

AAAS R&D Budget and Policy Program

**Congressional Action
on
Research and Development
in the
FY 2002 Budget**

**Kei Koizumi
Paul W. Turner**

in cooperation with the
Intersociety Working Group

**American Association for the
Advancement of Science**

The AAAS Board of Directors, in accordance with Association policy, has approved publication of this report as a contribution to the understanding of an important process. The interpretations and conclusions are those of the authors and do not purport to represent the views of the Board or the Council of the Association.

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Contents

Foreword	v
Intersociety Working Group	vi
PART I: Congressional Action	
Chapter 1: Highlights	3
Chapter 2: Overview of R&D Trends	5
The FY 2002 Congressional Budget Process	5
Figure 1. Trends in Federal R&D, FY 1976-2002	12
Trends in Total R&D	13
Emerging R&D Issues: Counter-Terrorism and Earmarks	14
Table A. Federal Counter-Terrorism R&D	15
Figure 2. FY 2002 Federal Counter-Terrorism R&D by Agency	16
Table B. Congressional Earmarks for R&D by Agency and Program	18
Figure 3. R&D Earmarks in FY 2002 Appropriations	19
Chapter 3: Agency R&D Budgets	21
Department of Defense	21
National Institutes of Health	24
National Aeronautics and Space Administration	26
Department of Energy	29
National Science Foundation	32
Other Agencies	34
PART II: Tables	
Table 1: Total R&D by Agency	44
Table 2: Basic Research by Agency	46
Table 3: Major Functional Categories of R&D	47
Table 4: Department of Defense, by Program	48
Table 5: Department of Defense, by Agency	49
Table 6: National Aeronautics and Space Administration	50
Table 7: Department of Energy	52
Table 8: National Institutes of Health	56
Table 9: Department of Health and Human Services	58
Table 10: National Science Foundation	59
Table 11: Department of Commerce	61
Table 12: U.S. Department of Agriculture	62
Table 13: Department of Transportation	64
Table 14: Department of the Interior	65

Table 15: Environmental Protection Agency	66
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PART III: Appendices

Appendix 1: Methodology and Data Sources	69
Appendix 2: Definitions	71
Appendix 3: Other AAAS Publications	73

Foreword

This *Congressional Action* report describes the results of congressional action on President Bush's proposed budget for research and development (R&D) for fiscal year (FY) 2002. It reviews the course of events taken by the congressional budget process during the past year and compares the congressionally approved FY 2002 funding levels for major R&D agencies and programs with the President's request and with estimated FY 2001 levels.

The *Congressional Action* report completes the series of AAAS reports on R&D in the FY 2002 budget. It is a companion piece and follow-up to *AAAS Report XXVI: Research and Development FY 2002*, published in June 2001. Supplementary information, including historical data and the complete text of both reports, is available on the AAAS R&D Web site (<http://www.aaas.org/spp/R&D>; see Appendix 3). Readers of these two reports will also be interested in the *AAAS Science and Technology Policy Yearbook 2002*, which is a collection of articles on the major science and technology policy issues of the past year. The above-named reports, as well as the three-book series from previous years, are available for purchase from the AAAS Distribution Center, P.O. Box 521, Annapolis Junction, MD 20701 (phone 1-800-222-7809; fax 301-206-9789.)

This report was prepared in collaboration with the Intersociety Working Group, whose organizations are listed on the following page, and under the auspices of the AAAS Committee on Science, Engineering, and Public Policy (COSEPP), which initiated the R&D Budget and Policy Project in 1976 and continues to oversee it. The authors are grateful to the members of these bodies who have contributed to the effort, as well as to individuals in federal agencies and on congressional staffs, especially the staff in the Energy and Science Division of the Office of Management and Budget.

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Paul W. Turner

Washington, DC
January 2002

Intersociety Working Group

(links to organization Web sites can be found on the on-line version of this book at www.aaas.org/spp/R&D)

American Association for the Advancement of Science
American Astronomical Society
American Chemical Society
American Educational Research Association
American Geological Institute
American Geophysical Union
American Institute of Aeronautics and Astronautics
American Institute of Physics
American Meteorological Society
American Physical Society
American Psychological Association
American Society of Mechanical Engineers
Association of American Universities
Consortium for Oceanographic Research and Education
Council of Professional Associations on Federal Statistics
Ecological Society of America
Federation of Behavioral, Psychological and Cognitive Sciences
Industrial Research Institute
Institute of Electrical and Electronics Engineers
National Association of State Universities and Land-Grant Colleges

Part I

Congressional Action

1

Highlights

The 107th Congress and President George W. Bush agreed to provide record increases for R&D programs throughout the federal government, and provided substantial increases to nearly all categories of R&D spending and most R&D funding agencies.

- The federal investment in research and development (R&D) exceeds \$100 billion for the first time. Federal R&D in FY 2002 totals \$103.7 billion, a \$12.3 billion or 13.5 percent increase over FY 2001 that is the largest dollar increase in history and the largest percentage increase in nearly 20 years (see Table 1).
- There are substantial increases for all the major federal R&D agencies, in contrast to proposed cuts for most agencies in the Bush Administration's April budget request (see Table 1). The largest dollar and percentage increases go to the two largest R&D funding agencies, the Department of Defense (DOD) and the National Institutes of Health (NIH), reflecting the high priority placed on defense and health by the Bush Administration and Congress.
- There are large increases for basic and applied research in FY 2002, especially in NIH. The total federal investment in research is \$48.2 billion, an increase of 11.0 percent or \$4.8 billion over FY 2001 (see Table 2). NIH remains the largest single sponsor of basic and applied research; in FY 2002, NIH alone will fund 46 percent of all federal support of research. All federal agencies receive increases for their research portfolios, especially agencies with defense or counter-terrorism research programs.
- In response to the terrorist attacks of September 11, terrorism-related R&D nearly triples over last year to \$1.5 billion (see Table A and Figure 2). Federal counter-terrorism R&D totals \$1.5 billion in FY 2002 (up from \$579 million in FY 2001), roughly half from regular appropriations and half from emergency appropriations out of a \$40 billion post-September 11 emergency response fund.

4 *Highlights*

- R&D for all national missions increases, with especially large boosts for defense and health R&D (see Table 3). In defense, DOD S&T investments exceed \$10 billion for the first time to reach \$10.5 billion (up 11.8 percent), while funding for missile defense development nearly doubles. In health, the NIH budget remains on track to double between FY 1998 and FY 2003 with a \$3.1 billion increase in R&D to \$22.8 billion, but NIH and the Centers for Disease Control and Prevention (CDC) also receive substantial emergency funds for bioterrorism R&D and improved laboratory facilities.
- Congress remains committed to funding R&D earmarks, congressionally designated performer-specific R&D projects that are not part of an agency's spending plan. R&D earmarks total \$1.5 billion in FY 2002 (see Table B and Figure 3). The U.S. Department of Agriculture (USDA), DOD, the Department of Energy (DOE), and the National Aeronautics and Space Administration (NASA) receive three-quarters of the total R&D earmarks.
- Nondefense R&D reaches another all-time high in FY 2002, the sixth year in a row that nondefense R&D has increased in inflation-adjusted terms (see Figure 1). A large part of the recent increases has been due to steady growth in the NIH budget, including increases of approximately 15 percent for four years in a row. As a result, NIH R&D has become nearly as large as all other nondefense agencies' R&D funding combined.
- The FY 2002 R&D appropriation is a record dollar increase for defense R&D, even in inflation-adjusted terms (see Figure 1). After nearly a decade of post-Cold War cuts, DOD R&D had been increasing slightly for the past few years, but this year's increase represents a decisive step back toward Cold War funding levels. DOE's defense R&D also receives a large boost, partially from emergency counter-terrorism R&D funds.
- The "FS&T budget" rises by 11.1 percent in FY 2002 to \$52.4 billion (see Table 1). Most of this increase is due to a 15.7 percent increase to the total NIH budget, although there are increases for all FS&T programs. (See Appendix 1 for details of the "FS&T Budget.")

Overview of R&D Trends

The FY 2002 Congressional Budget Process

The year 2001 witnessed several watershed events, each of which had significant implications for the FY 2002 budgetary process. First, on January 20, 2001, George W. Bush was sworn in as the 43rd president of the United States. The inauguration of President Bush returned the Republicans to the White House after an eight-year absence and foreshadowed important changes in presidential spending priorities. Moreover, it appeared that congressional obstacles to implementing these priorities would be negligible, given that the November 2000 elections had also given the Republicans control over both chambers of Congress. Republican control in the equally divided Senate, however, was made possible only by Vice President Cheney's constitutionally sanctioned ability to cast tie-breaking votes. And, when Senator Jim Jeffords of Vermont renounced his Republican affiliation in May, control of the Senate reverted to the Democrats and returned divided government to Washington after only a five-month hiatus. Second, March 2001 marked the end of the longest expansion of U.S. economic activity in the nation's history, an expansion that had begun exactly ten years earlier in March 1991. This, coupled with the Bush Administration's tax relief package signed into law by President Bush in June 2001, signaled an end to the era of budget surpluses that began in 1998. If not yet fully manifest in the FY 2002 budgetary process, this return to deficit spending will likely have a notable impact on discretionary spending over the next several years. Finally, above and beyond their enormous political and psychological effects, the terrorist attacks of September 11 had profound fiscal effects, not the least of which was a \$40 billion emergency supplemental appropriations bill signed into law on September 18. Not only did this bill portend additional deficit spending, but it also prompted an entirely new inventory of spending priorities focused on anti-terrorism and national security. Thus, as President Bush concludes his first year in office, the economic and political climate of the country – and the world – is vastly different from that which prevailed when he took office.

The budgetary priorities of the new Bush Administration began to emerge in late February when President Bush released a summary of the full budget request that he subsequently submitted in April. Wishing to signal a clean break from the Clinton era, President Bush titled his budget summary “A Blueprint for New Beginnings – A Responsible Budget for America’s Priorities.” In the document, President Bush asserted that his budget offered “a new vision for governing the Nation for a new generation,” a “different approach for an era that expects a Federal Government that is both active to promote opportunity and limited to preserve freedom.” The summary also resurrected the mantra of “compassionate conservatism” from the campaign trail to describe initiatives in the areas of education reform and faith-based delivery of social services as well as several programs important to senior citizens, such as Social Security, Medicare and prescription drug coverage. In addition, the President delineated plans to retire nearly \$1 trillion in debt over the ensuing four years, provide tax relief to all those who pay income taxes and re-evaluate defense priorities in the face of newly perceived national security threats. Thus, at least in rhetoric, President Bush outlined a budgetary vision that sought to fuse the traditional Republican values of fiscal discipline and military strength with more recent Republican emphases on re-defining the federal role in education and raising the profile of religious organizations in the public square.

In terms of absolute numbers, however, the full budget request that was submitted in April was not as much of a course change from the Clinton era as the budget summary might have suggested. The Bush Administration requested \$661 billion in discretionary spending, up from \$635 billion enacted during the last year of the Clinton Administration. Though an increase of some \$26 billion, the Bush Administration did point out that this 4 percent increase stood in contrast to the pattern of 6 percent increases that characterized the last few years of the Clinton presidency. However, the basis for this claim collapsed in June when President Bush submitted a budget amendment to Congress that covered spending for the Department of Defense (DOD). This amendment proposed a 9 percent increase in DOD spending, placing the overall DOD budget at \$328.9 billion. Largely as a result of this jump in DOD expenditures, discretionary spending would now rise to \$679 billion. Rather than the 4 percent increase envisioned in the original budget summary, discretionary spending under this revised scenario was now slated to increase by nearly 7 percent.

On the R&D side, increases in the Bush Administration's budget request were mostly confined to DOD and the Department of Health and Human Services – more specifically the National Institutes of Health. Each of these agencies was slated for increases in R&D funding of more than 10 percent. R&D funding for other federal agencies, however, was in comparatively short supply. Six of the eleven largest R&D funding agencies were slated for decreases in R&D activity in FY 2002. Under the request, the National Science Foundation, the Environmental Protection Agency and the Departments of Energy, Agriculture, Commerce and Interior would all have seen their R&D budgets decline. Thus, R&D largesse in the budget request was primarily limited to “missiles and medicine.” For agency-specific analyses of R&D spending, see Chapter 3 of this publication.

Being in control of both the House and the Senate, congressional Republicans moved quickly to translate President Bush's request into a budget resolution. In mid-May, Congress adopted a budget resolution that was fully consistent with the President's requested level of discretionary spending and his campaign promise of providing tax relief for the nation's taxpayers. This then set the stage for the Economic Growth and Tax Relief Reconciliation Act of 2001, which President Bush signed into law on June 7. At the time, unified budget surpluses were still projected to endure for several years into the future. This being the case, President Bush saw the legislation as a means of acting upon his belief that the surplus was “the people's money” and, therefore, should be returned to its rightful owners. Many congressional Democrats, on the other hand, claimed that President Bush's tax relief package was too large in light of deteriorating economic conditions and too skewed toward the wealthy. If enacted, and if projected budget surpluses failed to materialize, its opponents maintained, the legislation would force elected officials to dip into Medicare and Social Security trust funds in coming years just as Baby Boomers begin to retire. The implications of the tax relief package for mandatory spending notwithstanding, the enactment of the legislation had important consequences for discretionary spending. Absent a return to the bull-market conditions of the 1990s or a renewed tolerance of deficit spending, the legislation's price tag of \$1.35 trillion over ten years will inevitably reduce the space afforded discretionary spending programs in the years to come.

If the tax relief package was the first major victory of the Bush Administration, it was a Pyrrhic victory at that. In the negotiations leading up to the passage and enactment of the package, Senator Jim Jeffords of Vermont had grown increasingly frustrated with the policy directions that the Bush Administration and his fellow congressional Republicans were taking. On May 24, Senator Jeffords announced his decision to leave the Republican Party, citing major differences in the areas of fiscal policy, environmental policy, education and missile defense, among others. This ended the concurrent Republican control of the House, Senate and White House that had been won in the November 2000 elections – a situation that had last prevailed during the first term of the Eisenhower Administration. Though declaring himself an Independent, Senator Jeffords stated that he would caucus with the Democrats for organizational purposes. The announcement sent shock waves throughout Washington, as it returned the Senate to Democratic hands, including the chairmanships of all Senate committees.

Just as the rebate checks authorized by the tax relief package began to enter the postal system in late July, increasingly dire news about the state of the national economy was being released. On the last Friday of the month, the Bureau of Economic Analysis – a research arm of the Department of Commerce – announced that the gross domestic product (GDP) had increased at an annual rate of only 0.7 percent in the second quarter of 2001. This compared with GDP growth rates of 1.9 percent in the fourth quarter of 2000 and 1.3 percent in the first quarter of 2001. Thus, the economy continued its downward trajectory. This news confirmed the worst suspicions of the Federal Reserve Board, whose Federal Open Market Committee (FOMC) had in January begun an aggressive campaign to stimulate the economy through a series of interest rate cuts. From January to June, the FOMC cut the federal funds rate six times in an effort to decrease the cost of money and provide the economy with a much-needed infusion of capital. The FOMC would go on to cut the federal funds rate an additional five times in 2001. At the beginning of the year the federal funds rate stood at 6.50 percent; by year's end the rate had been reduced to 1.75 percent.

