Observations on the President's FY 2002 Federal Science and Technology Budget

OVERVIEW

Allocating Funds for Science and Technology

Allocating Federal Funds for Science and Technology (1995) recommended the Executive Office of the President and Congress develop a more coherent budget process for determining the federal investment in programs that create new knowledge and technologies—the federal science and technology (FS&T) budget. As an outcome of this process, the report recommended the President should present annually a comprehensive FS&T budget that both addresses national priorities and fosters a world-class science and technology enterprise.

Since then, the National Academies have tracked the FS&T budget in a series of annual reports. The Academies have examined FS&T as federal R&D spending, as estimated by the agencies, that creates new knowledge or technologies. At the same time, the Executive Office of the President has developed through the last four budget cycles another method for tracking the federal investment in key science and technology programs that is independent of R&D estimates provided by agencies. In the Administration's fiscal year 2002 budget, this tabulation was explicitly titled the Federal Science and Technology Budget and it was justified by reference *Allocating Federal Funds* and its call highlighting "more consistently and accurately activities central to the creation of new knowledge and technologies."

In the interest of good science policy and an efficient budget process, the science and engineering community and the Administration would be well served by adopting a single method for tracking the FS&T budget. We endorse the Administration's approach. It focuses on the largest S&T programs. It includes all costs associated with those programs, including staff salaries. It also includes key science and engineering education programs at the National Science Foundation that are not considered R&D but are critical investments in S&T. It is comprised of identifiable line items in the budget, permitting easy tracking through the Congressional appropriations process. This latter feature makes the Administration's method more practical than R&D for those seeking to engage the appropriations process as it unfolds each year.

Federal spending in three key program areas—Advanced Technology (6.3) in the Department of Defense (4.1 billion), Atomic Weapons Defense Activities, Department of Energy ($2.9 billion), and Human Space Flight R&D, NASA ($2.8 billion)—that are included in the National Academies' tabulation of FS&T account for almost all of the $10 billion difference between it and the way the Administration tracks FS&T. Time did not permit us to fully re-examine the extent to which these programs fund the creation of new knowledge and technology. The U.S. Office of Management and Budget should conduct such a review to determine whether some or all of the programs in these areas should be included in future tabulations of FS&T.

The President's FY 2002 FS&T Budget

The President's FY 2002 budget proposal would increase FS&T spending in constant dollars by $950 million, or 1.7 percent, according to the Academies method for tabulating FS&T and by $1,437 billion, or 3.0 percent, under the Administration's method. Either way, however, the FS&T budget decreases substantially from FY 2001 to FY 2002 when the budget for the National Institutes of Health is excluded. With the exception of FS&T at NIH or the Department of Transportation, which is independently supported by the Federal Highway Trust Fund, FS&T spending would be flat or cut at all other major science and technology agencies. To cite one key example, the budget of the National Science Foundation, which increased 11.0 percent in constant dollars from FY 2000 to FY 2001, would decrease 0.8 percent from FY 2001 to FY 2002 under the President's proposal.

The increase of 11.3 percent in the NIH budget contributes significantly toward the national goal of improving the health of the American people. It also contributes substantially toward advancing life sciences research in the United States, particularly biomedical research. Cuts in the FS&T budgets of other agencies are of concern for several reasons. The goal of improving the health of the American people may also be well served by federal investment in areas seemingly unconnected to health. Such investments have led in the past to breakthroughs in medical technology such as magnetic resonance imaging and miniaturization in arthroscopic surgery.

As it deliberates the federal budget and agency appropriations, Congress should bear in mind other national priorities and the FS&T expenditures that may be necessary to support them. National goals and policies in defense or energy, both under review by the Administration since the release of the President's budget proposal, may also be well served by increases in FS&T funding at DOD or in such areas as nuclear energy, now slated for a substantial budget cut, at the Department of Energy. Similarly, the national goal of a world-class science and technology enterprise, one that has provided the underpinning for recent, sustained economic growth, requires adequate FS&T spending across fields of science and engineering, a goal that cannot be accomplished if FS&T spending is increased only one or two agencies. At a minimum, Congress should consider carefully the current and future budgetary requirements for programs that support FS&T at the National Science Foundation that, alone among federal agencies, can provide funding for research across the science and engineering enterprise.

PREFACE

In 1994, the U.S. Senate Appropriations Committee requested the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine issue a report that addressed "the criteria that should be used in judging the appropriate allocation of funds to research and development activities, the appropriate balance among different types of institutions that conduct such research, and the means of assuring continued objectivity in the allocation process."[1] *Allocating Federal Funds for Science and Technology*, the resulting report issued in 1995, recommended the Executive Office of the President and Congressional appropriators develop processes for tracking federal investments in the creation of new knowledge and enabling technologies—what the report referred to as "the federal science and technology (FS&T) budget."

