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Federal Research and Development: Budgeting and Priority-Setting, 1993-2000

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Genevieve J. Knezo
Specialist in Science and Technology Policy
Resources, Science, and Industry Division

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Summary

During his two Administrations, President Clinton linked research and development (R&D) to economic growth and sought partnerships between government and business in research and innovation. In contrast to the two previous Administrations which increased defense R&D relative to civilian R&D, the Clinton Administration sought to reduce defense R&D funding and to increase funding for civilian R&D, including at the National Institutes of Health (NIH), the National Science Foundation (NSF), and for environmental research. The Republican majority priorities during the 104th to 106th Congresses stressed, in large part, deficit reduction, deregulation and tax incentives to foster market-driven innovation, and support for civilian basic research and defense R&D as governmental functions.

Both President Clinton's and Congress's R&D priorities reflected moves to balance the budget. As a result, in terms of constant dollars (that is, inflation-adjusted dollars) of budget authority, federal R&D was funded below the previous high funding level (FY1992) for each year from FY1993 to FY1999. During this period, pressures mounted to raise funding for R&D programs. As budget surpluses started to grow (beginning in 1997), Congress circumvented or raised caps imposed on the discretionary portion of the federal budget, and as a result, major R&D funding increases were made in the FY1998 to FY2001 budget cycles. In constant dollars, FY2001 funding for nondefense R&D was 28% higher than for FY1993, while FY2001 defense R&D was 6% less than for FY1993. Civilian R&D increases were led by NIH whose R&D budget grew 72% in constant dollars between these two years, followed by increases for R&D at NSF, at 40%; the Commerce Department, 22%; the Environmental Protection Agency, 20%; the Agriculture Department, 16%; and the National Aeronautics and Space Administration, 2%. Between FY1993 and FY2001, the Energy Department's R&D budget was cut 7% in constant dollars. FY2001 appropriations action funded defense and non-defense R&D at about the same dollar amount for the first time since 1977.

Debates about priority-setting for R&D included increasing R&D in non-health related fields to the same extent as in the health sciences fields; coordinating federal agency R&D budgets to promote national needs as well as support of cutting-edge science; and ensuring accountability for R&D spending. Special studies and caucuses dealing with science policy were initiated in the House and Senate. In 1998, the House passed a resolution endorsing the science policy study conducted by Congressman Vernon Ehlers. The Senate passed a bill that would have increased future R&D by specified minimum percentages, required the President to develop a coordinated R&D budget, and enhanced R&D accountability.

Potential issues during the 107th Congress could include whether R&D funding increases will be maintained in the face of potential tax cuts and economic slowdown, funding levels for defense R&D and nondefense energy-related R&D, the funding priority accorded areas of civilian R&D other than health research, and funding levels for federal technology development programs.

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Federal Research and Development: Budgeting and Priority-Setting, 1993-2000

Introduction

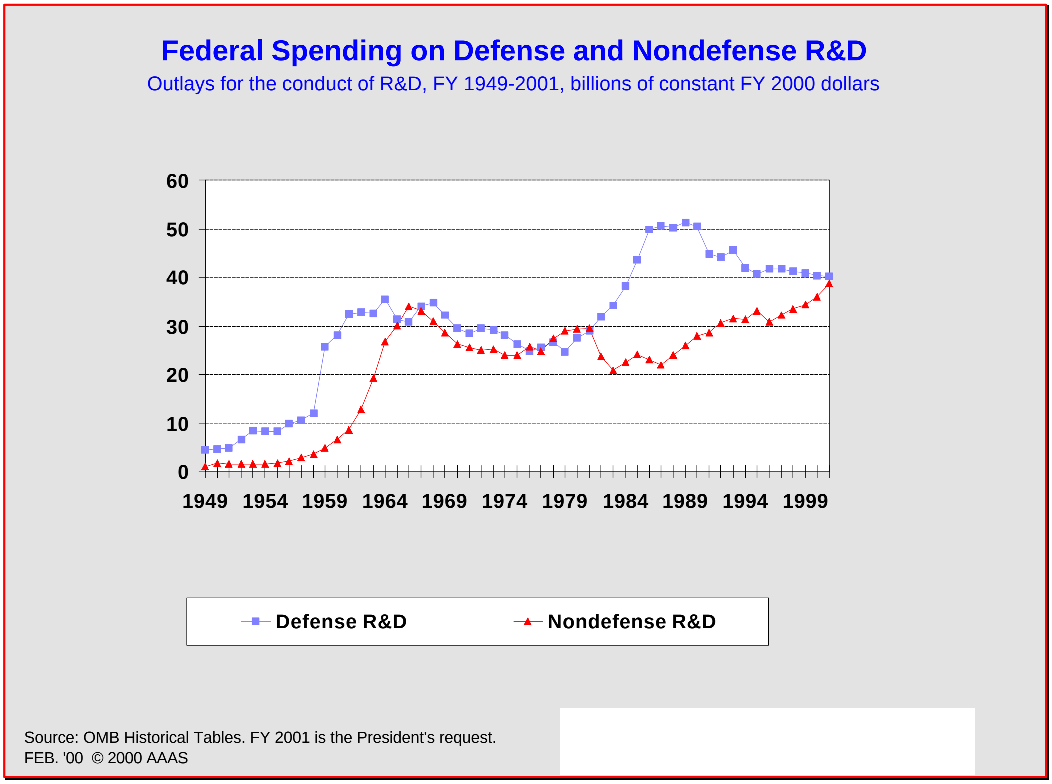
This report describes executive and legislative activities relating to research and development (R&D) budgets and priority-setting that occurred primarily during FY1993 to FY2001, the period of the two Clinton Administrations. It includes detailed summaries of presidential priorities and congressional appropriations activities for R&D in the 104th to 106th Congresses. In addition, the report summarizes other salient issues discussed during this period relating to congressional earmarking of R&D projects, activities to coordinate R&D priority-setting, priorities for critical technologies, implementation of the Government Performance and Results Act of 1993 in R&D agencies, and priority-setting activities of the National Science and Technology Council (NSTC). This report is based in part on CRS Issue Brief 94009, which chronicled R&D budgeting and priority-setting activities from 1994 to 2000.

Presidential Priority-setting

Since it started funding large amounts of R&D after World War II, the federal government has always supported core fields of science, but the focus in R&D budgets has changed in response to policy shifts, congressional concerns, and presidential prerogatives. During the 1970s, interest focused on space R&D, growth in energy and health research and reductions in defense R&D (R&D in the Department of Defense (DOD) and defense R&D in the Department of Energy (DOE)). In FY1978, non-federal sources, largely industry, started to eclipse the federal government as a source of R&D funding. Support for defense R&D and for basic research became prominent during the 1980s, with the Administrations of Presidents Ronald Reagan and President George Bush.[1] Energy research and space research funding declined. In FY1989, near the end of the Reagan Administration, about 65% of federal R&D funding went to defense R&D (R&D in DOD and defense R&D in DOE), and near the end of the Bush Administration in FY1993, defense R&D received about 57% of federal R&D funding. (For details, see Figures 1 and 2 and Table 2.)

[1]Following the precedent used by the National Archives and Records Administration, the Bush Administration, 1989-1993, is cited as the Administration of George Bush. The Bush Administration, beginning in 2001, is cited as the Administration of George W. Bush. These forms are used in this report.

Figure 1. Federal Spending on Defense and Nondefense R&D, FY1949-FY2001, Line Graph[a]



a Source: American Association for the Advancement of Science, AAAS, at [http://www.aaas.org/spp/dspp/rd/guihist.htm]. This source is used for all AAAS figures that are in this CRS report.

Partly in response to the end of the Cold War, but also influenced by policy inclinations, President Clinton sought to change these priorities — primarily to reduce defense R&D in DOD and in DOE and to increase civilian research, technology investment and development, basic research, computer networking, and commercialization of R&D.[2] This shift was intended to ensure federal support of R&D to promote economic growth, a basic policy objective of the Clinton Administration.[3] See Figure 2.

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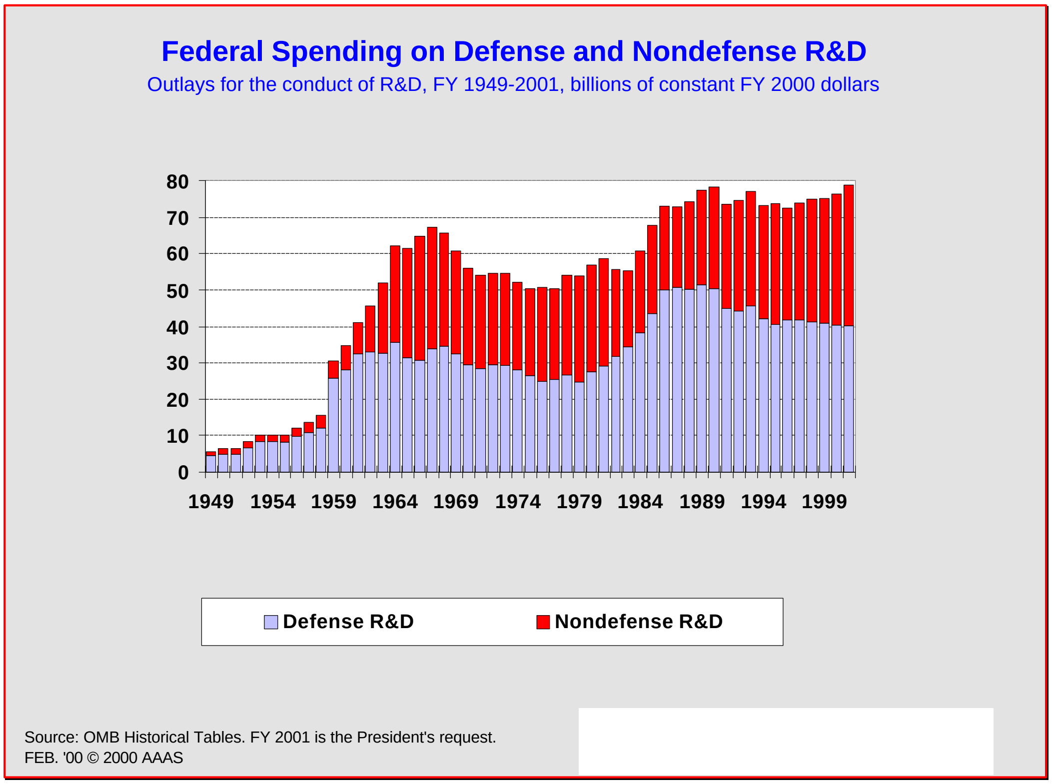
[2]For historical information, see: Genevieve J. Knezo, "Policies on Science and Technology Topics Proposed By the Clinton Campaign: A List," *CRS Report 93-96 SPR*, January 27, 1993, 6 p. See also Glenn McLoughlin and Wendy Schacht, "Technology Policy Initiatives in the Clinton-Gore Administration," *CRS Report 93-357 SPR*, Mar. 18, 1993. 48 p.

[3]The *1995 Economic Report of the President* and the Council of Economic Advisors' (CEA) October 1995 report, *Supporting R&D to Promote Economic Growth: The Federal Government's Role*, reported that the estimated social rate of return to R&D averages 50%, which, the CEA said, is significantly higher than returns on other investments. This finding (continued...)

