineering (REESE) program on what works, why, and for whom in math and science education coordinate with the Science of Learning Centers already underway at NSF? How have results from REESE's predecessor program—Research, Evaluation and Communication—affected NSF's K–12 programs and how are results from REESE expected to affect them in the future?

A2. The new Research and Evaluation on Education in Science and Engineering (REESE) program coordinates with the Science of Learning Centers (SLC) on several levels. At the NSF management level, one of the REESE program officers is the EHR representative to the SLC coordinating committee. At the scientific level, three of the four Principal Investigators for SLC centers are grantees of the Research on Learning and Education (ROLE) program, a predecessor to REESE. In addition, many of the co-Principal Investigators are also grantees of the ROLE program. At the discipline level, the SLCs are participating in the major meetings for education researchers (including the American Education Research Association meeting and the International Conference on the Learning Sciences meeting).

Results from REESE's predecessor programs (primarily ROLE) in the Research, Evaluation and Communication (REC) division have influenced NSF's K–12 programs in a variety of ways, thereby ensuring that practice is informed by research. Here are two examples:

1. An Interagency Education Research Initiative (IERI) project developed and distributed modeling and simulation software for biology, chemistry, and physics to over 250 high schools in a project called Modeling across the Curriculum. The use of this software has been shown to improve the performance of students taking science courses. Early research for the IERI project was supported by ROLE.
2. ROLE supported research that led to the development of cognitive tutors that provide individualized guidance to learners. Now these tutor systems help more than 325,000 middle school and high school students in 750 school districts learn complex problem-solving skills in areas such as algebra, geometry, and computer science. In carefully controlled studies, classes using the algebra tutor system have shown dramatic achievement gains over control

classes—as much as 25 percent better on standardized tests of basic skills, and 100 percent better on assessments of problem solving. The effective use of the tutors is being studied in an IERI project and in the Pittsburgh SLC.

Looking to the future, REESE will continue to support basic and applied research on teaching and learning that will subsequently influence the development of innovative instructional materials, curricula, pedagogical practices, and teacher training in math and science education. REESE program officers have served, and will continue to serve, on committees that manage several NSF programs that support K–12 science and math education in addition to the SLCs. These include, for example, Human and Social Dynamics, Information Technology Research, and Advanced Learning Technologies.

Questions submitted by Representative Bart Gordon

Q1. As was the case last year, the budget request includes $57 million to reimburse the Coast Guard for icebreaker services in support of Polar research. In addition, for FY 2006, NSF contracted for additional icebreaker services at a cost of $9 million.

Has a decision been made on the way NSF will obtain icebreaker support beyond FY 2007? Should we expect to see NSF retain the responsibility for maintaining and operating the aging Coast Guard icebreakers, or will NSF have the freedom to pursue other options for polar research support?

A1. NSF plans to continue to task the USCG to operate the HEALY in the Arctic, either singly or in concert with other nations' icebreakers such as the joint cruise with the ODEN that was funded in FY 2005.

For Antarctic resupply, NSF plans to continue to secure icebreaking services from a reliable provider at the most economical cost. USCG has stated that the NSF-funded maintenance being performed on the POLAR SEA in FY 2006 will enable her to conduct the Antarctic break-in for at least FY 2007 and FY 2008. Whether a back-up vessel will be needed in those years will be the subject of discussions with the USCG in the next few months. The decision will be based on many factors, such as progress on the POLAR SEA's maintenance work, casualties (if any) sustained to the POLAR SEA during the FY 2007 break-in and escort duties, and predictions of ice thickness and extent.

In securing polar icebreaking services to support NSF-funded research, NSF is guided by the FY 2006 President's Budget Request, which noted that funding for the polar icebreakers was transferred to NSF in order to "permit NSF to define the options for reimbursement or replacement of two of the ships. . .", and by Congressional action on the budget request noting that NSF is expected to "immediately begin a concurrent pursuit of alternative, more economical icebreaking solutions. . .."

NSF is in the process of reviewing comments from a Request For Information seeking information on the availability and cost of icebreaking services from any capable providers. The response to this RFI will assist NSF in formulating a strategy for meeting its Antarctic icebreaking needs over both the intermediate and the long-term. In addition, NSF is seeking funding to initiate projects that will enable it to deal with a possible one-year failure of the ship-borne resupply mission. For example, increasing fuel storage at McMurdo Station; implementing the surface traverse to South Pole Station; and investigating the feasibility of supplying South Pole Station largely by air from off-continent locations.

NSF does not operate or maintain the polar icebreakers. Rather, it is responsible for tasking the USCG to operate them and for providing the associated operations and maintenance funding in accordance with an MOA between the two agencies that outlines the process for budget submission, review and approval, and reimbursement. However, without significant refurbishment, the USCG polar class icebreakers are very close to the end of their useful lives, and NSF will not be able to rely on them beyond the next two to four years. Our longer-term solution to the Antarctic resupply problem will be informed by the National Research Council's study on Polar Icebreaker Roles and U.S. Future Needs. The Committee addressing the Nation's need for polar icebreakers has been very active and its meeting agendas demonstrate a commitment to ensuring that it appropriately and thoroughly considers all aspects of the question. In parallel with the NRC Committee's work, NSF will commission design and operating concept studies to determine the most reliable, efficient, and cost-effective resupply system.

Q2. The education directorate has been headed by an acting assistant director for the past year, and three of the five division director positions are vacant. What

steps are being taken to fill these positions and when may we expect to see permanent staff in place?

A2. Efforts to fill Executive positions within the Education and Human Resource Directorate (EHR) are underway. Since October 2005 a total of five Division Director positions have been advertised, and each is now at varying stages of being filled.

Each vacancy was announced with Senior Executive Service (SES) career and limited term appointment options, as well as Intergovernmental Personnel Act assignment options. Each announcement was open to all qualified applicants and posted on the NSF web site and OPM's USAJobs. In addition, the positions were advertised both in print and electronically in publications of *The Chronicle for Higher Education and Science.*

Details regarding the status of each vacancy follow:

Director, Division of Graduate Education: The vacancy announcement was posted from October 12, 2005 through January 16, 2006. As a result of the recruitment and merit staffing process a list of four highly recommended and five recommended candidates were referred to EHR for further consideration. EHR is in the process of interviewing the four highly recommended candidates.

Director, Division of Human Resource Development: The vacancy announcement was posted from December 23, 2005 through February 7, 2006. As a result of the recruitment and merit staffing process a list of five candidates were referred to EHR for further consideration. EHR is in the process of interviewing these candidates.