Since that time, the National Academies' Committee on Science Engineering, and Public Policy (COSEPUP) has issued three annual reports providing observations on the Administration's proposed spending on FS&T in fiscal years 1999, 2000, and 2001. These reports have provided the Administration, Congressional appropriators and the science policy community with data on that part of the research and development budget that focuses on science and technology. They did not make recommendations about specific spending levels, but rather identified key aspects of the President's proposed FS&T budget as they affect the health of the nation's research enterprise.

During the same period, the Clinton Administration provided its own crosscuts of proposed science and technology spending in its annual budget submissions. This began with the Research Fund for America focusing on civilian research in the fiscal year 1999 budget proposal. It continued in fiscal years 2000 and 2001 with a modified version of this tabulation entitled the 21st Century Research Fund that included basic and applied research in the Department of Defense.

The President's fiscal year 2002 budget represents an important opportunity for institutionalizing an annual, concerted focus on the nation's plans for investing in science and technology. In its budget proposal, the Bush Administration has continued the practice of including a tabulation of key science and technology programs in its budget proposal, modifying the 21st Century Research Fund further and re-naming it the Federal Science and Technology Budget to bring it explicitly in line with the National Academies' call for an analysis of this critically important component of federal spending. The Administration's Federal Science and Technology budget is comprised of budget elements that fund the "creation of new knowledge and enabling technologies" and are comprised of defined line items in the budget, permitting easy tracking of changes as the budget moves through Congress.

This report endorses the Administration's approach to examining the federal science and technology budget and accepts its definition of the FS&T budget as an appropriate baseline for further analysis and possible refinement. In this spirit, the report suggests several key federal

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[1] Press report, p. v.

programs that could be candidates for inclusion in a tabulation of the federal government's science and technology spending. The report also raises critical questions about the administration's proposed allocation of funds within the federal government's portfolio of science and technology programs which could lead to a serious imbalance in federal funding across fields of science and engineering.

The report has been reviewed by persons chosen for their diverse perspectives and technical expertise in accordance with procedures approved by the National Research Council's Report Review Committee. The purposes of the independent review are to provide candid and critical comments that will assist the committee in making its report as sound as possible and to ensure that the report meets institutional standards of objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their participation in the review of this report: [LIST REVIEWERS HERE]

The production of this report was the result of the hard work of the project committee chaired by James Duderstadt and consisting of Lewis Branscomb, Mildred Dresselhaus, Jack Halpern, Ruby P. Hearn, and Anita Jones. The project was supported by Peter Henderson, study director, and Evelyn Simeon, Administrative Associate, in the NRC's Division of Policy and Global Affairs.

James Duderstadt, Chair
Observations on the President's
FY 2002 Federal Science and Technology Budget

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Observations on the President's FY 2002 Federal Science and Technology Budget

ALLOCATING FUNDS FOR SCIENCE AND TECHNOLOGY

The Federal Science and Technology Budget

Since World War II, the science and engineering enterprise in the United States has produced enormous benefits for the nation's economy, defense, health, and social well being. Numerous reports over the past decade have documented this key role for science and engineering and have argued persuasively that advancing science and technology in the future is key to sustaining our nation's future health, security, and prosperity.[2]

In *Allocating Federal Funds for Science and Technology* and subsequent reports, the National Academies have called for the nation to continue to invest in science and technology at a level that allows the United States to achieve preeminence in a select number of fields and to perform at a world-class level in all other fields of science and technology. The federal government has played a critical role in funding the science and engineering enterprise in the United States. Until 1980, the federal government provided more than half of all R&D funding in the United States. Since that time, industry's share of the nation's funding for R&D has grown from one-half to two thirds, though much of that expanded funding focuses on development. The federal government has become an even more critical source of funds for research that creates new knowledge and enabling technologies and provides the underpinning for a growing high-tech economy. In 1999, for example, the federal government provided 50 percent of funding for basic research and 29 percent of funding for applied research in the United States.[3]

Given the continuing role of federal funding in meeting our nation's goals for advancing science and technology, *Allocating Federal Funds* specifically recommended that the President and Congress should ensure that federal spending on science and technology is both sufficient and targeted. The report urges that the Administration and Congress focus in particular on the federal science and technology budget (FS&T), defined as the federal investment leading to the "creation of new knowledge and enabling technologies."[4] The report also urged that the Administration and Congress develop a coherent and comprehensive process for deciding how federal funds are invested in science and technology. Key aspects of such a process follow:

1. At the beginning of the budget cycle, the President, with advice from the Director of OMB and the President's Science advisor, should determine the aggregate level of FS&T funding necessary for meeting agency missions and maintaining the nation's leadership role in science and technology. The aggregate FS&T budget should be loosely translated into

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[2] Cites to be added.