Unable to ignore this new economic reality, the Bush Administration produced revised budget projections in August. The White House's Office of Management and Budget (OMB) estimated that because of the tax cut and the slowing economy, the unified FY 2001 surplus projection had dropped from \$281 billion to \$158 billion. Additionally, the non-

Social Security surplus for both FY 2001 and FY 2002 had narrowed to a projected \$1 billion. The projections were heavily criticized, however, because the small remaining surpluses relied on some questionable accounting. Moreover, figures issued just one week later by the Congressional Budget Office (CBO) projected that the non-Social Security surplus in FY 2001 would actually disappear and go into deficit. Whether one chose to believe OMB's numbers or those put out by CBO, it was clear that the era of budget surpluses that had begun in 1998 was coming to an end, and talk of recession became increasingly prominent in the discourse over the nation's economic health.

Though certainly secondary to the human suffering brought about by their occurrence, the events of September 11 drove this point home even further. Over the course of a few short hours, the attacks on the World Trade Center and the Pentagon transformed the policy priorities of the nation. Gone (for the time being) were the partisan squabbles over the wisdom of reducing or eliminating budget surpluses through tax cuts. Front and center were bipartisan sentiments to make any effort and undertake any sacrifice to resurrect the nation from the terrorist attacks and prevent any such attacks from happening again. To this end, Congress moved quickly to fashion the Emergency Supplemental Appropriations Act for Recovery from and Response to Terrorist Attacks on the United States, which President Bush signed into law on September 18. With a price tag of \$40 billion, the legislation appropriated funds for federal, state and local preparedness for mitigating and responding to the attacks; efforts to counter, investigate and prosecute domestic and international terrorism; increased transportation security; and the repair of public facilities and transportation systems damaged in the attacks.

Thus, it was in this context that Congress returned its attention to completion of the thirteen appropriations bills that form the backbone of the appropriations process. At the time that President Bush signed the emergency supplemental into law on September 18, however, only six of the appropriations bills had even been reported to conference. With the beginning of FY 2002 coming in just two weeks, it became clear that Congress would miss the deadline and resuscitate its annual ritual of passing continuing resolutions until its work was done. Undoubtedly, Democratic control of the Senate agenda – the new counterweight to the Republican-controlled House and White House – and continually evolving spending needs brought about by the September 11 terrorist

attacks slowed this process even more. And, to add insult to injury, the work of Congress was further delayed by the receipt of anthrax-tainted letters on Capitol Hill in October, most notably in the offices of Senate Majority Leader Thomas Daschle (D-SD). These letters eventually forced the closure of the Senate Hart Office Building for environmental remediation that lasted well into January 2002.

From October until the time of the holiday recess that began in late December, Congress continued work on those appropriations bills that remained outstanding. This was done against the backdrop of waning bipartisanship and a continuing deterioration of economic conditions. The palpable bipartisan spirit that resulted from the terrorist attacks of September 11 faded as congressional Democrats and Republicans bickered over the design of an economic stimulus package that would right the economy and provide relief to the thousands of workers adversely affected by the September 11 attacks. On October 24, the Republican-controlled House narrowly passed (216-214) its version of an economic stimulus package, which centered on tax relief (to both individuals and corporations) and unemployment benefits. The plan would cost \$100 billion in FY 2002 and \$159 billion over ten years. Democrats criticized the bill for being top-heavy with tax breaks to large corporations and inattentive to the needs of low-income workers, particularly those laid off after September 11. For their part, Senate Democrats introduced a \$70 billion stimulus bill, giving roughly equal attention to tax cuts and aid to the unemployed. However, this bill languished in the Senate after it failed to attract the requisite sixty votes necessary to overcome procedural hurdles. From this point on, the dialogue deteriorated into a blame game in which the White House and congressional Republicans accused Senate Democrats of failing to move on any stimulus bill and, therefore, failing to act for the benefit of the nation. In response, Democrats argued that Republicans remained overly fixated on corporate tax relief and that the Republican plan would do little to put money in the hands of consumers whose spending would stimulate the demand necessary to wrest the economy from the doldrums. As the year ended, President Bush was still waiting to sign an economic stimulus bill that he claimed the country so desperately needed.

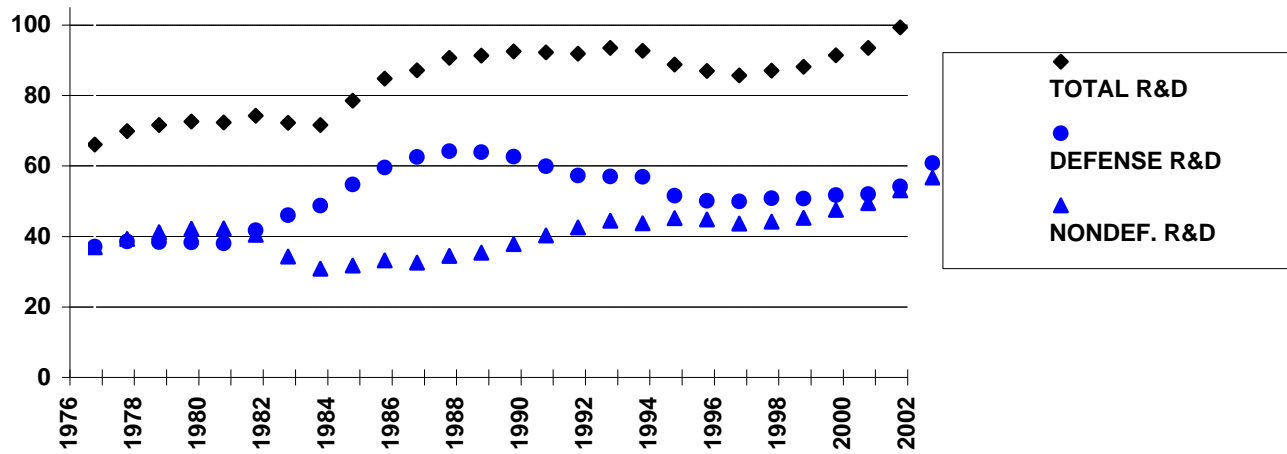
The end of the year also witnessed a continuing tide of negative reports regarding the state of the nation's economy. At a November 28 speech at the National Press Club, OMB Director Mitch Daniels stated that

because of the flagging economy and the new spending brought about by the September 11 attacks, federal budget deficits had not only arrived but were unlikely to end until 2005 at the earliest. On December 13, the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER) issued a release stating that the economy had in fact entered into recession back in March. This NBER committee is the commonly accepted arbiter in timing expansions and contractions of the U.S. economy. The presence of recession was reinforced later in December by another release from the Bureau of Economic Analysis, which showed that GDP had actually *decreased* at an annual rate of 1.3 percent in the third quarter of 2001. Thus, as 2001 drew to a close, the federal budget and the national economy entered into territory not seen for many years.

Despite the country's economic woes, however, the federal budget process lurched forward. Congress completed its work on the last appropriations bills on December 20. In the end, total funding level for FY 2002 appropriations was \$686 billion, far more than the original \$661 billion Bush request from April. In comparison with FY 2001, this represented an 8 percent increase in discretionary spending. In addition, Congress and the President agreed on \$40 billion in additional emergency funds for war, terrorism, and relief-related costs; the President allocated half of these funds, while Congress allocated the other half as part of the Defense bill.

These results of the FY 2002 appropriations process hold obvious consequences for fiscal policy in the short term. The return to deficit spending and the policy priorities that emerged from September 11 will undoubtedly shrink the pool of resources available for discretionary spending unrelated to defense and the war on terrorism. Neither the Democrats nor the Republicans are likely to tolerate a return to excessive deficit spending, given the general consensus in the nation for fiscal conservatism. Additionally, if the FY 2002 budget request of the Bush Administration is any indication, future increases in discretionary spending are likely to be confined to defense programs, biomedical research and, now, efforts to combat terrorism. Complicating all of this, of course, are the looming November 2002 mid-term elections. If the past can be trusted as prelude, the specter of mid-term elections will mean that politics will prevail over policy and the bipartisanship that was realized in the wake of September 11 will flow in increasingly short supply.

Figure 1. Trends in Federal R&D, FY 1976-2002
in billions of constant FY 2001 dollars



Source: AAAS analyses of R&D in AAAS Reports VIII- XXVI. FY 2002 figures are AAAS estimates of R&D in FY 2002 appropriations bills.

Trends in Total R&D

Figure 1 compares the trajectories of total R&D, defense R&D and nondefense R&D for the period FY 1976-2002. As the figure illustrates, defense R&D and nondefense R&D have achieved relative parity in recent years after a marked divergence during the defense build-up of the Reagan Administration in the 1980s. Growth in nondefense R&D in recent years has resulted primarily from steady growth in the NIH budget, including increases of approximately 15 percent for four years in a row. (Detailed historical tables and other supplementary material are available on the AAAS R&D Web site.)

- **The federal investment in research and development (R&D) exceeds \$100 billion for the first time.** Federal R&D in FY 2002 totals \$103.7 billion, a \$12.3 billion or 13.5 percent increase over FY 2001 that is the largest dollar increase in history and the largest percentage increase in nearly 20 years (see Table 1).
- **There are substantial increases for all the major federal R&D agencies, in contrast to proposed cuts for most agencies in the Bush Administration's April budget request.** The largest dollar and percentage increases go to the two largest R&D funding agencies, the Department of Defense (DOD) and the National Institutes of Health (NIH), reflecting the high priority placed on defense and health by the Bush Administration and Congress. DOD R&D increases by \$7.4 billion or 17.3 percent to reach \$50.1 billion thanks to dramatic increases for missile defense development and other DOD investments to respond to U.S. military needs. NIH R&D increases 15.8 percent to \$22.8 billion to fulfill the fourth year of a five-year campaign to double the NIH budget, with additional funds provided to combat bioterrorism.
- **There are large increases for basic and applied research in FY 2002, especially in NIH** (see Table 2). The total federal investment in research (basic and applied) is \$48.2 billion, an increase of 11.0 percent or \$4.8 billion over FY 2001. NIH remains the largest single sponsor of basic research; in FY 2002, NIH alone will fund 46 percent of all federal support of research. All federal agencies receive increases for their research portfolios, especially agencies with defense or counter-terrorism research programs.

- **R&D for all national missions increases, with especially large boosts for defense and health R&D** (see Table 3). In defense, DOD S&T investments exceed \$10 billion for the first time to reach \$10.5 billion (up 11.8 percent), while funding for missile defense development nearly doubles. In health, the NIH budget remains on track to double between FY 1998 and FY 2003 with a \$3.1 billion increase in R&D to \$22.8 billion, but NIH and the Centers for Disease Control and Prevention (CDC) also receive substantial emergency funds for bioterrorism R&D and improved laboratory facilities. Counter-terrorism R&D funds are responsible for large increases for other missions: agriculture R&D rises 9.4 percent to \$1.9 billion in part to address food safety issues and to improve security at agricultural laboratories that handle pathogens; natural resources and environment R&D rises 11.2 percent to \$2.5 billion in part for R&D on securing drinking water supplies; and transportation R&D climbs 6.7 percent to \$1.8 billion, partially because of a large infusion of emergency funds for the Federal Aviation Administration's (FAA) aviation security R&D programs.

Emerging R&D Issues

Though two among many, the issues of counter-terrorism and earmarks emerged to occupy more prominent spots on the R&D policy agenda in 2001. Interest in counter-terrorism soared after the September 11 terrorist attacks. Interest in R&D related to counter-terrorism also jumped as policymakers asked what the R&D community could do to help the nation recover from the attacks and to prevent any such future attacks. Earmarks continued to be of concern to those interested in R&D policy because of their attendant implications for the federal research budget and the practice of peer-reviewed science. This section provides a brief overview of these emerging R&D issues.

Counter-Terrorism

In response to the terrorist attacks of September 11 and anthrax attacks through the U.S. mail, Congress and President Bush approved \$1.5 billion for terrorism-related R&D in FY 2002 appropriations, nearly triple the FY 2001 funding level. Federal counter-terrorism R&D, funded by 11 different federal agencies, increases 156.5 percent over FY 2001 to reach \$1.5 billion, up from \$579 million (see Table A and Figure 2). This compares with \$555 million, a cut from FY 2001, that the Bush

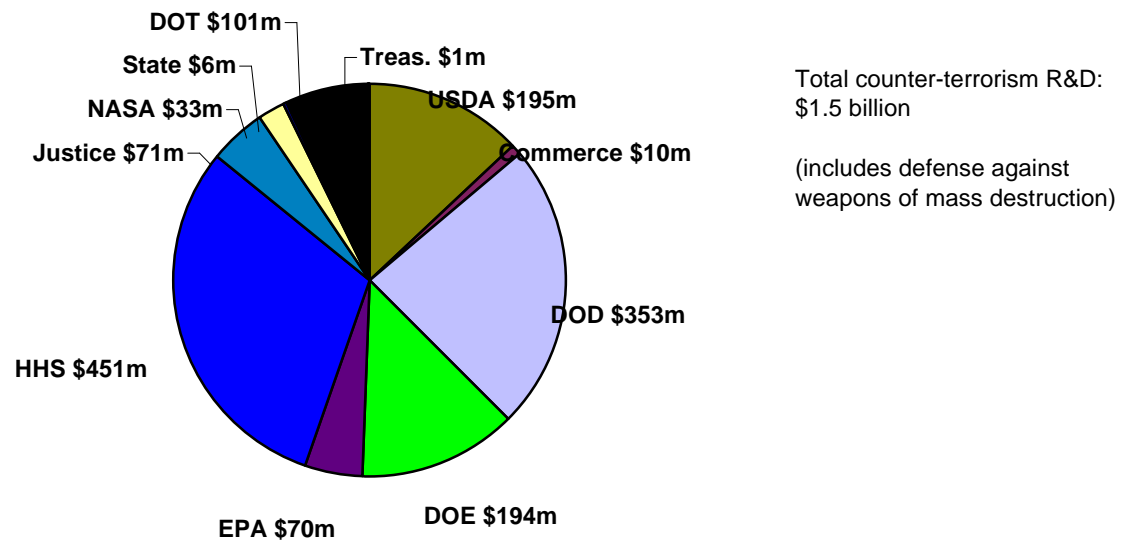
**Table. Federal Counter-Terrorism R&D, including Weapons of Mass Destruction
Congressional Action on R&D in the FY 2002 Budget**

(budget authority in millions of dollars)

	FY 2000	FY 2001	FY 2002	Change FY 01-02	
	Actual	Estimate	Approved	Amount	Percent
Agriculture	37	52	195	143	276.4%
<i>(Agri. Research Service)</i>	36	49	191	143	294.6%
<i>(APHIS)</i>	1	3	3	0	0.0%
Commerce (NIST)	10	4	10	6	151.8%
Department of Defense	190	235	353	118	50.1%
Department of Energy	60	68	194	126	184.7%
<i>(NNSA)</i>	55	63	109	46	72.1%
<i>(Other Defense programs)</i>	5	5	85	80	1634.7%
Environmental Protection Agency	0	0	70	70	--
Health and Human Services	110	116	451	335	288.2%
<i>(AHRQ)</i>	5	0	0	0	--
<i>(CDC)</i>	32	37	130	93	256.0%
<i>(FDA)</i>	0	0	20	20	--
<i>(NIH)</i>	43	50	293	244	489.9%
<i>(Office of Secretary)</i>	30	30	8	(23)	-75.0%
Justice	45	43	71	28	65.3%
<i>(FBI)</i>	15	7	7	0	0.0%
<i>(Office of Justice Programs)</i>	30	36	64	28	77.8%
Nat'l Aeronautics and Space Admin.	0	0	33	33	--
State	7	5	6	1	24.0%
Transportation	51	55	101	47	85.2%
<i>(FAA)</i>	50	55	100	46	84.0%
<i>(FTA)</i>	1	0	1	1	700.0%
Treasury	2	1	1	0	0.0%
Total Terrorism R&D	511	579	1,484	905	156.5%

OMB data from OMB's *Annual Report to Congress on Combating Terrorism*, August 2001.
FY 2002 Approved figures are AAAS estimates of R&D in enacted FY 2002 appropriations bills, including emergency funds appropriated in Public Law 107-38 and allocated in appropriations bills. Figures include conduct of R&D and R&D facilities.
Figures do not include non-R&D counterterrorism activities.

