

5. RESEARCH AND DEVELOPMENT

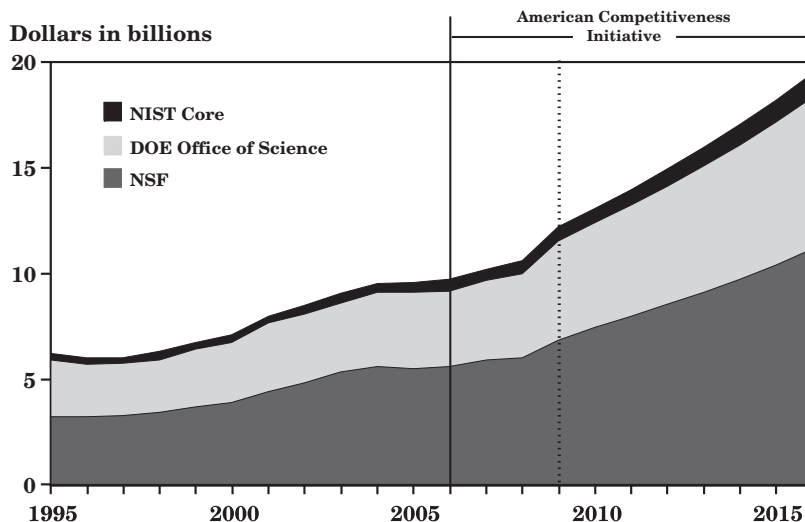
At a record \$147 billion in the President's 2009 Budget, Federal research and development (R&D) comprises one out of every seven dollars funded in the discretionary budget and 5 percent of total government spending. This substantial investment in the quest for new knowledge and future discovery will enhance U.S. economic strength, national security, and world leadership by building innovation capacity through a world-class science and technology research enterprise and a high-quality scientific and technical education infrastructure.

The relationship between support for science and economic growth is well documented. Investments in basic research lead to knowledge breakthroughs that fuel innovation, drive productivity, grow the economy, and improve our understanding of the world. Economists estimate that as much as half of post-World War II economic growth is directly due to technological progress fueled by R&D. Economic payoffs from research come in the form of process and product innovations that

reduce the costs of production, lower product prices, and result in new and better products and services. Consumers ultimately benefit from less expensive, higher quality and more useful products and services. Today's transforming technologies and most popular consumer items have deep roots in basic and applied research.

Under this Administration, Federal R&D is being increased 61 percent, from \$91 billion in 2001 to the \$147 billion in this year's request. To sustain the nation's economic competitiveness, the President, in his 2006 State of the Union address, presented a long-term vision to strengthen Federal support for the Nation's innovation enterprise in an integrated package of investments and policies called the American Competitiveness Initiative (ACI). President Bush remains firmly committed to the fulfillment of that vision and seeks to continue that implementation of the ACI in the 2009 Budget.

Chart 5-1. American Competitiveness Initiative Research



I. THE AMERICAN COMPETITIVENESS INITIATIVE

The President's 2009 Budget maintains a strong commitment to invest in basic research areas that advance knowledge and technologies used by scientists in nearly every field. Through the ACI, the President plans to double, over 10 years, investment in innovation-ena-

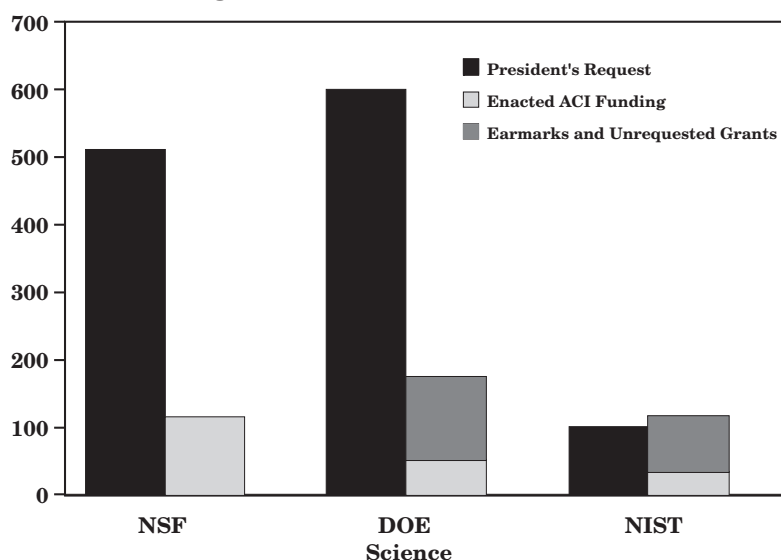
bling research at three Federal agencies—the National Science Foundation (NSF), the Department of Energy's (DOE's) Office of Science, and the Department of Commerce's National Institute of Science and Technology (NIST) laboratories.