Figure 2. Federal Spending on Defense and Nondefense R&D, FY1949-FY2001, Bar Graph



R&D Budgeting in the Context of Deficit Reduction

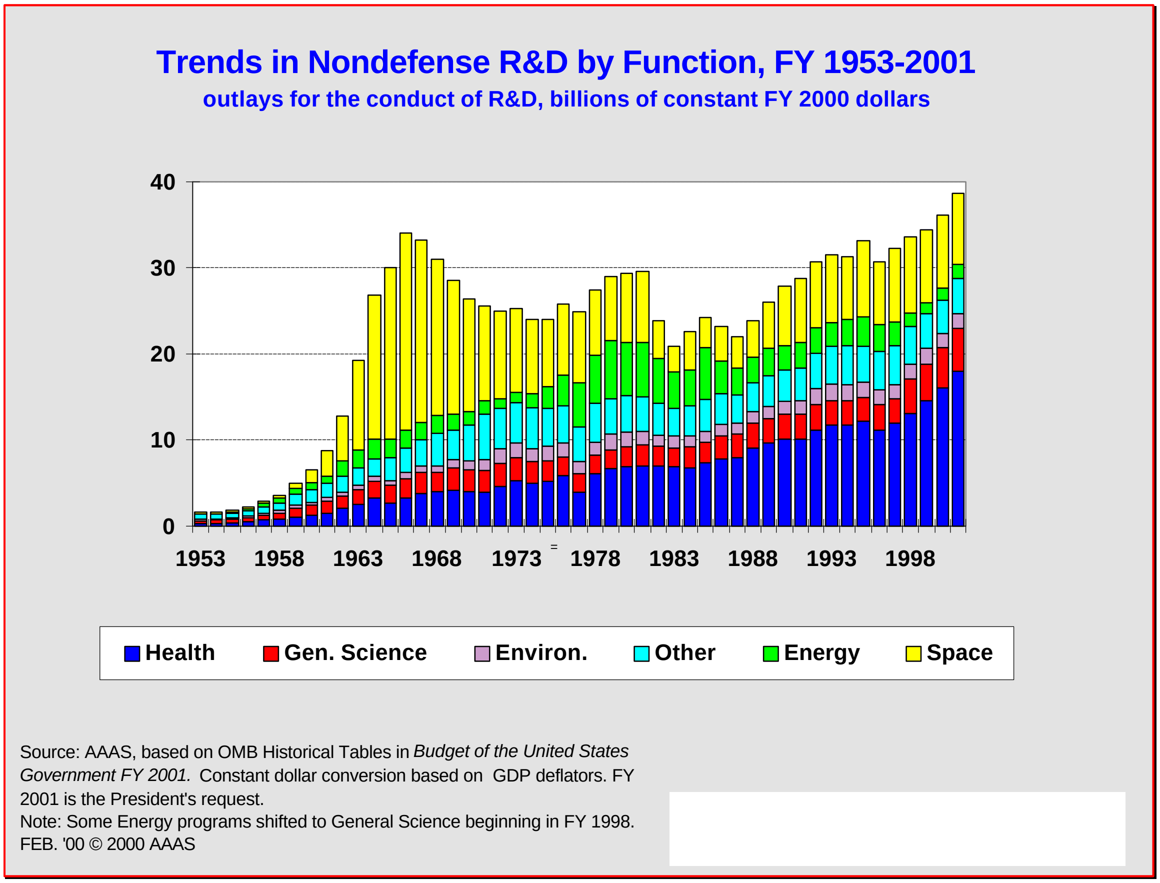
R&D budgeting during the period 1993-2001 occurred amid activities undertaken to halt deficit spending and to balance the budget. The 103rd Congress imposed, beginning in 1993, limits on discretionary spending—the part of the budget from which most R&D is funded. Later, in 1997, the President and Congress agreed on a balanced budget bill that capped discretionary spending through FY2002. Because of the spending caps imposed by Congress, R&D programs increasingly competed with funding for other discretionary programs as discretionary spending was projected to decline from 37% of total outlays in FY1999 to about 30% in FY2002. Thus R&D funding vied even more than it had in the past with programs for public infrastructure, housing, discretionary social services programs, and transportation, even as funding for these programs overall was projected to decline.

During the first Clinton Administration, 1993 to the beginning of 1997, funding for many R&D programs was reduced in constant dollar (inflation-adjusted) terms,

[3](...continued)
is not without controversy. For instance, *The Economic Laws of Scientific Research*, by Terence Kealey, 1996, disputed a link between government support of S&T and economic growth and endorsed a smaller governmental role in R&D.

especially for space, energy, defense, and environment (in EPA and the Interior Department). See Figure 3 and Tables 1 and 2. Appropriations in the 104th, 105th and 106th Congresses were subject to caps, which continued to be applied, even as the economy started to rebound and budgetary surpluses started to grow (beginning

Figure 3. Trends in Nondefense R&D Funding by Budget Function, FY1953-FY2001



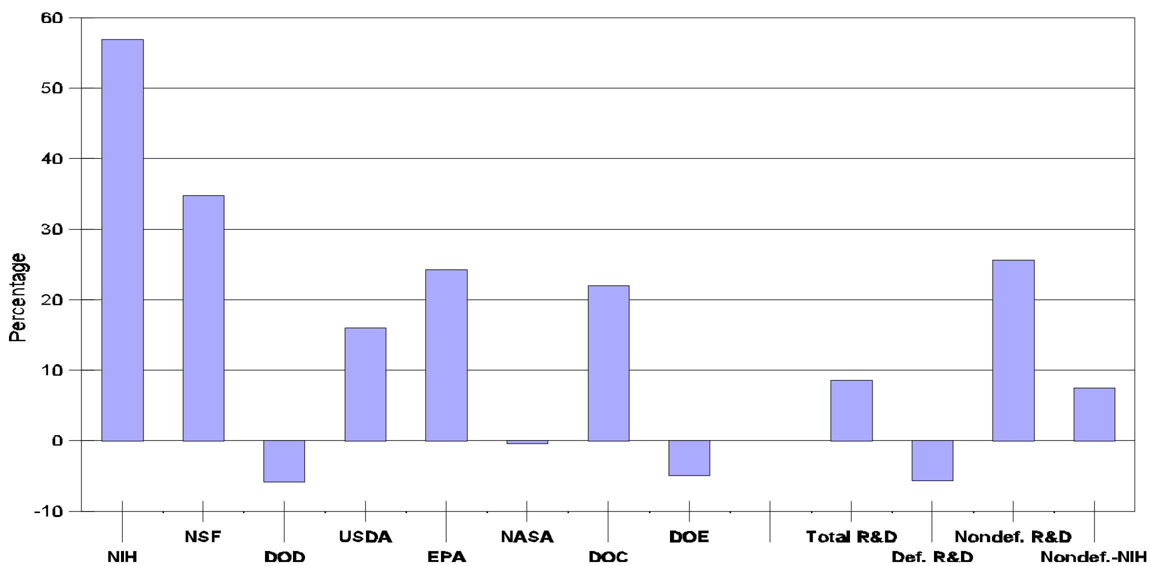
in 1997). Because of wide congressional support for R&D, starting in 1996, Congress, despite the pressure of caps, began to give R&D funding a higher priority. In 1996, Congress appropriated 1.8% more for FY1997 R&D than the President had requested. This pattern of congressional increases continued in succeeding years. In addition, R&D funding started to increase over each previous year in terms of constant dollars, beginning with FY1997. For FY1999 and FY2000, Congress used emergency spending authority to circumvent budget caps in many areas, and, as one result, federal R&D appropriations were increased.

For FY2001, Congress, utilizing CBO forecasts of additional surpluses, raised the discretionary caps to about $100 billion above the existing cap and above what the President had requested, paving the way for major increases in R&D appropriations. For FY2001, Congress substantially increased R&D funding to $91 billion, 9.1% more than in FY2000. R&D in every federal agency was funded at more than in FY2000. R&D funding in all agencies, except the National Science Foundation

(NSF), Commerce, Transportation, the Smithsonian, and the Environmental Protection Agency (EPA), was appropriated at levels higher than requested. Defense and non-defense R&D funding was equalized, for the first time since the late 1970s. In constant dollars, health R&D funding (which had received about 14% of total R&D funding at the end of the George Bush Administration) received about 21% of total FY2001 R&D appropriations, and about 43% of the civilian R&D budget.

Over the period FY1993 to FY2001, as shown in figure 4, funding was increased almost 60% in constant dollar terms for R&D in the National Institutes of Health (NIH); for the National Science Foundation (NSF), 35%; for R&D in the Department of Commerce and EPA, over 20%; and for the Agriculture Department,

Figure 4. Trends in R&D Funding, By Agency, From FY1993 to FY2001, Percentage Change in Constant Dollars of Budget Authority[a]



Source: AAAS Reports, based on OMB and agency R&D budget data, and on AAAS estimates of R&D in FY2001 appropriations. Includes conduct of R&D and R&D facilities. Constant dollar conversions based on OMB's GDP deflators. Based on millions of constant FY2000 dollars. Original source was prepared by AAAS in 2000, as "Historical Table 2," from [http://www.aaas.org/spp/dspp/rd/ca01main.htm].

about 15%). Large increases were made for research in computer and information sciences, for nanotechnology, and for technology initiatives in the Department of Commerce. R&D funding decreased in terms of constant dollars for NASA, and for DOE and DOD R&D, by about 5% each. Basic research funding was increased by about $5 billion in constant dollars from FY1993 to FY2001. The emphasis, however, was on NIH basic research which increased about $3.5 billion in constant dollars, while non-NIH basic research increased by a smaller amount, about $1.5

billion constant dollars. Considerable pressure was applied by non-biomedical scientists and their supporters during the FY1999 to FY2001 appropriation cycles to balance funding among fields of science and among R&D agencies while increasing funding. Specifically, they sought to increase funding for non-health civilian R&D to keep pace with the steady and substantial increases that had been made in health R&D.

The Clinton Administration's success at reducing defense R&D and increasing civilian technology-oriented funding altered federal R&D priorities. For instance, defense R&D spending declined in constant dollars by 18.2% between FY1987, the peak year of funding for defense R&D and FY2001. The percentage decline since the FY1993 budget (the last Bush budget) and FY2001, the last Clinton budget, was 6.3%. Civilian R&D spending increased about 28% in constant dollars between the FY1993 and FY2001, with the focus largely on biomedical research at NIH.

The last Democratic majority 103rd Congress had reoriented some R&D programs to focus more on projects which would generate economic benefits or contribute to "strategic" programs – to solve a problem or contribute to industrial capability. This was reflected in large increases for technology transfer and development at NIST and for clean car technology and high-performance computing programs. The NSF and the NIH emphasized "strategic," i.e., applications-oriented research. Attempts were made by some leaders of the succeeding Republican-led Congresses, beginning with the 104th Congress, to halt technology development and applications-oriented research and to abolish some technology-oriented programs and agencies, such as DOE and the Commerce Department. Funding for basic research and especially for health research in NIH typically has received considerable congressional priority.

Federal R&D Is a Decreasing Part of National R&D Spending

In FY2000, Federal R&D funding was estimated to be higher in constant dollars of budget authority for the first time since the previous peak in FY1992, a peak which was due largely to the Reagan and previous Bush Administrations' defense R&D buildups. In terms of outlays, the previous peak was in FY1990, which was estimated to have been surpassed for the first time since then in FY2001. Despite these increases, R&D funding decreased from about 12% of total federal outlays in 1965, during the buildup for the space program, to about 4.4% today, and from about 16% of budget authority in 1966 to about 12.9% in 2001.[4] Federal R&D funding has also

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[4] Based on data in tables 5.4 and 9.7 in Office of Management and Budget, *Historical Tables, Budget of the United States Government, Fiscal Year 2001.* The OMB data in these tables report **outlays** for each fiscal year. Outlays, according to the Congressional Quarterly's *American Congressional Dictionary,* are "Amounts of government spending. They consist of payments, usually by check or in cash, to liquidate obligations incurred in prior fiscal years as well as in the current year, including the net lending of funds under budget authority. In federal budget accounting, net outlays are calculated by subtracting the amounts of refunds and various kinds of reimbursements to the government from actual spending.

(continued...)

decreased as a percentage of discretionary outlays, from about 17% of total discretionary outlays in FY1965 to about 12% today. See Figure 5.

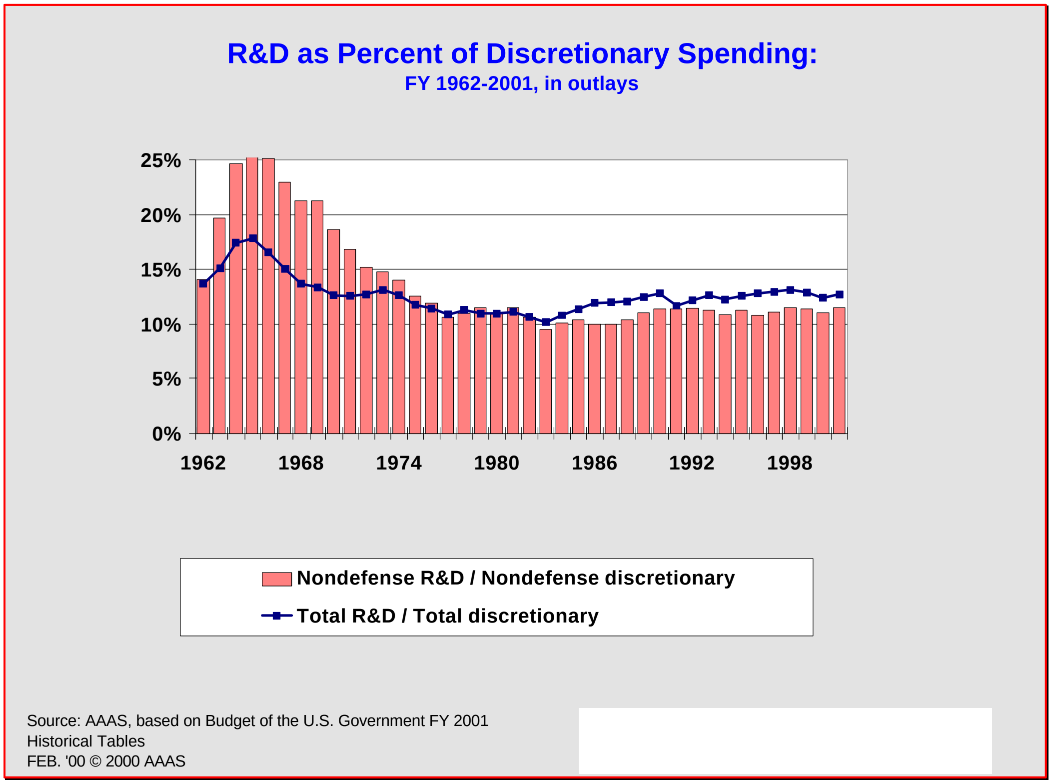
[4](...continued)

Much of the data used in this report, which come from the data series and analyses of the American Association for the Advancement of Science (AAAS), report R&D funding in terms of **budget authority**, which "is the authority provided in law to enter into obligations that will result in immediate or future outlays of Government funds. Government officials may obligate the Government to make outlays only to the extent they have been granted budget authority. The budget records budget authority as a dollar amount in the year when it first becomes available." (Office of Management and Budget, *The Budget Systems and Concepts, Fiscal Year 2001*, p. 9.) AAAS budget authority data, which were used to develop Tables 1 and 2 in this report, show that the previous constant dollar high for R&D spending occurred in 1992 (not 1990 as OMB reports, using outlay data). This was during the George Bush Administration. OMB data, like AAAS data show that in terms of constant dollars, R&D funding fell below this 1992 level for every succeeding year until FY2000. The OMB data show that the FY1990 OMB high year was not exceeded until FY2001, estimated.