**Figure 2. FY 2002 Federal Counter-Terrorism R&D, by Agency
(appropriated budget authority in millions of dollars)**



Source: AAAS estimates of R&D in enacted FY 2002 appropriations bills, including emergency funds.
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Administration requested in its FY 2002 budget proposal prepared before the September 11 attacks. Roughly half the final \$1.5 billion comes from regular FY 2002 appropriations, and half from emergency appropriations out of a \$40 billion post-September 11 emergency response fund.

In August, before the September 11 terrorist attacks, OMB released its annual report to Congress on combating terrorism. Included in the report was an inventory of federal spending on R&D related to combating terrorism, including spending on R&D to defend against weapons of mass destruction. Table A shows federal funding for counter-terrorism R&D in FY 2000 and FY 2001 from that report. The FY 2002 data reflect AAAS estimates of R&D in final FY 2002 appropriations bills based on OMB data for the FY 2002 request.

Counter-terrorism R&D is part of a broader, federal effort against terrorism that totaled \$10 billion in FY 2001 and may be double that amount or more in FY 2002 when all the regular and emergency appropriations are added up. It remains to be seen how much of the FY 2002 emergency R&D funding will become a more-permanent part of agencies' R&D portfolios in a longer war against terrorism, and how much will be a one-time appropriation responding to the unique circumstances of this year. The first indication of the longer-term trend in counter-terrorism R&D should be known in February 2002 with the release of the FY 2003 budget request.

Earmarks

In September 2001, OMB Director Mitch Daniels re-opened the R&D earmarks debate when he requested that members of the academic research community refrain from seeking earmarks as part of a Bush Administration effort to streamline federally funded research and contain overall discretionary spending. Earmarks, according to Daniels, were putting a strain on some government science budgets and forcing appropriators to forego research projects that would otherwise merit funding. This came in the wake of earlier efforts to monitor R&D earmarks and explore their implications for the practice of science. In the early 1990s, the late George E. Brown, Jr. used his position as Chairman of the House Committee on Science, Space and Technology to hold hearings on the rise of earmarks related to the performance of federally funded scientific research. At roughly the same time, the *Chronicle of*

Table. Congressional Earmarks for R&D by Agency and Program

Congressional Action on R&D in the FY 2002 Budget

(budget authority in millions of dollars)

	FY 2002 House	FY 2002 Senate	Final Congressional Action		
			FY 2002 Earmarks	FY 2002 R&D	Earmarks % of R&D
Defense (military)	288	171	336	50,134	0.7%
<i>(Army)</i>	111	32	120	7,064	1.7%
<i>(Navy)</i>	53	25	68	11,422	0.6%
<i>(Air Force)</i>	43	6	43	14,528	0.3%
<i>(Defense Agencies and Other)</i>	81	108	104	17,120	0.6%
National Aeronautics & Space Adm.	132	113	233	10,301	2.3%
<i>(Space Science)</i>	18	9	30	2,849	1.0%
<i>(Bio. And Phys. Research)</i>	5	0	15	714	2.1%
<i>(Earth Science)</i>	25	19	38	1,573	2.4%
<i>(Aero-Space Technology)</i>	48	32	83	2,490	3.4%
<i>(Academic Programs)</i>	35	53	67	231	28.9%
Energy	30	152	171	8,122	2.1%
<i>(Science programs)</i>	0	32	72	3,018	2.4%
<i>(Energy programs)</i>	5	84	27	1,310	2.0%
<i>(Defense programs)</i>	25	36	25	3,794	0.7%
Health and Human Services	0	0	31	24,145	0.1%
<i>(National Institutes of Health)</i>	0	0	0	22,822	0.0%
National Science Foundation	50	10	50	3,527	1.4%
<i>(Major Research Equipment)</i>	50	0	50	139	36.0%
Agriculture	182	283	369	2,139	17.3%
<i>(Agricultural Res. Service)</i>	86	176	257	1,234	20.8%
<i>(CSREES)</i>	91	100	107	532	20.1%
<i>(Forest Service)</i>	5	8	5	265	1.8%
Interior	0	13	14	673	2.1%
Transportation	18	38	63	853	7.4%
Environmental Protection Agency	11	33	62	702	8.9%
Commerce	27	21	72	1,354	5.3%
<i>(NOAA)</i>	18	0	31	836	3.7%
<i>(NIST)</i>	9	21	42	493	8.5%
Agency for Int'l Development	2	5	4	204	2.0%
Housing and Urban Development	0	10	30	69	43.6%
Department of Justice	0	5	29	104	27.9%
All Other	0	0	5	1,367	0.3%
Total	739	853	1,470	103,694	1.4%

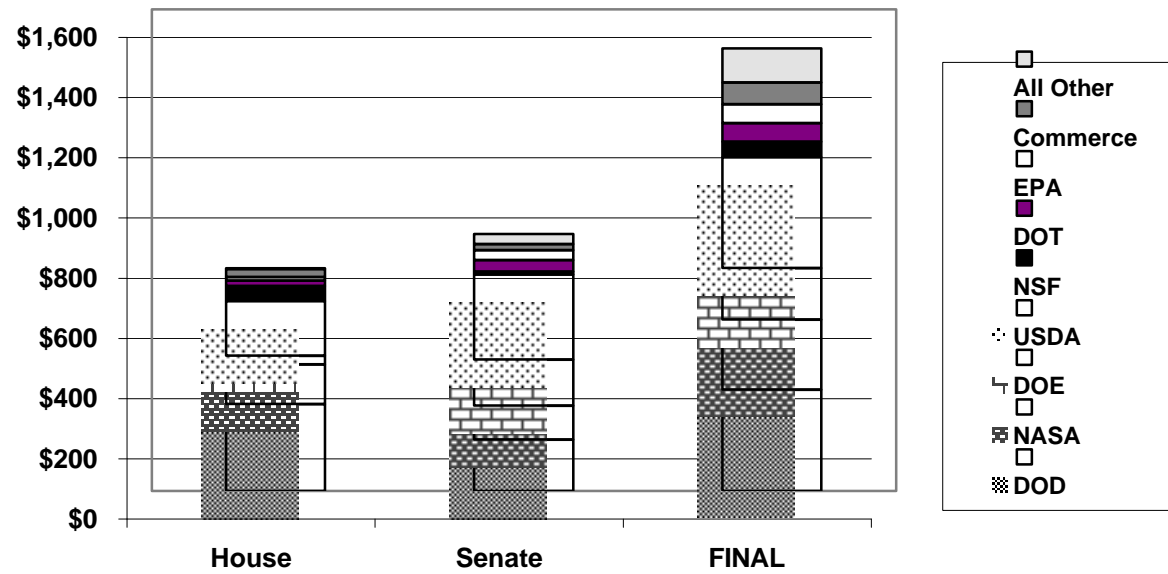
AAAS estimates of R&D in FY 2002 House, Senate, and final (enacted) appropriations bills.

Includes conduct of R&D and R&D facilities. All figures are rounded to the nearest million.

Changes calculated from unrounded figures. Does not include non-R&D projects.

"Earmarks" are AAAS interpretations of unrequested, congressionally designated, performer-specific R&D projects contained in legislative language or committee report language.

**Figure 3. R&D Earmarks in FY 2002 Appropriations
millions of dollars budget authority**



AAAS estimates of R&D earmarks based on FY 2002 House, Senate, and final (enacted) appropriations bills.
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Higher Education initiated an annual survey tracking the incidence of academic earmarks – most of which relate to scientific research – in the federal appropriations process.

Earmarks in the R&D context raise specific concerns over the purported trade-off between scientific norms and economic necessity. Opponents point out that such earmarks reduce the overall quality of science because they circumvent the peer-review process, thereby weakening a key cornerstone of the traditional scientific ethos. Defenders of the practice, however, maintain that the pursuit of R&D earmarks is an important strategy in the effort “spread the wealth” and help smaller research institutions compete with their wealthier counterparts.

This publication takes no position on the economic, political or scientific wisdom of R&D earmarks. However, because the topic is likely to remain of interest to policymakers and members of the research community who are concerned about the allocation of R&D resources, it does offer an analysis of R&D earmarks in the FY 2002 federal appropriations process. For the purposes of this analysis, R&D earmarks are defined as “congressionally designated performer-specific R&D projects not included in agency budget requests.”

As Table B and Figure 3 show, R&D earmarks totaled \$739 million in the House versions of the FY 2002 appropriations bills and \$853 million in the Senate versions. In the give-and-take between the House and Senate in negotiations over the final versions of the appropriations bills, give prevailed far more than take for a result of \$1.5 billion in R&D earmarks in FY 2002, providing most of what each chamber wanted. Four agencies (the U.S. Department of Agriculture (\$369 million), the National Aeronautics and Space Administration (\$233 million), the Department of Energy (\$171 million) and the Department of Defense (\$336 million)) will receive three-quarters of the total R&D earmarks.

Because an analysis of FY 2001 R&D earmarks is not available, it is unclear to what extent FY 2002 earmarks compare with FY 2001 earmarks or with FY 2001 base funding. Although subtracting R&D earmarks from FY 2002 funding reduces the increases provided by appropriators for certain R&D programs, these programs most likely received similar levels of earmarked funding in FY 2001, so most agencies are likely to have received substantial year-to-year gains in non-earmarked funding.

Agency R&D Budgets

(Full agency analyses of R&D in FY 2002 appropriations, including historical charts and supplemental material, are available on the AAAS R&D Web site, or as links from the on-line version of this book.)

Department of Defense (DOD)

Total research and development (R&D) at DOD rises to \$50.1 billion in FY 2002 – an increase of 17.3 percent or \$7.4 billion from the FY 2001 level of \$42.7 billion, the largest dollar increase in history. In comparison with the request of the Bush Administration, this total represents a 3.5 percent increase, or an additional \$1.7 billion for DOD R&D (see Table 4).

The FY 2002 R&D appropriation is a record dollar increase for DOD and defense R&D, even in inflation-adjusted terms, as shown in Figure 1. After nearly a decade of post-Cold War cuts, DOD R&D had been increasing slightly for the past few years, but this year's increase represents a decisive step back to Cold War funding levels because of the new war in which the United States is now engaged. Although the Bush Administration had requested substantial increases in DOD R&D spending even before September 11, the entry of the U.S. into war in Afghanistan made approval of these proposed increases much more likely in Congress, even for controversial items such as national missile defense. The regular DOD budget as a whole receives a large increase in FY 2002, and DOD's budget receives an additional boost out of the \$40 billion in emergency funds appropriated in the immediate aftermath of the September 11 terrorist attacks. President Bush has stated that he may request additional FY 2002 emergency funds early next year to pay for the ongoing war in Afghanistan and other DOD needs.

Perhaps most prominent in the final DOD budget is a 66.4 percent rise in funding for the Ballistic Missile Defense Organization (BMDO), which places the BMDO R&D budget at \$7.0 billion (see

Table 5). Though less than the \$7.6 billion requested by the Bush Administration, the final level still represents a significant jump in the BMDO R&D budget. Operating in partnership with each of the military services, other federal agencies, the private sector, and major research institutions, BMDO is charged with developing defensive systems to counter perceived theater and strategic ballistic missile threats. BMDO has received strong vocal and budgetary support from the Bush Administration. In fact, in a speech in early 2001 at the National Defense University, President Bush stated that the development of a national missile defense would be one of the top priorities of his administration. Furthermore, he asserted that the 1972 Anti-Ballistic Missile (ABM) treaty with the Soviet Union (now Russian Federation) – which explicitly precludes the development of a national missile defense system by either party – should not stand in the way of efforts by the United States to develop and deploy such a system; in December, he formally announced U.S. withdrawal from the treaty.

Basic Research (“6.1”) and Applied Research (“6.2”) also receive substantial increases in funding. Basic Research rises by 5.0 percent from \$1.3 billion to \$1.4 billion, while Applied Research rises by 14.6 percent from \$3.7 billion to \$4.2 billion.

Because of the agency’s national security mission, DOD’s research portfolio from the “6.1” and “6.2” accounts is weighted toward disciplines such as mathematics, physics, computer sciences, and especially engineering which have relevance to developing future weapons systems, but DOD also supports research in other fields for national security reasons, including the life sciences to combat bioterrorism threats and to ensure healthy soldiers, and environmental sciences (chiefly oceanography) to assist the Navy in operating its ships. DOD provides nearly one-third of all federal support for engineering research and a majority of federal support for some key engineering subfields. DOD also provides more than a third of total federal support for computer science research and plays a prominent funding role in other disciplines such as mathematics, oceanography, medical sciences, chemistry, physics, and environmental sciences. Because of the increases to “6.1” and “6.2”, DOD support for all of these disciplines should rise in FY 2002.

The “6.1,” “6.2,” and “6.3” categories are often grouped together as **“Science and Technology” (S&T)**. This category encompasses basic

research, applied research, and advanced technology development, which contribute to a broad knowledge base with potential applications to a wide variety of military as well as civilian uses. **DOD S&T**, including medical research appropriations outside the RDT&E account (see below), **exceeds \$10 billion for the first time to reach \$10.5 billion**, an 11.8 percent increase. Advocates for DOD S&T pushed last year for FY 2001 S&T funding of at least \$9 billion, and reached that goal. For FY 2002, they advocated \$10 billion, and although the Bush Administration fell far short with a request of \$8.8 billion, the final Defense bill reaches that goal. Advocates of DOD S&T in the science and engineering community argue that DOD S&T funding is essential for building the knowledge and technology base for future DOD needs, and have successfully argued that post-Cold War cutbacks over the past decade eroded this base. In the past year, there has been growing support inside and outside the Pentagon for setting 3 percent of the DOD budget as a goal for the proper level of S&T investment, a goal reaffirmed in September's Quadrennial Defense Review of defense strategy; the FY 2002 DOD S&T appropriation meets that goal.

The DOD budget contains a separate \$461 million appropriation, outside the regular R&D accounts, for **medical R&D** (see Table 4). Included in this total is \$150 million for breast cancer research and \$85 million for prostate cancer research (down from \$175 million and \$100 million, respectively, in FY 2001) in peer-reviewed, competitively awarded grants. The budget also contains \$10 million for ovarian cancer research and \$50 million for research on various medical topics. These programs were congressionally initiated in the early 1990s and DOD has never requested funding for them, but Congress has annually provided funding. The final Defense bill also contains \$43 million for a Senate-initiated national prion research project. Prions are modified forms of normal proteins that have been linked to variant Creutzfeldt-Jakob Disease (vCJD) and Bovine Spongiform Encephalopathy (BSE). The bill instructs the Army to set up a new prion research program modeled along the lines of the existing peer-reviewed cancer programs.

Among the service branches, Army, Navy, and Air Force R&D budgets all receive large increases (see Table 5). The **Defense Advanced Research Projects Agency (DARPA)**, one of the Defense Agencies, receives \$2.3 billion in FY 2002, 14.1 percent more than FY 2001. The Biological Warfare Defense program receives \$147 million, down from \$167 million in FY 2001. Defense Research Sciences, DARPA's basic

research program, rises from \$109 million to \$145 million (up 33 percent).