[3] National Science Foundation, *National Patterns of R&D Resources: 2000 Data Update* (NSF 01-309), Arlington: National Science Foundation, 2001.

[4] *Allocating Federal Funds for Science and Technology,* Committee on Criteria for Federal Support of Research and Development, NAP 1995; and the annual *Observations…* reports from COSEPUP in 1998 and 1999.

general investment goals for specific agencies, taking into consideration both agency missions and cross-agency initiatives where appropriate.

2. Departments and agencies should make FS&T allocations congruent with the investment goals developed by the Executive Office of the President. Agency officials should consider (1) investments necessary for meeting the science and technology goals essential for successfully carrying out their missions and (2) additional investments that contribute to meeting national investment targets in specific areas of S&T, including those associated with cross-agency S&T initiatives.

3. The President should present to Congress an annual comprehensive FS&T budget, detailing national priorities, cross-agency initiatives, and areas of increased and reduced emphasis.

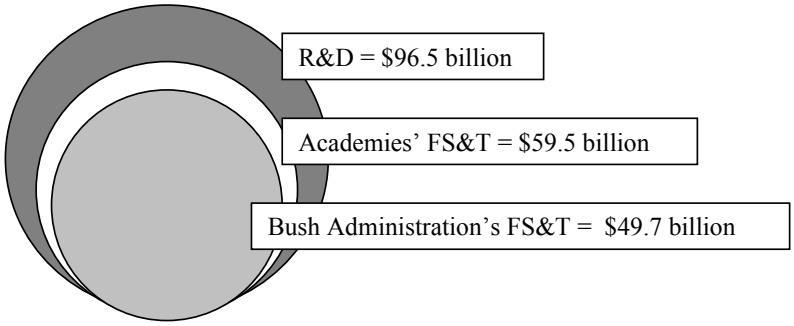
4. Congress should examine and make recommendations on the entire FS&T budget before the federal budget is disaggregated into allocations to appropriations committees and subcommittees.

Tabulating the FS&T Budget

To operationalize the FS&T concept, *Allocating Federal Funds* defined the FS&T budget as federal R&D spending that creates new knowledge and enabling technologies. As a practical matter, FS&T was calculated by taking the R&D budget and excluding from it those programs that clearly involved testing, evaluation, or other activities not primarily devoted to creation of new knowledge or technologies. This method for calculating FS&T excluded Demonstration and Validation (6.4), Engineering and Manufacturing Development (6.5), RDT&E Management Support (6.6), and Operational Systems Development (6.7) in the Department of Defense (DOD) budget, as well as the Naval Reactor Program in the Department of Energy (DOE). *Allocating Federal Funds* also suggested that parts of the Atomic Weapons Defense Program at DOE and the International Space Station at the National Aeronautics and Space Administration (NASA) might also be excluded from an operational definition of FS&T. However, in subsequent reports, the National Academies included the R&D associated with these latter DOE and NASA programs in their FS&T tabulation.

The National Academies' Committee on Science Engineering, and Public Policy (COSEPUP) has issued three annual reports providing observations on the Administration's proposed FS&T spending in fiscal years 1999, 2000, and 2001. These reports have provided the Administration, Congressional appropriators, and the science policy community with data on that part of the research and development budget that focuses on science and technology. During that same period, the Clinton Administration moved toward the FS&T concept by identifying in addition to the R&D budget, the federal investment in an array of major science and technology programs. In its first iteration in fiscal year 1999, this was presented as the Research Fund for America (RRFA), which focused exclusively on civilian research programs. Over the next two budget cycles, this crosscut was renamed the 21st Century Research Fund and expanded to include basic research (6.1) and applied research (6.2) in the Defense budget.

Figure 1. Proposed FY 2002 Federal Spending for R&D and FS&T



The new Administration's fiscal year 2002 budget proposal represents an important opportunity for institutionalizing an annual, concerted focus on the nation's plans for investing in science and technology. In its budget proposal, the Bush Administration has continued the practice of including a science and technology crosscut in its budget proposal, modifying the 21st Century Research Fund further and re-naming it the "Federal Science and Technology Budget." In doing so, moreover, the Bush Administration cited *Allocating Federal Funds* as its justification for highlighting "more consistently and accurately activities central to the creation of new knowledge and technologies" as the justification for including the fund in the budget package.[5]