In 2009, the third year of the ACI, President Bush proposes \$12.2 billion total for NSF, DOE's Office of Science, and NIST laboratories, an overall funding increase of \$1.6 billion, or 15 percent, above the 2008 enacted total of \$10.6 billion. Unfortunately, the 2008 omnibus appropriations bill drastically cut proposed

ACI research increases, funding only one-third of the President's requested increase. In addition, Congress directed over half of the enacted increase (\$207 million of a total \$408 million increase) to earmarks and an unrequested new grants program.

Chart 5-2. 2008 ACI Research Funding

Increase in funding above 2007 in millions of dollars



This outcome greatly impairs the Administration's efforts to strengthen long-term economic competitiveness through support for innovation-enabling basic research in the physical sciences and engineering. President Bush's call for doubling of these research levels had been roundly supported by business and academic lead-

ers and embraced by Congress when it enacted the bipartisan America COMPETES Act (Public Law 110-69). The President's Budget continues funding for ACI research on its doubling path to ensure this consensus national priority objective is realized.

Research Agencies in the American Competitiveness Initiative

The National Science Foundation is the primary source of support for academic research in the physical sciences, funding basic research in areas such as nanotechnology, advanced networking and information technology, physics, chemistry, materials science, mathematics, and engineering. It also is well regarded for funding nearly all of its research through a competitive, peer-reviewed process. The increase in NSF funding will support many more researchers, students, post-doctoral fellows and technicians contributing to the innovation enterprise.

The Department of Energy's Office of Science supports grants and infrastructure for a wide range of basic research related to economically significant innovations including nanotechnology, biotechnology, high-end computing and advanced networking, and energy technologies. The 2009 Budget increases funding for both research and cutting-edge facilities, meets the United States' contribution to the international fusion energy project known as ITER, upgrades the nuclear physics accelerator at the Thomas Jefferson lab in Virginia, accelerates strategic basic research for electrical energy storage and an advanced nuclear fuel cycle, and reorganizes and reforms the radioisotope production and application programs within the Department.

The Department of Commerce's National Institute of Standards and Technology (NIST) invests in technological innovation through research and standards development. These investments will improve NIST's research capabilities by providing high performance laboratory space for diverse research fields and world-class researchers; aid the responsible development of nanotechnology manufacturing; expand NIST's neutron facility to aid in characterizing novel materials in high-growth research fields; and improve our understanding of complex biological systems to accelerate innovations and enable investment in biosciences, including disease diagnosis and treatment.

II. IMPROVING THE PERFORMANCE OF R&D PROGRAMS

R&D is critically important for keeping our Nation economically competitive, and it will help solve the challenges we face in health, defense, energy, and the environment. Therefore, every Federal R&D dollar must be invested as effectively as possible.

R&D Investment Criteria

The Administration continues to improve the effectiveness of the Federal Government's investments in R&D by applying transparent investment criteria in analyses that inform recommendations for program funding and management. R&D performance assessment must be done with care. Research often leads scientists and engineers down unpredictable pathways with unpredictable results. This outcome can require special consideration when measuring an R&D program's performance against its initial goals.

With this in mind, the Administration is improving methods for setting priorities based on expected results, and is asking agencies to apply specific criteria that programs or projects must meet to be started or continued and supply clear milestones for gauging progress and improved metrics for assessing results.

As directed by the President's Management Agenda, the R&D Investment Criteria accommodate the wide range of R&D activities, from basic research to development and demonstration programs, by addressing three fundamental aspects of R&D:

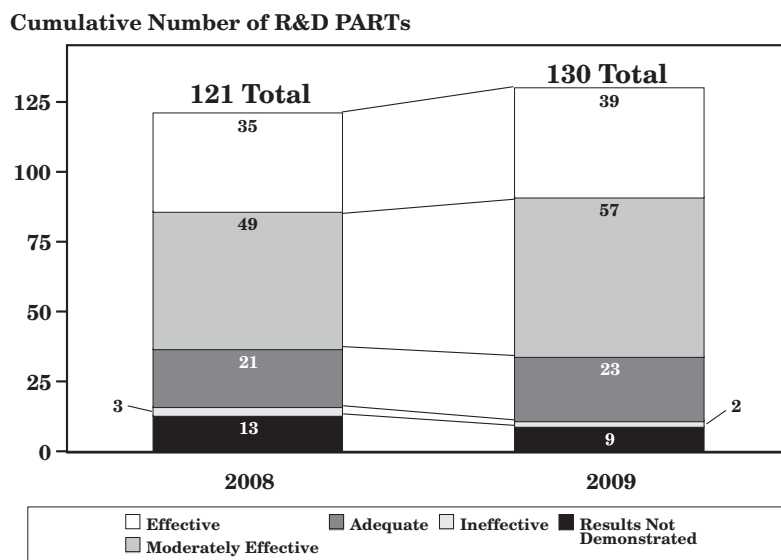
- *Relevance*—Programs must be able to articulate *why* they are important, relevant, and appropriate for Federal investment;
- *Quality*—Programs must justify *how* funds will be allocated to ensure quality; and

- *Performance*—Programs must be able to monitor and document *how well* the investments are performing.

In addition, R&D projects and programs relevant to industry are expected to apply criteria to determine the appropriateness of the public investment, enable comparisons of proposed and demonstrated benefits, and provide meaningful decision points for completing or transitioning the activity to the private sector.

As part of the President's Management Agenda's Performance Improvement initiative, the Administration uses the Program Assessment Rating Tool (PART) to consistently assess the effectiveness of programs. A section of the PART specifically addresses the assessment of R&D program management and performance and is aligned with the R&D Investment criteria. In the last six years, agencies completed 1,016 PART assessments, of which 130 were for R&D programs. The results of these PART assessments may be found on the web at www.expectmore.gov.

Performance assessments help policy makers identify those programs that are the most effective and worthy of funding; however, the Administration does not allocate funding levels and initiate management reforms strictly by formula or based solely on PART results. For instance, funding may be reduced for programs rated Effective by the PART that have achieved what they set out to do, and programs rated Ineffective by the PART might receive more money if it is clear it would help them become more effective. The PART provides information that leads to more informed decisions.

Chart 5-3. Scores of R&D PART Assessments

Research Earmarks

President Bush called on Congress to reform the earmark process, proposing a series of reforms that include full disclosure for each earmark and cutting the total number and cost of all earmarks by at least half. Consistent with this effort, the Administration is continuing its strong support for awarding research funds based on merit review through a competitive process refereed by scientists. Such a system has the best prospects for ensuring that the top research is supported. Research earmarks—in general the assignment of money during the legislative process for use by a specific organization or project—are counter to a merit-based competitive selection process. Earmarks signal to potential investigators that there is an acceptable alternative to creating quality research proposals for merit-based consideration. Such an alternative can be an ineffective use of taxpayer funds.

Unfortunately, the practice of earmarking funds to colleges, universities, and other entities for specific research projects expanded in recent years. Some argue that earmarks help spread the research money to states or institutions that would receive less research funding through other means. However, *The Chronicle of Higher Education* has reported that this is not the main role earmarks play. Often only a minor portion of academic earmark funding goes to the states with the smallest shares of Federal research funds.

Some proponents of earmarking assert that earmarks provide a means of funding unique projects that would not be recognized by the conventional peer-review process. To address this concern, a number of research agencies have procedures and programs to reward “out-

of-the-box” thinking. For example, the Defense Advanced Research Projects Agency, within the Department of Defense, seeks out high-risk, high-payoff scientific proposals, the National Institutes of Health has established a similarly focused “Pioneer Award,” and program managers at NSF set aside a share of funding for higher-risk projects in which scientists and engineers see high potential.

Earmarks for activities that are outside of an agency’s mission can detract from an efficient and effective Federal effort on behalf of taxpayers. For instance, in 2008, the Congress has directed DOD to fund research on a wide range of diseases including diabetes, autism, and muscular dystrophy. Funding for unrequested medical research projects in DOD’s budget totals about \$800 million in 2008 alone. While research on these diseases is very important, these diseases are not unique to the U.S. military and the research could be better selected, carried out and coordinated within civil medical research agencies without disruption to the military mission. At the same time, intrusion of earmarks into the peer-review processes of civilian medical research agencies would have a significant detrimental impact on ensuring that the most important and promising research is chosen by medical research professionals with access to information on the most promising research opportunities.