While budget authority and outlays are not equal, they provide internally consistent trend comparisons; historical trends of outlays and budget authority provide similar conclusions.

Note: according to the Congressional Quarterly's *American Congressional Dictionary*, obligations are defined as: "A binding agreement by a government agency to pay for goods, products, services, studies, and the like, either immediately or in the future. When an agency enters into such an agreement, it incurs an obligation. As the agency makes the required payments, it liquidates the obligation. Appropriation laws usually make funds available for obligation for one or more fiscal years but do not require agencies to spend their funds during those specific years. The actual outlays can occur years after the appropriation is obligated; for example, a contract for payment for a submarine when it is delivered in the future. Such obligated funds are often said to be "in the pipeline." Under these circumstances, an agency's outlays in a particular year can come from appropriations obligated in previous years as well as from its current-year appropriation. Consequently, the money Congress appropriates for a fiscal year rarely coincides with the total amount of appropriated money the government will actually spend in that year."

Figure 5. R&D Funding as a Percentage of Discretionary Spending, FY1962-FY2001



In addition, Federal R&D funding, expressed in terms of outlays, also dropped relative to total national economic performance, from an annual average of its peak of 2.1 % of GDP in 1964 to 0. 8% estimated for FY2001.[5] See Figure 6.

Overall federal R&D funding has increased over time even as it dropped as a percentage of federal discretionary spending. But because private sector R&D has increased even faster, federal R&D funding has continued to decrease as a percentage of total national R&D funding. The federal share of support first fell below 50% of the national R&D total in 1979 and it has been declining ever since.[6] The National Science Foundation (NSF) projected that total U.S. R&D would rise to about $264 billion in FY2000 (preliminary data), due largely to significant rises in industry-funded R&D, resulting from growth in the economy. Industry-funded R&D was expected to increase to $179 billion, or about 68% of total national funding for R&D, in FY2000 (preliminary data). The government's share has declined to 27% of the total. Most industrial R&D support goes to applied research and to development. Based on national expenditure data from NSF, preliminary data for FY2000 show that 31% of

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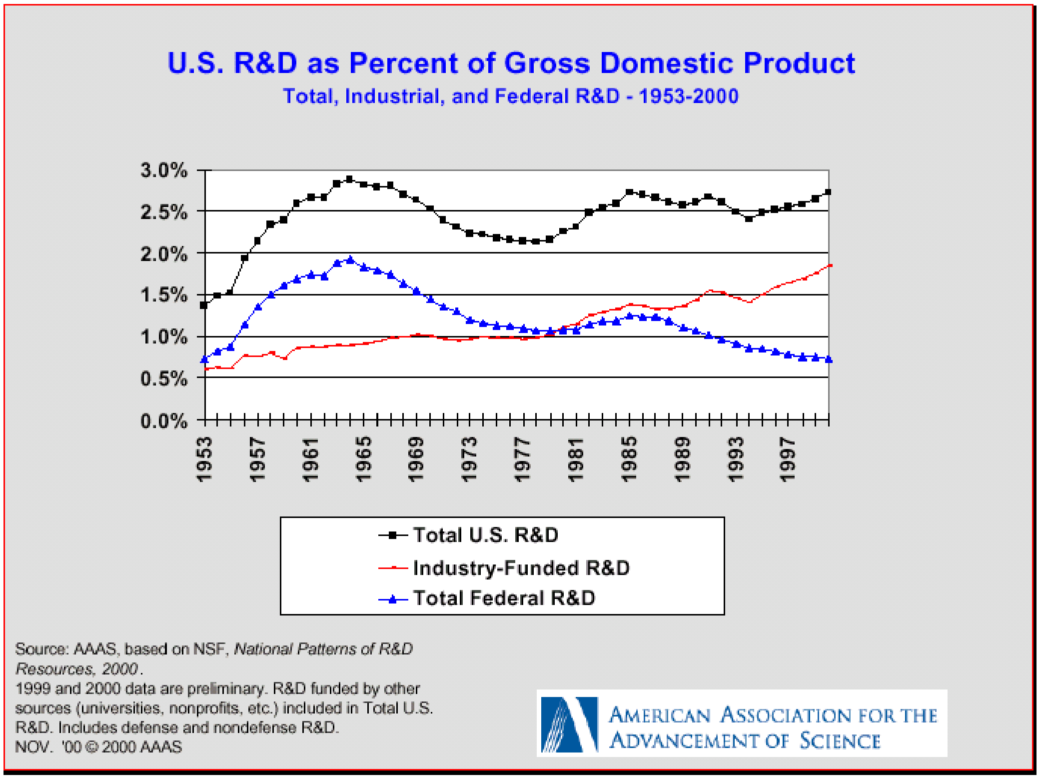
[5]These data are from OMB, *Historical Tables*, op. cit.

[6]See Tables 1B and 2B, In *National Patterns of R&D Resources: 2000 Data Update*. Available at: [http://www.nsf.gov/sbe/srs/nsf01309/start.htm].

federal government R&D expenditures[7] went to support basic research, compared with 8% of industry-funded R&D. During that same year, the federal government funded 49% of total national expenditures for basic research, while industry funded 31%.[8]

Figure 6. R&D as a Percentage of Gross, Domestic Product (GDP)



The federal government is the major national supporter of basic research, which generates much of the knowledge that industry uses for innovative R&D. Most industry-funded research typically is applied or development-oriented, geared to product development. As a result, some observers in and outside of Congress have expressed concern that federal support for research, especially for basic research, should be sustained at high levels as a public good to enhance the U.S. ability to advance scientifically and technologically and to broaden the knowledge base that industry uses.

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[7]NSF surveys performers and supporters of research to collect data about R&D expenditures. Apparently those who report information are given latitude in defining what an expenditure is. See NSF, *National Patterns, 1998*, "General Notes," pp. 2-3. Expenditures do not equal outlays or budget authority.

[8] Table 2 b, NSF, *National Patterns of R&D Resources: 2000.Data Update.*

Detailed Summaries of R&D Budgeting From FY1996 to FY2001

Presented next is summary discussion, for each of the fiscal years 1996 to 2000, of presidential R&D budget priorities, congressional R&D appropriations activities, and representative efforts made to modify R&D priorities. The objective of these summaries is to give a snapshot of each year's R&D budgeting highlights. The summaries also give illustrations and examples of some of the priorities and trends described above. Unless otherwise noted, the funding data in this section is expressed in terms of budget authority. See Table l for specific details of agency budgets. See Table 2 for funding levels expressed in terms of constant, inflation-adjusted dollars.

Fiscal Year 1996

For FY1996, the Clinton Administration proposed an R&D budget totaling $72.6 billion. The Administration's priorities were similar to FY1995, when cuts were made in defense and energy research (the Superconducting Super Collider and nuclear weapons), and funding was increased in applied technology programs in NIST, in NSF (for basic research, facilities and instrumentation), and in NIH. During 1995, congressional scrutiny of R&D increased in response to budget pressures, and efforts were made to de-emphasize the government's role in civilian applications-oriented R&D and to focus more attention on basic research. The Republican-majority 104th Congress attempted to reduce programs of civilian technology development, which many Republicans traditionally oppose on the grounds that the private sector, not the government, should make market-related choices and share the risks and rewards. P.L. 104-6 and P.L. 104-19, emergency supplemental appropriations acts, rescinded an additional $2.43 billion in R&D for FY1995 and FY1996.

Each year Congress passes a budget resolution, which sets spending levels, or caps, for total spending and for each budget function that appropriations committees use in setting discretionary spending allocations (called 302b allocations) for each appropriations subcommittee. The resolution also gives out-year projections based on current budget and economic assumptions and recommends priorities for spending. The accompanying legislative report may include explanations of the amounts to be allocated by the committees that have jurisdiction over the programs in each budget function.[9]

The Concurrent Resolution on the Budget for Fiscal Year 1996, (H.Rept. 104-159), reflected serious budget pressures that would affect R&D funding. The American Association for the Advancement of Science (AAAS) calculated, based on information in the budget resolution, that civilian R&D would be cut, in constant dollars, to about 66% of its 1995 level by FY2002.

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[9]For additional information, see OMB, *Budget Systems and Concepts of the United States Government*, published annually.

However, FY1996 congressional appropriations action reduced R&D less than projected (4% below the constant dollar FY1995 level) and R&D was increased in NIH, and in DOD and DOE, in the latter two agencies primarily for nuclear weapons and ballistic missile defense. Congress reduced funding for civilian energy R&D, transportation R&D, the Advanced Technology Program (ATP), and R&D in the National Oceanic and Atmospheric Administration (NOAA), in the Department of Commerce.

Fiscal Year 1997

President Clinton proposed an R&D budget of $72.7 billion for FY1997, a decrease of about 1.5% in constant dollars from FY1996. Using the President's *Mid-Session Review of the FY1997 Budget*, adjusted for the latest economic data, AAAS estimated that non-defense R&D would be reduced 19% in constant dollar terms by FY2002 if the budget were enacted as requested. The President sought increases for NSF, NIH and for the Advanced Technology Program and the Manufacturing Extension Program in the Commerce Department. Increases were also requested for environmental R&D, energy efficiency and pollution prevention, the new generation of vehicles partnership, and Mission to Planet Earth. H.Con.Res. 178, the budget resolution for FY1997 that both the House and the Senate passed, recommended reducing non-defense R&D 6% by 1997 and included projections of a 23% constant dollar reduction for non-defense R&D by 2002. It proposed cutting basic research less than in the Administration's budget plan, but recommended cutting R&D funding below requested levels for NASA, DOE, the Agriculture Department (USDA), Commerce, Transportation, and EPA–primarily for reductions in applied research and technology. The budget resolution recommended that space shuttle operations be contracted out and that programs for energy supply R&D, fossil energy, and conservation be reduced substantially. It recommended that NOAA refocus on core missions; that R&D be cut in the Interior Department for the Geological Survey, National Biological Services, and Bureau of Mines; that agricultural research and extension be cut; and that in the Department of Commerce, the National Institute of Standards and Technology's (NIST) science and technological activities be increased, and that ATP programs be eliminated.

Objections to R&D reductions were raised by the Administration and in Democratic staff documents. The National Science Board, the governing policy body of the National Science Foundation, released a statement, "On Federal Investments in Science and Engineering," NSF Press Release, January 25, 1996, calling for more R&D funding. The views of the Democratic membership of the House Science Committee were contained in comments on the "Omnibus Civilian Science Authorization Act of 1996," April 30, 1996. Eventually the FY1997 appropriations enactments raised R&D funding 3.7% above the FY1996 level, with increases for R&D in DOD and NIH and reductions for R&D in NASA, DOE, Agriculture, Interior, Transportation, Commerce, and Education. The ATP program was not eliminated. Basic research was funded at 8.2% above FY1999, a net gain of 1.9% in constant dollars.

Fiscal Year 1998

The President's FY1998 $74 billion R&D budget proposed to reduce overall funding in constant dollars, by increasing non-defense R&D and basic research, while reducing defense R&D. AAAS projected that this budget would reduce non-defense R&D funding by 9.4% in constant dollars by FY2002 and defense R&D funding by 17.8%.

By 1997, when the FY1998 budget was under consideration, federal R&D funding had been below the previous high funding level for six years in terms of constant dollars of budget authority. See Table 2. As a result, pressures were mounting from the research community and within Congress to raise federal R&D spending to help sustain the Nation's R&D infrastructure and to support R&D to enhance innovation and knowledge growth. Congressional differences with the President's budget proposals were embodied in several pieces of legislation, none of which was enacted. S. 124, the "National Research Investment Act of 1997," would have doubled funding authorization for non-defense R&D over the next 10 years, specifically doubling NIH's budget. The "National Research Investment Act of 1998," S. 1305, would have doubled the federal S&T budget between 1999 and 2009.[10]

S. Res. 15 would have expressed the sense of the Senate to double NIH funding over the next 5 years. Senator Arlen Specter, chairman of the Senate Appropriations subcommittee that deals with NIH, announced a commitment to a 7.5% increase in the NIH budget. In 1998, the Senate passed S. Amdt. 2272 to S.Con.Res. 86, the Senate Budget resolution, that the Senate passed. The amendment expressed the sense of the Senate that the NIH budget should be doubled within the next five years.