Figure 1 and Table 1 compare the National Academies' tabulation of the FS&T Budget ($59.5 billion) with both the Administration's method of tabulating FS&T ($49.7 billion) and the traditional R&D spending cross-cut ($96.5 billion) in the President's FY 2002 budget proposal. As the figure and table show, the Administration's FS&T budget tabulation differs from the Academies' FS&T tabulation by about $10 billion. The inclusion in the National Academies' FS&T budget of the advanced technology (6.3) budget in DOD ($4.1 billion), DOE Atomic Weapons Activities ($2.9 billion), and NASA Human Space Flight R&D ($2.8 billion) account for almost all of the numerical difference between the Academies' and Administration's FS&T calculations. In addition, the Academies FS&T budget includes R&D at all federal agencies, while the Administration's FS&T focuses on the twelve largest R&D agencies.

In addition to differences in the programs included in the tabulation, there are other differences in the way the Academies and the Administration approach the budgets of the twelve largest R&D agencies. The Academies have constructed the FS&T budget by including what each of these agencies' estimates as its R&D (excluding DOD 6.4-6.7 and DOE Naval Reactors R&D). The Administration, however, includes the entire line item (not just R&D) for the principal programs that fund research in the bigger agencies. Thus, for example, the Administration includes the entire budget for each of NIH, NSF, the DOE Energy and Science

[5] OMB, *Budget of the U.S. Government*, FY 2002

Programs, the National Institute for Standards and Technology, and the U.S. Geological Survey, not just their R&D components.

For four years, the National Academies and the Administrations of both President Clinton and President Bush have tracked federal spending on science and technology. The philosophical underpinnings and methods of tabulations used by the Academies and the two administrations have converged over time. It is in the interest of both good science policy and an effective budgetary process that the science and engineering community and the Administration adopt one method of tabulating the Federal Science and Technology Budget.

There is considerable merit to the approach to tabulating the federal investment in science and technology developed over the past several years by by the Office of Management and Budget and include in the Bush administrations FY2002 budget request. First, the practice of including the full budget for a program highlights the importance of program management and salary costs that are critical to operating science and technology programs but are not always included in agency estimates of R&D. Incorporating the full budget of an agency such as NSF, means that the full range of its science and mathematics education programs, arguably key investments in science and technology, are included in calculating the federal investment in S&T. Second, the Administration's method of including the full budget for each science and technology program allows each item and the entire FS&T budget to be tracked through the appropriations process, a feature which the R&D budget and the Academies' FS&T budget lack. As a tool for effecting the Congressional appropriations process, therefore, the Administration's approach has considerable advantages.

Given its benefits, we endorse the Administration's approach to tabulating the Federal Science and Technology Budget. The Administration should continue to tabulate this budget in future years and the science and engineering community should focus its observations on this tabulation. The Administration should also consider whether or not it would be appropriate to include the following programs in its annual tabulation:

- Advanced Technology (6.3), Department of Defense ($4.1 billion)
- Atomic Weapons Defense Activities, Department of Energy ($2.9 billion)
- Human Space Flight R&D (International Space Station), National Aeronautics and Space Administration ($2.8 billion)

Time did not permit this committee to fully re-examine the extent to which these federal programs fund the creation of new knowledge or technologies. In each instance, a detailed review may find that all, some, or none of the activities in these programs is science and technology as we have defined it. The U.S. Office of Management and Budget (OMB), in consultation with the National Academies, should carry out such a review. If all or nearly all of the activity in these programs funds the creation of new knowledge or technology, OMB should include them in the Administration's FS&T tabulation. If a non-trivial, but less than overwhelming, part of one of these programs funds the creation of knowledge or technology, then OMB should work with the agency in question to break out the science and technology component of the program into an identifiable budget line item that could be included in FS&T.

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THE PRESIDENT'S FY 2002 FS&T BUDGET

The President's FY 2002 Proposal

Allocating Federal Funds for Science and Technology and subsequent reports have called for the nation to continue to invest in science and technology at a level that allows the United States to achieve preeminence in a select number of fields, perform at a world-class level in all other fields of science and technology, and achieve our national goals. In this regard, previous volumes in this series of annual *Observations* have expressed particular concern over the size of the overall federal investment in S&T and over how differing rates of growth in agency S&T budgets impact both our ability to meet our national goals generally and achieve the goal of advancing science and technology.

As seen in Table 2, the overall size of the FS&T budget decreased annually from FY 1994 to FY 1996, before turning up in FY 1997. The FS&T budget only surpassed its 1994 level in 1999. Increases since then have generated an overall increase of 17.3 percent in constant dollars from 1994 to 2001. The increase in FS&T from FY 2000 to FY 2001, however, comprises more than half of the overall increase in FS&T since 1994.