Earmarks that divert funding from a merit-based process undermine America’s research productivity. The Administration commends Congress for taking measures to protect NSF and the National Institutes of Health from this practice, a practice that should be followed throughout the R&D programs.

III. PRIORITIES FOR FEDERAL RESEARCH AND DEVELOPMENT

The 2009 Budget requests \$147 billion for Federal R&D funding, which targets key research investments within agencies, in particular, the three ACI agencies: NSF, the DOE's Office of Science, and the NIST laboratories. In addition, DOD requests \$1.7 billion for basic research, \$270 million more than was requested in the 2008 Budget. This increase is partially hidden by the earmarked funding included in the 2008 enacted level. (Table 5-1 provides details by agency.)

Multi-Agency R&D Priorities

The 2009 Budget continues to target important research investments that must be coordinated across multiple agencies. A number of these challenges are being addressed through multi-agency research efforts coordinated through the National Science and Technology Council (NSTC) and other interagency forums. The Administration will continue to analyze other areas of critical need that could benefit in the future from improved focus and coordination among agencies.

Homeland Security R&D: A robust R&D effort continues to be a key asset in advancing technologies in support of the President's national strategy for homeland security. The United States derives much of its ability to thwart and recover from these threats via its advantage in the realm of science and technology (S&T), and we must continue to use this advantage and encourage innovative R&D to assist in protecting and defending against the range of natural and man-made threats confronting the country. Though there have been numerous achievements over the past five years to improve the Nation's counterterrorism capability, many challenges remain.

The Administration's annual R&D budget priorities memorandum summarizes priorities from the Administration's homeland security strategies that should be addressed via multi-agency coordination. For example, in response to the 2007 memo, agencies:

- advanced biometric capabilities as outlined in *The National Biometrics Challenge*, and established policy for agency adoption of biometric standards that will enable real-time, verifiable, interoperable, and privacy-protecting root identification;
- improved radiation portal monitors and developed standards for technologies that detect nuclear and radioactive material before it enters the U.S.;
- developed more sensitive environmental sensors to quickly detect the presence of biological or toxic agents; and
- integrated modeling efforts for high consequence foreign animal diseases, including avian influenza and foot and mouth disease, to facilitate coordinated response planning and guide countermeasure R&D investments.

The 2009 Budget provides continued support for these and many other interagency R&D programs, including: pursuing stand-off detection and imaging capabilities to locate and identify nuclear threat materials at a

distance; improving the capability to detect and mitigate the use of improvised explosive devices in the U.S.; continuing the implementation of the 2008-2012 R&D plan for high-consequence foreign animal diseases; and accelerating the advanced development of critical medical countermeasures that do not have a pre-existing market to stimulate their development.

Networking and Information Technology R&D: The Budget provides \$3.6 billion for the multi-agency Networking and Information Technology Research and Development (NITRD) Program, which plans and coordinates agency research efforts in advanced networking, cyber security, high-end computing systems, software development, high-confidence systems, information management, and other information technologies. Advances in information technology contribute both to accelerating progress in scientific research and to U.S. economic competitiveness. Federal agencies coordinate their R&D investments in the NITRD Program to avoid unnecessary duplication and to help ensure that the investments have maximum impact.

The NITRD agencies focused on implementing the recommendations contained in both the Federal Plan for High-End Computing and the Federal Plan for Cyber Security and Information Assurance R&D in 2007, and will complete the Federal Plan for Advanced Networking R&D in early 2008. Also in 2007, the President's Council of Advisors on Science and Technology (PCAST) issued a report reviewing the NITRD program and providing recommendations for the future. The Federal agencies are evaluating these recommendations and will begin implementation in 2008.

The 2009 Budget sustains a substantial level of investment in high-end computing research for large-scale scientific and national security applications, particularly in scalable systems software and applications that can capitalize on emerging architectures based on processing units with many computational cores. The 2009 Budget also increases support for investments in innovative research in both cyber security and advanced networking R&D that have the potential to transform the Internet into a more secure and reliable interconnected network to support both commerce and high-speed data transfers for scientific applications. Reports and general information about NITRD are available at www.nitrd.gov/.

