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ABSTRACT

This report provides comments and opinions from National Science Foundation (NSF) officials on proposed agency budget cuts which could affect three NSF Directorates: Science and Engineering; Biological, Behavioral, and Social Sciences; and Scientific, Technological, and International Affairs. Specific topics discussed focus on personnel levels, continuity of on-going research, and program changes. A general description of the Directorate and its programs, tables comparing funding for fiscal years 1980-1982, highlights of budget cut impacts, data on impacts, and NSF staff opinions (including their views on the impact of cuts on the communities and objectives they serve) are provided for each Directorate. Based on first quarter fiscal year 1982 planned expenditure rates, the programs affected most were in the following areas. All science and engineering programs would be eliminated except for graduate fellowships (Science and Engineering). Substantial cutbacks would occur in the social, economic, cognitive, and anthropological sciences (Biological, Behavioral, and Social Sciences). Reductions would take place in almost all programs of the Scientific, Technological, and International Affairs Directorate. Support to state and local governments would be sharply curtailed, and some programs such as the Appropriate Technology, University Based Innovation Centers, and State Science and Engineering Technologies program would be totally eliminated. (Author/JN)

REPORT BY THE U.S.

General Accounting Office

The Impact Of Budget Cuts On Three Directorates Of The National Science Foundation

This report provides comments and opinions from NSF officials on proposed agency budget cuts which could affect three directorates of the National Science Foundation. Specific topics discussed on these proposed cuts pertain to personnel levels, the continuity of ongoing research, and program changes.

PAD-82-25
JANUARY 26, 1982

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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

January 26, 1982

PROGRAM ANALYSIS
DIVISION

B-206166

The Honorable Doug Walgren
Chairman, Science, Research
and Technology Subcommittee
Committee on Science and
Technology
House of Representatives

Dear Mr. Chairman:

Subject: Impact of Budget Cuts on Three Directorates of the National Science Foundation (PAD-82-25)

In your letter of November 12, 1981 (see Enclosure I), you requested that the General Accounting Office provide information on the effect of recent cuts in certain areas of the National Science Foundation (NSF) budget. Specifically, you requested information on the impact of the cuts as they apply to three NSF directorates: Science and Engineering Education; Biological, Behavioral, and Social Sciences; and Scientific, Technological, and International Affairs. The short timeframe involved in responding to your request precluded an extensive or indepth analysis leading to judgments as to the extent of effects in areas that cannot be easily quantified.

Our evaluation was conducted at NSF in Washington, D.C. We reviewed various NSF budget documents and records pertaining to planned expenditures for fiscal years 1980, 1981, and 1982. We interviewed 26 NSF officials in the three directorates, the Division of Budget and Program Analysis, and the Office of Government and Public Programs. We converted budget figures to constant fiscal year 1980 dollars using GNP implicit price deflators which were obtained from NSF's Science Resources Studies group. These figures were derived from reports from the U.S. Department of Commerce's Bureau of Economic Analysis.

Enclosure II is a table comparing NSF funding for fiscal years 1980 through 1982 in both current and constant dollars. Fiscal year 1982 data is based on a projection of the budgeted rate of obligation for the first quarter of the fiscal year and is used to show what the impact would be if that rate of obligation were experienced throughout the remainder of the fiscal year. Enclosures III through V provide similar information for each of the three directorates included in your request. In

addition, these enclosures provide data on personnel, continuity of ongoing research, and program changes. The information was provided to us by NSF officials. Because of the short timeframe for completion of our work, we were not able to verify the accuracy of the data. Enclosures III through V also provide information on opinions of NSF staff, including their views on the effect of NSF's funding cuts on the communities and objectives they serve. This information has not been verified and does not necessarily represent an agency position on the subjects addressed. Enclosure III covers the Science and Engineering Education Directorate; Enclosure IV, the Biological, Behavioral, and Social Sciences Directorate; and Enclosure V, the Scientific, Technological, and International Affairs Directorate.

After we completed our work, NSF's appropriation for fiscal year 1982 was passed with the enactment of P.L. 97-101 on December 23, 1981. This Act appropriated a greater amount than the projection of the first quarter obligation rate on which our work is based. We based our work on the projected annual funding level of $909.5 million. The appropriation passed December 23 provides total funding to NSF of $1,035.1 million. NSF officials have informed us that information on the allocation of the appropriation to NSF's directorates and programs will not be available until the President submits his fiscal year 1983 budget in February. Depending on how the appropriation is allocated, the increased funding will modify the planned reductions of personnel, the funds available for grants, and the impact of reductions in the three directorates.