The President's FY2002 budget returned to a pattern of slower FS&T growth by proposing an increase in FS&T from FY 2001 to FY 2002 substantially smaller than the increase from FY 2000 to FY 2001. As seen in Table 3, the Academies' method of tabulating FS&T shows an increase of $950 million, or 1.7 percent in constant dollars from FY 2001 to FY 2002 compared to an increase of 8.5 percent from FY 2000 to FY 2001.[6] It is also less than the overall increase in discretionary spending requested by the Bush Administration (4.0% in current dollars; 1.9% in constant dollars). If one uses the Administration's tabulation of FS&T, that budget fares slightly better than discretionary spending as a whole, but the proposed increase in FS&T still pales compared to the increase enacted last year. As seen in Table 4, in the Administration's tabulation FS&T increased 9.2 percent in constant dollars from FY 2000 to FY 2001. The Administration's proposal increases FS&T in constant dollars by 3.0 percent.

As also seen in Table 2, increases in FS&T at the NIH account for 54 percent of the overall increase in FS&T from 1994 to 2001. Without the substantial budget increases enjoyed by many science and technology programs FY 2001, the NIH share of the FS&T increase since 1994 would have been still larger.

The President's FY2002 budget proposes also returns to a pattern of substantially differing growth rates for science and technology programs in the federal government. In the Academies FS&T tabulation as seen in Table 3,[7] FS&T in NIH would increase more than $2.2 billion, or 11.3 percent in constant dollars, from FY 2001 to FY 2002. FS&T without NIH would decrease by 3.4 percent from FY 2001 to FY 2002. The only other major Department with a substantial increase would be the Department of Transportation (DOT), whose FS&T budget benefits from a dedicated source of revenue in the Federal Highway Trust Fund and would

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[6] The GDP deflator, which has been about 2.2 percent a year for 1994-2000, 2.0 percent for 2001, and 2.01 percent for FY 2002, is used by both COSEPUP and AAAS in calculating constant-dollar figures.

[7] Trends are essentially the same whether one uses the Academies' or the Administration's FS&T budget.

increase 4.6 percent in constant dollars. FS&T spending in all other departments and agencies with major FS&T programs would be flat or decrease in constant dollars from FY 2001 to FY 2002. FS&T at the National Science Foundation, which increased 9.6 percent from FY 2000 to FY 2001 in constant dollars, would decrease by 3.4 percent from FY 2001 to FY 2002. FS&T at NASA would decrease 1.7 percent; at DOE by 6.8 percent; at Commerce and Agriculture by 9.5 and 9.9 percent respectively.[8]

The FS&T Budget and National Goals

The Administration's FY 2002 Federal Science and Technology Budget proposal must be understood within the Administration's overall budget and policy context. The Administration developed its FY 2002 budget so that it would achieve key national goals articulated in the presidential campaign: enacting a $1.6 trillion tax cut,[9] holding discretionary spending to an overall increase of four percent, and funding Administration initiatives in education, biomedical research, and defense.

The most direct impact on FS&T of focusing the federal budget in this way is the proposal for a large increase in funding for NIH to keep it on, or nearly on, track for doubling its budget by FY 2003. Once this and other Administration's initiatives are funded, however, the constraints imposed on discretionary spending limit FS&T in other agencies to flat budgets at best, and large decreases at worst. The Administration argues that even those FS&T programs whose budgets may be decreased in FY 2002 would still be in relatively good shape financially; many FS&T programs enjoyed unusually large increases in FY 2001, so even agencies with decreases from FY 2001 to FY 2002 would have substantial average annual budgetary increases from FY 2000 to FY 2002. Furthermore, the budgetary reductions for some agencies reflect in part the removal of funding Congress provided in FY 2001 for "research conducted at Congressional direction."

Still, differing growth rates in FS&T investments by agency and field of science and engineering and their impact on our ability to meet national goals are of concern.

The proposed increases for FY 2002 in NIH FS&T budget and the overall effort to double that agency's budget over a five year period from 1998 to 2003 are critical for achieving the important national goal of improving the health of the American people. NIH primarily funds research in the life sciences, which is a key component of the biomedical research that impacts health care delivery. Yet many of the improvements in medical technology seen in the past decades are due to advancement of knowledge that comes from other fields, often from research seemingly unconnected to health and funded by other agencies. Examples would include magnetic resonance imaging, positron emission, and miniaturization in arthroscopic surgery. If trends in federal funding do not restore the historic balance between fields of science and engineering, the continued flow of medical innovation may be threatened.

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[8] As of this writing, the final budget proposal of the Department of Defense has not been released, pending a strategic review of the Department's programs. In the meantime, DOD FS&T is assumed to level funded in constant dollar terms.