National Institutes of Health (NIH)

NIH's final appropriation of \$23.6 billion in FY 2002 keeps the agency on track to double its budget between FY 1998 and FY 2003 (see Table 8). There is bipartisan support for doubling the NIH budget in five years, with FY 2002 as the fourth year. The final appropriation exceeds the \$22.9 billion House-proposed appropriation for NIH and the \$23.1 billion Bush Administration request, but falls slightly short of the \$23.8 billion Senate proposal. The final appropriation does not include a House proposal to delay the obligation of nearly \$2.9 billion until the last day of FY 2002.

NIH R&D, which makes up 97 percent of the NIH budget, totals \$22.8 billion (up 15.8 percent) in FY 2002. The remaining 3 percent of the NIH budget goes to research training and overhead costs.

Every institute receives an increase greater than 12 percent, and five receive increases greater than 20 percent (see Table 8). The **National Institute of Allergy and Infectious Diseases (NIAID)** sees its budget jump 22.5 percent to \$2.5 billion, primarily because of an emergency appropriation of \$155 million, separate from the regular NIH budget, for counterterrorism activities. Construction of a new biosafety laboratory receives \$70 million of the emergency funds, while the remaining \$85 million goes to bioterrorism R&D. **NIH Buildings and Facilities funding more than doubles to \$345 million (up 124.1 percent)**, continuing the trend of large increases in NIH construction funds in recent years. Part of this appropriation comes from emergency funds to boost security of NIH laboratory facilities against terrorist attacks.

Funding for the National Center for Research Resources (NCRR) increases by 23.8 percent to \$1.0 billion. NCRR is charged with developing and supporting critical research technologies and shared resources that underpin biomedical research. One beneficiary of the increase in NCRR funding is the **Institutional Development Award (IDeA)** program, a program that provides capacity-building assistance for biomedical research in states that have not previously participated fully in the research programs of NIH. IDeA receives \$160 million in FY 2002, up sharply from the \$100 million FY 2001 funding level. IDeA,

established in FY 1993, has grown dramatically in the past few years from \$40 million in FY 2000 and is open to proposals from 23 states and Puerto Rico. It is similar in intent to the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR). Other beneficiaries of increases in NCCR funding are extramural research performers seeking to renovate or construct biomedical facilities. The final NIH appropriation increases funding levels for extramural construction from \$75 million in FY 2001 to \$110 million in FY 2002. These funds are to be awarded on a competitive basis.

Although NIH has come under increasing congressional scrutiny over the past year because of several controversies in areas such as gene therapy research, stem cell research, and human cloning, the final Labor-HHS bill funding NIH is relatively free of legislative provisions that restrict the types of research NIH can fund. The only major provision is the restatement of an existing ban on NIH using its funds to create **human embryos for research purposes** or to fund any research in which human embryos are destroyed. The bill does not limit federal support for research involving human embryonic stem cells listed on an NIH registry and carried out in accord with the policy outlined by President Bush on August 9, 2001.

There are large increases for R&D programs in other agencies within the **Department of Health and Human Services** (HHS; see Table 9). R&D in the Centers for Disease Control and Prevention (CDC) increases by 33.3 percent or \$172 million to \$689 million because of CDC's higher profile in recent weeks in combating anthrax terrorism. In addition to substantial increases in the regular Labor-HHS bill, CDC will receive more than \$1 billion in emergency funds through the Defense bill to boost its capacity to respond to anthrax and other bioterrorism threats, including nearly \$100 million in emergency funding for anthrax and other bioterrorism research, and R&D facilities upgrades. The Food and Drug Administration (FDA) sees its R&D funding rise by 15.4 percent to \$159 million, partially because of emergency funds to boost FDA's ability to safeguard the U.S. food supply. Total HHS R&D rises 15.8 percent or \$3.3 billion to \$24.1 billion.

Federal counter-terrorism R&D climbs from \$579 million in FY 2001 to \$1.5 billion in FY 2002 thanks to an infusion of emergency funds included in the Defense bill (see Chapter 2 for more details of counter-terrorism R&D). HHS agencies make up the largest part of the counter-

terrorism R&D portfolio with \$451 million in FY 2002, nearly four times the \$116 million FY 2001 amount. As stated above, the CDC, FDA, and NIH all receive substantial funds for R&D and R&D facilities related to terrorism.

Although other R&D funding agencies have struggled to maintain their budgets in the past several years, NIH has enjoyed extraordinary success on Capitol Hill and its budget growth is accelerating. NIH is on track to double its budget (in non-inflation adjusted terms) in the five years to FY 2003. Because of this growth, which far outpaces growth in other agencies' budgets, **NIH alone now accounts for two-thirds of all federal support for R&D in colleges and universities.** A majority of NIH R&D funds go to colleges and universities; because of the size of the NIH budget in comparison to other federal agencies, NIH is the dominant funding source for nearly all colleges and universities with medical schools. Because of the enormous increases for NIH R&D in the FY 2002 budget, universities and colleges and medically oriented nonprofits can expect substantial increases in federal R&D support in FY 2002, while the CDC and NIH laboratories will also receive substantial increases because of counter-terrorism R&D funds.

National Aeronautics and Space Administration (NASA)

In 2001, NASA administrator Daniel Goldin resigned after the longest-ever tenure of a NASA administrator, serving through the entire Clinton Administration and parts of both Bush (father and son) Administrations. At the end of the year, the Senate confirmed OMB deputy director Sean O'Keefe as the new NASA administrator, but O'Keefe will not have a chance to get a fresh start in 2002: the continuing saga of the International Space Station will take up much of his time, and he may be forced to continue his predecessor's drive to do more science with less money, as NASA and other domestic agencies face budgeting in another era of deficits. He will at least have some budgetary breathing room this year: the final NASA budget is \$14.9 billion in FY 2002, \$648 million or 4.5 percent more than FY 2001 (see Table 6). This is \$390 million more than the Administration's request of \$14.5 billion, and includes \$109 million in emergency funds for counter-terrorism and domestic security activities. Two-thirds of the NASA budget, which excludes the Space Shuttle program and its associated costs, is classified as R&D. **NASA's R&D totals \$10.3 billion in FY 2002, \$375 million or 3.8 percent above FY 2001.**

The troubled **International Space Station** is now projected to run more than \$4 billion over budget over the next five years, but Congress cut the Space Station budget in FY 2002. The International Space Station account receives \$1.7 billion, down 18.4 percent or \$389 million from FY 2001, but the final NASA spending bill transfers Space Station research to the Biological and Physical Research (BPR) account; the FY 2002 final appropriation for life and microgravity research aboard the Station is \$284 million, the same as the request, and there is another \$55 million in BPR for the Fluids and Combustion Facility and other space station research and equipment. Placing these research funds in a separate account would make it more difficult for NASA to siphon funds from research to construction of the Station. After adjusting for transfers, the total Space Station project receives \$50 million less than the FY 2001 funding level.

The final bill includes \$40 million for a Crew Return Vehicle (CRV). The House bill would have provided \$275 million for a CRV, a program deleted from the request and Senate plans. The CRV would be used as an emergency escape vehicle for the Station crew. Without this six or seven-person vehicle, Station crews would be limited to three, drastically reducing the amount of research that can be done on the Station to an estimated 20 person-hours a week. NASA had proposed to eliminate the CRV as a cost-cutting measure.

Although the Space Station receives nearly full funding, the conference report of the final VA-HUD bill expresses major concerns about the project. It criticizes NASA's newly redesigned concept for the finished space station as ill-defined, and expresses concerns that research space and time are inadequately provided for. The report instructs NASA to submit a report to Congress outlining in full NASA's plans for the "U.S. Core Complete" configuration of the Space Station, including a ten-year cost profile and clear definitions of the station research program.

The **Science, Aeronautics, and Technology (SAT)** account, which funds nearly all of NASA's R&D not related to the Space Station, receives \$7.9 billion, 11.6 percent or \$823 million above FY 2001 (see Table 6). Included in the appropriation is \$33 million in emergency R&D funds from the \$40 billion post-September 11 emergency response fund for security upgrades, communications, and information security. Nearly half of the remaining increase is due to the transfer of Space

Station research to Biological and Physical Research (BPR), while much of the remainder is due to \$233 million in congressionally designated R&D projects. BPR, formerly known as Life and Microgravity Sciences and Applications, receives \$714 million for an 88.6 percent increase. Taking out the Space Station research, however, would leave \$375 million, slightly below the FY 2001 funding level. This program funds ground and space-based research to advance the safety and health of astronauts in space, but covers investigations on a variety of life, medical, and microgravity sciences research topics. In Space Science (up 8.5 percent to \$2.8 billion), Congress added \$30 million to the budget for a Pluto mission that NASA has tried to cancel.

The **Aero-Space Technology** program rises 12.4 percent or \$275 million to \$2.5 billion. Much of the increase is due to a boost from \$272 million in FY 2001 to \$465 million in FY 2002 for the Space Launch Initiative, which funds research and development efforts for reusable launch vehicle technology. There are also unrequested congressional earmarks totaling \$83 million. Because NASA funds both space and aeronautics programs from this account, obscuring the precise NASA investment in aeronautics, the conference report instructs NASA to establish a separate aeronautics line in the next budget.

The **Academic Programs** appropriation of \$231 million is a substantial 73.9 percent or \$98 million increase over FY 2001. The final budget includes 40 congressionally designated projects totaling \$67 million. Although all programs in this account are classified as R&D, the congressionally designated projects include funds for planetariums, science museums, education center, and even a dormitory.

The relatively generous FY 2002 appropriation is welcome news for NASA, whose budget has stagnated in recent years both because of tight fiscal policies for all discretionary programs and because of NASA's goal of doing more with less. After adjusting for inflation, NASA's R&D has been essentially flat at \$10 billion in today's dollars since FY 1991, and in fact has declined slightly. NASA's R&D grew dramatically from the mid-1980s to the early 1990s, first because of the development of a new Space Shuttle after the Challenger disaster, and then because of the International Space Station and the expansion of NASA's earth science activities. Since then, however, NASA has had to accommodate increased costs of the Space Station and an ambitious research agenda

within a stagnant R&D budget. After bottoming out in FY 2000, NASA R&D has stayed ahead of inflation for two years.

Department of Energy (DOE)

Although energy policy was much in the news in 2001 before the September 11 terrorist attacks because of gasoline price hikes, brownouts in California, the release of a controversial Bush Administration National Energy Policy, and proposals to open the Alaska National Wildlife Refuge (ANWR) for oil drilling, in the later months of 2001 those concerns took a back seat to simply moving appropriations forward and responding to the terrorist attacks. In the end, the Bush Administration was unsuccessful in its plan to dramatically reduce DOE investments in energy R&D and to reorder U.S. national energy policy toward expanding supply and away from managing demand. The final DOE budget avoids controversies over DOE and energy in order to provide DOE with basically a status-quo budget, except for emergency appropriations from the post-September 11 response fund. Falling oil prices even in a time of U.S. military action in the Middle East have taken much of the urgency away from formulating new energy policies.

Total DOE R&D in FY 2002 is \$8.1 billion, a 4.9 percent increase over FY 2001, with small increases for energy R&D (up 1.6 percent) and science R&D (up 2.1 percent) and a larger increase for defense R&D (up 8.4 percent). The slight increase for energy R&D compares favorably to the DOE budget request, which called for a 28.3 percent cut in DOE's energy-related R&D (see Table 7).

While the Bush Administration proposed drastic cuts in many of DOE's energy R&D programs, the final bills generally keep funding at FY 2001 levels or provide slight increases. While the Administration requested a 30.8 percent cut in **Renewable Energy Resources** R&D, the final appropriation allows for a 3.3 percent increase over FY 2001 to \$339 million. In the final Interior bill, **Fossil Energy** R&D increases 3.0 percent to \$408 million, a far cry from the requested cut of more than 25 percent. The request would have reduced funding for several fossil energy areas such as oil and gas by as much as 50 percent, offset somewhat by an increased emphasis on coal research. The final bill keeps funding for most fossil fuels at close to FY 2001 levels, while also providing additional funds for coal technologies. The Interior bill also

boosts **Energy Conservation** R&D by 3.1 percent to \$454 million, a sharp contrast to a proposed 28 percent cut. The overall Energy Conservation account climbs by 11.9 percent to \$913 million because of significant boosts to two non-R&D grants programs, the weatherization assistance program and the state energy grants program. The only energy R&D program to decline is Nuclear Energy R&D, down 3.5 percent to \$78 million, though this is well above the \$57 million request.

In the **Science** account, the final Energy-Water bill provides \$3.0 billion for R&D, a \$63 million or 2.1 percent increase. Most Science programs receive funding close to FY 2001 funding levels. Both **Fusion Energy Sciences** and Nuclear Physics receive the same amounts as last year (\$245 million and \$355 million, respectively). The **High Energy Physics** (up 0.6 percent to \$706 million) program edges up slightly. The **Advanced Scientific Computing Research** (ASCR) declines by 4.6 percent to \$158 million. Within the **Basic Energy Sciences** (BES) program, Congress provides \$291 million in funding for **the Spallation Neutron Source (SNS)**, the same as the request and 4.8 percent more than FY 2001. The largest increase in the Science account is in the **Biological and Environmental Research** (BER) program, which funds DOE's contribution to the Human Genome Project. BER funding jumps \$46 million or 9.6 percent to \$527 million because the conference report contains \$73 million for more than 50 congressional earmarks, some of them renewed from FY 2001.

On the defense side, most of DOE's R&D is funded by the **National Nuclear Security Administration (NNSA)**, which was created two years ago by Congress in response to national security concerns and allegations of espionage at DOE weapons laboratories. NNSA began operations on March 2000, and is designed to be a semi-autonomous agency within DOE with its own command structure separate from the rest of DOE. NNSA is responsible for \$7.6 billion, or more than a third, of the total DOE budget in FY 2002 (up 12.2 percent from FY 2001; see Table 7a).

NNSA funds almost half of DOE's total R&D, \$3.6 billion out of a \$8.1 billion portfolio in FY 2002. Maintaining the U.S. nuclear weapons stockpile is one of DOE's major defense responsibilities, and since the U.S. banned nuclear testing DOE has relied on science to ensure the continuing reliability and safety of U.S. nuclear weapons. DOE's major R&D program in that effort is in Weapons Activities. **The final Energy-**

Water bill provide \$2.6 billion for Weapons Activities R&D in FY 2002, a 9.0 percent increase. The total includes a supplemental emergency appropriation of \$60 million for R&D out of the post-September 11 emergency fund. This program funds most of the R&D at the three weapons labs (Los Alamos and Sandia in New Mexico, Lawrence Livermore in California) which are responsible for the nation's nuclear weapons stockpile. Within the account, the final bill cuts funding for **Advanced Simulation and Computing** (formerly the Accelerated Strategic Computing Initiative (ASCI)), an effort to develop the next generation of computer processing technologies to better model nuclear explosions. The program receives \$730 million, down 2.3 percent from this year. Inertial Confinement Fusion (ICF) receives \$261 million, an increase of 11.9 percent. DOE hopes to use ICF technologies to simulate nuclear explosions. The **National Ignition Facility**, the major facility for the ICF effort, receives the requested \$245 million for construction in the final bill, despite continuing concerns that the project may fall further behind schedule and over budget. The emergency funds mostly go to improving physical and cyber security at the weapons laboratories.

Included in the Defense bill's emergency appropriations for DOE is \$78 million for nonproliferation R&D to develop improved detection technologies for bioterrorism and nuclear terrorism agents and an expanded research effort on potential nuclear terrorism. Because of the emergency funds, total nonproliferation and verification R&D increases 51.2 percent to \$309 million.