EFFECT OF FUNDING CUTS ON THE THREE DIRECTORATES

Based on first quarter fiscal year 1982 planned expenditure rates, the programs affected the most were in the following areas of the three directorates. In the Science and Engineering Education Directorate, all science and engineering education programs would be eliminated except for graduate fellowships. In the Biological, Behavioral, and Social Sciences Directorate, substantial cutbacks would occur in the social, economic, cognitive, and anthropological sciences. In the Scientific, Technological, and International Affairs Directorate, reductions would take place in almost all the Directorate's programs. Support to State and local governments would be sharply curtailed and some programs such as the Appropriate Technology, University Based Innovation Centers and State Science and Engineering Technologies programs would be totally eliminated.

As of December 31, 1981, no reductions in force have taken place in the three directorates. However, reductions have been achieved through attrition in two directorates. In the Science and Engineering Education Directorate, from September 30, 1981,

to December 31, 1981, 15 positions have been eliminated through attrition--bringing onboard strength to 63. A planned September 30, 1982, level of 10 positions could require a reduction in force of 53 positions. In the Scientific, Technological, and International Affairs Directorate, from March 8, 1981, to December 31, 1981, 13 positions were eliminated through voluntary termination and retirement. In order to reach the planned September 30, 1982, level of 171, six positions would have to be eliminated.

As of January 1, 1982, the budget cuts have affected the grant awards of the three directorates. The Scientific, Technological, and International Affairs Directorate was unable to fund approximately 220 continuing grants and planned commitments totaling about $11 million. Other planned commitments have been scaled back. No continuing awards were terminated in the Biological, Behavioral, and Social Sciences Directorate due to lack of funds. However, continuing awards were reduced by about $1.4 million (19 percent of the total amount approved) by the Division of Social and Economic Science and by about $100,000 (2 percent of the total amount approved) in the behavioral sciences. The Science and Engineering Education Directorate did not have to terminate any ongoing grants or fellowships but it estimates that 2,200 new grants that it would have made will not be awarded through fiscal year 1982 due to lack of funds. These figures were provided to us by NSF officials. Because of the short timeframe for completion of our work, we were not able to verify the accuracy of the data.

In each directorate, we have obtained opinions from NSF staff on possible effects of funding cuts. The possible effects were not prioritized and are based on budget figures, which at an aggregate level are substantially lower than the level that was actually passed. Some or all of these effects will change with the higher level of funding.

We would suggest that the information contained in this report would be used best as a basis for asking further questions and should be viewed in light of the effect of the higher amount which has just been appropriated.

As arranged with your office, we did not obtain agency comments on this information in order to meet your requested timeframe. Unless you publicly announce the contents earlier, no further distribution of this report will be made until 30 days after the report date. At that time, we will make copies available to others upon request.

Sincerely yours,

Morton A. Myers

Morton A. Myers
Director

ENCLOSURE I

ENCLOSURE I

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6371

November 12, 1981

Honorable Charles A. Bowsher
Comptroller General of the
United States
Washington, D. C.

Dear Mr. Bowsher:

The Subcommittee on Science, Research and Technology is concerned with the effect of recent cuts in certain areas of the National Science Foundation budget. Specifically, we need information on the impact of cuts as they apply to three NSF Directorates: Biological, Behavioral, and Social Sciences; Scientific, Technological, and International Affairs; and Science and Engineering Education.

Budget hearings on NSF's fiscal year 1983 budget are scheduled for the first part of February. For this reason, we need your response by mid-January. We recognize that the short time-frame involved will preclude an extensive or indepth analysis leading to judgments as to the extent of effects in areas that cannot be easily quantified. However, information in areas such as personnel changes, continuity of ongoing research, and program changes that can be quantified, and opinion of NSF staff obtained through interviews, would be of assistance to us.

We look forward to your response and thank you for your continued assistance.