[9] Congress has since passed a tax cut of approximately $1.3 trillion over ten years.

The Administration's budget, developed in a time of transition, requires additional adjustments to also bring proposed FS&T spending in line with other critical national goals in such diverse areas as defense, energy, and agriculture. The Administration is currently undertaking a strategic review of the Department of Defense and may provide a new budget proposal for DOD FS&T, as well as for other DOD spending, that brings spending in this area more in line with national goals for defense once the review is completed. The Administration has also reviewed since submitting its budget proposal our national energy goals and policies. Among the Administration's energy proposals, for example, is increased use of nuclear energy to generate electric power. This policy shift suggests that Administration would be well served to review its proposed spending for nuclear energy R&D, currently slated for a large decrease, to determine if this is sufficient for meeting national goals and the Administration's energy program.

Science and technology has enabled much of the innovation that has been the source of our recent, sustained economic growth, as a source of both promising commercial opportunities and scientific and engineering talent, now in critically short supply in industry. The FS&T Budget should support the national goals of advancing science and technology, achieving preeminence in a select number of fields and maintaining world class science and engineering across all fields. An awareness of the need to provide adequate funding to programs that invest in a range of fields led to substantial increases in funding for FS&T across agencies, such as NSF, in FY 2001, yet the NSF and other agencies are facing substantial decreases in FY 2002.

While agency budgets can be increased or decreased from year to year, abrupt changes in federal funding can raise difficult problem's for the nation's science and engineering enterprise. For example, DOD has been and remains a major sponsor of academic research in the physical sciences and engineering. As international threats have diminished, outlays for defense programs have fallen. These reductions can be reversed if threats intensify, but the research capacity that has brought the U.S. dominance in military technology cannot be recreated so readily.

Much greater attention needs to be given to the impact of such reductions on both research and human resources in those fields. While there are many indicators of productivity, it is worth noting as one example that while federal funding for physics research at our nation's universities decreased by more than one-fifth from 1993 to 1997, the number of article submissions by U.S. researchers to *Physical Review* and *Physical Review Letters* peaked in 1993 and declined each year from 1993 to 1997 before leveling off.[10] Federal research funding also supports the training of the next generation of scientists and engineers and cuts in such funding send a strong signal to current and prospective graduate students. In fields with decreased federal support for university research between 1993 and 1997, there was also decreasing graduate enrollment from 1993 to 1999. For example, federal funding for university research in physics decreased 20.9 percent in constant dollars from 1993 to 1997 and graduate students with federally-funded research assistantships in that field decreased 20.8 percent from 1993 to 1999 (graduate enrollment in physics decreased 22.1 percent during that period). There were similar trends for such fields as mathematics, chemistry, chemical engineering, and astronautical engineering.[11]

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research funding (1993-1997) and graduate enrollment (1993-1999) to account for the time lag in the effect of research funding changes on the hiring of graduate research assistants.

CONCLUSION

In the interest of good science policy and an efficient budget process for science and technology, it is time for the science and engineering community and the Administration to adopt one method for tabulating the Federal Science and Technology Budget. The Administration's approach has several merits: it focuses on the largest science and technology programs, including all costs associated with them; it also includes key science and engineering education programs at the National Science Foundation that are not considered R&D but are critical investments in science and technology; it is comprised of identifiable line items in the budget, permitting easy tracking through the Congressional appropriations process. Because of this, the Administration's approach is preferred and OMB should continue track the FS&T budget in this manner in future budget cycles, using its current definition as the baseline subject to occasional refinements in the definition of the FS&T categories as warranted by further analysis.

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The President's FY 2002 FS&T budget proposal presents a strong NIH budget that moves the nation toward achieving the goal of improved health for the American people. Proposed budgetary decreases in FS&T at other federal agencies are of concern for several reasons: breakthroughs in medical technology, which also improve the health of the American people, have often been the result of investments in areas seemingly unconnected to health; national goals in defense, energy, other areas may be well served by increases, rather than flat funding or decreases, for FS&T in other Federal agencies; the national goal of advancing science and technology, which continues to provide the underpinning for sustained economic growth, must be met through funding that ensures a world-class science and engineering enterprise across all fields.