DOE's R&D budget has had an up-and-down history over the past several years. After the end of the Cold War, DOE's defense R&D declined sharply from FY 1992 to FY 1995, but has increased since then as the Stockpile Stewardship (now Weapons Activities) program's budget has grown. The FY 2002 increase brings DOE defense R&D nearly back to its late Cold War funding levels. DOE's nondefense R&D also peaked in FY 1992 but then suffered a steeper and more prolonged decline that lasted until FY 1998. Initially, the cuts were driven by the cancellation of the Superconducting Super Collider in 1993. But after the Republican takeover of Congress in 1994, DOE nondefense R&D declined further because of tight restrictions on domestic discretionary spending aimed at achieving a balanced budget and because of Republican animosity toward DOE itself. In the last few years, DOE nondefense R&D has begun to inch back toward previous funding levels

but falls behind inflation in FY 2002. Total DOE R&D has been increasing for the past five years but remains well below the funding levels of the early 1990s.

National Science Foundation (NSF)

There was dismay among NSF advocates in April when the Bush Administration requested only a \$56 million or 1.3 percent increase in the total NSF budget, after a 13 percent increase in FY 2001 led to high expectations of substantial increases in FY 2002. Because the Bush Administration chose to emphasize a large increase for education and human resources programs in NSF, NSF's R&D programs were actually proposed to decline 1.6 percent in the request. Congress, however, awarded large increases to NSF's budget and to NSF's R&D: the final NSF budget exceeds the request with \$4.8 billion, an increase of \$373 million or 8.4 percent. **NSF's R&D funding, which excludes NSF's education and training activities and overhead costs, totals \$3.5 billion in FY 2002, an increase of 7.6 percent or \$249 million (see Table 10).**

The **Research and Related Activities (R&RA)** account, which funds most of NSF's R&D, receives \$3.6 billion, 7.7 percent or \$256 million more than FY 2001 in contrast to a requested cut from the Bush Administration. The final appropriation gives most of the research directorates increases of 8 percent or greater, except for Biological Sciences (BIO; up 4.9 percent to \$509 million) and Social, Behavioral, and Economic Sciences (SBE; up 2.7 percent to \$169 million). The BIO appropriation includes a \$75 million designation for the plant genome research program, up from \$65 million in FY 2001. The final budget adds \$25 million to the request of \$50 million for the Major Research Instrumentation program to bring funding back to the FY 2001 level. This program provides funds to address research equipment needs of research institutions, mostly universities; the final NSF bill contains language directing NSF to address the instrumentation needs of smaller research institutions. The bill boosts the requests for information technology and nanotechnology research at NSF by \$25 million each, bringing the IT research investment to \$180 million (up from \$155 million in FY 2001) and nanotechnology to \$199 million (up from \$150 million).

Research funding in the Research and Related Activities (R&RA) account includes no R&D earmarks; the Senate had proposed to allocate \$10 million in R&RA funds to maintain the Homestake Mine in South Dakota in preparation for construction of a National Underground Science Laboratory for particle physics research. In the final FY 2002 budget, that \$10 million earmark moved to the Department of Housing and Urban Development (HUD) instead of NSF. The final FY 2002 Defense bill transferred title of the mine from the mine owners to the state of South Dakota in exchange for liability relief from environmental hazards on the site. NSF is reviewing a proposal for the laboratory, and further funding for the project may be part of the FY 2003 budget or appropriations.

The **Major Research Equipment** (MRE) account, which funds construction of large-scale scientific facilities, receives \$139 million, \$17 million or 14.1 percent more than FY 2001 and \$42 million more than the request. The bill allocates \$12.5 million to the Atacama Large Millimeter Array (ALMA) radio telescope project; the request proposed to fund the project out of R&RA instead of Major Research Equipment, but the final bill funds the project in MRE and thus frees up R&RA funds for more astronomy research. Within MRE, the Senate would have provided the requested \$55 million for the Terascale Computing Systems project, part of the Information Technology R&D initiative; the final bill provides only \$35 million. The final bill follows the House in adding \$35 million for the High-Performance Instrumented Airborne Platform for Environmental Research (HIAPER) in FY 2002 although NSF proposed to eliminate funding. The \$35 million allocation is far above the FY 2001 funding level of \$12 million for this atmospheric research aircraft. The final bill also follows the House in providing a new start of \$15 million for the IceCube Neutrino Detector project, a South Pole facility recently approved by the National Science Board but not yet part of NSF's budget plans. The final bill changes the name of this account to Major Research Equipment and Facilities Construction.

NSF's **Education and Human Resources** programs receive \$875 million, 11.4 percent more than FY 2001. The heart of the Administration's request was \$200 million for a new Math and Science Partnerships program to encourage academic institutions and schools to work together to improve math and science education. Although half of the program was proposed as new money, the other half would have

come out of existing EHR programs. The final appropriation offers \$160 million, and avoids cuts to other EHR programs.

The final NSF appropriation boosts funding for the Experimental Program to Stimulate Competitive Research (EPSCoR) from \$75 million to \$80 million and adds another \$11 million to fund the Office of Innovation Partnerships, and encourages R&RA programs to fund at least \$30 million in research at EPSCoR institutions. Both programs assist research institutions and states that have traditionally been underrepresented in federal R&D funding. The Senate bill encouraged consideration of an application from Rhode Island to be eligible for the EPSCoR program; the final bill does not mention this provision.

The FY 2002 appropriation continues the recent trend of large increases for NSF, although the FY 2002 increase is smaller than the 13 percent increase of last year. NSF R&D grew steadily in the 1980s and until FY 1995, but then stagnated and even declined because of severe budget pressures in the mid-1990s as the federal government restrained discretionary spending to achieve a balanced budget. NSF's R&D investment resumed its long-term growth trend after FY 1998, when the government entered a (now-ended) era of surpluses. **The FY 2002 increase brings NSF R&D to an all-time high.**

Other Agencies

The **U.S. Department of Agriculture (USDA)** funds agricultural research in universities and in its own laboratories, and forestry research through the Forest Service. On November 28, President Bush signed into law the final version of an appropriations bill providing funding for USDA, but USDA also received emergency counter-terrorism and domestic security appropriations in a Defense bill that cleared Congress on December 20. Together, the bills provide **\$2.1 billion for USDA's R&D programs, \$180 million or 9.2 percent more than FY 2001, and a substantial \$338 million above the request** (see Table 12). The final bill blocks funds for two mandatory competitive research grants programs, and instead dramatically boosts funding for congressionally designated, geographically specific projects in both USDA's intramural and extramural programs. The emergency funds will boost security at two USDA laboratories and fund research on bioterrorism.

The President's request for USDA R&D of \$1.8 billion, 8.0 percent less than FY 2001 funding levels, called for steep cuts in congressionally designated research projects, mostly for extramural research grants. Both the House and the Senate proposed higher funding levels, mainly by increasing congressionally earmarked projects. The final bill keeps most of the House-proposed and Senate-proposed earmarks and makes offsetting cuts in competitively awarded research grants.

In a reprise of a perennial fight, Congress blocked two mandatory (non-appropriated) grants programs from spending their funds. The **Initiative for Future Agriculture and Food Systems (IFAFS)** was created in June 1998 as a mandatory program to spend \$120 million a year for five years on competitively awarded grants for agricultural research and extension, to be administered by USDA's Cooperative State Research, Education and Extension Service (CSREES). The Appropriations Committees were upset that this program, created by the House and Senate Agriculture Committees, would take spending decisions on agricultural research out of their jurisdictions, so they have periodically tried to block USDA from spending these funds. Although funding for IFAFS was eventually released in FY 2000 and FY 2001, the final Agriculture bill blocks FY 2002 funds, of which an estimated \$64 million would have gone toward R&D. Similarly, the Fund for Rural America in the Office of the Secretary was reauthorized two years ago for five years, but Congress has also tried periodically to block these funds for competitively awarded research and extension grants on rural topics. The final Agriculture bill blocks funds for this program, resulting in a cut of \$8 million from planned R&D spending in FY 2002.

Other competitively awarded research grants fare somewhat better in the final USDA budget. **CSREES** also administers appropriated research grants programs. The **National Research Initiative (NRI)**, the existing competitive research grants program which IFAFS was designed to supplement, receives \$120 million, above the FY 2001 and requested level of \$106 million but far short of the amount needed to make up for lost IFAFS funds. Instead of competitively awarded grants, Congress directs funds toward **Special Research Grants**, which receive \$97 million, \$94 million more than the request. The House and Senate would have awarded \$82 million and \$84 million, respectively, for these grants; the final bill funds nearly all of the partially overlapping House and Senate proposed projects. These funds go to 174 itemized projects, all but six of which are for geographically specific congressionally

designated projects. The final bill also contains 29 other congressionally designated R&D projects in other parts of the CSREES budget. Most formula funding programs for academic R&D such as the **Hatch Act** (\$181 million, same as FY 2001) receive level funding.

Agricultural Research Service (ARS) R&D totals \$1.2 billion in FY 2002, a substantial increase of 22.0 percent or \$223 million, \$265 million more than the request. ARS funds intramural research through a nationwide network of intramural laboratories and agricultural experiment stations. In addition to substantial increases in regular appropriations, in December the Defense appropriations bill allocated additional emergency funds for ARS programs out of the \$40 billion post-September 11 emergency response fund for domestic security and counter-terrorism activities. The emergency allocation provides \$40 million for ARS research programs related to security or terrorism and \$73 million for Buildings and Facilities. The net result is an 11.2 percent increase in ARS research and a 158.7 percent increase in Buildings and Facilities. Although USDA requested only \$30 million for Buildings and Facilities, Congress nearly quadrupled the request to fund congressionally designated R&D facilities projects at ARS laboratories. The largest designation is \$40 million for construction and modernization of ARS facilities in Ames, Iowa, devoted to animal research, a facility made famous because of its stocks of anthrax spores for research purposes. Then, in the Defense bill, Congress provided an additional \$50 million for Ames for a new animal bio-containment facility and \$23 million for security upgrades of laboratory facilities at the Plum Island Animal Disease Center in New York.

The **Forest Service (FS)** funds an extensive program of forest and rangeland research, mostly in FS laboratories, as well as programs in fire science. FY 2002 Forest Service R&D totals \$265 million, an increase of \$19 million or 7.7 percent over FY 2001. The core forest and rangeland research program receive an increase of \$11 million to \$241 million, but Congress also boosted funding dramatically for research aimed at assisting FS efforts in wildland fire management.

The FY 2002 increase for R&D continues a trend of increases over the past few years. USDA R&D peaked in FY 1992 and declined for several years before hitting a low in FY 1996. Since then, the funding trend has been generally upward, especially in the last four years as the federal budget surplus has made more discretionary funds available to

congressional appropriators. In FY 2000 and FY 2001, the release of the IFAFS funding allowed USDA to exceed its early 1990s funding levels; although the IFAFS funds will not be available in FY 2002, the explosion in congressionally designated R&D projects and the last-minute infusion of emergency funds will **bring USDA R&D to an all-time high in FY 2002.**

The **Department of Commerce** receives **\$1.4 billion for its R&D programs, \$153 million or 12.7 percent more than FY 2001, and a substantial \$244 million above the request** (see Table 11). Commerce's two major R&D agencies—the National Oceanic and Atmospheric Administration (NOAA) and the National Institute of Standards and Technology (NIST)—both receive substantial increases. NOAA R&D rises by 15.3 percent, or \$111 million above FY 2001, while NIST R&D rises by 17.1 percent, \$72 million above the FY 2001 level. The final budget breaks with the Bush Administration and the House's proposals to eliminate NIST's Advanced Technology Program and provides an almost 30 percent increase in FY 2002 for the program.

NOAA performs R&D related to its mission of environmental stewardship of coastal and marine environments and the atmosphere to ensure sustainable economic opportunities. It plays a key role in research on the topics of climate change, weather, and fisheries. **The final NOAA budget provides large increases—ranging from 4 to more than 20 percent—across several NOAA R&D accounts**, including those in the National Ocean Service (NOS); Oceanic and Atmospheric Research (OAR); the National Weather Service (NWS); and the National Environmental Satellite, Data and Information Service (NESDIS). Total NOAA R&D rises 15.3 percent to \$836 million.

The final Commerce spending bill follows the Senate lead in keeping NIST's **Advanced Technology Program (ATP) alive with a boost of 26.6 percent in its R&D to \$150 million.** The Bush Administration and the House would have all but eliminated the program. Started by the first Bush Administration but promoted as a key technology initiative by the Clinton Administration, the ATP is an extramural research grants program to provide precompetitive cost-shared R&D support for promising market technologies. The House has repeatedly voted to terminate the program, but the Senate and the Clinton Administration had managed to preserve it in past budget struggles. The new Bush Administration requested only \$13 million for ATP in FY 2002, only

enough to close out previously awarded grants and pay for administration costs, with no funds for R&D in FY 2002. The House went along with the Administration proposal, but the Senate bill expressed strong support for the program and the final bill follows the Senate version.

Because of the large boost to ATP R&D, total NIST R&D increases by 17.1 percent to \$493 million, in sharp contrast to the House's proposed 24.1 percent cut down to \$319 million and an even steeper cut in the request down to \$313 million. The main NIST R&D activity—**Scientific and Technical Research and Services (STRS), which funds intramural research at the NIST laboratories—rises by a modest 4.3 percent** (or \$12 million) to \$279 million. The STRS appropriation includes \$5 million in emergency funds for the development of cybersecurity technologies, allocated in the Defense bill out of the \$40 billion post-September 11 emergency response fund. The other NIST R&D program, Construction of Research Facilities, increases a substantial \$29 million over FY 2001 and \$43 million over the request for a total of \$64 million, of which \$41 million is reserved for 11 congressionally designated research projects and \$1.2 million of which is emergency funds to upgrade NIST lab security.

The FY 2002 increase, after adjusting for expected inflation, brings Commerce R&D to an all-time high, surpassing the previous peak of FY 1995. Mostly because of strong Clinton Administration support for NIST programs over the last eight years, and secondarily because of bipartisan support for NOAA's R&D programs in the early 1990s, Commerce R&D in FY 2002 is nearly double the funding level of a decade ago (in inflation-adjusted terms). Commerce R&D peaked in FY 1995 and had been up and down since then because partisan disagreements on the proper role of the federal government in commercial technology made ATP a contentious political issue, because Republican hostility toward some environmental R&D programs resulted in cuts to NOAA, and because tight discretionary spending caps limited the pool of money available for both NIST and NOAA. But in recent years, continuing to FY 2002, there has been strong growth for NOAA R&D programs as the agency's environmental R&D mission has gained increasing favor in Congress, and NIST R&D programs have grown because of bipartisan support for the intramural lab programs and a more stable funding outlook for the ATP.

The **Department of the Interior** has an R&D budget of \$673 million in FY 2002, \$41 million or 6.5 percent more than FY 2001 (see Table 14).

The **U.S. Geological Survey (USGS)** is the primary sponsor of R&D in Interior. The final Interior bill provides \$914 million for its total budget in FY 2002, \$101 million more than the request. The Administration requested a \$70 million cut in USGS from the FY 2001 funding level; the final Interior appropriation restores the cuts and provides a 3.5 percent increase over FY 2001.

R&D accounts for nearly two-thirds of the USGS budget. The Bush Administration requested only \$491 million for USGS R&D, a proposed cut of 10.7 percent from FY 2001, but the final Interior bill provides \$567 million, an increase of 3.1 percent over FY 2001.

The request proposed to cut funding for R&D in all four USGS divisions, but hardest hit would have been programs in Water Resources (down 25.5 percent) and Biological Research (down 7.0 percent). The FY 2002 request explained that USGS performs a significant amount of research that primarily benefits other federal agencies, states, and local governments; the budget proposed to reduce funding for these programs, though without corresponding increases in other agencies' budgets. The final Interior bill instead keeps most programs' funding close to or slightly above the FY 2001 level.