Director, Division of Elementary, Secondary and Informal Education and Director, Division of Research, Evaluation and Communication: The announcements for these two positions were posted from January 6, 2006 through February 17, 2006. The merit staffing process is underway and the most qualified applicants will be referred to EHR for consideration.

Director, Division of Undergraduate Education: The vacancy announcement that opened on February 10, 2006 closes on March 24, 2006. Once closed, the merit staffing process will commence, and the most highly qualified will be referred to EHR for consideration.

In addition to these five positions, the Office of the Director is conducting a nation-wide search to fill the Assistant Director position for the EHR Directorate.

Q3. The budget request includes $50 million, the first payment of a $200 million investment, to develop a leadership-class high-performance computing system for support of scientific and engineering research. The Department of Energy is also acquiring very high-performance computing systems. What is the nature and extent of coordination and collaboration between the two agencies in providing high-performance computing capability so that the needs of U.S. scientists and engineers in different fields are met?

A3. While DOE has specific energy-related mission requirements that they must address, NSF provides high performance computing resources specifically targeted to fundamental research in the broad, open science and engineering communities. Nonetheless, there are many ways in which the two agencies collaborate and coordinate activities in high performance computing.

For quite some time now, NSF has been coordinating and collaborating its high performance computing systems activities with the Department of Energy (Office of Science and National Nuclear Security Administration), the Department of Defense's DARPA High Productivity Computing Systems (HPCS) initiative as a mission partner in that activity during its Phases I and II, and with NASA.

There are instances where Department of Energy (DOE) and NSF jointly fund activities that are of common interest. An example of such a collaboration is the High-End Computing University Research Activity (HEC–URA) which began in 2004 and is co-funded by NSF, DOE and DARPA. HEC–URA is an outgrowth of the interagency High-End Computing Revitalization Task Force (2003), in which NSF, DOD and DOE played leadership roles. There are also several ongoing activities coordinated through the High-End Computing Interagency Working Group, a subgroup of the Administration's Networking and Information Technology Research & Development (NITRD) National Coordinating Office (NCO). An example of such an activity is the identification of a common set of benchmarks that are being used to guide the acquisition of high performance computing systems; NSF and DOE play significant roles in this activity too.

Finally, NSF and DOE share high performance computing expertise through participation in review panels and committees, with DOE experts serving on NSF re-

view panels and committees and NSF experts serving on DOE review panels and committees. We expect to continue to have frequent discussions with our colleagues in DOE and other federal agencies, as we move forward with the proposed FY 2007 acquisition.

The interactions described herein allow both NSF and DOE to leverage expertise and promising practices and to minimize duplication of effort. Most importantly however, it allows us, together, to better serve the American public, stimulating innovation and economic growth through scientific breakthroughs created with a portfolio of leadership-class systems.

Q4. A recent report from the National Academy of Sciences called for federal R&D agencies to institute programs to allow institutions of higher education to acquire research instrumentation that costs in the $1 to $10 million range. The report specifically recommends that NSF expand its Major Research Instrumentation program to allow awards over the current $2 million limit.

Q4a. What is your view of this recommendation, and what priority would you give to such an instrumentation program?

A4a. In the 2003 report of the National Science Board entitled *Science and Engineering Infrastructure for the 21st Century: the Role of the National Science Foundation (NSB02–190),* the Board recommended that NSF develop a funding mechanism to support mid-sized instrumentation projects. This report was published shortly after enactment of the NSF reauthorization law that included language doubling NSF's budget over five years. Since that time, budgetary restrictions have limited the agency's ability to initiate such a program.

As currently designed, NSF's Major Research Instrumentation Program (MRI) supports instrumentation acquisition and development for research and research training purposes for awards between $100,000 and $2 million. Increasing the scale of the MRI program to include mid-size instrumentation (between $2 million and $20 million) would require a higher degree of management oversight than is required for typical MRI awards. Many awards, even at the low end of this scale, require long-term commitments on the part of the host institution, the federal supporting agencies, and often the scientific community. The NSF currently supports a small number of such research instrumentation efforts through other NSF programs. Rather than being supported by the MRI Program, proposals can be submitted to and awards can be made by divisions that support instrumentation. Before an award is made, there are in-depth discussions with the cognizant research communities, the research institutions that are involved, and the federal agencies that are partners. It is now clear that available opportunities and mechanisms are not always transparent to the scientific community. Therefore, NSF senior management will make changes this year to ensure more transparency of the processes it uses to support mid-size instruments. Moreover, raising the cap on the MRI program is currently under discussion. There will be some closure on this issue by July 2006.

The 2005 report of the National Academy of Sciences, *Academic Research Instrumentation and Facilities* was presented to the Director of NSF on January 5, 2006. Since that presentation, NSF senior management has been studying the report along with NSF's current set of (17) instrumentation programs, with a focus on how we might best implement the numerous recommendations.

Q4b. What has been the effect of NSF's abandonment of cost sharing on the number of awards provided under its existing Major Research Instrumentation program?

A4b. FY 2005 was the first year that the no cost sharing policy set by the National Science Board was implemented. Based on one year's data, it does not appear that the number of awards provided under the existing MRI program was significantly affected by the change in cost sharing. To guarantee the productive use of the equipment, the 2005 program solicitation required institutions to submit management plans describing how they planned to address those costs that had previously been considered as 'cost sharing' throughout the life of the project. In addition, the management plan became an explicit review criterion. The drop in the number of proposals from the FY 2004 level to the FY 2005 level can be attributed to proposals that were withdrawn (n=13) and returned without review (n=58) because they did not respond to the changes in the MRI program. While the number of awards and the success rate decreased between FY 2004 and FY 2005, the decline can be attributed to the decrease of approximately $20 million in program funds between those years. Approximately 36 awards could have been made had there not been a decrease in the MRI program budget.

The following table has been provided for your reference.

Fiscal Year	# Proposals	Total $ Requested	Average $ Requested	Median $ Requested	# Awards	Total MRI Funding In Awarding Year	Average MRI $ Awarded	Median MRI $ Awarded	Success Rate
2000	475	$251,953,775	$530,429	$385,000	163	$50,208,570	$308,028	$210,074	34%
2001	741	$305,490,586	$412,268	$277,198	311	$74,548,846	$239,707	$167,447	42%
2002	691	$296,273,914	$428,761	$315,000	279	$75,452,727	$270,440	$211,783	40%
2003	757	$351,192,737	$463,927	$338,795	280	$83,045,823	$296,592	$249,238	37%
2004	838	$421,372,027	$502,831	$375,822	327	$109,067,161	$333,539	$267,196	39%
2005*	786	$473,579,186	$602,518	$445,980	255	$89,281,684	$350,124	$240,000	32%
2006^	752	$424,856,436	$564,969	$441,270	*not available*				

*FY 2005 data are accurate as of March 23, 2006, when 9 proposals were still pending; success rate figure calculated by taking known awards / proposals reviewed as of March 23, 2006

^FY 2006 data are based on proposals received as of February 22, 2006

Q4c. Why doesn't cost sharing make sense for this kind of program as a way to leverage a greater national investment in cutting-edge research instrumentation?