TABLE 1 Alternative Perspectives on the President's FY .2002 Science and Technology Budget (millions of current dollars)

Agency	Bush Admin. FS&T	Academies' FS&T	R&D
Dept. of Defense*	**5,086**	**9,589**	**45,855**
Basic research (6.1)	1,345	1,345	1,345
Applied research (6.2)	3,741	3,741	3,741
Advanced technology development (6.3)	--	4,082	4,082
Medical Research (not included in 6.1-6.3)	--	421	421
Test and evaluation (6.4-6.7)	--	--	36,266
National Aeronautics and Space Administration	**7,038**	**9,966**	**9,966**
Space, Aeronautics, and Technology	7,038	7,141	7,141
Human Space Flight	--	2,825	2,825
Dept. of Energy	**4,682**	**6,733**	**7,399**
Science Programs	3,160	2,930	2,930
Energy Supply	494	284	284
Energy Conservation	484	316	316
Fossil Energy R&D	544	296	296
Radioactive Waste Management	--	31	31
Atomic Defense Programs (excl. Naval Reactors)	--	2,876	2,876
Naval Reactors	--	--	666
Dept. of Health & Human Services	**23,112**	**23,496**	**23,496**
National Institutes of Health (R&D)	22,395	22,395	22,395
National Institutes of Health (Non-R&D)	717	--	--
Other HHS R&D	--	1,101	1,101
National Science Foundation	**4,472**	**3,226**	**3,226**
Research and Related Activities	3,327	2,991	2,991
Major Research Equipment	96	96	96
Education and Human Resources	872	139	139
Salaries, Expenses, and Inspector General	177	--	--
Dept. of Agriculture	**1,759**	**1,803**	**1,803**
Dept. of the Interior	**814**	**593**	**593**
Dept. of Transportation	**631**	**798**	**798**
Environmental Protection Agency	**679**	**569**	**569**
Dept. of Commerce	**671**	**1,110**	**1,110**
Dept. of Veterans' Affairs	**361**	**722**	**722**
Dept. of Education	**368**	**259**	**259**
Other Agencies	**--**	**663**	**663**
TOTAL	**49,673**	**59,527**	**96,459**

*The final Department of Defense budget has not yet been released, pending completion of a departmental strategic review. In the meantime, OMB has assumed increases in DOD science and technology (6.1-6.3) equal to inflation; the DOD R&D initiative would largely fall into the 6.4-6.7 categories.

Source: OMB, *Budget of the U.S. Government FY 2002*, Departmental Budget Documents, and AAAS, Preliminary Tables.

Table 2 NIH FS&T, National Academies' FS&T Budget and Research and Development Budget, FY1994-FY2002 (in current dollars and in constant FY 2001 dollars)

	NIH	NIH	FS&T	FS&T	R&D	R&D
Fiscal year	Current	Constant	Current	Constant	Current	Constant
1994	10,474	11,913	43,002	48,910	71,074	80,839
1995	10,762	11,980	42,688	47,521	70,948	78,980
1996	11,425	12,468	42,162	46,013	71,206	77,710
1997	12,217	13,079	43,340	46,398	73,934	79,150
1998	13,110	13,837	45,191	47,700	75,942	80,159
1999	14,995	15,609	48,151	50,116	80,171	83,451
2000	17,243	17,600	51,757	52,846	83,769	85,548
2001	19,710	19,710	57,353	57,353	90,887	90,887
2002	22,395	21,934	59,527	58,303	96,459	94,475
Chg, FY1994-FY2001	88.2%	65.4%	33.4%	17.3%	27.9%	12.4%
Chg, FY2000-FY2001	14.3%	12.0%	10.8%	8.5%	8.5%	6.2%
Chg, FY2001-FY2002	13.6%	11.3%	3.8%	1.7%	6.1%	3.9%

Source: AAAS, Table I-16; U.S. O.M.B, Budget of the U.S. Government; FS&T figures for 1994-1999 carried forward from *Observations on the President's FY 2001 Federal Science and Technology Budget.*

TABLE 3 The National Academies' Federal Science and Technology (FS&T) Budget, by Agency, FY 1999-FY2002 (millions of constant FY 2001 dollars)