Sincerely,

DOUG WALGREN
Chairman
Science, Research and
Technology Subcommittee

DF/Mmr

ENCLOSURE II

Table 1

Comparison of Funding for the National Science Foundation
Fiscal Years 1980, 1981, and 1982 $(Millions)

Directorate	Actual[1] FY1980	Est. Actual FY1981	% Change[2] FY80-FY81	Est.[3] FY1982	% Change[2] FY81-FY82	% Change[2] FY80-FY82
Science and Engineering Education	$ 77.2	$ 70.7	- 8.4	$ 8.7	- 87.7	- 88.7
Biological, Behavioral, and Social Sciences	185.7	184.4	- .7	157.4	- 14.6	- 15.2
Scientific, Technological, and International Affairs	36.6	37.0	+ .8	28.2	- 23.6	- 23.0
Mathematical and Physical Sciences	227.0	256.2	+ 12.9	249.4	- 2.7	+ 9.9
Engineering	76.6	85.4	+ 11.5	88.2	+ 3.3	+ 15.1
Astronomical, Atmospheric, Earth, and Ocean Sciences[4]	293.4	325.3	+ 11.0	307.3	- 5.5	+ 4.8
Cross Directorate Programs	15.6	16.1	+ 3.3	5.0	- 68.9	- 67.9
Program Development and Management	58.2	59.7	+ 2.5	62.2	+ 4.2	+ 6.8
Special Foreign Currency	4.8	5.6	+ 15.2	3.1	- 44.6	- 36.2
Total-NSF (Planned)	$975.1	$1040.4	+ 6.7	$909.5	- 12.6	- 6.7

Comparison in Constant FY1980 $(Millions)[5]

Science and Engineering Education	$ 77.2	$ 64.6	- 16.4	$ 7.3	- 89.7	- 90.6
Biological, Behavioral, and Social Sciences	185.7	168.5	- 9.3	131.6	- 21.9	- 29.1
Scientific, Technological, and International Affairs	36.6	33.7	- 7.9	23.6	- 30.0	- 35.6
Mathematical and Physical Sciences	227.0	234.1	+ 3.1	208.6	- 10.9	- 8.1
Engineering	76.6	78.0	+ 1.8	73.8	- 5.4	- 3.7
Astronomical, Atmospheric, Earth, and Ocean Sciences[4]	293.4	297.2	+ 1.3	257.0	- 13.5	- 12.4
Cross Directorate Programs	15.6	14.7	- 5.6	4.2	- 71.6	- 73.2
Program Development and Management	58.2	54.5	- 6.3	52.0	- 4.6	- 10.7
Special Foreign Currency	4.8	5.1	+ 5.3	2.6	- 49.3	- 46.6
Total-NSF (Planned)	$975.1	$960.4	- 2.5	$760.7	- 20.0	- 22.0

1/The FY1980 amounts have been amended to reflect program changes that occurred during FY1981.
2/The percentage change was computed using dollar amounts before rounding.
3/The budget figures shown for FY1982 are based on a projection of the budgeted rate of obligation for the first quarter of FY1982. They are used to show what the impact would be if that rate of obligation were experienced throughout the remainder of the fiscal year.
4/The Astronomical, Atmospheric, Earth, and Ocean Sciences Directorate includes funding for Ocean Drilling and the Antarctic program.
5/The GNP implicit price deflator for FY1980 is 176.72, for FY1981, 193.44, and for FY1982, 211.3.

ENCLOSURE II

ENCLOSURE III

SCIENCE AND ENGINEERING EDUCATION DIRECTORATE

The Science and Engineering Education Directorate (SEE) has had broad responsibility for initiating and supporting programs to strengthen science and engineering education. One of its responsibilities has been to help all citizens increase their basic understanding of science and its contributions to the quality of life. Another responsibility has been to assure a stable flow of the most talented students into careers in science and engineering, with particular reference to increasing the participation of minorities and women. Special emphasis has been placed on four areas which include early adolescence, groups underrepresented in science (women, minorities, and the physically handicapped), out-of-classroom learning, and undergraduate faculty development. The Directorate has been divided into four operating units: Scientific Personnel Improvement, Science Education Resources Improvement, Science Education Development and Research, and Science Education Communication.

Impact Highlights

The Directorate has been almost eliminated for fiscal year 1982 (see table 2). During fiscal years 1980 and 1981, the Directorate had been funded at levels of $77.2 and $70.7 million respectively. The only program element remaining in fiscal year 1982 is the graduate fellowship program which is designed to assure that talented graduate students in the sciences obtain the education necessary to become top quality scientific researchers. Unless fiscal year 1982 funding is increased from $8.7 million, NSF will be unable to renew some ongoing fellowships, and will have to forego awarding new grants during fiscal year 1982.

Data on Impact

The following information was provided to us by NSF officials. Because of the short timeframe for completion of our work, we were not able to verify the accuracy of the data.