Nanotechnology R&D: The Budget provides \$1.5 billion for the multi-agency National Nanotechnology Initiative (NNI). The NNI focuses on R&D that creates materials, devices, and systems that exploit the fundamentally distinct properties of matter as it is manipulated at the atomic and molecular levels. The results of NNI-supported R&D are already leading to breakthroughs in disease detection and treatment, manufacturing at or near the nanoscale level, environmental monitoring and protection, energy production and storage, and creating electronic devices that have even greater capabilities than those available today. Re-

search opportunities cover a similarly broad spectrum. Advances that will be foundational for all aspects of nanotechnology R&D in particular include: instrumentation for characterizing nanoscale materials in the laboratory, in the body, and in the environment; and computational research to model and predict properties at the nanoscale, for designing novel materials, and for determining their behavior under various conditions and environments.

Guided by the NNI Strategic Plan, participating agencies will continue to support discovery, development and application of nanotechnology through investigator-led fundamental and applied research; multi-disciplinary centers of excellence; education and training of nanotechnology researchers, teachers, workers, and the public; and infrastructure and standards development, including user facilities and networks that are broadly available to support research and innovation. In addition, agencies continue to maintain a focus on the responsible development of nanotechnology, with attention to the human and environmental health impacts, as well as ethical, legal, and other societal issues.

These activities will be appropriately coordinated with stakeholders outside of the Federal government, including industry, academia, and other governments. Agency investments in nanotechnology R&D are informed by the NSTC's Nanoscale Science, Engineering, and Technology Subcommittee and by outside reviews of the PCAST and the National Research Council. Reports of these Federal and non-Federal bodies help to identify and prioritize research, including in the area of environmental, health, and safety aspects of nanotechnology. Reports and general information about the NNI are available at www.nano.gov/.

Climate Change R&D: The 2009 Budget for the Climate Change Science Program (CCSP) continues to support the implementation of the CCSP Strategic Plan, which was released in July 2003. The 13 departments and agencies that participate in the CCSP coordinate preparation of the budget and program implementation. During 2009, the CCSP will continue research into important physical science aspects of climate change, including scientific uncertainties and preparation of a series of *Synthesis and Assessment* reports. In addition, added emphasis will be placed on the impacts of climate change and the science of adaptation. Working within the overarching priorities defined in the Strategic Plan, the CCSP's interagency coordination and integration efforts will give particular emphasis in FY 2009 to the following climate change research issues: development of an integrated earth system analysis capability; a focus toward creating a high-quality record of the state of the atmosphere and ocean since 1979; development of an end-to-end hydrologic projection and application capability; enhanced carbon cycle research on high latitude systems; quantification of climate forcing and feedbacks by aerosols, non-carbon dioxide greenhouse gases, water vapor, and clouds; assessment of abrupt change in a warming climate; examination of the feasibility of development an abrupt

change early warning system; and ecological forecasting.

The program expects to receive input from the National Research Council under the terms of a continuing advisory agreement. This advice will include review of several CCSP Synthesis and Assessment Products. The CCSP will continue to track deliverables and milestones for each of its programs in order to assess overall performance. Additional detail on individual agency activities will be provided in the Administration's 2009 edition of *Our Changing Planet*. Reports and general information about the CCSP are available on the program's website: www.climatescience.gov/.

The Climate Change Technology Program (CCTP) continues to provide strategic direction, planning, and analysis to help coordinate and prioritize activities within the portfolio of federally funded climate change technology R&D consistent with the President's National Climate Change Technology Initiative (NCCTI). The CCTP has published a Vision and Framework for Strategy and Planning and a Strategic Plan that outlines the program's goals and priorities. The CCTP has also identified within its portfolio a subset of NCCTI priority activities, defined as discrete R&D activities that address technological challenges, which, if solved, could advance technologies with the potential to dramatically reduce, avoid, or sequester greenhouse gas emissions. In 2009, CCTP will continue to focus on implementing the elements of its Vision and Framework document and Strategic Plan. Reports and general information about the CCTP are available on the program's website: www.climateotechnology.gov/.

The CCSP and CCTP will continue to coordinate implementation of relevant climate change provisions in the 2005 Energy Policy Act as appropriate.

Ocean Research: The 2009 Budget supports ocean and coastal research as outlined in *Charting the Course for Ocean Science in the United States for the Next Decade: An Ocean Research Priorities Plan and Implementation Strategy*. Developed by the NSTC's Joint Subcommittee on Ocean Science and Technology, the plan provides a framework for an ocean observing system that will accurately describe marine conditions in real-time, enhance our capability to forecast ocean processes, and provide scientific support for ecosystem-based management. These three overarching goals will maintain U.S. leadership in ocean technology and enhance U.S. competitiveness. These goals are supported by 20 national ocean research priorities, established with extensive community input and oriented around the most compelling societal issues. The Joint Subcommittee on Ocean Science and Technology will coordinate multi-agency research into key aspects of the oceans, coasts and Great Lakes and work closely with the other coordinating bodies of the President's Ocean Action Plan.