The House Science Committee, in "Views and Estimates for FY1998" recommended an increase of 3% above FY1997 for the S&T programs within the committee's jurisdiction. This goal, it said, could be met within the framework of a balanced budget. Representative George Brown, ranking Democrat on the Science Committee, testified to the House Budget Committee that funding should be increased for R&D, capital infrastructure, and education and training by $70 billion over the next 5 years, using the $135 billion surplus estimated by CBO. Pressure to increase funding came also from the National Academy of Sciences (NAS) Panel on Federal S&T Analyses;[11] the AAAS, in a March 24, 1997 analysis; and from the presidents of four scientific societies, who, at a March 4 press conference, recommended a 7% increase in funding. In contrast, a CATO Institute meeting in early February 1997 discussed *The Economic Laws of Scientific Research*, by Terence Kealey, which disputed a link between government support of S&T and economic growth and endorsed a smaller governmental role in R&D.

About $468 million worth of R&D rescissions were included in a supplemental appropriations bill for FY1997, with reductions for DOD R&D and for a NASA wind

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[10] Introduction of the bill followed a conference on "A Decade of Investment," attended by more than 100 scientific and engineering societies.

[11] At: http://www.nas.edu/fsrd/fsrd.html.

tunnel. As the year progressed, a healthy economy and increased tax receipts led to forecasts of budget surpluses and elimination of deficits in 1998. For FY1998, final congressional appropriations action raised federal R&D funding 4.2% above the FY1997 level and 1.8% above the President's request. All major R&D agencies except the Department of Transportation (DOT) and USDA received increases ahead of the expected 2.5% inflation rate, including: DOD, 2.8%; USDA, 0.6%; DOE, 3.1%; NSF, 6.1%; EPA, 14.2%; and NASA, 5.3%. The Research and Experimentation Tax Credit for industry was extended retroactively and to June 30, 1998 in P.L. 105-34.

Fiscal Year 1999

The Administration sought $78 billion for R&D in FY1999, 2.6% more than for FY1998, including an increase of 5.8% for non-defense R&D and a decrease of 0.3% for defense R&D. The President's budget gave priority to R&D in NIH, NSF, and DOE (for greenhouse gas emissions reduction technology and for DOE defense R&D). Reductions were proposed overall for R&D at DOD, but with increases in basic and applied research; for NASA, NOAA, EPA, and DOT; and for most agencies' support for R&D facilities, except for DOE's Spallation Neutron Source. Basic research was to be increased by about 7.7% overall. AAAS said, "the programs slated for increases show the priority the Administration is placing on fundamental science, biomedical research, energy research in support of reducing U.S. greenhouse gas emissions, industrial technology, and science in support of a Comprehensive Test Ban treaty...."[12] $27.1 billion of the non-defense R&D budget would have been funded from discretionary funds. The rest (about $4 billion), "essentially representing all of the requested increases for non-defense R&D in NIH, NSF, DOE and other key agencies, would come from new offsetting revenues outside the cap,"[13] would have been funded from a special "Research Fund for America," which excluded the Space Station and other programs. About $3.6 billion of this approximately $4 billion would have come from a proposed controversial tobacco settlement (S. 1415), that Congress did not approve.

The Senate budget resolution for FY1999 (S.Con.Res. 86) called for cuts in non-defense research to 2003, but expressed non-binding language to support increases for funding at NIH and for basic research. The House budget resolution (H.Con.Res. 284), which passed in the Senate in an amended form, endorsed increasing NIH funding by about 10% for 5 years, but would have reduced other civilian R&D budgets. Using assumptions in the budget resolution, AAAS made out-year projections that defense R&D funding would decrease by 4.5% between FY1998 and 2003 and non-defense funding would increase by 21%.

Although it represented an increase over FY1998 in current dollars (not adjusted for inflation), the FY1999 request was about 2% less than FY1998 in constant, inflation-adjusted dollars. The House Science Committee in its *Views and Estimates for FY1999* proposed sustained increases at or above requested levels. The Science

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[12]AAAS, *Preliminary Analysis of R&D in the FY1999 Budget*, March 5, 1998, p. 5

[13]AAAS, *Preliminary Analysis of R&D in the FY1999 Budget*, p. 2.

Committee's criteria stressed funding long-term, high-risk, well-managed R&D; agency-relevant research; exclusion of "marketing and commercialization" projects; full leveraging of international, industry, and state science partnerships; and prioritizing of infrastructure necessary for program requirements.[14] Both President Clinton and House Speaker Gingrich spoke publicly about the importance of R&D to the economy and pledged to seek additional R&D funding.[15] OMB Director Franklin Raines called for scientists to give more attention to priority-setting, measuring performance, and avoiding special pleading for pet projects in order to increase federal support of R&D.[16]

Congress approved $80.2 billion for R&D, about 3.1% above the presidential request and 5.3% more than for FY1998. All major R&D agencies except NASA received increases above the expected 2.0% rate of inflation. Congress increased funding by using some of the $70 billion federal surplus and by allocating $21 billion in emergency "off-budget" spending, freeing up funding for some programs which would have been restricted by budget caps. In relation to FY1998, basic research funding was increased 11.3%. The largest R&D appropriations increase went to NIH, at 15% over FY1998. DOE's R&D appropriation was 11.4% higher than FY1998, with increases in R&D in solar and other renewables, fossil energy and energy conservation, and basic energy. Total defense R&D was increased 3.5%; NASA's R&D budget was cut by 1.6%, reducing funds for the International Space Station, but increasing funding for space sciences and for life and microgravity sciences and applications. NSF's R&D was increased 8.4%; increases were made for NIST laboratories, the Advanced Technology programs and NOAA; USDA's budget was increased 6.6%; funding for the U.S. Geological Survey's biological research was increased; in EPA, R&D appropriations were 3% higher than in FY1998, with an increase in funding for particulate matter research.

Authorizing legislation which had been introduced first in 1997 generated considerable attention, although it was not enacted: S. 1305, the "National Research Investment Act of 1998," (introduced in 1997) would have doubled R&D funding within 10 years. It was not supported by some members of the academic community or by some appropriations committee members. Its out-year projections would have funded R&D about $12 billion more than the budget resolution in 2003. House Science Committee analysis concluded the bill would reduce non-defense R&D by more than $3.5 billion from current levels between 1999 and 2003 and that it disproportionately favored NIH.[17] The succeeding bill introduced in 1998, S. 2217, the "Federal Research Investment Act," (H.R. 3121 in the House), whose principal sponsor was Senator Bill Frist, one of the leaders of the Senate Caucus on Science and Technology that had been created in 1996, passed in the Senate. The bill mandated federal funding levels for fundamental, scientific, and pre-competitive engineering research to be increased to equal approximately 2.6% of the total federal

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[14] *Science Committee Calls for Increase in Research Funding,* press release, March 20, 1998.

[15] "The Reappropriator," *Washington Post*, June 18, 1998, A23; and American Institute of Physics, 1998, FYI #91 and #96.

[16] *Science*, June 12, 1998, p. 1671.

[17] *Washington Fax*, April 22, 1998

budget. It also required a presidential report on R&D, and study and actions dealing with improving measures of research performance by agencies, and termination of research programs that were not performing successfully. It passed the Senate in October 1998. No action was taken in the House.

P.L. 105-277 extended the research and experimentation tax credit for industry for one year retroactively to July 1998, allowed full funding of $335 million without incorporation into a block grant for the Eisenhower Professional Development Program to improve training for teachers in math and science, and, in a move which generated controversy, extended the provisions of the Freedom of Information Act to extramural grants (the Shelby amendment). This was later narrowed by OMB interpretation to selected research data used or cited in federal actions having the force and effect of law.[18]

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[18]The FY1999 omnibus appropriations bill (P.L. 105-277) required OMB to establish procedures for the public to obtain access to data from federally funded research, through provisions of the Freedom of Information Act. This was a major change from traditional practice. While permitted, federal agencies typically have not required grantees to submit research data, and pursuant to a 1980 Supreme Court decision, agencies, under FOIA, did not have to give the public access to research data not part of agency records.

There was considerable debate about this legislation. Opponents said that FOIA is an inappropriate vehicle to allow wider public access. They said that using it would harm the traditional process of scientific research--human subjects would refuse to participate in scientific research, believing that the federal government might obtain access to confidential information; researchers would have to spend additional time and money preparing data for submission to the government, thereby interfering with ongoing research; and government/ university/industry partnerships would be jeopardized because data funded jointly would be made available under FOIA. Proponents of the amendment said that "accountability" and "transparency" were paramount: the public should have a right to review scientific data underlying research funded by government taxpayers and used in making policy or setting regulations. OMB released final revisions to Circular A-110, as directed by law, on September 30, 1999. After considerable public comment, OMB limited access under FOIA to selected research data that the federal government cites or uses in actions having the force and effect of law. Legislation was introduced in the 106th Congress (H.R. 88) to repeal the law and hearings were held, but the bill did not pass.

Court challenges may be raised to the circular. (See: *Public Access to Data from Federally Funded Research: OMB Circular A-110 and Issues for Congress*. By Eric A. Fischer and Genevieve J. Knezo, CRS Report RL30376, Nov. 18, 1999. 37 p.) Reportedly, William L. Kovacs, vice president of environmental and regulatory affairs for the U.S. Chamber of Commerce and a major supporter of the legislation, predicted that the OMB regulations, which some see as being too narrow in allowing access to research data, could be revisited by the new Bush Administration. Court challenges to the amendment, he was reported to have said, probably would wait until the government sought to issue controversial new regulations "based on unavailable research data." (Victoria Slind-Flor, "Law Applies Act to Information if U.S. Funds Are Involved," *The National Law Journal*, October 30, 2000.) The National Academies held a conference on this topic, entitled, "Seeking Access to Research Data in the 21st Century: An Ongoing Dialogue Among Interested Parties," part of the Science, Technology, and Law Program, in Washington, D.C., on March 12, 2001.

Fiscal Year 2000

The President's budget request for R&D included an increase of 2.9%, which was above the inflationary level of 2% for non-defense R&D, making it 51% of the R&D budget request. Defense R&D was slated to decline 5.3% from FY1999 due to cuts in weapons development and applied research. Within the defense R&D category, only DOD basic research was proposed to be increased, by about $6 million more than in FY1999. The Administration sought a $336 million initiative in "Information Technology for the 21st Century," with increases in long-term fundamental research funding in NSF, DOE and DOD, representing a 28% increase in the then current level of funding for information technology. The President requested 8.6% more than in FY1999 for DOE's R&D in renewable energy technology and energy conservation; transportation R&D was proposed to be increased 11.6%. Basic research would increase 4.2% over FY1999, continuing the pattern of recent increases. NSF's R&D budget would be increased by 7.8%; DOE's non-defense R&D budget would increase 6.4%. NIH's budget was proposed to increase by 2.0%. The President sought to increase NASA's R&D to $9.8 billion, primarily for the International Space station, up 7.7%. Commerce's R&D budget included an 18% increase for the NIST Advanced Technology program and would have provided $283 million to NOAA for research related to climate change and associated subjects. The Administration proposed a "21st Century Research Fund," to highlight important R&D programs. For the long-term, the President's budget showed all agencies' R&D budgets' declining in constant dollar terms between FY2000 and FY2004, with the largest declines in NIH.

Final congressional action funded FY2000 R&D at about $83 billion, about 5% over FY1999 and 7% over the President's request. The largest increases were in NIH and DOD, followed by NSF, DOE, and USDA. Excluding NIH, R&D funding for nondefense R&D increased 2.4%. Because of the large projected budget surplus ($123 billion), there was pressure to circumvent caps in the appropriations process, as was done in 1998 for the FY1999 budget. While sticking to mandatory budget caps, Congress allowed appropriations for discretionary programs to exceed capped levels by designating up to $14 billion above the caps as emergency spending, mandating a 0.38% across the board cut, delaying some spending to FY2001, and using offsets. The increases for R&D exceeded those proposed by the President for NIH, NASA, DOD S&T, defense R&D, and basic research. Congressional action resulted in R&D funding at levels less than the President proposed for NSF, DOE, and USDA, and for information technology programs.

H.R. 2086, a Science Committee bill on networking and information technology that passed the House in 2000, would have increased funding over the following five years for information technology. The House Science Committee's calls for increasing R&D budgets appeared in its "Analysis and Review" of the FY2000 R&D budget.[19] Its bipartisan FY2000 *Views and Estimates Report* endorsed a 3% increase for R&D programs under its jurisdiction. Non-biomedical scientists and others

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[19] Appearing at: [http://www.house.gov/science/welcome.htm].

continued to criticize the emphasis given to biomedical research and sought to rebalance the federal R&D funding portfolio to support lagging fields of science.[20]

H.R. 1180, enacted as P.L. 106-170, the "Work Incentives Improvement Act," contained a 5-year extension of the research and experimentation tax credit for industry. (See CRS Issue Brief IB92039.) S. 296, the "Federal Research Investment Act," (H.R. 3121 in the House), the successor to S. 2217, 105th Congress, passed the Senate on July 26, 1999. The bill would have doubled R&D funding within 11 years, at a 2.5% annual increase above the rate of inflation for all fields of science in major agencies. It also mandated a separate detailed budget presentation on R&D; addressed better accountability, effectiveness and efficiency in federal R&D funding; required an NAS study and OMB guidance on performance measures for research; and established a process to terminate unsuccessful research programs. No action was taken in the House on the bill in 1999.