A4c. Cost sharing may make sense for this kind of program as a way to leverage greater national investment in cutting-edge research instrumentation. As noted above, the emphasis has shifted from capital, one time, cost sharing requirements to cost sharing by way of long-term institutional commitment to operations and maintenance. Requiring awardees to document these costs leverages the investment and ensures that the equipment is functioning, put to good use, and not idle due to lack of resources to support ongoing cost for operations and maintenance. This approach is consistent with the National Science Board's cost sharing policy while still recognizing the partnership between the federal sponsors of research and the grantee.

Q5. Last May, the NSF's Advisory Committee for Business and Operations reviewed NSF's management of large facilities construction projects. It criticized what it characterized as "under-investment" in engineering, cost-estimating and project management support during the development stage when baseline project definitions are being formulated. Please comment on this finding. Do you believe the NSF scientific directorates are budgeting adequately for the costs associated with the development stage of large facilities projects which they must bear prior to a project's approval for construction (after which costs are covered by funds from the Major Research Equipment and Facilities Construction account)?

A5. Projects proposed for future construction funding must be well defined, well budgeted, and there must be appropriate emphasis and resources provided to those involved in planning so that there is a capable project management infrastructure in place and prepared to execute construction. NSF has taken steps to make it clear to our research communities, and to NSF staff, that NSF has these expectations and that they will be held accountable for satisfying them. In November, NSF released a new document, endorsed by the National Science Board, entitled "Guidelines for Planning and Managing the Major Research Equipment and Facilities Construction Account" which lays out NSF"s expectations for a structured, incremental process of planning, development, and assessment by NSF of proposed projects; proceeding through a Conceptual Design, a Preliminary Design, and a Final Design Review prior to commencement of construction. NSF recognizes this will cost money (increasing the investment in engineering, cost-estimating, and project management leading to baseline definition) but the greater investment in pre-construction planning will result in net savings in terms of improved definition of a project's scope, better assessment of a project's risks, the formulation of a plan that minimizes risk exposure, a more robust budget estimate, and a better forecast of a facility's likely operating costs, so that NSF knows beforehand that these costs are supportable.

Under the new Guidelines, the NSF's MREFC Panel, with the independent assessment of the Deputy Director for Large Facility Projects, will make a recommendation, which the NSF Director must approve, in order to advance any candidate new project to a more advanced stage of pre-construction planning (for example, from Conceptual Design to Preliminary Design related activities). NSF recognizes that adequate investment in the pre-construction planning process is essential to project advancement and eventual construction. Each Directorate/Office has the responsibility to make that judgment regarding how much of their budget to devote

to project planning versus investment in other base program activities, in order to maintain and promote the vitality of the research in that area.

Q6. The past few independent auditor's reports for NSF have pointed to shortcomings in the agency's post award management. NSF has developed procedures for identifying high-risk awards, but the IG finds that NSF does not ensure that all high-risk institutions are adequately monitored. The IG's last report indicates that, out of 167 high-risk institutions, only 25 were visited during the past year. How does NSF plan to monitor high-risk institutions that are not visited? Does NSF have the sufficient staff and travel funds to carry out substantially more site visits?

A6. The strategic plan to monitor all institutions identified by the model as managing high risk awards is detailed in the Office of Budget, Finance and Award Management (BFA) Post-award Monitoring Standing Operating Guidance (SOG) 2005–2. It is a comprehensive, integrated plan for post-award monitoring of all institutions including those that manage high risk awards. Post award monitoring is not limited to site visits and includes evaluation of final adjustments, FCTR transaction testing, and monitoring by grants and agreements officers in the Division of Grants and Agreements (DGA) and the Division of Acquisition and Cooperative Support (DACS) as well as program officer monitoring, and evaluations performed by special request. As part of its ongoing effort to strengthen its award monitoring program, NSF management anticipates making a contract award in Spring 2006 that will provide additional resources to conduct desk reviews of high risk awards that are not selected for award monitoring site visits during development of our annual monitoring plan. Once the contract is awarded, the task order for this particular deliverable will address the need to develop the specific procedures that will comprise the desk reviews, including any needed follow up to results.

NSF management will continue to update the above noted SOG and linked policy or procedural documents as appropriate based on changes in its operations including items such as the above noted desk reviews. In addition, NSF management will ensure that the guidance clearly states how site visit selections are determined including the basis for excluding institutions managing high-risk awards from a site visit review.

It is important to note that NSF management identifies awards as high risk; accordingly, NSF does not identify an institution itself as being high risk. This nuance is important in that an institution is identified as managing a high risk award rather than being considered a high risk institution. In addition, it is important to understand that of the 167 institutions identified in the IG's last audit report as managing high risk awards, that not only were 25 visited in FY 2005 but also 48 had been visited or audited during the previous four years and 49 had awards that were due to expire. The remainder of institutions that were not visited results in only 45 institutions.

NSF management believes that the augmentation of our current resources with contract resources will strengthen our Post Award Monitoring and Business Assistance Program. While the augmentation of existing staff and travel funds would certainly bring additional resources to our program, NSF strongly believes that the selection of institutions for site visits is based on a sound methodology that is one part of its larger NSF "Gold Standard" Post Award Monitoring and Business Assistance Program.

Questions submitted by Representative Eddie Bernice Johnson

Q1. Improvement of math and science education is a major longstanding responsibility of NSF. The President's proposed competitiveness initiative provides a funding increase for NSF of nearly eight percent. Unfortunately, this same budget proposal actually cuts NSF's K–12 education programs by seven percent.

Dr. Bement, within the healthy budget increase proposed for NSF for FY 2007, why does K–12 education fare so poorly?

If one looks at educational materials development, teacher development, and the Math and Science Partnership program, which has been heavily focused on improving teacher performance, the FY 2007 budget proposal is 38 percent below the FY 2004 level. You have even reorganized the education directorate in a way that drops "elementary and secondary education" from the title of the division that contains the remaining K–12 programs. This certainly sends the signal that NSF is de-emphasizing K–12 education activities. Is this the case, and if not, what do you consider NSF's role to be, and what is your long-term plan for supporting K–12 science and math education?