Biomass R&D: The Biomass R&D Act of 2000 established the Biomass R&D Board to guide interagency coordination and bring coherence to Federal strategic planning on biomass-related issues. The Board is com-

pleting an interagency coordination and planning document that will be reviewed by the National Academy of Sciences. In addition to assessing the goals and plans for interagency biomass research, the Academy will be tasked with considering economic and other impacts of increased biomass utilization under various energy price and policy scenarios. Additional information on the Biomass R&D Board is available online at www.biomass.govtools.us.

Stimulating Private Investment

Along with direct spending on R&D, the Federal Government has sought to stimulate private R&D investment through incentives in the Internal Revenue Code.

A long-standing credit, which had provided a 20-percent tax credit for private research and experimentation expenditures above a certain base amount, expired at the end of December 2007. The Administration again proposes making the enhanced Research and Experimentation tax credit permanent starting in 2008. The proposed extension will cost \$55 billion over the period from 2008 to 2013. In addition, a permanent tax provision lets companies deduct, up front, the costs of certain kinds of research and experimentation, rather than capitalize these costs. Also, equipment used for research benefits from relatively rapid tax depreciation allowance.

IV. FEDERAL R&D DATA

Federal R&D Funding

R&D is the collection of efforts directed towards gaining greater knowledge or understanding and applying knowledge toward the production of useful materials, devices, and methods. R&D investments can be characterized as basic research, applied research, development, R&D equipment, or R&D facilities, and the Office of Management and Budget has used those or similar categories in its collection of R&D data since 1949.

Basic research is systematic study directed toward a fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. Basic research, however, may include activities with broad applications in mind.

Applied research is systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met.

Development is systematic application of knowledge or understanding, directed toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

Research and development equipment includes acquisition or design and production of movable equipment, such as spectrometers, research satellites, detectors, and other instruments. At a minimum, this cat-

egory should include programs devoted to the purchase or construction of R&D equipment.

Research and development facilities include the acquisition, design, and construction of, or major repairs or alterations to, all physical facilities for use in R&D activities. Facilities include land, buildings, and fixed capital equipment, regardless of whether the facilities are to be used by the Government or by a private organization, and regardless of where title to the property may rest. This category includes such fixed facilities as reactors, wind tunnels, and particle accelerators.

There are over twenty Federal agencies that fund R&D in the U.S. The nature of the R&D that these agencies fund depends on the mission of each agency and on the role of R&D in accomplishing it. Table 5-1 shows agency-by-agency spending on basic and applied research, development, and R&D equipment and facilities.

The "Federal Science and Technology" (FS&T) budget (shown in Table 5-2) highlights the creation of new knowledge and technologies more consistently and accurately than the overall R&D data. The FS&T budget emphasizes research; does not count funding for defense development, testing, and evaluation; and totals less than half of Federal R&D spending. The 2009 Budget requests \$62 billion for FS&T.

Table 5-1. FEDERAL RESEARCH AND DEVELOPMENT

(Budget authority, dollar amounts in millions)