--The projected end-of-year onboard strength for the Directorate for September 30, 1982, is 10 full-time permanent positions. On September 30, 1981, the staff level was 78 positions. As of December 31, 1981, the staff level had been reduced to 63 positions through the attrition of 15 positions. NSF officials informed us that the Directorate is overstaffed and they may have to RIF as many as 53 positions within the next few months.

--Overall attrition for the Directorate since March 1981 has been 43 full time permanent positions from an end-of-year onboard strength of 106 positions as of September 30, 1980.

Table 2

Comparison of Funding for the Science and Engineering Education Directorate
Fiscal Years 1980, 1981, and 1982 $(Millions)

Program Description	Actual[1] FY1980	Est. Actual FY1981	% Change[2] FY80-FY81	Est.[3] FY1982	% Change[2] FY81-FY82	% Change[2] FY80-FY82
Faculty Improvement	$ 11.8	$ 10.2	- 13.7	0.0	-100.0	-100.0
Fellowships and Traineeships	14.0	14.0	+ 0.5	8.7	- 38.0	- 37.7
Student Oriented Programs	5.1	5.7	+ 11.1	0.0	-100.0	-100.0
Minorities, Women, and Handicapped	2.2	3.5	+ 56.2	0.0	-100.0	-100.0
Total-Scientific Personnel Improvement	33.1	33.4	+ 0.8	8.7	- 73.9	- 73.7
Comprehensive Assistance to Undergraduate Sci. Ed.	13.3	8.9	- 33.0	0.0	-100.0	-100.0
Undergraduate Instructional Improvement	5.7	6.1	+ 8.2	0.0	-100.0	-100.0
Resource Centers for Science and Engineering	2.7	2.8	+ 1.0	0.0	-100.0	-100.0
Minority Institution Science Improvement	0.1	0.0	-100.0	0.0	-100.0	-100.0
Total-Science Education Resources Improvement	21.8	17.8	- 18.3	0.0	-100.0	-100.0
Development in Science Education	8.1	6.2	- 24.0	0.0	-100.0	-100.0
Research in Science Education	5.7	4.7	- 16.8	0.0	-100.0	-100.0
Total-Science Education Development and Research	13.8	10.9	- 21.1	0.0	-100.0	-100.0
Public Understanding of Science	3.9	4.3	+ 9.9	0.0	-100.0	-100.0
Information Dissemination for Science Education	1.3	1.2	- 3.7	0.0	-100.0	-100.0
Ethics and Values in Science and Technology 4/	1.3	2.0	+ 55.2	0.0	-100.0	-100.0
Science for Citizens 4/	2.0	1.1	- 46.3	0.0	-100.0	-100.0
Total-Science Education Communication	8.5	8.6	+ 1.2	0.0	-100.0	-100.0
Total-Science and Engineering Education	$ 77.2	$ 70.7	- 8.4	$ 8.7	- 87.7	- 88.7
Comparison in Constant FY1980 $(Millions)[5]						
Fellowships and Traineeships	$ 14.0	$ 12.8	- 8.2	$ 7.3	- 43.2	- 47.9
All Other Programs	63.2	51.8	- 18.1	0.0	-100.0	-100.0
Total-Science and Engineering Education	$ 77.2	$ 64.6	- 16.4	$ 7.3	- 89.7	- 90.6

1/The FY1980 amounts have been amended to reflect program changes that occurred during FY1981.
2/The percentage change was computed using dollar amounts before rounding.
3/The budget figures shown for FY1982 are based on a projection of the budgeted rate of obligation for the first quarter of FY1982. They are used to show what the impact would be if that rate of obligation were experienced throughout the remainder of the fiscal year.
4/The Ethics and Values in Science and Technology and Science for Citizens programs are included here for comparative purposes. During 1981, these programs were transferred to the Scientific, Technological, and International Affairs Directorate and subsequently scheduled for elimination. However, they were funded by the Science and Engineering Education appropriation.
5/The GNP implicit price deflator for FY1980 is 176.72, for FY1981, 193.44, and for FY1982, 211.3.

ENCLOSURE III

--Ordinarily, the Science and Engineering Education Directorate would award about 450 new fellowships each year and provide support for another 950 continuing fellows. In addition the Directorate would award about 1,600 grants, making the total number of awards each year approximately 3,000. At the $8.7 million level, no grants could be awarded and only about 800 fellowships could be supported in fiscal year 1982. Thus there would be a total of about 1,600 grants and 600 fellowships that would not be funded during the fiscal year.