A1. The ongoing consolidation of the Math and Science Partnership at the Department of Education accounts for a significant portion of the drop in NSF's K–12 budget (down $17.18 million from the FY 2006 Current Plan). Also, the K–8 pilot program was funded in FY 2006 and not in FY 2007 ($6.94 million). The total planned reduction of these two programs combined is $24.12 million. With this planned reduction taken into account, and when the entire NSF budget for K–12 programs is counted, K–12 investments throughout the Foundation actually increase by over 10 percent. This is because the Foundation's education portfolio includes a number of investments throughout the Research and Related Activities account. This includes programs, such as the Graduate Teaching Fellowships in K–12 Education (GK–12) program (managed by EHR and funded by both EHR and R&RA), which contributes significantly to K–12 education but whose funding is counted as graduate research dollars."

The NSF portfolio for FY 2007 emphasizes four priorities that will strengthen the science and engineering enterprise through investments in frontier research, the workforce, education, and cutting-edge research tools. *Bolstering K–12 Education* is one of the four priorities, signaling its importance to the Foundation. NSF has a long history of building strong research foundations and fostering innovation in K–12 science and mathematics education. Skills in science, technology, engineering, and mathematics are increasingly necessary for success in the workforce and for full participation in the life of the Nation. The Foundation's education portfolio, including its K–12 portfolio, resides in both the Education and Human Resources account and the Research and Related Activities account. A new program to improve geoscience education at the middle and high school levels, for example, is funded in the Research and Related Activities account.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Charles E. McQueary, Under Secretary, Science and Technology, Department of Homeland Security

Questions submitted by Chairman Sherwood L. Boehlert

Q1. The Fiscal Year 2007 (FY07) Department of Homeland Security (DHS) budget request for the DHS Science and Technology (S&T) Directorate is organized by "portfolios" (biological countermeasures, cyber security, critical infrastructure protection, etc.).

Q1a. How is the money in each portfolio area being spent, by performer? Please provide for each area a breakdown of the amount of funding that was directed to the private sector, Department of Energy laboratories, federal laboratories, other government agencies, and universities in FY05. Please provide an estimate of the same information for FY06.

A1a. The following are obligations against the FY 2005 S&T Directorate appropriation by Program, Project, Activity (PPA); the obligations include those made through March 30, 2006.

PERFORMER	(All)

Sum of AMOUNT		PERFORMER TYPE											
PPA	ORGANIZATION	DOE Lab	Federal Agency	Federal Employee*	Federal Lab	FFRDC	Foreign	Non-Profit	Other Federal Agency	Private Industry	TSD	University	Grand Total
BIO (01)	HSARPA	1,203,216			6,907,200	250,000		3,246,594	572,210	48,978,793	2,727,789	400,000	64,285,802
	ORD	86,035,210	6,480,684	54,799	22,281,031			3,100,000		20,592,771		160,000	138,704,495
	PPR	4,280,000			836,000	2,080,000		8,110,077	1,492,412	19,670,877		250,000	36,719,366
	SED	16,807,815		21,806	3,500,000				38,947,480	19,936,998			79,214,099
BIO (01) Total		108,326,241	6,480,684	76,605	33,524,231	2,330,000		14,456,671	41,012,102	109,179,439	2,727,789	810,000	318,923,762
CHEM (04)	HSARPA	1,700,000			951,399			772,876	1,844,800	17,970,463		1,838,720	25,078,258
	ORD	6,758,625	96,000		4,706,500	113,000							11,674,125
	PPR							732,000	300,000	4,575,000			5,607,000
	SED	1,490,711								9,289			1,500,000
CHEM (04) Total		9,949,336	96,000		5,657,899	113,000		1,504,876	2,144,800	22,554,751		1,838,720	43,859,383
CIP (09)	HSARPA					200,000		1,500,000		2,126,000			3,826,000
	ORD	7,600,000										11,000,000	18,600,000
	PPR							839,638	114,000	2,487,953		234,480	3,676,071
CIP (09) Total		7,600,000				200,000		2,339,638	114,000	4,613,953		11,234,480	26,102,071
CONV MISSIONS (10)	HSARPA	1,610,400			4,560,000	425,000			7,046,000	7,852,255	6,979,600	279,371	28,752,626
	ORD	1,749,000								300,556			2,049,556
	PPR	74,000		6,538	1,450,000			1,385,000	3,464,000	6,656,557			13,036,095
	SED	2,000,000											2,000,000
CONV MISSIONS (10) Total		5,433,400		6,538	6,010,000	425,000		1,385,000	10,510,000	14,809,369	6,979,600	279,371	45,838,277
CYBER (15)	HSARPA	665,000			733,835	200,000		913,793	916,594	5,530,280	3,500,000	3,535,498	15,995,000
	PPR							232,000		1,052,478		515,520	1,799,998
CYBER (15) Total		665,000			733,835	200,000		1,145,793	916,594	6,582,758	3,500,000	4,051,018	17,794,998
EMERG THREATS (11)	HSARPA								500,000	269,000	500,000		1,269,000
	ORD	4,320,187			95,000								4,415,187
	PPR							650,000	500,000	233,000			1,383,000
EMERG THREATS (11) Total		4,320,187			95,000			650,000	1,000,000	502,000	500,000		7,067,187
EXPLOSIVES (06)	HSARPA	143,942			200,000					1,663,951		417,250	2,425,142
	ORD	560,000			3,540,000	200,000							4,300,000
	PPR	150,000						1,437,643	196,998	690,800			2,475,440
	SED	8,262,873							235,838				8,498,711
EXPLOSIVES (06) Total		9,116,815			3,740,000	200,000		1,437,643	432,836	2,354,751		417,250	17,699,294
MANPADS (16)	SED			1,822	150,747				3,353,127	52,841,285			56,346,981
MANPADS (16) Total				1,822	150,747				3,353,127	52,841,285			56,346,981
NBACC (13)	ORD									32,431,750			32,431,750
NBACC (13) Total										32,431,750			32,431,750
OIC (19)	SED			1,916	950,000			2,305,578	125,000	7,495,028		1,000,000	11,877,522
OIC (19) Total				1,916	950,000			2,305,578	125,000	7,495,028		1,000,000	11,877,522
RADN/NUC (03)	HSARPA	5,022,667								14,377,673	2,000,000		21,400,340
	ORD	36,352,775		1,856	2,550,000								38,904,631
	PPR	536,000					20,000	1,140,000	350,000	366,388			2,412,388
	SED	3,930,915		482	50,000			33,825		2,611,444			6,626,666
RADN/NUC (03) Total		45,842,357		2,338	2,600,000		20,000	1,173,825	350,000	17,355,506	2,000,000		69,344,026
RP(02)	HSARPA	1,300,000						269,992	2,861,730	9,773,581	32,872,675	1,324,073	48,402,051
	ORD	3,900,000											3,900,000
	PPR							1,030,000	490,000	3,999,539			5,519,539
	SED	350,000							885,071	764,917			1,999,988
RP(02) Total		5,550,000						1,299,992	4,236,801	14,538,037	32,872,675	1,324,073	59,821,578
SAFETY ACT (18)	PPR							5,617,000		944,331			6,561,331
SAFETY ACT (18) Total								5,617,000		944,331			6,561,331
STANDARDS (07)	HSARPA									993,000			993,000
	ORD	4,825,000		538	27,027,000								31,852,538
	PPR							2,629,191		2,437,926			5,067,117
STANDARDS (07) Total		4,825,000		538	27,027,000			2,629,191		3,430,926			37,912,655
TA (05)	HSARPA									2,812,909		3,832,091	6,645,000
	ORD	41,788,537								750,000			42,538,537
	PPR					462,439		3,060,862	322,083	1,950,181			5,795,565
	SED			1,262					7,499,039	500,000			8,000,301
TA (05) Total		41,788,537		1,262		462,439		3,060,862	7,821,122	6,013,090		3,832,091	62,979,403
UP (08)	HSARPA									1,750,000			1,750,000
	ORD	28,897,034		15,783				533,890		112,449		30,587,846	60,147,002
	PPR	898,259						700,000		3,831,561		47,071	5,476,891
UP (08) Total		29,795,293		15,783				1,233,890		5,694,010		30,634,917	67,373,893
Grand Total		273,212,166	6,576,684	106,799	80,488,712	3,930,439	20,000	40,239,959	72,016,381	301,340,985	48,580,064	55,421,920	881,934,109