	2007 Actual	2008 Estimate	2009 Proposed	Dollar Change: 2008 to 2009	Percent Change: 2008 to 2009
By Agency					
Defense	78,329	80,192	80,494	302	0%
Health and Human Services	29,201	29,475	29,480	5	0%
NASA	9,952	10,436	10,737	301	3%
Energy	8,522	9,739	10,558	819	8%
National Science Foundation	4,479	4,500	5,201	701	16%
Homeland Security	1,246	1,143	3,287	2,144	188%
Agriculture	2,275	2,309	1,952	-357	-15%
Commerce	1,080	1,113	1,157	44	4%
Transportation	768	823	901	78	9%
Veterans Affairs	892	960	884	-76	-8%
Interior	604	676	617	-59	-9%
Environmental Protection Agency	606	557	550	-7	-1%
Other	1,118	1,140	1,145	5	0%
TOTAL	139,072	143,063	146,963	3,900	3%
Basic Research					
Defense	1,525	1,634	1,699	65	4%
Health and Human Services	15,646	15,897	15,884	-13	0%
NASA	1,786	2,104	1,912	-192	-9%
Energy	3,123	3,232	3,556	324	10%
National Science Foundation	3,635	3,689	4,336	647	18%
Homeland Security	247	248	276	28	11%
Agriculture	893	856	798	-58	-7%
Commerce	142	96	176	80	83%
Transportation	2	3	3		
Veterans Affairs	358	385	354	-31	-8%
Interior	34	43	40	-3	-7%
Environmental Protection Agency	101	97	95	-2	-2%
Other	196	188	190	2	1%
SUBTOTAL	27,688	28,472	29,319	847	3%
Applied Research					
Defense	5,103	5,058	4,245	-813	-16%
Health and Human Services	13,405	13,414	13,424	10	0%
NASA	947	974	919	-55	-6%
Energy	2,630	3,513	3,474	-39	-1%
National Science Foundation	357	340	422	82	24%
Homeland Security	434	382	381	-1	0%
Agriculture	1,072	1,103	922	-181	-16%
Commerce	637	731	737	6	1%
Transportation	562	576	614	38	7%
Veterans Affairs	482	519	478	-41	-8%
Interior	510	549	513	-36	-7%
Environmental Protection Agency	415	379	370	-9	-2%
Other	576	574	588	14	2%
SUBTOTAL	27,130	28,112	27,087	-1,025	-4%
Development					
Defense	71,641	73,358	74,393	1,035	1%
Health and Human Services	22	22	22		
NASA	5,576	5,436	5,731	295	5%
Energy	1,973	2,232	2,472	240	11%
National Science Foundation					
Homeland Security	434	365	380	15	4%
Agriculture	195	195	186	-9	-5%
Commerce	83	76	68	-8	-11%
Transportation	185	225	264	39	17%
Veterans Affairs	52	56	52	-4	-7%
Interior	55	62	62		
Environmental Protection Agency	90	81	85	4	5%
Other	300	324	298	-26	-8%
SUBTOTAL	80,606	82,432	84,013	1,581	2%
Facilities and Equipment					
Defense	60	142	157	15	11%
Health and Human Services	128	142	150	8	6%

Table 5-1. FEDERAL RESEARCH AND DEVELOPMENT—Continued

(Budget authority, dollar amounts in millions)

	2007 Actual	2008 Estimate	2009 Proposed	Dollar Change: 2008 to 2009	Percent Change: 2008 to 2009
NASA	1,643	1,922	2,175	253	13%
Energy	796	762	1,056	294	39%
National Science Foundation	487	471	443	-28	-6%
Homeland Security	131	148	2,250	2,102	1420%
Agriculture	115	155	46	-109	-70%
Commerce	218	210	176	-34	-16%
Transportation	19	19	20	1	5%
Veterans Affairs					
Interior	5	22	2	-20	-91%
Environmental Protection Agency					
Other	46	54	69	15	28%
SUBTOTAL	3,648	4,047	6,544	2,497	62%

Table 5-2. FEDERAL SCIENCE AND TECHNOLOGY BUDGET

(Budget authority, dollar amounts in millions)

	2007 Actual	2008 Estimate	2009 Proposed	Dollar Change: 2008 to 2009	Percent Change: 2008 to 2009
By Agency					
National Institutes of Health	28,880	29,307	29,307		
Energy ¹	6,200	7,226	7,627	401	6%
Science Programs	3,797	3,973	4,722	749	19%
Electricity Transmission & Distribution	97	110	100	-10	-9%
Nuclear Energy	540	962	854	-108	-11%
Energy Efficiency and Renewable Energy Resources ²	1,176	1,440	1,197	-243	-17%
Fossil Energy R&D ³	590	741	754	13	2%
National Science Foundation	5,917	6,032	6,854	822	14%
Defense	6,628	6,692	5,944	-748	-11%
Basic Research	1,525	1,634	1,699	65	4%
Applied Research	5,103	5,058	4,245	-813	-16%
NASA	6,148	5,911	5,517	-394	-7%
Science	4,610	4,627	4,442	-185	-4%
Aeronautics	594	505	447	-58	-11%
Exploration Systems ⁴	755	654	452	-202	-31%
Innovative Partnerships	189	125	176	51	41%
Agriculture	2,158	2,156	1,921	-235	-11%
CSREES Research and Education ⁵	674	672	539	-133	-20%
Economic Research Service	75	77	82	5	6%
Agricultural Research Service ⁶	1,129	1,121	1,037	-84	-7%
Forest Service: Forest and Rangeland Research	280	286	263	-23	-8%
Commerce	891	1,008	1,012	4	0%
NOAA: Oceanic & Atmospheric Research	398	398	378	-20	-5%
NIST Intramural Research and Facilities	493	610	634	24	4%
Interior (USGS)	988	1,006	969	-37	-4%
Veterans Affairs ⁷	892	891	884	-7	-1%
Environmental Protection Agency ⁸	764	786	790	4	1%
Transportation	560	577	601	24	4%
Highway research: Federal Highway Administration ⁹	430	430	430		
Federal Aviation Administration: Research, Engineering, and Development	130	147	171	24	16%
Education	342	337	344	7	2%
Special Education Research and Innovation	72	71	71		
National Institute on Disability and Rehabilitation Research	107	106	106		
Research, Development, and Dissemination ¹⁰	163	160	167	7	4%
Total	60,368	61,929	61,770	-159	-0.3%