The Interior bill provides \$140 million for R&D in the Water Resources Division (up 2.8 percent from FY 2001), \$38 million more than the request. The request proposed to cut the National Water Quality Assessment Program (NAWQA) by nearly a third. NAWQA is charged with monitoring the nation's water quality, and its data are used by the Environmental Protection Agency (EPA) and many state regulatory agencies. The final Interior bill allows the program to continue at close to its FY 2001 funding level.

The final Interior bill provides \$166 million for the USGS **Biological Resource Division (BRD)**, \$17 million more than the request and \$6 million more than FY 2001. The request proposed to eliminate funding for the National Biological Information Infrastructure (NBII) program. The NBII uses the World Wide Web and other technologies to establish a distributed web of biological data and information sources through which people can find specific information, retrieve it electronically, and

apply it to resource management questions. The request also proposed to cut funding for other BRD programs, but the final bill restores funding for all programs to at least their FY 2001 funding levels.

The FY 2002 increase enables Interior R&D to stay just ahead of inflation. Interior R&D has declined sharply since FY 1994, primarily because of the elimination of the Bureau of Mines in FY 1996 and the merging of the National Biological Service into USGS. Since then, Interior R&D has been mostly flat, with small increases in some years.

The **Environmental Protection Agency's (EPA)** R&D totals \$702 million in FY 2002, 15.3 percent or \$93 million above the FY 2001 level because of emergency R&D appropriations totaling \$70 million (see Table 15).

EPA requested \$7.3 billion for its total budget, a cut of \$494 million or 6.3 percent from FY 2001 because of cuts to State and Tribal Assistance Grants, perennially a higher priority for Congress than for EPA, and cuts in funds for congressionally designated projects. The final EPA budget provides \$8.1 billion (including \$176 million in emergency funds out of the \$40 billion post-September 11 emergency response fund), 3.4 percent more than FY 2001 and \$762 million more than the request.

EPA's R&D, mostly funded in the Science and Technology account, totals \$702 million, well above both the request and the FY 2001 funding level. EPA requested a cut in R&D down to \$569 million (down 6.5 percent), mostly because EPA proposed to eliminate dozens of congressionally designated research projects while keeping core research funding flat. The final FY 2002 EPA budget funds most R&D programs at the requested level, but adds nearly 50 congressionally designated research projects to the Science and Technology account and nearly 20 earmarked projects to the normally non-R&D Environmental Programs and Management account to bring FY 2002 R&D more than \$63 million above the requested level and \$23 million above the earmark-laden FY 2001 level. The R&D earmarks in the final VA-HUD bill total \$62 million, nearly exactly the amount total EPA R&D exceeds the request. On top of that, the Defense bill allocates an estimated \$70 million in emergency R&D funds to EPA S&T out of the post-September 11 \$40 billion emergency fund. The funds go to R&D and R&D facilities projects, including security upgrades at EPA laboratories, drinking water vulnerability assessments, and anthrax decontamination work.

Congress mostly stuck to the EPA's priorities for FY 2002, except for a boost in funding for **State and Tribal Assistance Grants**. Although EPA requested a cut in this program from \$3.6 billion to \$3.3 billion, the final EPA budget bill provides \$3.7 billion because of more than 300 congressional add-on projects. Most of this money goes to state and local governments. For **Environmental Programs and Management**, which funds most of EPA's operating expenses, the final bill provides \$2.1 billion, \$10 million more than FY 2001 and \$121 million more than the request because of congressionally designated projects, including some for R&D projects. The **Superfund** program increases slightly to \$1.3 billion. Superfund continues to support \$37 million (same as FY 2001) in research on hazardous substances.

The EPA research portfolio is balanced between the environmental sciences, the life sciences, and engineering research. Although EPA is the major environmental regulatory agency in the federal government, its R&D is primarily oriented toward its regulatory mission. Many other agencies (NOAA, NASA, Interior) fund environmental research related to their missions of research, resource stewardship, and economic management of the natural environment, so EPA is a relatively small part of federal environmental R&D. Roughly a quarter of EPA's R&D is performed in the agency's own laboratories, while about a third is performed by industrial firms. Nearly a third of EPA's R&D is performed by colleges and universities, a share that has been growing in recent years as EPA has attempted to expand its links with academia. The remainder is performed by nonprofit institutions and state and local governments.

The **Department of Transportation** (DOT) has a record R&D budget of \$853 million in FY 2002, a substantial boost of 14.2 percent or \$106 million over FY 2001 (see Table 13). The large increase for DOT R&D is in part due to emergency appropriations for aviation security R&D out of the post-September 11 response fund. The total DOT budget, also bolstered by emergency funds, rises by 6.3 percent or \$3.7 billion to \$61.7 billion thanks to guaranteed funding increases provided in recent highway and aviation authorization bills.

Much of the spending in the Transportation bill is exempt from limits on discretionary spending and the normal give-and-take of the appropriations process because of three new categories of discretionary

spending created in the Transportation Equity Act for the 21st Century (**TEA-21**) of 1998 and the Aviation Investment and Reform Act for the 21st Century (**AIR21**) of 2000. TEA-21, a six-year authorization bill for most highway and transit programs, dedicated all highway and transit trust fund receipts to transportation and created two new categories of discretionary spending (highways and transit programs) for that purpose. Spending in these two categories is determined by receipts from transportation taxes and not by legislative limits. AIR21 provided TEA21-like guarantees of increased funding for many FAA programs beginning in FY 2001.

Because transportation revenues have been rising and all these revenues are required to be spent on transportation, the final bill is relatively generous toward R&D programs in the two primary beneficiaries of guaranteed spending, the Federal Highway Administration (FHWA; \$322 million, up 9.6 percent) and the Federal Aviation Administration (FAA; \$323 million in non-emergency funds, up 7.3 percent).

The **Federal Aviation Administration (FAA)** receives \$373 million for R&D activities, an increase of 23.9 percent. FAA's R&D benefits from increased concern over aviation security in the aftermath of the September 11 terrorist attacks, although most of the post-September 11 increases go to non-R&D measures such as using existing technology to better protect airports and buying new security equipment. Included in the FAA R&D portfolio is \$64 million for aircraft safety technology R&D, \$45 million for aviation system security technology, and \$24 million for weather research. In mid-December, Congress approved an additional \$50 million in emergency R&D funds for FAA R&D out of the \$40 billion post-September 11 emergency response fund, mostly for development of new security technologies to protect the U.S. civil aviation system. The overall FAA budget rises by \$2.1 billion to \$14.1 billion, including more than \$1 billion in emergency funds.

Because of large increases for DOT R&D in FY 2001 and FY 2002, the agency's support for R&D reaches an all-time high in FY 2002, even after adjusting for inflation. DOT's R&D peaked in FY 1995 and then suffered a steep decline, particularly in the FAA, as a result of efforts to bring the federal budget into surplus. Because of guaranteed funding in TEA-21 and AIR21, FAA and FHWA R&D have been increasing in recent years, and with the help of emergency FAA R&D funds DOT R&D rises above the FY 1995 level in FY 2002.

Part II

Tables

Table 1. Total R&D by Agency

Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request		Chg. from FY 2001	
				Amount	Percent	Amount	Percent
Department of Defense (military)	42,743	48,454	50,134	1,680	3.5%	7,390	17.3%
("S&T" 6.1,6.2,6.3 + Medical)	9,420	8,827	10,527	1,700	19.3%	1,107	11.8%
(All Other DOD R&D)	33,324	39,627	39,607	-20	-0.1%	6,283	18.9%
National Aeronautics and Space Admin.	9,925	9,967	10,301	334	3.4%	375	3.8%
Department of Energy	7,744	7,399	8,122	723	9.8%	378	4.9%
Health and Human Services	20,859	23,496	24,145	650	2.8%	3,287	15.8%
(National Institutes of Health)	19,710	22,395	22,822	428	1.9%	3,113	15.8%
National Science Foundation	3,279	3,226	3,527	301	9.3%	249	7.6%
Department of Agriculture	1,959	1,801	2,139	338	18.8%	180	9.2%
Department of the Interior	631	593	673	80	13.5%	41	6.5%
Department of Transportation	747	798	853	55	6.9%	106	14.2%
Environmental Protection Agency	609	569	702	133	23.4%	93	15.3%
Department of Commerce	1,201	1,110	1,354	244	22.0%	153	12.7%
(NOAA)	726	772	836	64	8.3%	111	15.3%
(NIST)	421	313	493	180	57.6%	72	17.1%
Department of Education	265	259	265	6	2.5%	0	0.1%
Agency for International Development	200	193	204	11	5.7%	4	2.0%
Department of Veterans Affairs	703	722	733	11	1.5%	30	4.3%
Nuclear Regulatory Commission	50	67	68	1	2.0%	18	36.6%
Smithsonian Institution	118	118	119	1	0.7%	1	0.7%
Tennessee Valley Authority	0	0	0	0	--	0	--

(continued)

Table 1. (continued)

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
Corps of Engineers	60	46	51	5	11.5%	-9	-14.5%
Labor	22	13	19	6	46.2%	-3	-13.6%
Housing and Urban Development	54	43	69	26	60.7%	15	28.0%
Justice	90	74	104	30	40.5%	14	15.6%
U.S. Postal Service ¹	45	46	46	0	0.0%	1	2.2%
Social Security Administration	42	42	42	0	0.0%	0	0.0%
Treasury	7	8	8	0	0.0%	1	14.3%
All Other	16	13	15	2	17.3%	-1	-4.7%
TOTAL R&D	91,371	99,057	103,694	4,638	4.7%	12,324	13.5%
Defense R&D	46,243	51,996	53,928	1,932	3.7%	7,685	16.6%
Nondefense R&D	45,128	47,061	49,766	2,706	5.7%	4,638	10.3%
"FS&T" ²	47,138	49,572	52,373	2,802	5.7%	5,235	11.1%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

¹ Financed out of postal revenues.

² An alternative measure of the federal investment in science and technology proposed by the Office of Management and Budget.

Includes both R&D and non-R&D programs. Please see Appendix 1 for details.

**Table 2. Estimated Research (Basic and Applied) by Agency
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Percent	Chg. from FY 2001 Amount	Percent
Health and Human Services	20,575	23,046	23,539	493	2.1%	2,964	14.4%
<i>National Institutes of Health</i>	19,478	21,988	22,348	360	1.6%	2,870	14.7%
National Science Foundation	3,016	3,017	3,266	249	8.3%	250	8.3%
Department of Defense	5,405	5,028	6,056	1,028	20.4%	651	12.0%
Department of Energy	4,597	4,474	4,802	329	7.3%	206	4.5%
National Aeronautics & Space Admin.	4,243	4,277	4,523	246	5.7%	280	6.6%
Department of Agriculture	1,664	1,545	1,693	148	9.5%	29	1.7%
Department of the Interior	594	557	629	72	12.9%	35	5.9%
Environmental Protection Agency	475	442	552	110	24.8%	77	16.3%
Department of Commerce	995	987	1,136	149	15.1%	142	14.3%
NOAA	692	741	772	31	4.2%	80	11.6%
NIST	296	239	358	118	49.5%	62	20.9%
Department of Transportation	477	530	563	33	6.3%	86	18.0%
Department of Veterans Affairs	689	707	718	11	1.5%	29	4.2%
Department of Education	167	169	173	4	2.5%	6	3.7%
All Other	568	535	596	61	11.4%	28	4.9%
TOTAL Est. Research	43,464	45,314	48,246	2,932	6.5%	4,782	11.0%

AAAS estimates of basic and applied research based on FY 2002 appropriations bills and historical trends for agencies and programs.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

**Table 3. Major Functional Categories of R&D
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Percent	Chg. from FY 2001 Amount	Percent
Defense ¹	46,243	51,996	53,928	1,932	3.7%	7,685	16.6%
Nondefense ²	45,128	47,061	49,766	2,706	5.7%	4,638	10.3%
Space	8,999	9,077	9,368	292	3.2%	369	4.1%
Health	21,506	24,173	24,818	646	2.7%	3,312	15.4%
Energy	1,340	994	1,379	384	38.7%	38	2.9%
General Science	6,234	6,156	6,545	389	6.3%	312	5.0%
Natural Resources & Environment	2,272	2,230	2,528	297	13.3%	255	11.2%
Agriculture	1,713	1,551	1,874	322	20.8%	161	9.4%
Transportation	1,673	1,688	1,785	98	5.8%	112	6.7%
Commerce	475	337	517	180	53.5%	42	8.8%
International	216	206	217	11	5.3%	1	0.5%
All Other	700	649	736	87	13.3%	36	5.1%
TOTAL R&D	91,371	99,057	103,694	4,638	4.7%	12,324	13.5%

AAAS estimates of R&D in FY 2002 appropriations bills based on historical trends for agencies and programs.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

Includes conduct of R&D and R&D facilities. Classifications generally follow the government's budget function categories except health (which here includes health R&D in HHS and VA).

¹ Includes DOD R&D and atomic energy defense R&D in DOE.

² Includes all R&D not in defense (domestic and international discretionary programs).

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

**Table 4. Department of Defense by Program
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
Research, Development, Test, and Evaluation:							
Basic Research ("6.1")	1,317	1,304	1,383	79	6.0%	65	5.0%
Applied Research ("6.2")	3,676	3,659	4,212	553	15.1%	536	14.6%
Advanced Tech. Development ("6.3")	4,015	3,799	4,471	672	17.7%	457	11.4%
TOTAL Science and Technology	9,008	8,762	10,066	1,304	14.9%	1,058	11.7%
Demonstration/Validation ("6.4")	7,993	11,381	10,401	-981	-8.6%	2,407	30.1%
Engineering and Manuf. Dev. ("6.5")	8,893	10,249	11,022	772	7.5%	2,129	23.9%
RDT&E Management Support ("6.6")	2,639	2,802	2,847	45	1.6%	207	7.9%
Operational Systems Dev. ("6.7")	12,961	14,235	14,385	150	1.1%	1,424	11.0%
BA Adjustment	-180	0	0	--	--	--	--
TOTAL RDT&E	41,315	47,429	48,720	1,290	2.7%	7,405	17.9%
Other Appropriations ¹	1,017	959	953	-7	-0.7%	-64	-6.3%
Medical research ²	412	65	461	396	606.7%	49	12.0%
TOTAL DOD R&D	42,743	48,454	50,134	1,680	3.5%	7,390	17.3%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities. All figures are rounded to the nearest million. Changes calculated from unrounded figures. FY 2002 Approved figures adjusted to reflect rescissions and general reductions.

¹ R&D support in military personnel, military construction, and other DOD appropriations.

² Medical research appropriated in Defense Health Programs, not RDT&E. These funds are not included in "6.2."

**Table 5. Department of Defense by Agency
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Percent	Chg. from FY 2001 Amount	Percent
Research, Development, Test, and Evaluation:							
Army	6,247	6,513	7,064	551	8.5%	817	13.1%
Navy	9,555	10,735	11,422	687	6.4%	1,867	19.5%
Air Force	14,190	14,344	14,528	184	1.3%	338	2.4%
Defense Agencies	11,098	15,620	15,475	-145	-0.9%	4,377	39.4%
<i>(Defense Adv. Research Projects Agcy.)</i>	2,010	2,281	2,293	11	0.5%	283	14.1%
<i>(Ballistic Missile Defense Organization)</i>	4,204	7,606	6,995	-610	-8.0%	2,791	66.4%
<i>(Other)</i>	4,884	5,733	6,187	454	7.9%	1,303	26.7%
Director of Test and Evaluation	0	0	0	0	--	0	--
Dir. of Operational Test & Evaluation	223	217	231	13	6.1%	8	3.5%
TOTAL RDT&E	41,315	47,429	48,720	1,290	2.7%	7,405	17.9%
Other Appropriations ¹	1,017	959	953	-7	-0.7%	-64	-6.3%
Medical research ²	412	65	461	396	606.7%	49	12.0%
TOTAL DOD R&D	42,743	48,454	50,134	1,680	3.5%	7,390	17.3%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities. All figures are rounded to the nearest million. Changes calculated from unrounded figures. FY 2002 Approved figures adjusted to reflect rescissions and general reductions.