* Federal employee obligations are for travel required to execute the program.

Q1b. How much funding did the Homeland Security Advanced Research Projects Agency distribute in FY05? How much do you estimate it will distribute in FY06 and FY07? Please specify this distribution by portfolio and performers as above.

A1b. The following are obligations against the FY 2005 S&T Directorate appropriation by Program, Project, Activity (PPA) made through HSARPA; the obligations include those made through March 30, 2006.

PERFORMER	(All)

Sum of AMOUNT		PERFORMER TYPE								
PPA	ORGANIZATION	DOE Lab	Federal Lab	FFRDC	Non-Profit	Other Federal Agency	Private Industry	TBD	University	Grand Total
BIO (01)	HSARPA	1,203,216	6,907,200	250,000	3,246,594	572,210	48,978,793	2,727,789	400,000	64,285,802
BIO (01) Total		1,203,216	6,907,200	250,000	3,246,594	572,210	48,978,793	2,727,789	400,000	64,285,802
CHEM (04)	HSARPA	1,700,000	951,399		772,876	1,844,800	17,970,463		1,838,720	25,078,258
CHEM (04) Total		1,700,000	951,399		772,876	1,844,800	17,970,463		1,838,720	25,078,258
CIP (09)	HSARPA			200,000	1,500,000		2,126,000			3,826,000
CIP (09) Total				200,000	1,500,000		2,126,000			3,826,000
CONV MISSIONS (10)	HSARPA	1,610,400	4,560,000	425,000		7,046,000	7,852,255	6,979,600	279,371	28,752,626
CONV MISSIONS (10) Total		1,610,400	4,560,000	425,000		7,046,000	7,852,255	6,979,600	279,371	28,752,626
CYBER (15)	HSARPA	665,000	733,835	200,000	913,793	916,594	5,530,280	3,500,000	3,535,498	15,995,000
CYBER (15) Total		665,000	733,835	200,000	913,793	916,594	5,530,280	3,500,000	3,535,498	15,995,000
EMERG THREATS (11)	HSARPA					500,000	269,000	500,000		1,269,000
EMERG THREATS (11) Total						500,000	269,000	500,000		1,269,000
EXPLOSIVES (06)	HSARPA	143,942	200,000				1,663,951		417,250	2,425,142
EXPLOSIVES (06) Total		143,942	200,000				1,663,951		417,250	2,425,142
RADN/NUC (03)	HSARPA	5,022,667					14,377,673	2,000,000		21,400,340
RADN/NUC (03) Total		5,022,667					14,377,673	2,000,000		21,400,340
RP(02)	HSARPA	1,300,000			269,992	2,861,730	9,773,581	32,872,675	1,324,073	48,402,051
RP(02) Total		1,300,000			269,992	2,861,730	9,773,581	32,872,675	1,324,073	48,402,051
STANDARDS (07)	HSARPA						993,000			993,000
STANDARDS (07) Total							993,000			993,000
TA (05)	HSARPA						2,812,909		3,832,091	6,645,000
TA (05) Total							2,812,909		3,832,091	6,645,000
UP (08)	HSARPA						1,750,000			1,750,000
UP (08) Total							1,750,000			1,750,000
Grand Total		11,645,225	13,352,434	1,075,000	6,703,255	13,741,334	114,097,905	48,580,064	11,627,003	220,822,220

The S&T Directorate is working to determine the appropriate FY 2006 funding levels to be directed through HSARPA to private sector, national laboratories, federal laboratories, other government agencies, and universities while considering how best to meet the Directorate's and Department's mission. Based on the FY 2005 figures, the S&T Directorate anticipates a similar funding breakdown by PPA, through HSARPA, for FY 2006 and likewise for FY 2007.

Q2. In his testimony, Dr. McQueary mentioned a "Research, Development, Testing and Evaluation (RDT&E) process" that has been developed to assist with the determination of priorities. Please explain how you assess the threats and vulnerabilities across a broad range of possible terrorist actions and develop a strategy to reduce the risks through investments in science and technology? Do you take into account the DHS mission to respond to natural disasters in your prioritization of projects?

A2. The S&T Directorate's RDT&E process consists of four main sub-processes: 1) needs and risk assessment, 2) strategic planning, 3) program definition, and 4) program execution. The first two sub-processes ensure that the S&T Directorate considers user needs, available intelligence, big-picture risks, national goals and inputs from other external agencies and advisory bodies to establish its annual RDT&E program. The second two sub-processes provide a framework for program execution using the best available systems engineering and program management techniques. Threat assessments and material threat determinations developed by DHS are critical factors in the determination of requirements and the identification of critical capability gaps.