¹ Data do not reflect actual transfers to Science Programs from other Department of Energy R&D programs to support the Small Business Innovation Research and the Small Business Technology Transfer programs.

² Excludes Weatherization, State grants, and intergovernmental activities.

³ Excludes funding for the Alaska Natural Gas Pipeline project.

⁴ Exploration Systems includes the Exploration Technology Development Program, the Human Research Program, and the Lunar Precursor Robotic Program.

⁵ Includes the appropriation of earnings from the Native American Endowment Fund, but not the appropriation to the Endowment's principal.

⁶ Excludes building and facilities. Also excludes \$3 million transfer to the account in 2007.

⁷ Includes the medical care and prosthetic research appropriation and research support from the VA medical care appropriations. In 2008, \$69 million in emergency funding provided to the Medical and Prosthetics Research account by the Consolidated Appropriations Act of 2008.

⁸ Science and Technology, plus superfund transfer.

⁹ According to the process established in section 1102(f) of SAFETEA-LU, FHWA annually adjusts the research funding level from the appropriated obligation limitation.

¹⁰ Does not include funding for Regional Educational Labs.

Table 5-3. AGENCY DETAIL OF SELECTED INTERAGENCY R&D EFFORTS

(Budget authority, dollar amounts in millions)

	2007 Actual	2008 Estimate	2009 Proposed	Dollar Change: 2008 to 2009	Percent Change: 2008 to 2009
Networking and Information Technology R&D:					
Defense	1,194	1,267	1,242	-25	-2%
National Science Foundation	909	931	1,090	159	17%
Health and Human Services ¹	566	556	555	-1	0%
Energy	349	436	494	58	13%
Commerce	76	85	90	5	6%
National Aeronautics and Space Administration	91	86	84	-2	-2%
Environmental Protection Agency	6	6	6	.....	.....
National Archives and Records Administration	4	5	5	.....	.....
TOTAL	3,195	3,372	3,566	194	6%
National Nanotechnology Initiative:					
Defense	450	487	431	-56	-11%
National Science Foundation	389	389	397	8	2%
Energy	236	251	311	60	24%
Health and Human Services ²	222	232	232	.....	.....
Commerce (NIST)	88	89	110	21	24%
National Aeronautics and Space Administration	24	24	24	.....	.....
Environmental Protection Agency	8	10	15	5	50%
Agriculture	7	11	8	-3	-27%
Justice	2	2	2	.....	.....
Transportation	1	1	1	.....	.....
Homeland Security	2	1	1	.....	.....
TOTAL	1,429	1,497	1,532	35	2%
Climate Change Science Program:					
National Aeronautics and Space Administration	1,084	1,078	1,204	126	12%
Commerce (NOAA)	184	240	260	20	8%
National Science Foundation	207	205	221	16	8%
Energy	126	128	146	18	14%
Agriculture	61	65	62	-3	-5%
National Institutes of Health	47	47	47	.....	.....
Interior (USGS)	27	34	31	-3	-9%
U.S. Agency for International Development	14	14	20	6	43%
Environmental Protection Agency	16	20	16	-4	-20%
Smithsonian	6	6	6	.....	.....
Transportation	1	1	2	1	100%
TOTAL	1,773	1,838	2,015	177	10%

¹ Includes funds from offsetting collections for the Agency for Healthcare Research and Quality.² Includes funds from both the National Institutes of Health and National Institute of Occupational Safety and Health.