Fiscal Year 2001

With the FY2001 budget submission, President Clinton proposed to raise budget caps, permitting a 5.2% increase in total discretionary spending. He also sought to ensure greater funding balance among R&D agencies and fields, given the recent large increases for health R&D. However, funding for most other fields had decreased, remained stable, or increased less. The President also sought to raise the federal R&D budget 3% over FY2000 to $85.3 billion, with the largest increases for non-defense R&D, at 6.2%; and to reduce defense R&D by about 0.2%. The FY2001 budget proposed larger increases for R&D in non-life sciences disciplines than for life sciences research. R&D increases, in descending order, were proposed for DOT, 25%; NSF, 19%; DOE, 8%, the Commerce Department, 7%; NIH, 6%; and EPA, 5%. NSF's increase would go to support the agency as the lead for interagency initiatives in nanotechnoloy, information technology, and biocomplexity research. Projections for the budget showed that between FY2000 to FY2005, non-defense R&D would increase by 14.2% (3% in constant dollars); defense R&D would decrease by 4.7% (a 14.6% decrease in constant dollars).

The FY2001 congressional budget resolution, H.Con.Res. 290, approved April 13, did not include detailed recommendations for federal support of R&D, but it developed targets for budget functions and appropriations that support R&D. AAAS projected that the resolution would permit increases in non-defense R&D in FY2001, but, nonetheless, would reduce R&D spending 7.8% in inflation-adjusted dollars by 2005. R&D would be reduced in constant dollars in all agencies, except for NSF and DOT. Because the plan proposed tax cuts and would not allow use of the Social Security surplus, funding levels would be lower than those projected in the President's budget. Defense R&D was projected to decline 13.7% in inflation-adjusted dollars by 2005.

For FY2001, Congress, utilizing CBO forecasts of additional surpluses, raised the caps on discretionary spending to about $100 billion above the existing cap and

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[20] "Balancing the Federal Research Portfolio: Who's Deciding and Why?" *Science*, August 11, 1999.

above what the President had requested, paving the way for major increases in R&D appropriations. During the FY2001 appropriations process, Congress substantially increased R&D funding to $91 billion, 9.1% more than FY2000. R&D in every agency was increased over FY2000 and R&D in most agencies, except NSF, DOT, EPA, the Commerce Department, and the Smithsonian, was funded higher than requested. The largest increases were for NIH and the Defense Department. Funding levels for defense and non-defense R&D were about equal, for the first time since the late 1970s. There was an 8.9% increase in funding for non-defense research, excluding NIH. This was smaller than the NIH increase of 15%, but reversed recent trends of declining or stable funding for non-health sciences. The increase in DOD research support resulted in increases for physical sciences and engineering research. Nanotechnology research was increased 55% over FY2000 (but NSF's lead role was scaled down); NSF's support for information technology R&D was more than doubled; basic research support was increased by about 11.8% overall. Substantial increases in NIH's R&D budget were made during the 1990s, so that its funding totals about the same as all other non-defense agencies' R&D funding combined. The FY2001 increases for civilian R&D agencies, excluding NIH, raised their funding levels to about what they were in the early 1990s in terms of inflation-adjusted dollars. See Table 2.

Considerable effort was made during congressional deliberations to increase funding for federal R&D. The House Science Committee in its *Views and Estimates...for Fiscal Year 2001*, noted that "...out-year budgets are either flat or actually decline. The President's budget fails to meet the stable and sustainable funding criteria needed for science and technology programs in the out-years" (p. 2). Rep. Vernon Ehlers sought support from colleagues "... to sign a letter to the chairman and senior Democratic member of the House Appropriations Committee," urging that high priority be given to basic scientific research in the FY2001 appropriations process ((302b) allocations).[21] In part in an effort to explain the importance of R&D to the public, the President's Committee of Advisors on Science and Technology released a report, *Wellspring of Prosperity, Science and Technology in the U.S. Economy, How Investments in Discovery Are Making Our Lives Better*, Spring 2000. An Office of Science and Technology (OSTP) report sought to demonstrate the economic benefits of federal R&D: *Discovery and Innovation: Federal Research and Development activities in the Fifty States....*, 2000, 650 pp.

S. 296, the "Federal Research Investment Act" that was passed the Senate first in 1999 as S. 2217, passed again in the Senate in 2000 as Title I of the "Next Generation Internet Act," S. 2046, amended. It authorized increases for civilian R&D funding at set amounts, with the goal of investing 10% of the discretionary budget in civilian R&D by 2011. It also included provisions to measure research performance and accountability. House Science Committee Chairman James Sensenbrenner opposed it because, he said, it would weaken the authorizations process.[22] The House did not pass the bill.

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[21] *The American Institute of Physics Bulletin of Science Policy News*, no. 33, March 23, 2000. A copy of the letter is included in the article.

[22] "The Bombs Bursting in Air," What's New, Sept. 29, 2000, <Whatsnew@aps.org>.

Other Issues Relating to Priority-Setting

Several other issues relating to priority-setting were prominent between 1993 and 2000, including criticism of so-called earmarking, coordination of R&D priority-setting, priorities for critical technologies, the "Ehlers" report, implications for R&D of the Government Performance and Results Act, and the role of the National Science and Technology Council.

Congressional Earmarking of Specific R&D Projects

There has been considerable controversy about congressional earmarking for R&D. Earmarking may be defined as the practice of Congress, in report language or law, directing that appropriated funds go to a specific performer to conduct a project or designating awards for certain types of performers or in certain geographic locations.[23] Typically an agency has not included these awards in its budget request

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[23]This definition accords with common standard definitions. See, for instance, (1) from the *Congressional Quarterly American Congressional Dictionary*: "Earmark - To set aside funds for a specific purpose, use, or recipient. Generally speaking, virtually every appropriation is earmarked, and so are certain revenue sources credited to trust funds. In common usage, however, the term is often applied as an epithet for funds set aside for such purposes as research projects, demonstration projects, parks, laboratories, academic grants, and contracts in particular congressional districts or states or for certain specified universities or other organizations." [Http://www.crs.gov/products/guides/newformat/Glossary/e.html]; (2) OMB Circular A-11, (Revised 2000), defines the following as "Research Performed at Congressional Direction: Intramural and extramural research programs where funded activities are awarded to a single performer or collection of performers with limited or no competitive selection or with competitive selection but outside of the agency's primary mission, based on direction from the Congress in law, in report language, or by other direction. Funded activities may be merit-reviewed prior to award," p.282; and (3) The CRS report, *Fact Sheet on House Budget Process*, 98-518 GOV, by Sandy Streeter, Updated Feb. 11, 1999, defines "Earmarks and Limitation in Appropriations Bills," as "An annual appropriations act is generally made up of separate paragraphs, each of which provides funding for specific agencies and programs. Generally, each paragraph corresponds to a unique account and provides appropriations for multiple projects and purposes as a single lump sum. Earmarks and limitations are two devices regularly used in annual appropriations acts to restrict, or more precisely direct, the availability of funds for specific projects or purposes of an account. Sometimes an earmark or a limitation may generate more interest or controversy than the total appropriation. ...An earmark refers to funds set aside within an account for a specified purpose. Sometimes earmark refers to any congressional set-aside for a specified program, project, activity, institution, or location. At other times, the term more narrowly refers to set-asides for individual projects, locations, or institutions. For example, an appropriations bill including $100 million for a construction account may set aside $10 million of the construction funds for a particular project. In addition to setting aside funds, the earmark might also provide spending floors by stating that not less than $10 million must be used for the specified project. Some earmarks are included in the text of appropriations measures, floor amendments, and conference reports to such measures. If enacted, these earmarks are legally binding. Most earmarks, however, are included in the Senate and House Appropriations Committees' reports explaining a measure as reported. Earmarks are also frequently included in the managers' joint explanatory

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and often such awards may be made without prior competitive peer review. Opponents believe that the practice forces agencies to fund projects that they normally would not have funded. Critics believe that earmarking undermines the authorization process and distorts agency R&D priorities. In addition, many earmarks establish new centers or institutions, which might require federal support in the future. Supporters of earmarking believe the practice helps to develop R&D capability in a wider variety of institutions, that it compensates for reduced federal programs for instrumentation and facilities renewal, and that it generates economic benefits in targeted regions because R&D capacity generates industrial growth. The enactment of legislation to give the President a line-item veto was expected to reduce earmarking if the earmarks were specified as line-items in relevant enactments (P.L. 104-130). Subsequently, the Supreme Court struck down the line-item veto.

There is scant federally collected data about earmarking and these data differ from that collected by others. The Office of Science and Technology Policy (OSTP) reported that for FY1993, Congress had earmarked about $1,712 million for R&D and research facilities (71% more than for FY1992), including $442 million for universities (22% more than for FY1992).[24] The *Chronicle of Higher Education* reported that congressional earmarks for academia, which consist largely of R&D projects, totaled $763 million for FY1993.[25] OSTP has not released any similar data since then. President Clinton's chief of staff, John Podesta, said in a speech on September 1, 1999 at the National Press Club, that Congress earmarked about $1 billion for R&D for FY2000.[26] The *Chronicle of Higher Education* (July 28, 2000), which has been collecting data on congressional earmarks to colleges and universities for several years, reported that such language, largely for R&D, totaled $1.044 billion for FY2000, an increase of 31% over FY1999, continuing an upward trend begun for FY1997, after 3 years of decline following the previous peak of $763 million in FY1993.

There have been attempts to limit earmarking for R&D. In 1993, the late George E. Brown, chairman of the House Science Committee, sought to limit the ability of appropriations committees to earmark R&D funding for specific projects,

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[23](...continued)
statement (or managers' statement) that accompanies the conference report. Committee reports and managers' statements do not have statutory force; departments and agencies are not legally bound by their declarations. These documents do, however, explain congressional intent and frequently have effect because departments and agencies must justify their budget requests annually to the Appropriations Committees."

[24]"Congressional Earmarks in the FY1993 Appropriations," Memorandum for J. Thomas Ratchford From Willis H. Shapley, December 8, 1992, attached to Letter from D. Allan Bromley, The Assistant to the President for Science and Technology to Honorable George Brown, U.S. House of Representatives, December 10, 1992.

[25]Colleen Cordes and Katherine McCarron, "Academe Gets $763 million in Year From Congressional Pork Barrel," *The Chronicle of Higher Education*, June 16, 1993, pp. A21-A26.

[26]Speech before National Press Club, discussed in *American Institute of Physics Bulletin of Science Policy News*, no. 79, July 5, 2000.

because he said it undermined the authorizations process.[27] Proposals have also been made to limit the dollar amount that could be spent on earmarked capital projects and to subject all grants to competitive review. The Clinton-Gore technology policy document, *Technology for America's Economic Growth*, February 1993, stated that the Administration would "work closely with Congress to prevent 'earmarking' of funds for science and technology." The *Final Report of the House Members of the Joint Committee on the Organization of Congress,* December 1993, recommended that committee reports list all earmarked funds below the appropriations account level.[28] Aspects of earmarking and indirect costs were scrutinized in a GAO report, *Department of Transportation: University Research Activities Need Greater Oversight.*[29] Sec. 7203 of P.L. 103-355, the Federal Acquisition Streamlining Act of 1994, was expected to encourage merit-based selection procedures and to discourage earmarks. However, the law does not appear to be applicable to report language, where many earmarks appear.[30] In 1997, several FY1998 authorization bills passed by the House (for NSF, NASA, NIST, and other agencies) would have limited agency funding for R&D beginning in FY1998 only to persons who received funds from any federal agency after FY1997 by means of a competitive, merit-based process. The ban would have lasted for 5 years. This provision was not enacted into law.

OMB categorizes federal agency R&D awards into five categories, whose spectrum ranges from earmarks (called "research performed at congressional direction") to rigorously merit-reviewed, competitively selected research.[31] The categories are

- Research performed at congressional direction,
- Inherently unique research,
- Merit-reviewed research with limited competitive selection,
- Merit-reviewed research with competitive selection and internal (program) evaluation,
- Merit-reviewed research with competitive selection and external (peer) evaluation.

Although in some cases congressionally-directed funds may be merit-reviewed prior to award, they are not competitively selected as is much merit-reviewed R&D, and as such are considered a distinct category from merit-reviewed research. The Clinton Administration announced in 1995 that increasing the amount of merit- (peer)

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[27]"Brown Sees Gains in His Battle Against Academic Earmarks," *Congressional Quarterly*, December 4, 1993, 3307-3310.

[28]H. Rept. 103-413, vol 1, p. 11.

[29]RCED-94-175, May 1994.

[30]For technical information on earmarking as part of the legislative process, see *The Congressional Appropriations Process: An Introduction*, by Sandy Streeter, CRS Report 97-684 GOV, Updated Sept. 29, 2000, 33 p.