¹ R&D support in military personnel, military construction, and other DOD appropriations.

² Medical research appropriated in Defense Health Programs, not RDT&E.

**Table 6. National Aeronautics and Space Administration
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request		Chg. from FY 2001	
				Amount	Percent	Amount	Percent
Summary of R&D by Appropriation:							
1. Human Space Flight (HSF)							
Space Station *	2,113	2,087	1,724	-364	-17.4%	-389	-18.4%
Other HSF R&D	788	737	737	0	0.0%	-51	-6.5%
Total R&D HSF	2,901	2,825	2,461	-364	-12.9%	-440	-15.2%
2. Science, Aeronautics, and Technology (SAT)							
Space Science	2,625	2,786	2,849	63	2.2%	224	8.5%
Biological & Physical Research *	379	361	714	353	97.9%	336	88.6%
Earth Science	1,716	1,515	1,573	58	3.9%	-143	-8.3%
Aero-Space Technology	2,214	2,376	2,490	114	4.8%	275	12.4%
Academic Programs	133	154	231	77	50.2%	98	73.9%
Emergency Funds	0	0	33	33	--	33	--
Total R&D SAT	7,067	7,192	7,890	698	9.7%	823	11.6%
Less Non-R&D in SAT	-42	-50	-50	0	0.0%	-7	17.5%
TOTAL NASA R&D	9,925	9,966	10,301	334	3.4%	375	3.8%

(continued)

Table 6. (continued)

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
NASA Non-R&D Activities:							
Space Shuttle (in HSF)	3,119	3,284	3,284	0	0.0%	165	5.3%
Other Non-R&D in HSF	1,144	1,188	1,244	56	4.7%	100	8.7%
Non-R&D in SAT	42	50	50	0	0.0%	7	17.5%
Inspector General	23	24	24	0	0.0%	1	3.5%
Total NASA Non-R&D Activities	4,328	4,545	4,601	56	1.2%	273	6.3%
TOTAL NASA Budget	14,253	14,511	14,902	390	2.7%	648	4.5%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

* - The FY 2002 Approved appropriation transfers Space Station research from the International Space Station account to the Biological and Physical Research account. The FY 2002 Approved transfer for Space Station research is \$284 million; there is an additional \$55 million in BPR for space station equipment.

**Table 7. Department of Energy
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
DOE Appropriations Containing R&D:							
1. Energy Supply R&D	409	284	417	133	46.8%	8	2.0%
2. Fossil Energy R&D	396	296	408	112	37.8%	12	3.0%
3. Energy Conservation	441	316	454	138	43.8%	14	3.1%
4. Science	2,955	2,930	3,018	88	3.0%	63	2.1%
5. Atomic Energy Defense Activities	3,499	3,542	3,794	252	7.1%	295	8.4%
6. Clean Coal Technology ¹	0	0	0	0	--	0	--
7. Radioactive Waste Management	45	31	31	0	0.0%	-13	-29.9%
TOTAL DOE R&D	7,744	7,399	8,122	723	9.8%	378	4.9%
Detail of selected appropriations:							
1. Energy Supply R&D							
Solar and Renewables	328	227	339	112	49.3%	11	3.3%
Nuclear Energy	81	57	78	21	36.7%	-3	-3.5%
TOTAL Energy Supply	409	284	417	133	46.8%	8	2.0%
4. Science							
High Energy Physics	702	706	706	0	0.0%	4	0.6%
Nuclear Physics	355	355	355	0	0.0%	0	0.0%

(continued)

Table 7. (continued)

	FY 2001 Estimate	FY 2002 Request	FY 2002 Approved	Action by Congress			
				Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
Fusion Energy Sciences	245	245	245	0	0.0%	0	0.1%
Advanced Scientific Computing Research	166	163	158	-5	-3.1%	-8	-4.6%
Bio. and Environmental Research	481	442	527	86	19.4%	46	9.6%
Basic Energy Sciences	984	997	1,004	7	0.7%	20	2.0%
<i>(Spallation Neutron Source)</i>	278	291	291	0	0.0%	13	4.8%
Energy Research Analyses	1	1	1	0	0.0%	0	2.5%
Multiprogram Lab Support	22	22	22	0	0.0%	0	0.0%
TOTAL Science	2,955	2,930	3,018	88	3.0%	63	2.1%
5. Atomic Energy Defense Activities							
National Nuclear Security Administration (NNSA)							
Naval Reactors	669	667	665	-2	-0.3%	-3	-0.5%
Weapons Activities	2,357	2,449	2,569	120	4.9%	212	9.0%
<i>Stockpile R&D</i>	246	306	349	44	14.2%	104	42.2%
<i>(Adv. Simulation and Computing)</i>	747	738	730	-8	-1.1%	-17	-2.3%
<i>(Inertial Confinement Fusion)</i>	234	223	261	39	17.3%	28	11.9%
<i>(Nat'l Ignition Facility Construction)</i>	197	245	245	0	0.0%	48	24.2%
<i>All Other Weapons R&D</i>	934	938	984	46	4.9%	50	5.4%
Nonproliferation & Verification R&D	204	195	309	114	58.5%	105	51.2%
Fissile Materials Disposition	62	67	67	0	0.0%	6	9.6%
Total NNSA R&D	3,292	3,379	3,611	232	6.9%	319	9.7%

(continued)

Table 7. (continued)

	FY 2001 Estimate	FY 2002 Request	FY 2002 Approved	Action by Congress			
				Chg. from Request Amount	Percent	Chg. from FY 2001 Amount	Percent
Nuclear Safeguards and Security	26	26	26	0	0.0%	0	0.0%
Intelligence	5	5	5	0	0.0%	0	0.0%
Environmental Management	176	131	151	20	15.2%	-25	-14.0%
TOTAL Atomic Defense R&D	3,499	3,542	3,794	252	7.1%	295	8.4%
DOE R&D by Budget Function:							
Defense	3,499	3,542	3,794	252	7.1%	295	8.4%
General Science	2,955	2,930	3,018	88	3.0%	63	2.1%
Energy	1,290	927	1,310	383	41.3%	20	1.6%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

¹ Budget authority is negative for some years because of enacted or proposed deferrals of previously appropriated funds.

Excludes deferrals of funds in Clean Coal Technology and other deferrals. FY 2002 CCT deferral is \$40 million.

Table 7a. Department of Energy Budget (budget authority in millions of dollars)

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
Weapons Activities (NNSA)	5,201	5,300	5,565	265	5.0%	364	7.0%
Other NNSA Activities	1,571	1,477	2,030	553	37.5%	459	29.2%
Defense Environmental Restoration	5,061	4,549	5,243	694	15.3%	182	3.6%
Nuclear Waste and Other Defense	1,970	2,030	2,074	44	2.2%	104	5.3%
Total DOE defense	13,803	13,355	14,912	1,557	11.7%	1,109	8.0%
Science	3,155	3,160	3,233	73	2.3%	78	2.5%
Energy Supply	661	505	667	162	32.0%	5	0.8%
Fossil Energy	539	449	583	134	29.8%	43	8.0%
Energy Conservation	815	756	913	157	20.8%	97	11.9%
Other Energy Programs	344	324	352	28	8.6%	9	2.5%
Nondefense Environmental Mngmt.	291	229	236	8	3.4%	-55	-18.8%
Power Marketing Administrations	202	205	208	2	1.2%	6	2.9%
Departmental Administration	106	115	105	-10	-8.5%	-1	-0.8%
Total DOE Budget	19,917	19,098	21,209	2,111	11.1%	1,292	6.5%

Source: Department of Energy budget justification and FY 2002 appropriations bills.

DOE appropriations only (does not include offsets and other mandatory). Includes R&D and non-R&D programs.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

Excludes deferrals of funds in Clean Coal Technology and other deferrals. FY 2002 CCT deferral is \$40 million.

FY 2002 Approved includes emergency funds transferred to DOE from funds appropriated in Public Law 107-38.

**Table 8. National Institutes of Health
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Percent	Chg. from FY 2001 Amount	Percent
Cancer	3,738	4,177	4,190	13	0.3%	452	12.1%
Heart, Lung and Blood	2,299	2,567	2,576	9	0.3%	277	12.0%
Dental and Cranofacial Research	306	342	343	1	0.4%	37	12.1%
Diabetes, Digestive and Kidney	1,304	1,458	1,467	9	0.6%	163	12.5%
Neurological Disorders and Stroke	1,177	1,316	1,328	12	0.9%	151	12.8%
Allergy and Infectious Diseases	2,063	2,355	2,527	172	7.3%	464	22.5%
General Medical Sciences	1,540	1,720	1,725	5	0.3%	185	12.0%
Child Health & Human Development	979	1,097	1,114	17	1.5%	135	13.8%
Eye	511	571	581	10	1.8%	71	13.9%
Environmental Health Sciences ¹	566	632	647	15	2.4%	81	14.4%
Aging	786	880	893	13	1.5%	107	13.6%
Arthritis & Musculoskeletal & Skin	397	444	449	5	1.2%	52	13.2%
Deafness and Comm. Disorders	301	337	342	5	1.6%	41	13.6%
Mental Health	1,107	1,238	1,249	10	0.8%	142	12.8%
Drug Abuse	781	907	888	-19	-2.1%	107	13.7%
Alcoholism and Alcohol Abuse	341	382	384	2	0.6%	44	12.8%
Nursing Research	105	118	120	3	2.3%	15	14.5%
Research Resources	817	974	1,012	38	3.9%	194	23.8%
Human Genome Research	382	427	430	3	0.7%	47	12.4%
Fogarty International Center	50	56	57	0	0.9%	6	12.8%

(continued)

Table 8. (continued)

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request		Chg. from FY 2001	
				Amount	Percent	Amount	Percent
National Library of Medicine	246	276	278	2	0.7%	31	12.7%
Office of the Director	188	232	236	3	1.5%	48	25.6%
Buildings and Facilities	154	307	345	38	12.4%	191	124.1%
Complementary and Alternative Medicine	89	100	105	5	4.6%	16	17.4%
Biomed. Imaging/Bioengineering	2	40	112	72	178.5%	110	5570.1%
Minority Health and Health Disparities	132	158	158	-1	-0.4%	26	19.5%
TOTAL NIH Budget	20,361	23,112	23,556	444	1.9%	3,195	15.7%
add Mandatory Funds	103	103	103	0	0.0%	0	0.0%
<i>Subtract:</i>							
<i>Estimated Research Training</i>	<i>592</i>	<i>645</i>	658	12	1.9%	66	11.2%
<i>Other Non-R&D</i>	<i>162</i>	<i>175</i>	178	3	1.9%	16	9.9%
TOTAL NIH R&D	19,710	22,394	22,822	428	1.9%	3,113	15.8%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

¹ FY 2002 Approved includes \$81 million appropriated to NIEHS in the VA-HUD and Defense bills.

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

**Table 9. Department of Health and Human Services
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Percent	Chg. from FY 2001 Amount	Percent
National Institutes of Health	19,710	22,395	22,822	428	1.9%	3,113	15.8%
Centers for Disease Control	517	568	689	121	21.4%	172	33.3%
Food and Drug Administration	138	140	159	19	13.7%	21	15.4%
Centers for Medicare & Medicaid Services ¹	139	55	118	63	114.9%	-21	-15.0%
Health Resources & Services Admin.	26	28	28	0	0.0%	2	7.7%
Healthcare Research and Quality	226	255	248	-7	-2.9%	22	9.6%
Admin. for Children & Families	25	27	27	0	0.0%	2	8.0%
Office of Aging	31	18	33	15	83.9%	2	6.8%
Departmental Administration	47	10	21	11	105.0%	-27	-56.4%
TOTAL HHS R&D	20,859	23,496	24,145	650	2.8%	3,287	15.8%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

¹ Formerly the Health Care Financing Administration.

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

**Table 10. National Science Foundation
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request		Chg. from FY 2001	
				Amount	Percent	Amount	Percent
Research and Related Activities ¹ :							
Mathematical and Physical Sciences	851	864	922	59	6.8%	71	8.4%
Engineering	431	431	468	36	8.5%	37	8.5%
Biological Sciences	485	483	509	26	5.4%	24	4.9%
Geosciences	562	559	611	52	9.3%	48	8.6%
Computer and Info. Science and Eng.	478	470	516	45	9.7%	38	7.9%
Social, Behavioral and Econ. Scis.	164	163	169	6	3.5%	4	2.7%
US Polar Programs	273	277	298	22	7.8%	25	9.1%
Integrative Activities	98	81	107	26	32.1%	9	9.0%
Total Research and Related Activities ¹	3,343	3,327	3,599	272	8.2%	256	7.7%
Major Research Equipment	122	96	139	42	44.1%	17	14.1%
Education and Human Res. R&D	139	139	140	0	0.3%	0	0.3%
<i>Subtract Non-R&D in R&RA ¹</i>	<i>-325</i>	<i>-336</i>	<i>-350</i>	<i>-13</i>	<i>4.0%</i>	<i>-25</i>	<i>7.6%</i>
TOTAL NSF R&D	3,279	3,226	3,527	301	9.3%	249	7.6%

(continued)

Table 10. (continued)

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Chg. from Request Percent	Chg. from FY 2001 Amount	Chg. from FY 2001 Percent
Non-R&D Programs and Activities:							
Non-R&D in R&RA ¹	325	336	350	13	4.0%	25	7.6%
Other Education and Human Res.	646	733	735	2	0.3%	89	13.8%
Salaries and Expenses	161	170	170	0	0.0%	10	5.9%
Inspector General	6	7	7	0	0.0%	0	7.8%
Total NSF Non-R&D Activities	1,138	1,246	1,262	16	1.3%	124	10.9%
TOTAL NSF Budget	4,417	4,473	4,789	317	7.1%	373	8.4%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

¹ R&RA funds are not appropriated by directorate. The FY 2002 Approved directorate figures are AAAS estimates based on language in the FY 2002 appropriations bill.