					Percent Change	
	1999 Actual	2000 Actual	2001 Est.	2002 Budget	FY 2000-FY 2001	FY 2001-FY 2002
Dept. of Defense*	7,923	8,784	9,392	9,392	6.9%	0.0%
Basic Research (6.1)*	1,107	1,160	1,317	1,317	13.5%	0.0%
Applied Research (6.2)*	3,182	3,477	3,664	3,664	5.4%	0.0%
Advanced Technology Dev. (6.3)*	3,594	3,846	3,999	3,999	4.0%	0.0%
Medical Research (not in 6.1-6.3)*	40	301	412	412	36.8%	0.0%
NASA	10,113	9,694	9,925	9,761	2.4%	-1.7%
Science, Aeronautics, and Technology	7,697	6,616	7,024	6,994	6.2%	-0.4%
Human Space Flight	2,417	3,077	2,901	2,767	-5.7%	-4.6%
Dept. of Energy	6,476	6,434	7,076	6,595	10.0%	-6.8%
Science Programs	2,781	2,718	2,955	2,870	8.7%	-2.9%
Energy Supply	374	340	409	278	20.3%	-32.0%
Energy Conservation	397	419	441	310	5.3%	-29.8%
Fossil Energy R&D	307	296	396	290	33.7%	-26.8%
Radioactive Waste Management	65	61	45	30	-26.5%	-32.5%
Atomic Defense (excl. Naval Reactors)	2,553	2,600	2,830	2,817	8.9%	-0.5%
Dept. of Health & Human Services	16,471	18,564	20,859	23,013	12.4%	10.3%
National Institutes of Health	15,607	17,596	19,710	21,934	12.0%	11.3%
Other	864	968	1,149	1,078	18.7%	-6.1%
National Science Foundation	2,779	2,993	3,280	3,160	9.6%	-3.7%
Research and Related Activities R&D	2,591	2,764	3,018	2,929	9.2%	-2.9%
Major Research Equipment	94	95	122	94	28.5%	-22.9%
Education and Human Resources R&D	95	134	140	136	4.7%	-2.8%
Dept. of Agriculture	1,712	1,813	1,961	1,766	8.1%	-9.9%
Dept. of Commerce	1,128	1,199	1,201	1,087	0.2%	-9.5%
Dept. of Transportation	632	620	747	782	20.5%	4.6%
Dept. of Veterans Affairs	670	659	703	707	6.7%	0.6%
Dept. of the Interior	519	631	631	581	0.0%	-8.0%
Environmental Protection Agency	696	570	609	557	6.9%	-8.5%
Dept. of Education	213	243	265	254	9.1%	-4.3%
Other Agencies	783	643	704	649	9.4%	-7.8%
FS&T Total	50,116	52,846	57,353	58,303	8.5%	1.7%
National Institutes of Health	15,607	17,596	19,710	21,934	12.0%	11.3%
FS&T Total minus NIH	34,509	35,249	37,643	36,368	6.8%	-3.4%
NIH as % of FS&T	31%	33%	34%	38%	--	--

*The final Department of Defense budget has not yet been released, pending completion of a departmental strategic review. In the meantime, OMB has assumed increases in DOD science and technology (6.1-6.3) equal to inflation; the DOD R&D initiative would largely fall into the 6.4-6.7 categories.

Source: OMB, *Budget of the U.S. Government*, FY 2002; AAAS, Preliminary Tables.

TABLE 4 The Administration's Federal Science and Technology (FS&T) Budget, by Agency, FY 2000-FY2002 (millions of constant FY 2001 dollars)

				Percent Change	
	2000 Actual	2001 Est.	2002 Budget	FY 2000-FY 2001	FY 2001-FY 2002
Dept.of Defense	4,637	4,981	4,981	7.4%	0.0%
Basic Research (6.1)	1,160	1,317	1,317	13.5%	0.0%
Applied Research (6.2)	3,477	3,664	3,664	5.4%	0.0%
NASA	6,523	6,957	6,893	6.6%	-0.9%
Science, Aeronautics, and Technology	6,523	6,957	6,893	6.6%	-0.9%
Dept. of Energy	4,445	4,910	4,586	10.5%	-6.6%
Science Programs	2,847	3,179	3,095	11.7%	-2.6%
Energy Supply	596	661	484	10.9%	-26.8%
Energy Conservation	589	625	474	6.1%	-24.2%
Fossil Energy R&D	412	445	533	7.9%	19.7%
Dept. of Health & Human Services	18,202	20,361	22,637	11.9%	11.2%
National Institutes of Health	18,202	20,361	22,637	11.9%	11.2%
National Science Foundation	3,979	4,416	4,380	11.0%	-0.8%
Dept. of Agriculture	1,776	1,831	1,723	3.1%	-5.9%
Dept. of Commerce	836	809	657	-3.3%	-18.8%
Dept. of Transportation	660	621	618	-5.9%	-0.5%
Dept. of Veterans Affairs	328	350	354	6.8%	1.0%
Dept. of the Interior	830	883	797	6.4%	-9.7%
Environmental Protection Agency	697	732	665	5.0%	-9.1%
Dept. of Education	324	363	360	12.2%	-0.7%
FS&T Total	43,236	47,214	48,651	9.2%	3.0%
NIH	18,202	20,361	22,637	11.9%	11.2%
FS&T Total minus NIH	25,034	26,853	26,015	7.3%	-3.1%
NIH as % of FS&T	42%	43%	47%	--	--

Source: OMB, *Budget of the U.S. Government*, FY 2002.