--If the $22 million reported out of conference were appropriated for fiscal year 1982, it would allow the graduate fellowships program to continue uninterrupted. NSF officials informed us that it would also permit them to meet most of $5.1 million in prior year commitments involving 60 ongoing projects in areas such as Undergraduate Engineering Education Development Programs and Basic Research Grants in Science and Engineering Education. The remaining 1540 grants would still not be funded during the fiscal year.

--NSF had planned to increase the education allowance for fellowships from $3,400 per year to $4,000 per year. They also had planned to increase the stipend for fellowships from $4,800 to $6,900 for fiscal year 1982. However, because of the current level of budget authority, the education allowance will be limited to $3,400 and the stipend increased to $6,400.

NSF Staff Opinions

This information represents opinions of NSF staff including their views on the impact of NSF's funding cuts on the communities and objectives they serve. The information has not been verified and does not necessarily represent an agency position on the subjects addressed.

--NSF officials believe that the total elimination of science and engineering education programs will harm the future ability of educators to provide students at all levels with the advanced knowledge and training they will need in order to function fully as members of a rapidly advancing technological society.

--NSF has not been providing sustaining support for the ongoing operations of educational institutions. NSF's role has been one of providing grants which have served as vehicles for changes and improvements in science and engineering education. This "seed" money operates as a catalyst that attracts additional funding from both private and other public sources which prefer to contribute to NSF sponsored activities because of their

guaranteed quality. Some examples are the PBS television series such as "NOVA" and the "3-2-1 Contact" programs for children.

--NSF's proportion of total national expenditures for science and engineering education has been very small, but as a proportion of expenditures for changing and improving education, its impact has been significant. For example, the "BASIC" computer language which provides many students with their first exposure to computer science was developed under an NSF science education grant.

--One of the benefits associated with NSF's mode of support of science and engineering education that has been expressed by educators has been the quality control provided by NSF's peer review system. This system is rigorous and assures that only the most meritorious proposals are funded.

--Another spin-off from the high quality of NSF-sponsored projects is the translation of materials and programs into other languages for use by other countries. For example, the "3-2-1 Contact" program has been translated into Spanish. The Japanese are making widespread use of instructional material in their math and science curricula which were developed under NSF-sponsored educational research and development grants.

--The impact of eliminating the NSF science and engineering education programs is to effectively remove NSF from its role as the national focal point for science and engineering education issues and information of national interest. This will shift the emphasis of the Directorate from a multi-level program to that of a program limited to graduate fellowships.

--The greatest negative impact will be on small 2- and 4-year institutions with women's and minority institutions being hit particularly hard.

--The other major national organization similar to NSF is the National Institute for Education (NIE). However, NIE is locked into its own ongoing commitments and the prospects are practically nonexistent that it can take up the slack resulting from NSF's loss of support for education. The most significant national issue NIE is working on today is the school financing problem associated with declining enrollments and the overstock of school facilities. NIE is also heavily involved with the Education Resources Information Centers and the regional education laboratories and centers.

ENCLOSURE III

--Mission-oriented Federal agencies, for the most part, have their own budget reductions to contend with and cannot nor would they be predisposed to assume a comprehensive national role in science and engineering education. Only in those instances where other agencies--the Department of Defense (DOD), for example--or certain industries have a particular stake in assuring an adequate supply of skilled employees, would there be a response to education needs. DOD, through a program initiated by the Defense Communication Agency, has recently implemented a pilot program in the Los Angeles school system where ROTC students are encouraged to pursue engineering studies. DOD and industry have also sponsored fellowships as a means of supporting science and engineering education. DOD (Navy, Army, and Air Force) has plans for fellowships in selected areas for fiscal year 1983.

--Other sources of support for science and engineering education are not likely, because for most organizations (both public and private), science and engineering education are considered to be on the fringe of their primary missions. Education is, by its very nature, a long term investment in people. The benefits associated with any improvements in curriculum or materials and breakthroughs in the state-of-the-art usually are not realized for several years. Similarly, terminating NSF education programs will have the most impact in future years, perhaps 5 to 10 years hence.

--Some training for graduate students will continue to be available through NSF's traditional research grants but the science and engineering education programs targeted for women and minorities will be eliminated.

--NSF will no longer be able to facilitate an interface between science organizations or industry and the science and engineering education teachers and educators.