**Table 11. Department of Commerce
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request		Chg. from FY 2001	
				Amount	Percent	Amount	Percent
National Oceanic and Atmospheric Administration (NOAA):							
TOTAL NOAA R&D	726	772	836	64	8.3%	111	15.3%
National Institute of Standards and Technology (NIST):							
Scientific & Technical Research	268	292	279	-12	-4.2%	12	4.3%
Advanced Technology Program R&D	118	0	150	150	- -	31	26.6%
Construction	35	21	64	43	204.5%	29	82.8%
TOTAL NIST R&D	421	313	493	180	57.6%	72	17.1%
<i>(STRS, ATP Non-R&D Activities)</i>	72	69	82	13	18.9%	9	12.8%
<i>(Manufacturing Extension Partnership)</i>	105	106	107	0	0.2%	1	1.3%
<i>(Total NIST Budget)</i>	598	487	681	193	39.7%	82	13.8%
Departmental Administration	1	1	1	0	0.0%	0	0.0%
Bureau of the Census	2	2	2	0	0.0%	0	0.0%
National Telecomm. and Info. Admin.	51	21	21	0	0.0%	-30	-58.8%
Economic Development Administration	1	1	1	0	0.0%	0	0.0%
TOTAL Commerce R&D	1,201	1,110	1,354	244	22.0%	153	12.7%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities. All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

**Table 12. U.S. Department of Agriculture
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request Amount	Percent	Chg. from FY 2001 Amount	Percent
Agricultural Research Service (ARS) Programs ¹	937	939	1,042	104	11.1%	105	11.2%
Buildings and Facilities ²	74	30	192	162	530.3%	118	158.7%
Total ARS R&D	1012	969	1,234	265	27.4%	223	22.0%
Cooperative State Research, Education and Extension Service (CSREES):							
Total CSREES R&D	594	468	532	64	13.7%	-61	-10.3%
<i>(National Research Initiative)</i>	106	106	120	15	13.9%	15	13.9%
<i>(Special Research Grants)</i>	85	3	97	94	3421.2%	12	13.5%
<i>(Hatch Act)</i>	180	180	180	0	0.0%	0	0.0%
<i>(Integrated Grants)</i>	19	19	19	0	2.4%	0	2.4%
<i>(Initiative for Future Agri. ³)</i>	64	64	0	-64	-100.0%	-64	-100.0%
<i>(CSREES Non-R&D Programs)</i>	540	521	499	-22	-4.2%	-41	-7.6%
<i>(Total CSREES Budget)</i>	1,134	990	1,031	42	4.2%	-102	-9.0%
Forest Service	246	250	265	15	6.1%	19	7.7%
Economic Research Service	66	67	67	0	0.3%	1	1.8%
Agricultural Marketing Service	5	5	5	0	0.0%	0	0.0%

(continued)

Table 12. (continued)

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request		Chg. from FY 2001	
				Amount	Percent	Amount	Percent
Foreign Agricultural Service	1	1	1	0	0.0%	0	0.0%
Nat'l Agricultural Statistics Service	4	4	4	0	0.0%	0	0.0%
Grain Inspection	5	6	6	0	0.0%	1	20.0%
Animal & Plant Inspection Service	22	23	24	1	4.1%	2	8.8%
Office of the Secretary ⁴	5	8	0	-8	-100.0%	-5	-100.0%
Total USDA R&D	1,959	1,801	2,139	338	18.8%	180	9.2%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

FY 2001 ARS and CSREES figures include mandatory R&D funds appropriated in the Agricultural Risk Protection Act (P.L. 106-224).

¹ Includes spending from trust funds.

² Includes repair and maintenance funded through the Programs account.

³ Mandatory (non-appropriated) program of competitive grants for agricultural research. R&D portion only.

The final Agriculture bill (P.L. 107-76) blocks FY 2002 spending.

⁴ Fund for Rural America, a mandatory program. R&D portion only. The final Agriculture bill (P.L. 107-76) blocks FY 2002 spending.

**Table 13. Department of Transportation
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	FY 2002 Approved	Action by Congress			
				Chg. from Request		Chg. from FY 2001	
				Amount	Percent	Amount	Percent
Federal Aviation Administration	301	276	373	97	35.2%	72	23.9%
Federal Highway Administration	294	374	322	-53	-14.1%	28	9.6%
Federal Transit Administration	13	5	13	8	161.1%	0	-0.2%
Nat'l Highway Traffic Safety Admin.	58	59	57	-2	-2.9%	-1	-1.7%
Federal Railroad Administration	28	31	32	1	2.2%	4	14.2%
Coast Guard	22	23	21	-2	-6.5%	-1	-4.7%
Research and Special Programs	9	10	8	-2	-20.3%	-2	-16.2%
Fed. Motor Carrier Safety Admin.	10	14	14	0	0.0%	4	43.8%
Office of the Secretary	11	5	12	7	130.9%	1	9.3%
Total DOT R&D	747	798	853	55	6.9%	106	14.2%
DOT Budget (includes R&D components):							
Federal Aviation Administration	11,981	12,927	14,123	1,196	9.3%	2,142	17.9%
Federal Highway Administration	33,433	32,530	33,214	685	2.1%	-218	-0.7%
Federal Transit Administration	6,254	6,747	6,881	134	2.0%	627	10.0%
Coast Guard	4,511	5,140	5,258	118	2.3%	747	16.6%
Federal Railroad Administration	744	651	840	188	28.9%	96	12.9%
All Other	1,137	1,122	1,410	288	25.6%	273	24.0%
Total DOT Budget	58,060	59,117	61,726	2,609	4.4%	3,666	6.3%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities. Figures rounded to the nearest million. Changes calculated from unrounded figures. DOT figures include budget authority (regular and emergency), limitations on obligations, and other budgetary resources. FY 2002 Approved includes emergency funds transferred to DOT from funds appropriated in Public Law 107-38.

**Table 14. Department of the Interior
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	FY 2002 Approved	Action by Congress			
				Chg. from Request Amount	Percent	Chg. from FY 2001 Amount	Percent
U.S. Geological Survey:							
Surveys, Investigations, and Research (SIR):							
National Mapping	28	26	28	1	4.2%	0	-0.6%
Geologic Resources	225	214	233	19	8.9%	7	3.3%
Water Resources	136	101	140	38	38.0%	4	2.8%
Biological Research	161	149	166	17	11.5%	6	3.6%
Total USGS R&D	549	491	567	76	15.4%	17	3.1%
<i>(USGS Non-R&D SIR Activities)</i>	333	323	347	25	7.7%	14	4.3%
<i>(Total USGS SIR Budget)</i>	883	813	914	101	12.4%	31	3.5%
Bureau of Reclamation	6	6	10	4	66.7%	4	66.7%
National Park Service	30	30	30	0	0.0%	0	0.0%
Bureau of Land Management	14	19	19	0	0.0%	5	35.7%
Minerals Management Service	32	47	47	0	0.0%	15	46.9%
TOTAL Interior R&D	631	593	673	80	13.5%	41	6.5%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.
All figures are rounded to the nearest million. Changes calculated from unrounded figures.

**Table 15. Environmental Protection Agency
Congressional Action on R&D in the FY 2002 Budget (budget authority in millions of dollars)**

	FY 2001 Estimate	FY 2002 Request	Action by Congress				
			FY 2002 Approved	Chg. from Request		Chg. from FY 2001	
				Amount	Percent	Amount	Percent
Science and Technology ¹	533	497	618	122	24.5%	86	16.1%
Superfund	37	37	37	0	0.0%	0	1.1%
Leaking Underground Storage Tanks	1	1	1	0	0.0%	0	0.0%
Oil Spill Response	1	1	1	0	0.0%	0	0.0%
Other R&D Support Costs	38	34	46	12	34.1%	7	18.8%
TOTAL EPA R&D	609	569	702	133	23.4%	93	15.3%
EPA Budget:							
Science and Technology (incl. non-R&D) ²	732	677	825	148	21.8%	93	12.8%
Environ. Progs. and Management	2,083	1,973	2,094	121	6.1%	10	0.5%
Superfund ²	1,231	1,231	1,274	43	3.5%	44	3.5%
State and Tribal Assistance Grants	3,621	3,289	3,738	450	13.7%	118	3.2%
Buildings and Facilities	24	25	25	0	0.0%	1	6.0%
Leaking Underground Storage Tanks	72	72	73	1	1.5%	1	1.5%
Oil Spill Response	15	15	15	0	0.2%	0	0.2%
Inspector General	34	34	34	0	0.0%	0	0.0%
TOTAL EPA Budget	7,812	7,317	8,079	762	10.4%	267	3.4%

AAAS estimates of R&D in FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

¹ Does not include transfers from Superfund.

² Transfers from Superfund to S&T account recorded under S&T.

FY 2002 Approved figures include emergency appropriations for domestic security and counterterrorism activities.

Part III

Appendices

Appendix 1: Methodology and Data Sources

Within the federal budget there is no separately identified R&D budget as such; nor are most appropriations for R&D so labeled except for certain program areas, such as defense. Consequently, most funds for R&D are not line items in an agency's budget but are included within general program funding. The Office of Management and Budget (OMB) requires agencies whose annual R&D funding is greater than \$10 million to submit data on their R&D programs as part of their annual budget submissions. Specifically, the agencies provide data (reported on MAX Schedule C as part of the budget process) on funding levels for basic research, applied research, development, and R&D facilities (see Appendix 2: Definitions). However, agencies differ in their reporting. For example, some agencies classify program direction or management support as R&D; others do not.

In the data tables, the columns "FY 2001 Estimate" and "FY 2002 Request" represent the agencies' best estimates of actual and proposed federal funding for R&D collected during the winter and spring by OMB and AAAS. These figures incorporate information provided to OMB by 26 agencies accounting for more than 99 percent of all federal R&D and information collected by AAAS from individual agencies after the budget is prepared. Some adjustments to these figures have been made during 2001 to reflect a revised Department of Defense (DOD) request in June 2001, other agency revisions, supplemental appropriations, and rescissions. "FY 2002 Approved" figures are AAAS estimates of R&D contained in FY 2002 appropriations bills and their accompanying committee reports as approved by Congress and signed by the President in the fall and early winter of 2001, and reflect rescissions and emergency supplementals (including contingent emergency appropriations) enacted at that time. For FY 2002, they also reflect emergency appropriations provided in Public Law 107-38 and other laws enacted in the aftermath of the September 11 terrorist attacks.

Due to rounding in the tables, the detail may not add to the totals, and the percentage changes may not correspond to the difference shown. Most figures are rounded to the nearest million; totals and changes are calculated from unrounded figures. In the tables, subtotals are occasionally provided for additional detail. These subtotals are shown in italics to indicate that they do not add into the totals.

Special Note on Table 1. The Office of Management and Budget (OMB) has introduced a new “Federal Science and Technology” (FS&T) budget in the FY 2002 budget. The FS&T budget is successor to the Clinton Administration’s “21st Century Research Fund” (see previous editions of this report) and contains most of the same programs. FS&T is a collection of selected R&D and non-R&D programs that emphasize basic and applied research and the creation of new knowledge or technologies. It also includes some S&T education and training activities but excludes most development, and is designed to be an alternative measure for the federal investment in science and technology. (This FS&T budget has a similar emphasis but different definitions from the FS&T concept proposed in 1995 by the National Academy of Sciences (NAS) as a subset of federal R&D; thus, the data in Table 1 differ from discussions of “FS&T” in previous editions of this report.)

Special Note on Table 2. Basic and Applied Research by Agency. Most R&D programs contain a mix of basic research, applied research, and development. Agencies determine what proportions of a program’s R&D are basic and applied research. “FY 2002 Approved” figures for research (basic and applied) are AAAS estimates of basic and applied research contained in FY 2002 appropriations bills as approved by Congress and signed by the President in the fall of 2001, based on historical trends in basic and applied research and agency budget documents.

Special Note on Table 3. Major Functional Categories of R&D. All activities in the federal budget are classified into 20 broad functional categories. (AAAS separates the general science, space, and technology function into its subfunctions of General Science and Space). Each function often includes programs from several agencies. Each R&D program is assigned to only one function, even though the R&D activity may address several functional concerns.

Appendix 2: Definitions

In this report, R&D refers to actual research and development activities as well as R&D facilities. These definitions are used by the Office of Management and Budget, the National Science Foundation, and AAAS.

Research is systematic study directed toward more complete scientific knowledge or understanding of the subject studied. The federal government classifies research as either basic or applied according to the objective of the sponsoring agency.

- In **basic research** the objective is to gain knowledge or understanding of phenomena without specific applications in mind.
- In **applied research** the objective is to gain knowledge or understanding necessary for meeting a specific need.

Development is the systematic use of the knowledge or understanding gained from research directed toward the production of materials; devices; systems; or methods, including design, development, and improvement of prototypes and new processes. It excludes quality control, routine product testing, and production.

R&D funding normally includes those personnel, program supervision, and administrative support costs directly associated with R&D activities. Laboratory equipment is also included. Defense R&D also includes testing, evaluation, prototype development, and other activities which precede actual production.

Funding for **R&D facilities** includes construction, repair, or alteration of physical plant (*e.g.*, reactors, wind tunnels, particle accelerators, or laboratories) used in the conduct of R&D. This also includes funding for major capital equipment used in the conduct of R&D.

The federal R&D funding data in this report are presented in terms of **budget authority**. Budget authority is the initial budget parameter for congressional action on the President's proposed budget. Other R&D data sources may express R&D funding in terms of obligations or outlays. There are also R&D data sources which obtain funding data

from funding **recipients** (companies, universities) rather than from funding **sources** (agencies).

Budget authority is the legal authorization to expend funds.

Obligations represent orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated and when the future payment of money is required.

Outlays represent checks issued and cash payments made during a given period, regardless of when the funds were appropriated or obligated. Some surveys refer to outlays as expenditures.

As an example, Congress may appropriate \$100 million to NASA in FY 1999 for an R&D laboratory. NASA may then issue contracts to build the lab and sign \$50 million of the contracts in FY 1999 and \$50 million in FY 2000. Upon completion of the lab in FY 2001, NASA may then write checks to the contractors for a total of \$100 million. Budget authority would be \$100 million in FY 1999; obligations would be split \$50 million each in FY 1999 and FY 2000; outlays would be \$100 million in FY 2001. In the federal budget process, there is normally a lag between budget authority and outlays for large capital projects and research contracts; budget authority and outlays usually occur in the same year for recurring expenses such as staff salaries.

(Definitions adapted from National Science Foundation, *Federal R&D Funding by Budget Function: Fiscal Years 2000-2002*, Arlington, VA, 2001.)

**Appendix 3:
Related Publications**

AAAS Report XXVI: Research and Development FY 2002, Intersociety Working Group, 2001. \$19.95; \$15.96 for AAAS members. AAAS Publication Number: 01-05S. (Companion to this volume, a comprehensive analysis of the President's proposed budget for R&D for FY 2002 by agency, issue area, and discipline. The full text is available on line on the AAAS R&D Web site.)

AAAS Science and Technology Policy Yearbook 2001, Albert H. Teich, Stephen D. Nelson, Celia McEnaney, Stephen J. Lita, editors, 2001. \$24.95; \$19.95 for AAAS members. AAAS Publication Number 01-03S. (A collection of writings on the major science and technology policy issues of 2000 including selections from the proceedings of the 25th Anniversary AAAS Colloquium on Science and Technology Policy. The full text is also available on line on the AAAS R&D Web site.)

Working with Congress: A Practical Guide for Scientists and Engineers, Second Edition, William G. Wells, Jr., 1996. AAAS Publication Number: 96-2S. \$15.95; \$12.76 for AAAS members.

The above publications may be ordered from the AAAS Distribution Center. Please add \$4.00 for postage and handling per order. Orders must be prepaid by check or accompanied by purchase order payable to AAAS. Address: AAAS Distribution Center, P.O. Box 521, Annapolis Junction, MD 20701. For VISA / Mastercard orders call 1-800-222-7809 (8:30 AM - 5:00 PM ET). Fax orders to 301-206-9789. For shipments to CA and DC, add applicable sales tax. For shipments to Canada, add the GST. Please allow 2-3 weeks for delivery.

AAAS World Wide Web Site

Updated information on federal funding for R&D, including the **complete text of this book, detailed agency analyses, revised historical tables, and supplementary materials**, is available on the AAAS R&D Web Site at:
<http://www.aaas.org/spp/R&D>

Further information on the activities and publications of the AAAS Directorate for Science and Policy Programs is available on the AAAS Web site at:
<http://www.aaas.org/spp/>

Further information on the activities of the American Association for the Advancement of Science (AAAS) can be found on the AAAS Home Page at:
<http://www.aaas.org>