Risks and gaps are identified using multiple sources and techniques including the Homeland Security Council's 15 Planning scenarios which include two catastrophic natural disasters. In developing solutions, the process also engages end-users throughout the requirements definition, development, testing, and transition phases. One of the primary areas where end-users are directly involved in requirements generation is the Emergency Responder community. Firefighters, law enforcement officers, and other federal, State, and local agencies have been key partners and participants in various workshops to identify and define the technology needs of those entities that have the responsibility to respond to all-hazards events including natural disasters.

Q3. DHS received $23 million in FY06 to conduct a planning and feasibility study for a National Bio- and Agro-defense Facility, which would serve as a replacement for the Plum Island Animal Disease Center. No additional request was submitted for the new facility for FY07.

Q3a. Please describe the timeline and process for how DHS will decide whether to build a new facility and how it will choose a site. What are DHS's long-term plans for funding this large capital project?

A3a. The S&T Directorate initiated an Expression of Interest (EOI) to explore potential sites for the National Bio- and Agro-defense Facility (NBAF). The EOI was published Jan. 17, 2006 in the *Federal Business Opportunities* and Jan. 19, 2006 in the *Federal Register*. Site criteria and requirements were developed by an interagency technical working group [including DHS, the U.S. Department of Agriculture (USDA), and the Department of Health and Human Services (HHS)] to evaluate sites that would best support research in high-consequence animal and zoonotic diseases in support of Homeland Security Presidential Directives, HSPD–9 and HSPD–10.

The results of the EOI will be evaluated in an environmental impact statement (EIS) in the fall of 2006, at which time the public will have the opportunity to comment on the scope of the analysis. In addition, the S&T Directorate issued a solicitation in April 2006 to procure architect-engineer services to conduct conceptual design studies and initial cost estimates for the NBAF. The conceptual design will be completed in 2007. Under the present schedule construction for NBAF will begin in 2009 and be operational by the end of 2012.

Q3b. In Dr. McQueary's testimony, he mentioned that we have an insufficient supply of laboratory space for foreign animal diseases. What evaluations have been conducted to assess the Nation's future needs for capacity in this area? Have these evaluations been coordinated with the National Institutes of Health, which is currently providing funding to build a number of bio-containment laboratories across the country?

A3b. The departments of Homeland Security (DHS), Health and Human Services (HHS) and Agriculture (USDA) have together determined that their interrelated bio-

defense missions with respect to agriculture security all require new research and development infrastructure that can accommodate extensive testing with a variety of animal models.

This conclusion was reinforced in two independent reports: a Report of the joint U.S. Animal Health Association/American Association of Veterinary Laboratory Diagnosticians Committee on *Diagnostic Laboratory and Veterinary Workforce Development*[1] and the *GAO Report to Congressional Committees, GAO–06–132 Plum Island Animal Disease Center*,[2] December 2005. These reports recognize the importance of having adequate facilities to counter today's agroterrorism threats. They state respectively that: over 75 percent of all emerging infectious diseases and over 80 percent of biothreat agents of concern are zoonotic; and that over 40 contagious foreign animal diseases threaten the United States' agriculture economy, the largest and most integrated in the world.

Currently, the Plum Island Animal Disease Center (PIADC) provides the only U.S. research and confirmatory diagnostic capability for high-consequence foreign animal diseases. It is also the only laboratory in the United States equipped with research facilities that permit study of these diseases in livestock, such as cattle, sheep and swine. The proposed National Bio- and Agro-defense Facility (NBAF) would replace the existing PIADC facility and enhance capabilities to meet the mandated national bio- and agro-defense mission requirements of DHS, HHS and USDA.

NBAF is envisioned to provide the Nation with the first integrated agricultural, zoonotic disease and public health research, development, testing and evaluation facility with the capability to address threats from human pathogens, high-consequence zoonotic disease agents, and foreign animal disease.

Site criteria and requirements for NBAF were developed by an interagency technical working group, including DHS, USDA, and HHS to evaluate sites that would best support research in high-consequence animal and zoonotic diseases in support of Homeland Security Presidential Directives, HSPD–9 and HSPD–10.

Q4. Funding for research on decontamination technologies and protocols appears to be receiving less attention than in prior budget requests. The FY06 budget request for DHS called for a reduction in funding for building decontamination research and development (R&D) programs, and the FY07 DHS budget request contained little reference to decontamination programs. What will be DHS's role in addressing the remaining challenges to decontamination of chemical agents in FY07? How will this be coordinated with the Environmental Protection Agency?

A4. In the chemical countermeasures program, the emphasis on decontamination has not decreased. Rather, it increases from FY 2005 through FY 2007. In FY 2005, our budget for decontamination was $800,000. Our FY 2006 decontamination budget is $8.8 million and our FY 2007 request is $9 million.

The decontamination program consists of two major components. The first is a Facility Restoration Demonstration Program, which concludes in FY 2008. It will provide guidance on the use of decontamination technologies for restoration after a chemical attack. The guidance will be developed in concert with transit facility Los Angeles International Airport (LAX) management and transition to other similar operational situations. EPA participates on the advisory board for this demonstration program.

The second program is a research and development (R&D) program to develop approaches to fill gaps in our ability to decontaminate persistent chemicals. This R&D program increases substantially from FY 2006 to FY 2007. In FY 2006, our budget for decontamination R&D is $2.9 million, and the budget request for FY 2007 is $4 million.

The program addresses emerging threat materials (such as non-traditional agents) and specific operational gaps. EPA is a key partner in this effort. The Science and Technology (S&T) Directorate and the EPA's Homeland Security Research Center hold annual joint workshops to coordinate programs such as this.

Additionally the S&T Directorate works closely with the EPA on related projects that provide the capability to conduct analysis of environmental samples in the wake of a chemical attack, which is an important adjunct to decontamination in the restoration process. Specifically, the Department and the EPA are working together to ensure that the DHS-developed mobile laboratory will be consistent with EPA practice when it transitions to EPA.

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[1] Report of the USAHA/AAVLD Committee on Diagnostic Laboratory and Veterinary Workforce Development, *http://www.usaha.org/committees/reports/2005/report-lwwi-2005.pdf*

[2] GAO Report to Congressional Committees, GAO–06–132 Plum Island Animal Disease Center, December 2005.

DHS is also establishing, in FY 2006 and FY 2007, prototype fixed laboratories that can analyze environmental samples that contain chemical warfare agents. These laboratories will be established in the Washington, D.C. and New York City regions for eventual transition to EPA stewardship. Multiple agencies, including EPA and the Department of Defense (DOD), have joined with the S&T Directorate to develop this capability.

Q5. When DHS develops a useful new technology, like BioWatch, that gets deployed into an essential national system, the DHS S&T Directorate then has to allocate an increasing proportion of its R&D budget to maintaining and operating this new system. Can the S&T Directorate hand these new technologies off to somewhere else within DHS? How will this be managed in the future as new technologies are purchased, installed, and maintained by cities and other local communities?