[31]OMB Circular A-11, revised 2000, pp. 282-283.

reviewed R&D programs would constitute one of its performance goals.[32] Merit-reviewed R&D programs constituted "almost 40%" of the proposed R&D budget for FY1996.[33] In the FY2001 proposed budget, merit-reviewed programs were reported to constitute about 37% of the proposed R&D budget.[34]

Other efforts were made by the Clinton Administration to increase merit-reviewed research, and, it seems, to decrease earmarking. President Clinton's FY2001 budget proposal noted that as result of a recommendation made in a NSTC report on the Government-University Partnership, "..agencies have reported the amount of funding that was awarded through...Congressional direction. The Administration is in the process of developing consistent measures across Federal agencies for [this type of award] in order to publish the data in the 2002 budget."[35]

The National Science and Technology Council (NSTC)[36] report, *Renewing the Federal Government-University Research Partnership for the 21st Century*, April 1999, issued by the NSTC in response to Presidential Review Directive - 4, endorsed the need for merit-review in funding federal research projects (Chaps. 4 and 5). It said the NSTC "supports OMB's effort to refine the definition of merit-review in its annual revision of the terms in OMB Circular-11, Preparation and Submission of Budget Estimates (part 1)." It also said the NSTC would seek ways to decrease practices of awarding research funds that bypass merit-review processes (chap. 5).

Coordination of R&D Priority-Setting

Some observers recommend more centralized priority-setting for R&D in Congress and in the Executive branch. They cite the disadvantages of not having a single mechanism in the executive branch to determine a unified and explicit R&D budget or to evaluate the total government R&D portfolio in terms of progress toward meeting national objectives. They also argue that congressional jurisdiction for R&D is split among a number of committees and subcommittees preventing examination of the R&D budget as a whole. This, they say, means that R&D funding can serve particular local or program interests, but may not be appropriate for a national R&D agenda. Opponents see value in a decentralized system in which budgets are developed, authorized, and appropriated separately by those most familiar with the needs of specific fields of R&D—the department or agency head and the specific authorizing and appropriations subcommittees with jurisdiction for the agency.

Several recommendations were made during the period FY1993 to FY2000 to improve coordination of R&D priority-setting and budget-making. For instance, in the

[32]Chapter 7 of President's *FY1996 Budget* entitled "Investing in Science and Technology"

[33]Ibid.

[34]*Budget of the U.S. Government, Fiscal Year 2001*, p. 99.

[35]*Analytical Perspectives, Budget of the U.S. Government, Fiscal Year 2001,* p. 183.

[36]Created by President Clinton by Executive Order 12881 on November 23, 1993 with cabinet-level status.

biomedical area, in October 1997, House Speaker Gingrich announced he would appoint a group, including Members of Congress, to assess how NIH sets research priorities.[37] The Institute of Medicine produced *Scientific Opportunities and Public Needs: Improving Priority Setting and Public Input at the National Institutes of Health*, 1998. NIH held public meetings on priority-setting, in response to the report.

Outside of Congress, a 1996 report by the Council on Competitiveness, "Endless Frontier, Limited Resources," recommended new partnerships between governmental and non-governmental sectors to keep U.S. R&D vital. Considerable attention was given to emphasizing the need for federal support of basic research (not technology development) as a priority.[38] In December 1997, the National Science Board, part of the governing body of the National Science Foundation, released a report, "Government Funding of Scientific Research," calling for mandatory priority-setting and coordination of federal R&D. This followed its August 1997 announcement that it would try to play a bigger role in setting national S&T priorities and policy. A series of 1997 National Academy of Sciences (NAS) reports, *Preparing for the 21st Century*, identified priorities for support to maintain U.S. research strength, social and environmental quality, and economic growth. The 1999 NAS Committee on Science, Engineering and Public Policy (COSEPUP) report, *Evaluating Federal Research Programs*, recommended better coordination of federal research priorities and designation of lead agencies in instances when similar R&D was conducted by different federal agencies.

In 1991, the Office of Technology Assessment (OTA), an agency of Congress (since disbanded), reported that R&D priorities should be explicit, in order to evaluate R&D projects against such national goals as national prestige, political needs, scientific merit, education, building regional capacity, geographic distribution, and training.[39] In 1995, as NAS report, *Allocating Federal Funds for Science and Technology*, 1995, recommended that the President present to Congress, and that the Congress consider, the R&D budget as a unified whole before the separate parts of the budget were considered by individual congressional committees. It also recommended that it be reconstituted from an R&D budget to a science and technology (S&T) budget, excluding development activities, to connote the function of creating new knowledge. Objections to this concept were raised by the American Physical Society at hearings held by the House Science Committee in February 1996.[40] S. Amdt. 2235 (Bingaman and Lieberman) to the Senate Budget Resolution (S.Con.Res. 86) for FY1999 endorsed the views of the 1995 Academy Report, and expressed the sense of the Senate that for fiscal years 2000 to 2004, all federal civilian S&T program spending should be classified under budget function 250, which now

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[37] *COSSA Washington Update*, June 29, 1998, 6.

[38] Committee for Economic Development, *America's Basic Research: Prosperity Through Discovery*, 1998.

[39] *Federally Funded Research: Decisions for a Decade*, 1991.

[40] "House Science Committee Holds Hearing on the "Press Report." *What's New, American Physical Society*, March 1, 1996.

encompasses science and technology,[41] and that the President should classify these programs, which cross all federal civilian departments and agencies, in function 250. The resolution passed the Senate on April 2, 1998.

As for Administration activity, a presidential report, *Science in the National Interest, 1994*, outlined the Administration's goals to support both long-range research and research aimed at meeting shorter term "strategic goals," to increase support for civilian research to establish interagency initiatives on topics the Administration considered priority issues, and applied research and proposed actions to meet five broad goals for U.S. global leadership in S&T. National R&D investment, it said, should be increased to 3% of GDP. The President's priorities appeared in *Science and Technology Shaping the 21st Century, Report to Congress, 1997*, and in a 1995 white paper, "Technology and Economic Growth: Producing Real Results for the American People," which stressed applied R&D. In 1997, the White House and the National Governors Association established a mechanism to promote coordinated federal and state technology efforts.

Pressure to coordinate priority-setting for R&D could continue in the new George W. Bush Administration, especially if physical, natural sciences, and social sciences researchers continue to press for more funding in the face of continuous increases for health sciences research. In addition, Congress could enforce tight discretionary caps depending upon FY2002 budget projections and outyear assumptions. This could increase pressure to set priorities for federal R&D more systematically and to ensure that it receives what supporters consider an appropriate share of federal discretionary spending.

Funding for Large Research Projects

Megaprojects, or "big" science projects, like the space station, require long-term, large capital investments or long-term funding commitments for individual researchers working toward a research goal, such as the Human Genome Project. They may necessitate building new large facilities or instruments, which require commitment of large amounts of annual operating funds that can limit long-term flexibility of federal R&D funding. Critics say that as funding for big science increases and large amounts of financial support are committed to one R&D topic, less money is likely to be available for smaller research projects which might be riskier, and, as a result, opportunities for "frontier" creative science could diminish.

Funding for U.S. megaprojects decreased and the composition of megaprojects priorities has changed considerably since FY1992, with decreases for defense, and some slight increases for civilian megaprojects, despite the cancellation of the

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[41] According to OMB Circular A-11, Exhibit 79 b, p. 178, Circular A-11, revised (2000), function 250, GENERAL SCIENCE, SPACE AND TECHNOLOGY includes the subfunctions of 251, General science and basic research, and 252, Space flight, research and supporting activities. NSF reports, however, that "Not all federally sponsored basic research is categorized in function 251, ... some basic research is included in the remaining 19 functional categories,(*Federal R&D Funding by Budget Function, Fiscal Years 1998-2000*, p. 2).

Superconducting Super Collider and the scaling back of the space station. Cutbacks occurred because of perceived waste resulting from failures, budgetary pressures, lack of foreign contributions, and pressures from other fields of science.

The Organization for Economic Cooperation and Development (OCED) science ministers, in September 1992, adopted a U.S.-initiated proposal to establish a formal body to promote cooperation and priority selection for megaprojects, called the Megascience Forum. Its mandate was renewed for three years in 1995 and, in April 1999, the forum was given a new mandate for five years and renamed the OECD Global Science Forum, with the goals of promoting collaboration, removing barriers to effective international scientific cooperation and preserving funding resources.[42] Recent activities focus on international cooperation in structural genomics, high-tensity proton beam facilities, biological informatics, nuclear physics, radio astronomy, neutron sources, and neutron scattering facilities in the OECD countries and in Russia.

Priorities for Critical Technologies

The 1989 enactment of P.L. 101-189, a national defense authorization act for FY1990 and FY1991, authorized the director of OSTP to prepare biennial reports for the President and Congress to identify no more than 30 national critical dual-use technologies "essential for the United States to develop to further the long-term national security and economic prosperity of the United States." The list is meant to help guide priority setting for R&D. OSTP produced four reports under this mandate. The third, *National Critical Technologies Report*, 1995, covered 27 technologies and compared the current U.S. competitive position relative to Japan and Europe. The fourth and most recent report produced under these mandates, *New Forces at Work: Industry Views Critical Technologies*, 1998, identified the most often cited essential technologies as: software, microelectronics and telecommunications technologies, new materials, and sensor and imaging technologies, and emphasized the importance of finding enough skilled people to work in these areas.

In one of its final actions, the Clinton Administration's National Science and Technology Council, in January 2001, released the executive summary of a forthcoming report, *New Foundations for Growth: The U.S. Innovation System Today and Tomorrow.*[43] The report provides a blueprint for establishing priorities and enhancing the effectiveness of federal policies that facilitate technological innovation in the private and public sectors. It was prepared by the RAND Corporation's Science and Technology Policy Institute (a successor to the Critical Technologies Institute created by OSTP in part to fulfill the mandate of the law), a federally funded research and development center (FFRDC) serving as the policy research arm of the Office of Science and Technology Policy. The report made recommendations for both private and public sector initiatives. Among the many recommendations were: improve the portfolio of public research by assessing priorities and providing balance

[42]Available at: http://www.oecd.org/dsti/sti/s_t/ms/index.htm.

[43]Available at: http://www.rand.org/publications/MR/MR1338.0/.

across fields; make the Research and Experimentation tax credit permanent; clarify intellectual property rights policy; examine federal investment priorities in "infratechnologies"—data, measurement and testing methods, and standard practices and techniques; evaluate policy guidelines for R&D partnerships; raise the awareness of federal agencies to issues affecting the national innovation system; and work on ways to improve methods to measure performance of research investments.

P.L. 100-456, the National Defense Authorization Act for FY1989 required the DOD to report annually to the congressional defense committees a plan for developing the 20 technologies considered by the Secretary of Defense and the Secretary of Energy to be the technologies most essential to develop in order to ensure the long-term qualitative superiority of U.S. weapon systems. The law required both product and process technologies to be considered in selecting the technologies to be included in such a plan. The DOD's first report responsive to this requirement was *Critical Technologies Plan, 1989.* During 1992, the DOD released its *Defense Science and Technology Strategy* report, the first in the department's series of science and technology reports responsive to the law. The names and types of reports DOD prepares in response to the law have evolved over time. Currently the department's objectives, plans and priorities for science and technology appear in the reports entitled *Defense Science and Technology Strategy, 2000, 2000 Defense Technology Objectives, 1999 Defense Technology Area Plan*, and in 2000 Joint Warfighting Science and Technology Plan (JWSTP). In addition, the Defense Threat Reduction Agency, part of DOD, maintains and continuously updates a publication entitled *Militarily Critical Technologies,* of which "Part III: Developing Critical Technologies (DCT)," describes critical technology in 20 areas, ranging from aeronautics, through information technologies, to weapons effects technologies. The document lists U.S. and worldwide technologies that would produce increasingly superior performance of military systems or maintain a superior capability more affordably. DOD develops the list in cooperation with other U.S. government agencies, U.S. industry, and academia, through the militarily critical technologies list process in response to the Export Administration Act of 1979. The documents are available from the Defense Technical Information Center (DTIC).

The "Ehlers" Report

In 1997, Representative Vernon Ehlers was tasked by the House leadership to head a special study on science policy. Following a series of hearings, a report entitled *Unlocking Our Future* was released on September 24, 1998. On October 8, 1998, the House passed H.Res. 578, declaring "it is the sense of the House...that...[the report] should serve as a framework for future deliberations on congressional science policy and funding." The academic community generally praised the report, although some criticized it as not supporting the social sciences, not addressing all major issues critical to future applications of science, and not proposing major changes in funding patterns or mechanisms. On the whole, it generated considerable discussion about future policies for U.S. science support.[44]

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[44]"Congress Ratifies Ehlers Science Policy Report," *Washington Fax*, October 15, 1998; "Seeing the Ehlers Report as a Republican R&D Manifesto, Rather Than a National Science

(continued...)