A5. To the extent that the S&T Directorate is responsible for maintaining and operating the systems that arise out of the technology it develops, the directorate has to allocate an increasing portion of its research and development (R&D) budget for these activities. Ideally, this would be addressed by transitioning the systems' operation to a DHS operational directorate or to end users. The S&T Directorate has looked closely at this transition issue for the BioWatch system, since its maintenance and operation requires about 25 percent of the Biological Countermeasures Portfolio budget. A *'BioWatch Transition Study'* concluded that in its current form, BioWatch requires considerable technical support for its operations and in evolving its concept-of-operations. Hence, it is not yet ready for transition. We believe that once we develop and field the fully autonomous Gen-3 BioWatch system, that it would be appropriate to transition BioWatch to a DHS operational directorate such as the Preparedness Directorate, and to fund that activity either directly through that directorate or the Office of Grants and Training program.

Similar considerations will apply to other systems developed by the S&T Directorate. In general, systems that are reasonably self-contained, commercial systems, can be transferred to operational directorates. Systems that are still evolving and require considerable scientific reach-back for their routine operations, are best retained within the S&T Directorate.

Q6. The Homeland Security Act of 2002 *requires DHS to establish a Homeland Security Institute (HSI) to provide analytical services, including risk assessment and vulnerability modeling. What tasks has it accomplished to date? Please provide examples. What projects are planned for FY06 and FY07? Have other units of DHS utilized HSI's capabilities? How are those projects funded?*

A6. To date, the Homeland Security Institute (HSI) has developed and continues to refine core capabilities in the areas outlined in the *Homeland Security Act of 2002;* including systems analysis, risk-consequence-vulnerability analyses, operational and capability assessments, multi-faceted threat evaluations, economic and policy analysis, alternative investment comparisons, and simulations. As envisioned by Congress, the HSI is developing rigorous independent concepts, like an overarching risk management methodology and decision-support tool to help prioritize programs which are currently being incorporated in the Science and Technology (S&T) Directorate and are planned for roll-out in the DHS planning process.

At the request of a variety of DHS sponsors, the HSI studies and analyzes germane topics like Wide Area Biological Restoration, Sector Specific Infrastructure R&D Needs, Illegal Immigration Modeling, Improvised Explosive Devices Scenario Modeling, and other similarly focused issues. HSI has also been working with various standards committees to help foster development and promote community-wide acceptance of homeland security related standards. HSI was also funded to assess Urban Bio-Monitoring Architecture, Vulnerability of the Global Positioning System Network, Advances in Red Teaming Methods, in addition to evaluating the readiness of federal assets like the National Science and Technology Threat Assessment and Reachback Support Center and the federal laboratory network.

HSI continues to reach out and build its understanding of the homeland security complex through interactions and funded tasks with the various DHS operating elements like the Office of Policy, the Office of Intelligence and Analysis, Customs and Border Protection, the Office of Grants and Training, the Coast Guard, and the DHS Preparedness Directorate. Through these diverse interactions, HSI develops knowledge to describe strategic processes and interactions. This knowledge, in turn, helps HSI to build overarching frameworks for DHS processes that can emphasize the particular requirements within the various operating elements and identify synergies throughout the Department.

Each year, the S&T Directorate and the Institute, in coordination with the Assistant Secretary for Policy, the Under Secretary for Preparedness, and the Chief Intelligence Office, work together to develop an annual research plan. This plan supports projects that serve the entire Department by performing research and analysis needed to address the Department's most critical and strategic initiatives, such as those outlined in the Department's Integrated Planning Guidance (IPG). The $10 million annual core funding investments reflect the Secretary's five priorities: improving preparedness; strengthening the borders and reforming immigration; increasing information sharing with its partners; enhancing transportation security through more efficient and secure system control; and strengthening the Department's organization to maximize its performance.

The S&T Directorate funds HSI core tasks, while analytic tasks may be funded by various sponsors throughout DHS including the S&T Directorate. Core tasks are intended to be cross-cutting in nature and scoped to address broader and longer-term research needs and strategic issues of the Department. Analytic tasks support more immediate research that is focused on specific issues. In FY 2005, the S&T Directorate funding was more than double that of the FY 2004 funding level; and the S&T core funding represented 67 percent of the total funding. The FY 2006 funding for HSI includes the same amount of core funding as FY 2005; but the FY 2006 funding ratios are about 45 percent S&T core, 25 percent S&T analytic, and 30 percent non-S&T analytic. The planned FY 2007 funding for HSI is expected to increase by 25 percent due to increased analytic task funding—predominantly from non-S&T elements within DHS.

Questions submitted by Representative Bart Gordon

Q1. The R&D summary from the President's FY 2007 budget shows that basic research funding at DHS drops by 48 percent, which is only three percent of the total R&D funding level. Also, applied research falls by 14 percent. Are you satisfied that the balance between near-term technology development and deployment and more long-term R&D is addressed satisfactorily by this budget allocation? How will DHS meet future threats unless it supports a more long range vision?

A1. The emphasis toward the development-and-deployment end of the R&D spectrum is to provide DHS agents, officers, screeners, and enforcement personnel the best counter-terror tools available in the shortest amount of time. Most of their expressed needs—such as improved detection of fraudulent documents, faster scheduling of duty assignments, more secure cargo containers, easy access to multiple databases, robust communications, information sharing protocols, user-friendly command and control techniques, simpler ways to tell if a white powder is dangerous, better identification of watercraft in harbors, even relatively simple (but meaningful) upgrades in their uniforms, protective gear, and equipment—do not require basic research or, in some cases, only require a little applied research.

However, this focus does not mean that critical, long-term issues are being abandoned. Substantial (and necessary) basic and applied research is underway in many critical areas—such as improved biometric identification techniques; reliable ways to determine hostile intent; automated video scene understanding; and detection of chemical, biological, and explosive substances in the most stressing and difficult environments. For the most critical DHS long-term needs, diligent, careful research is underway.

Because basic research programs typically have a longer timeline than applied and developmental programs, it is essential that the S&T Directorate always has a stable basic research program in areas relevant to the Department's and the S&T Directorate's strategic objectives. The S&T Directorate budget is currently focused on areas of highest risk and greatest benefit, aligned with the Department's and the S&T Directorate's strategic plans. The following shows the breakdown.