Government Performance and Results Act of 1993

The Government Performance and Results Act, P.L. 103-62, is related to the issue of priority-setting since the law requires agencies to define long-term goals, set specific annual performance targets, and report annually on performance. The law is intended to ensure accountability for federal investments and to develop processes which ensure that an agency's programs and priorities meet its goals. The law allows the use of qualitative measurement alternatives if quantitative methods can not be used. This is especially salient to agencies that fund R&D since, they say, it is difficult to define goals and priorities for many basic research programs and to measure the results quantitatively , since research outcomes often can not be defined well in advance and accomplishments take a long time to demonstrate and document. The NSTC Committee on Fundamental Science in *Assessing Fundamental Science,* July 1996, and the Federal Research Roundtable, an informal interagency group now terminated, developed guidance for R&D performance measures. Also, GAO produced *Measuring Performance: Strengths and Limitations of Research Indicators,* RCED-97-91. The National Research Council in a February 1999 report, *Evaluating Federal Research Programs: Research and the Government Performance and Results Act*, recommended that federal agencies use performance measures for research and issued "benchmarking" reports comparing the status of U.S. science to other countries for mathematics, materials science and engineering, and immunology.

Federal agencies submitted GPRA-related strategic plans to Congress in September 1997 and delivered their first annual performance plans with FY1999 budget justifications. A House Majority Leader report rated the FY1999 plans. The House Committee on Government Reform and Oversight and the Senate Committee on Governmental Affairs held hearings on implementation. The House Science Committee held hearings in 1996 and 1997 on implementation in the science agencies and, in 1997, announced that research performance measurement would be an oversight target. Several congressional committees asked agencies to link FY1999 and FY2000 budget requests to goals expressed in their strategic and performance plans. The agencies' first performance reports, for FY1999, were delivered to the Congress during 2000.[45] During 2001 agencies will submit FY2000 performance reports and FY2002 performance plans.

S. 296, the Federal Research Investment Act, an amendment to S. 2046 that passed the Senate in 2000,[46] would have required the OSTP director to enter into an agreement with the NAS to conduct a comprehensive study to develop methods for

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[44](...continued)
Policy, Is Not a Bad Thing...," *Washington Fax*, October 21, 1998; and Richard E. Scolve, "For U.S. Science Policy, It's Time for a Reality Check, *Chronicle of Higher Education*, October 23, 1998, pp. B4-B5. The NAS endorsed specific follow-up in its *Science and Technology for the Nation: Issues and Priorities for the 106th Congress: Views...on "Unlocking Our Future...,"* December 16, 1998.

[45]For additional details on this issue, see: Genevieve J. Knezo, *Government Performance and Results Act: Brief History and Implementation Activities,* CRS Report RS20257, 6 p.

[46]Passed in the Senate on September 21, 2000.

evaluating federally-funded R&D programs and would have required the OMB director, based on study results, to promulgate one or more alternative forms for federal R&D performance. It also would have set in motion a process to terminate "unsuccessful" federal research programs. Versions of these provisions appeared in the 105th Congress in S. 2217. Also in the 105th Congress, the Senate report on the FY1999 VA/HUD appropriations bill that was enacted as P.L. 105-276, called on NSF to identify quantifiable goals for research and gave OSTP and OMB authority to seek the NAS study, as listed in S. 2217, 105th Congress, (predecessor to S. 2046, 106th Congress). However, no funds were appropriated for the NAS study.

During 2000, the National Academies' Committee on Science, Engineering and Public Policy, (COSEPUP), with endorsement by the OSTP, the leadership of the House Science Committee, and the major sponsors of the Senate legislation, conducted a study to examine the processes R&D agencies use to prepare their GPRA documents in an effort to ensure agency responsiveness to the GPRA mandates. The final report is expected in Summer 2001.

In a 1993 report, *Science, Technology, and the Federal Government: National Goals for a New Era*, the Committee on Science, Engineering, and Public Policy (COSEPUP) of the National Academies[47] recommended that in order to determine priorities for funding basic research, two main goals be used: (1) "the United States should be among the world leaders in all major areas of science;" and (2) "the United States should maintain clear leadership in some major areas of science." Subsequently the group examined the status of U.S. R&D in relation to other nations, using a technique called international benchmarking. U.S. R&D status was examined in three fields—mathematics, immunology, and materials science and engineering.

In March, 2000, a report that assessed U.S. status vis a vis other nations, using benchmarking methodology was released, entitled *Experiments in International Benchmarking of US Research Fields*. The Subcommittee on Basic Research of the House Science Committee held a hearing on this topic on October 4, 2000, entitled "Benchmarking U.S. Science: What Can It Tell Us?" The purpose of the hearing was to examine the NAS report and benchmarking as a method to evaluate research performance from an international comparative perspective.[48]

Requirements for agencies to give precise goals for research and statements of performance outcomes could become more salient because of congressional actions taken in 2000 and 2001. P.L. 106-531, the "Reports Consolidation Act of 2000," permits agencies to combine annual GPRA performance reports with financial reports required under the Chief Financial Officers Act, to be called a "Performance and Accountability Report." The agency head is required to assess the completeness and reliability of the performance data that agencies use and to include a summary of the performance report in the accountability report if the two reports are not combined. In addition, with the passage of H.Res. 5, the House Rules Committee adopted a rule

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[47]64 pages; available online at [http://books.nap.edu/catalog/9481.html].

[48]U.S. Congress, House, Committee on Science, Subcommittee on Basic Research, *Benchmarking U.S. Science: What Can It Tell Us?*, Hearing, 106th Congress, 2nd Session, October 4, 2000, 56 pp.

requiring that all "committee reports include a statement of general performance goals and objectives, including outcome-related goals and objectives for which the measure authorizes funding." These requirements are intended to make performance measures more precise.

National Science and Technology Council (NSTC)

Executive Order 12881, issued by President Clinton on November 23, 1993, established NSTC with cabinet-level status. It was a successor to the previous Federal Coordinating Council for Science, Engineering, and Technology (FCCSET). Among NSTC's functions were recommending federal agency R&D budgets that would help accomplish national objectives, advising OMB on federal agency R&D budgets, and helping to coordinate presidential interagency R&D initiatives. In a 1997 report, *Science and Technology and the President: A Report to the Next Administration*, the Carnegie Commission on Science, Technology, and Government criticized the breadth of these activities. It recommended "fine-tuning" NSTC to concentrate on its role as a policy council and to allocate "its resources on a small number of priority policy issues of concern to the President and reduce...its emphasis on detailed R&D program development and coordination."[49] There is no evidence that the NSTC reoriented its work in response to this recommendation.

Beginning in 1995, with the FY1996 budget request, NSTC started to identify major Administration R&D priorities and submitted budget requests that identified these as cross-cutting budget initiatives whose R&D activities were coordinated by NSTC interagency committees. The FY2001 initiatives, which represented major Administration priorities, whose funding was highlighted in the President's budget under the heading of the "21st Century Research Fund, included: the "National Nanotechnology Initiative; Change Technology; U.S. Global Change Research; Partnership for a New Generation of Vehicles; Integrated Science for Ecosystem Challenges; Fundamental Health Research; Weapons of Mass Destruction; Preparedness and Critical Infrastructure Protection R&D; and Education Technology and the Interagency Education Research Initiative." NSTC said had it established performance measures for these areas. These were not published with the budget.

[49] Available at [http://www.carnegie.org/sub/pubs/science_tech/nextadm.htm].

Potential Issues for the 107th Congress

President Bush released a preliminary budget outline in February 200l, that gives summary information about funding.[50] But discussion of detailed R&D budget issues that will confront the 107th Congress must await the release of the President's full budget. Candidate George W. Bush's views on science were inventoried before the election in *Science* magazine,[51] among other places. Among issues that could be raised in the 107th Congress are such questions as

- whether R&D funding increases should continue, given predictions of a possible slowdown in the economy, tax cuts, and increases in social services spending, which may increase pressure to maintain congressional discretionary spending caps in the outyears;

- whether the George W. Bush Administration will maintain the technology policy initiatives favored by the Clinton Administration; and

- whether the George W. Bush Administration will restore the emphasis given to defense R&D by previous Republican Administrations and implied by President George W. Bush's support for enhanced missile defense systems.

Debates are likely to continue on topics that were prominent during the last few years, including earmarking, the appropriate balance between health research and other fields of science, research priority-setting and accountability under the Government Performance and Results Act, the emphasis to be given to energy R&D, and coordination of priority-setting in the executive and legislative branches.

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[50] *A Blueprint for New Beginnings -- A Responsible Budget for America's Priorities*, February 2001.

[51] "Gore and Bush Offer Their Views on Science," *Science*, Oct. 13, 2000, pp. 262-269..

Table 1. Budget for R&D, FY1994 to FY2001, est.

(Millions of dollars budget authority)

Based on information prepared by the American Association for the Advancement of Science (R&D Budget and Policy Project), which appears electronically at *[http://www.aaas.org/spp/dspp/rd]*. Data are from AAAS, as described in the footnote. These AAAS data include conduct of R&D and R&D facilities. R&D is a line-item in only some agency budgets. Thus reported R&D funding data for specific programs vary depending upon the judgment of researchers, agency sources, assumptions made, definitions of R&D, and a determination of whether science education is included and so forth. Alternative CRS data for R&D agencies, FY1996-FY2001 that vary slightly from the historical AAAS data appear in *Research and Development Funding: Fiscal Year 2001*, CRS Issue Brief IB10051.

Agency/Program together with Budget Function [represented by numbers in brackets in this column]	**R&D, FY1994** [A]	**R&D FY1995**	**R&D FY1996,** [B]	**R&D FY1997,** [C]	**R&D FY1998**	**R&D FY1999**	**R&D FY2000 AAAS, est.**	**R&D FY2001, request, est. by AAAS**	**R&D FY2001, est.**
NIH[1*] [550]	10,459	$10,762	$11,443	$12,217	$13,097	$14,971	$17,102	$18,094	$19,597
Health Care Res/Quality (before	141	135	65	96	90				
FY2000, called Health Care						100	168	209	229
Res/Policy)[3]									
CDC[1]	203	318	323	346	358	438	477	518	585
FDA[1]	195	170	170	173	159	104	135	146	140
HCFA[3]	86	77	50		50	50	61	55	139
HRSA[2]	10	14	17		14	25	15	15	47
Other HHS R&D[2]	74		9	99	41	62	124	131	141
Total HHS **R&D**	**11,169**	**11,476**	**12,077**	**12,912**	**13,809**	**15,750**	**18,082**	**19168**	**20,879**
Res & Related Acts.[1*]	2,089	2,064	2,137	2,254	2,366	2,516	2,649	3,183	3,343
Academic Research Infra	100	118		0	0	0			
Major Res. Equipment	52	126	70	80	109	90	94	139	121
R&D in Edu.& Hum.Res.[1]	100	88	93	90	93	108	121	110	118
Total NSF R&D [250]	2,240	**2,396**	**2,401**	**2,424**	**2,568**	**2,714**	**2,863**	**3,431**	**3,240**

Agency/Program together with Budget Function [represented by numbers in brackets in this column]	**R&D, FY1994** [A]	**R&D FY1995**	**R&D FY1996,** [B]	**R&D FY1997,** [C]	**R&D FY1998**	**R&D FY1999**	**R&D FY2000 AAAS, est.**	**R&D FY2001, request, est. by AAAS**	**R&D FY2001, est.**
NASA Hum Space Flt.[4]	**1,971**	**1,902**	1,876	2,180	2,500	2,272	2,333	2,135	2,130
NASA SAT	**5,803**	**5,917**	5,929	5,453	5,680	4,885	5,585	5,929	6,177
[Space Science[4]] [250]			[489]		[2,020]		2,193	2,399	2,483
[Life/Microgravity					[219]		275	302	314
Science[4]]							1,443	1,406	1,483
[NASA Earth Science[4]]				1,714	[1,422]	1,790	1,862	1,976	1,991
NASA Mission Supt.R&D[1] [250]	**1,688**	**1,640**	1,612	in SAT	1,704	769	1,125	1,193	1,241
Other NASA R&D					1,491		545	629	657
Total NASA R&D	**9,462**	**9,459**	**9,416**	**9,352**	**9,884**	**9,715**	**9,777**	**10,040**	**10,298**
General Science[1*] [250]	966	959	972	986					
Science					2,228	2,651	2,638	2,969	3,001
Energy Supply R&D[1]	2089	2,245	1,811	1,746	550				
[270] Interior Bill						373	364	468	444
Fossil Energy R&D[1] [270]	341	327	333	274	276				
Interior Bill						295	328	293	339
Energy Conserv.R&D[1]	342	357	309	324	356				
[270] Interior Bill						400	431	465	458
Clean Coal Technology[6]	225	37	27	-2	-101				
[270] Interior Bill	3.4		3.0			-40			0
Uranium Enrichment [270]									
Other nondef.R&D [2]		23		0		61	55	40	55
Totl DOE nondef R&D	**3,966**	**3,932**	**3,455**	**3,328**	**3,309**	**3,740**	**3,816**	**4,234**	*4,297*

Agency/Program together with Budget Function [represented by numbers in brackets in this column]	**R&D, FY1994 [A]**	**R&D FY1995**	**R&D FY1996, [B]**	**R&D FY1997, [C]**	**R&D FY1998**	**R&D FY1999**	**R&D FY2000 AAAS, est.**	**R&D FY2001, request, est. by AAAS**	**R&D FY2001, est.**
U.S. Geological Survey[1] +	367	367	Total =	391	402	267	365	388	543
Nat'l Biological Service[1*]	167	152	516	138	0	162	137	151	
Bureau of Mines									
Minerals Mangmnt Ser.	106	106	56	0	0				
Nat'l Park Service[1]	6	21	31		25			11	13
Bur. of Reclamation	20	12	12	21	34	34	31	31	31
Bur. of Land Mangmnt	0	8	8		10			6	7
BCM and BIA	0	2	2	31				3	3
Other Interior R&D[2]	0				1				
Total Interior R&D [300]	1		**7**		2	36	40		
	673	**668**	622	**591**	**472**	**499**	**573**	**590**	**597**
Agr.Research Serv. R&D[1*]	707	722	724	732	760	811	853[6]	917[6]	920
Facilities[1*]	33		30	69	79	56	53	39	74
CSRS	429								
CSREES [3]		418	406	405	413	462	538	523	559
Facilities	54	61	58	62		0			
Economic Research Serv.[3]	55	54	53	53	72	63	64	55	67
Natl Agric. Stats Service	4	4	4	4	3	3	4	4	4
Foreign Agr.Serv.	1	1	1	1	1	1	1	1	1
Forest Service[3]	198	198	181	183	191	211	211	237	237
Other R&D	33	29	32	36	35	31	44	42	91
Total USDA R&D [350]	**1,513**	**1,487**	**1,489**	**1,556**	**1,553**	**1,638**	**1,763**	**1,824**	**1,953**

Agency/Program together with Budget Function [represented by numbers in brackets in this column]	**R&D, FY1994** [A]	**R&D FY1995**	**R&D FY1996,** [B]	**R&D FY1997,** [C]	**R&D FY1998**	**R&D FY1999**	**R&D FY2000 AAAS, est.**	**R&D FY2001, request, est. by AAAS**	**R&D FY2001, est.**
FHWA (Highway Adm).[2]	243	240	256	289	504	258	257	314	272
Federal Transit Admin.[2]	16	25	16	16	23	17	17	14	14
Maritime Admin.	2	3	0	—	—	—			
Federal Railroad Admin.[1*]	21	28	30	23	21	22	25	29	28
Federal Aviation Admin.[1*]	298	299	233	253	242	226	226	284	292
Research and Special Progs.	5	8	7		6	7	7	13	11
Coast Guard[1*]	23	20	18	19	19	15	20	23	22
Nat'l Hgwy Trfc Safty Ad. .	25	40	**38**		41		51	95	58
Office of Secretary	4	**4**	**3**	50	9	50	5	5	3
Other Transp R&D[2]	2	**3**				9		3	
Total DOT R&D [400]	**636**	**666**	**602**	650	**859**	**603**	**606**	**778**	**701**
NOAA R&D Facils[1]	561= NOAA	558=	536=	22	580 =	35	35	37	638-all NOAA
NOAA Opers, Res. & Facils R&D[1]	total	NOAA total	NOAA total	535 6	NOAA total	565 0	556	557	
Other NOAA R&D[2]	436= NIST	198	208						257
NIST S&T Res.[1]	Total	318	208	225	227	233	236	269	128
NIST ATP[1] and IIIP[1]	0.5	35	[31]	203	170	178	115	192	35
NIST Construction[3]	10	0.5	0.5	-16	95	57	107	36	1
Econ. Develop. Admin.	**1,007**	9	11	1	1	1	1	1	52
Other Commerce R&D[1]		**1,118**	**932**	9	8	7	23	56	**1,111**
Totl Comm.R&D [370]				**964**	**1,081**	**1,075**	**1,073**	**1,148**	
Total **EPA** R&D[1*] [250]	536	619	528	595	636	669	647	673	686
Total **Educ**.R&D[5] [500]		175	165	185	209	224	233	271	263
Total **AID** R&D[1] [150]		314	223	169	150	164	142	114	124
Total **VA** R&D[1]* [700]		297	263	588	608	674	655	655	684
Total **NRC** R&D[1] [270]		82	71	62	61	49	53	53	53
Total **Smithsn** R&D[1]		135	138	142	146	138	113	122	119
Total **TVA** R&D[2]		89	52	52	37	35	33	32	

Agency/Program together with Budget Function [represented by numbers in brackets in this column]	**R&D, FY1994 [A]**	**R&D FY1995**	**R&D FY1996, [B]**	**R&D FY1997, [C]**	**R&D FY1998**	**R&D FY1999**	**R&D FY2000 AAAS, est.**	**R&D FY2001, request, est. by AAAS**	**R&D FY2001, est.**
Tol**CrpsEngrs** R&D[1]		55	44	44	42	40	53	42	
Total **Labor** R&D[2]		62	37	35	71	70	71	42	
Total **HUD** R&D[3]		41	34	34	37	48	45	62	
Total **Treasury** R&D[2]		N.A.	N.A.	13.	13	13	6	6	
Total **Justice** R&D[2]				**48**	65	71	77	74	
Total **Other** R&D[2]					97	122	71	88	
TOTAL NONDEF. R&D	32,500	**33,115**	**32,667**	**33,886**	**35,697**	**38,073**	**40,751**	**43,446**	**45,348**
DOD R&D[1,4] [050]	35,603	35,349	35,842	37,430	37,568	37,975	39,344	38,576	41,846
DOE Def. R&D,[2,3] [050]	2,813	2,484	2,602	2,979	2,979	3,234	3,301	3,405	3,697
TOTAL DEFENSE	38,400	**37,833**	**38,444**	**39,801**	**40,409**	**41,208**	**42,583**	**41,981**	**45,543**

Source for data consists of tables and analyses that may be found at the AAAS websites [http://www.aaas.org/spp/dspp/rd/fy01.htm] and [http://www.aaas.org/spp/dspp/rd/guide.htm]. AAAS analysis for FY2000-FY2005 "AAAS Analysis. Outyear Projections for Nondefense R&D in the FY2001 Budget and Outyear Projections for Defense R&D in the FY2001 Budget," March 10, 2000, Available via [http://www.aaas.org/spp/dspp/rd/prev01p.htm]. "Data from *Budget of the United States Government for Fiscal Year 2001"* Public Budget Database table "Budget Authority and Offsetting receipts, 1976-2005," and Analytical Perspectives Table 25. Percentage changes in right column adjusted for inflation according to GDP deflators."

Footnotes to Table:
A=Adjusted to reflect rescissions and supplementals in P.L. 103-211.
B= Includes rescisions and supplementals enacted in FY1997 omnibus appropriations law (P.L. 104-208)
C= Includes funds in P.L. 105-18

KEY OF ASSUMPTIONS (applies only to FY2001 budget request and projections columns):

For nondefense R&D:
"*=Source: estimates of R&D in the forthcoming AAAS *Report XXV: Research and Development FY2001*.
1=Based on specific outyear projections for account in Public Budget Database, assuming R&D as percent of account remains constant at the proposed FY2001 ratio.
1*=See above. R&D accounts for over 90 percent of spending in this account.
2=Not specifically mentioned in outyear projections; assumes freeze at FY2001 requested level.
3=R&D accounts for 100 percent of spending in this account; specific outyear projection for this account in the Public Budget Database.
4=Based on detailed NASA projections in NASA budget justification.
5=Based on projections for the two accounts containing most of Education's R&D."
6=includes spending from trust funds.
For defense R&D:"Data from *Budget of the United States Government for Fiscal Year 2001*, Public Budget Database table "Budget Authority and offsetting receipts, 1976-2005" and Analytical Perspectives Table 25. Percentage changes in right column adjusted for inflation according to GDP deflators."

"*=Source: estimates of R&D in forthcoming AAAS *Report XXV: Research and Development FY2001*.
1 = Based on outyear projections for RDT&E, which accounts for 98 percent of total DOD R&D.
2 =Based on specific outyear projections for account in DOE budget justification, assuming R&D as percent of account remains constant at the FY2001 ratio.
3 = Not specifically mentioned in outyear projections; assumes freeze at FY2000 level.
4 = Based on account-level projections for RAT&E, courtesy of DOD."

Key to Budget Functions: 150 International Affairs; 270 Energy; 350 Agriculture 400 Transportation; 550 Health; 250 General Science, Space, and Technology — Note: Some NASA work reported as 250, includes non-R&D activities; 300 Natural Resources and Environment; 370 Commerce and Housing Credit; 500 Education, Training, Employment, and Social Services; 550 Health.

Table 2. Historical Data on Federal R&D, FY1976-2001

(Budget authority in billions of CONSTANT FY2000 dollars)

Based on AAAS Table, "Historical Table 2. Total R&D by Agency, FY 1976-2001 DEC. '00, Revised." Source: AAAS at [http://www.aaas.org/spp/dspp/rd/guihist.htm].

Fiscal Year	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
DoD	25.51	26.98	26.29	26.46	26.36	29.78	33.47	36.37	41.37	45.87	49.04	50.69	50.42	49.12	46.45	44.01	43.68	43.80	39.14	38.16	37.89	38.78	38.63	39.47	39.28	41.02
NASA	8.94	8.92	8.89	9.31	9.86	9.47	7.37	4.20	4.43	5.11	5.22	5.91	6.20	7.54	8.72	9.61	9.88	9.94	10.37	10.21	9.99	9.74	10.03	9.86	9.78	10.10
DOE	7.78	9.76	11.12	11.11	10.85	10.56	8.69	7.94	8.35	8.58	7.76	7.40	7.76	7.96	8.57	8.68	9.40	8.39	7.46	6.92	6.64	6.47	6.53	7.07	7.12	7.84
NIH*	5.74	5.84	6.25	6.58	6.48	6.12	5.93	6.23	6.85	7.55	7.58	8.74	9.15	9.61	9.94	10.62	11.13	11.15	11.54	11.62	12.10	12.72	13.48	15.22	17.10	19.21
NSF	1.69	1.70	1.74	1.71	1.72	1.64	1.56	1.63	1.85	2.03	1.96	2.08	2.10	2.24	2.12	2.24	2.28	2.27	2.47	2.59	2.53	2.53	2.57	2.71	2.86	3.18
Agri. Dept.	1.31	1.28	1.39	1.46	1.34	1.40	1.33	1.36	1.45	1.44	1.34	1.49	1.48	1.45	1.50	1.64	1.76	1.65	1.69	1.61	1.57	1.62	1.61	1.67	1.76	1.92
DOI	.82	.77	.79	.84	.77	.71	.62	.59	.54	.56	.54	.56	.56	.61	.65	.73	.74	.73	.78	.72	.61	.62	.55	.51	.57	.59
DOT	.82	.78	.82	.72	.75	.69	.50	.57	.72	.63	.53	.42	.42	.42	.43	.49	.72	.70	.71	.72	.64	.64	.61	.62	.61	.69
EPA	.69	.69	.83	.78	.64	.64	.46	.36	.37	.44	.45	.47	.49	.51	.52	.54	.57	.56	.65	.59	.51	.62	.66	.68	.65	.67
DOC	.59	.59	.62	.68	.67	.59	.49	.49	.54	.56	.55	.57	.54	.54	.56	.64	.67	.89	1.13	1.21	1.02	1.00	1.12	1.10	1.07	1.09
Other *	1.99	2.09	2.36	2.53	2.69	2.41	1.77	1.77	1.67	1.44	1.54	1.71	1.66	1.85	2.03	2.11	2.35	2.13	2.41	2.24	1.90	2.25	2.31	2.47	2.53	2.81
Total R&D	55.89	59.41	61.12	62.18	62.13	64.03	62.19	61.53	68.14	74.22	76.53	80.05	80.71	81.84	81.50	81.32	83.17	82.23	78.34	76.58	75.41	76.99	78.08	81.37	83.33	89.11
R&D Defense	28.04	29.33	29.18	29.20	29.01	32.63	36.76	39.41	45.17	49.80	52.75	54.37	54.18	52.94	50.26	47.76	47.67	47.48	42.21	40.84	40.73	41.70	41.71	42.72	42.58	44.65
R&D Non-defense	27.85	30.07	31.93	32.98	33.12	31.39	25.43	22.12	22.97	24.42	23.79	25.68	26.53	28.91	31.24	33.56	35.50	34.75	36.13	35.74	34.67	35.29	36.37	38.65	40.75	44.46
Basic^	6.26	6.79	8.76	9.17	9.61	8.76	8.73	9.59	10.46	11.18	11.44	12.30	12.57	13.52	13.83	14.68	14.96	15.16	15.09	14.87	15.29	15.58	15.96	17.69	18.97	20.79

Note: The data in this table may differ from data in Table 1 due to rounding off.
Based on data in: AAAS Reports I through XXV, based on OMB and agency R&D budget data. Includes conduct of R&D and R&D facilities. Figures in **bold** represent peak funding levels in constant-dollar terms. Constant dollar conversions based on OMB's GDP deflators from the FY 2001 budget.
* Between FY 1991 and 1992, R&D from ADAMHA (HHS) transferred to NIH. ADAMHA R&D included in NIH totals for all years.
** - Latest estimate for FY 2000.
*** - AAAS estimates of R&D in final FY 2001 appropriations bills.
^ - Basic Research Source: AAAS -December 19, 2000 - Revised