In FY 2005 approximately two percent of S&T Directorate funding went to basic research, 79 percent to applied research, and 19 percent to developmental research—very similar to our FY 2004 budget allocations. The budget allocation in FY 2006 and FY 2007 is expected to be similar. An improved method for tracking these types of allocations was established in FY 2006 and will improve the accuracy of estimates in the future. The table below shows budget allocations by PPA with actuals for FY 2005 and estimates for FY 2006 and FY 2007. Dollars shown are in thousands.

	Basic			Applied			Development		
	FY 2005 Actuals	FY 2006 Estimates	FY 2007 Estimates	FY 2005 Actuals	FY 2006 Estimates	FY 2007 Estimates	FY 2005 Actuals	FY 2006 Estimates	FY 2007 Estimates
Bio Countermeasures	2,286	3,105	2,783	$270,619	367,531	329,430	4,097	5,564	4,988
NBACC	-	-	-	32,432	-	-	-	-	-
Chemical Countermeasures	-	-	-	22,877	74,192	65,548	6,123	19,858	17,544
Explosives Countermeasures	383	1,034	2,055	5,775	15,597	31,002	9,970	26,929	53,524
Radiological and Nuclear Countermeasures	666	114	-	72,439	12,404	-	37,241	6,377	-
Threat Awareness Portfolio	-	-	-	59,097	40,547	37,957	2,949	2,023	1,894
Standards	-	-	-	36,004	34,270	21,889	399	380	242
Support to the Components	3,884	7,870	8,806	26,769	54,244	60,698	8,432	17,086	19,118
University and Fellowship Programs	766	724	603	64,219	60,732	50,605	966	914	762
Emerging Threats	-	-	-	4,994	6,931	-	713	989	3,890
Rapid Prototyping	-	-	-	23,074	13,550	-	35,933	21,100	-
Emergent and Prototypical Technology	-	-	-	-	-	15,561	-	-	-
Counter MANPADS	12,786	26,870	1,204	621	1,305	58	38,413	80,725	3,617
SAFETY Act	-	-	-	1,061	6,930	4,710	-	-	-
Office for Interoperability and Compatibility	-	-	-	6,744	26,235	29,735	-	-	-
Critical Infrastructure Protection	-	-	-	25,026	39,059	14,904	854	1,333	509
Cyber Security		-	-	6,790	6,346	8,726	10,900	10,187	14,007
R&D Consolidation	-	-	-	-	19,780	-	-	79,118	-
Total	$20,770	$39,716	$15,452	$658,543	$779,654	$670,822	$156,989	$272,583	$120,096

Q2. The Science Committee has advocated that DHS allot greater resources to cyber security research, and this budget request does provide a 47 percent funding increase. Unfortunately this is from a very small base, so that the funding for cyber security, $23 million, is only about two percent of the Science and Technology Directorate's budget. Will we see efforts in the next few years toward substantial increases in cyber security research, or are you satisfied that the priority reflected by this request is consistent with addressing the potential threat to the Nation from cyber attack?

A2. We believe that our investment balance among the various technical portfolios, including cyber security, is appropriate for the resources that the S&T Directorate currently has available. The allocation of funding resources to portfolios in the S&T Directorate is based on a formal planning process that takes into consideration risks, threats, vulnerabilities, and other strategic objectives, to perform prioritization within and across technical portfolios. The Department is highly supportive of the planning approach taken by the S&T Directorate, and believes that this process results in technically sound and supportable decision-making with regards to funding allocations.

Q3. Explosives Countermeasures is one of the major components of the S&T budget. How are activities supported at DHS related to DOD efforts in this area? Also, NSF proposes a new initiative on sensors relevant to the detection of explosives. What is the nature and extent of coordination on explosives programs between NSF and DHS?

A3. Although Department of Defense (DOD) and the Department of Homeland Security (DHS) explosives threats and their associated scenarios are different, common technologies employed as explosives countermeasures can be appropriate. When appropriate, DOD and DHS have leveraged their resources and collaborated on research, development, testing and evaluation (RDT&E) efforts. For example, the Night Vision Laboratory's evaluation of Millimeter-wave and Infrared cameras to screen people for suicide bombs.

The S&T Directorate also works to coordinate explosives countermeasures programs with the National Science Foundation (NSF). The S&T Directorate plans to work with the NSF on explosives countermeasures projects relevant to the domestic improvised explosive device threat. In addition, the S&T Directorate plans to collaborate with the NSF to develop a strategic roadmap of the most promising enabling sciences.

Q4. The budget request merges the Rapid Prototyping Program with the Emerging Threats Program into the Emergent and Prototypical Technology Program. The funding for the new program, which looks at emerging threats and seeks rapid solutions, as well as provides a clearinghouse relevant to public safety technologies, is 40 percent below the previous combined funding level. What are the reasons for this funding decrease in an area that would seem to have a high priority?

A4. The Science and Technology (S&T) Directorate places high priority on identifying and assessing emerging threats and developing rapid solutions to those

threats for which countermeasures do not exist. We believe that our investment balance among the various technical portfolios, including Emergent and Prototypical Technology, is appropriate for the resources that the S&T Directorate currently has available.

Congressional appropriations for the separate portfolios in FY 2006 (Conference Report H.R. 2360, *Department of Homeland Security Appropriations Act, 2006*) were $8 million for Emerging Threats and $35 million for Rapid Prototyping, for a total of $43 million. Included in the Rapid Prototyping funding for FY 2006 was $10 million to evaluate civil aviation defense technologies and $4 million to encourage further implementation of Section 313 of the *Homeland Security Act of 2002,* and to increase the speed innovative products are being reviewed, certified, and released to market; these one-time funding actions total about 33 percent of the combined FY 2006 appropriated funding and 40 percent of the FY 2006 appropriations for Rapid Prototyping.

Q5. After a large funding decrease for FY 2006, the University Programs receives an additional four percent cut in the request. Why does this program continue on a downward path?

A5. The President's FY 2007 budget request for University Programs is $52 million. This funding will allow us to sustain six DHS Research and Education Centers of Excellence. Collectively, these centers are working on more than 150 projects, with higher education institutions that include Historically Black Colleges and Universities and other Minority Serving Institutions, State and local agencies, and industry in numerous states. Hundreds of researchers associated with these centers are conducting multidisciplinary research in risk and economic analysis of terrorism events, agricultural security, social and behavioral aspects of terrorism, and high consequence event preparedness and response. The Science and Technology (S&T) Directorate has teamed with other entities to work on topics of mutual interest. The first cooperative center is with the U.S. Environmental Protection Agency and focused on microbial risk assessment. The other is with Lawrence Livermore National Laboratory in discrete sciences. Additionally, University Programs will continue to sustain a cadre of public service-oriented scientists and engineers from undergraduates to postdoctoral scholars.