--Another area in which NSF could provide much needed assistance to the Nation's education needs is in emerging opportunities created by the advance of knowledge and technology. For example, the new biology (or biotechnology) is creating whole new fields and perhaps even whole new industries. Similarly, the development of low-cost information technology, especially the computer, calls for major shifts in the Nation's approach to science and engineering education. Because of the elimination of NSF's Science and Engineering Education programs, NSF can no longer provide opportunities for researchers and industry to transfer their knowledge and technology to the classroom where tomorrow's scientists and engineers are being trained.

ENCLOSURE III

--Our civilization is technologically oriented, so the science and engineering education program at NSF has on the Nation's competitiveness in the international market place.

--The United States is facing future economic problems and these will only increase if we do not increase our productivity. The demand for qualified workers who can cope with increasingly complex technology will continue to grow; given adequate funding, NSF can make a significant contribution to resolving that need.

--The dissolution of the Science and Engineering Education staff would be particularly detrimental because of the loss of talent which had taken NSF several years to accumulate. Once these people are gone it would be very difficult to form another group that had accumulated an equivalent level of expertise and experience. NSF should continue to act as a catalyst to link the high schools and colleges with researchers and engineers in the field.

ENCLOSURE IV

BIOLOGICAL, BEHAVIORAL, AND SOCIAL SCIENCES DIRECTORATE

The Biological, Behavioral, and Social Sciences Directorate (BBS) directs its activities to expanding knowledge of life and its processes through an understanding of biological and social phenomena. Research supported by the Directorate ranges from the study of the fundamental molecules of living organisms to studies of the complex interactions of people and societal organizations. The Directorate is divided into five divisions which support research in the areas of Physiological, Cellular and Molecular Biology; Environmental Biology; Behavioral and Neural Sciences; Social and Economic Sciences; and Information Science and Technology.

Impact Highlights

The most significant budget reductions have been in the area of social and economic sciences which has been reduced by about 67 percent from its fiscal year 1980 level. The Behavioral and Neural Sciences Division has been reduced by over 26 percent from its fiscal year 1980 level. Within the Division, the largest reductions were in the cognitive sciences--reduced by 65 percent from the fiscal year 1980 level, and anthropological science--reduced by 23.8 percent. All other divisions have been reduced by less than 10 percent from fiscal year 1980 levels (see table 3).

Data on Impact

The following information was provided to us by NSF officials. Because of the short timeframe for completion of our work we were not able to verify the accuracy of the data.

--The projected end-of-year onboard strength for the Directorate, for September 30, 1982, is 144 full-time permanent positions. As of December 31, 1981, there were 139 full-time permanent employees.

--No continuing awards were terminated due to lack of funds. Attempts to accommodate budget reductions have included the following:

-Reducing the amount of previously approved incremental awards to continuing grants. Between October 1, 1980, and December 31, 1981, continuing awards were reduced by about $1.4 million (19 percent of the total amount approved) by the Division of Social and Economic Sciences and by about $100,000 (2 percent of the total amount approved) in the behavioral sciences. These reductions were selectively negotiated with grantee organizations to ensure that the cuts would not jeopardize the successful conduct of the research. NSF staff report that since NSF attempts to honor the amount

of previously approved awards and because budgets for continuing awards are carefully reviewed at the time the first increment of such an award is made, there is little room for further budget reductions.

-Sharply limiting the number of continuing awards, which entail funding from future year appropriations (only one such award has been made by the Division of Social and Economic Science in the first quarter of fiscal year 1982).

-Reducing the amount of funds awarded for new starts.

-Attempting to arrange for joint funding with other units of NSF or with other Federal agencies for projects of mutual interest.

--The cutbacks have already affected the community; fewer proposals are being submitted in social, economic, cognitive, and anthropological sciences. For example, in the social and developmental psychology program, there is usually an average of 50-60 proposals per panel (peer review of proposals by an assembled panel of experts). The last panel was canceled because only nine proposals were received. In this program, there are ordinarily three panels per year. Some program officials have had to send notices to the scientists in the field to let them know that NSF is still awarding some grants.

NSF Staff Opinions

This information represents opinions of NSF staff including their views on the impact of NSF's funding cuts on the communities and objectives they serve. The information has not been verified and does not necessarily represent an agency position on the subjects addressed.

--In the United States, social and behavioral basic research is done primarily in the universities, heavily funded by the Federal Government. In the social, economic, cognitive, and anthropological sciences, a significant portion of these funds has been withdrawn. For at least the next 5 years, the funds will not be made up from other sources. Given what the Federal Government now has to spend on basic research in these areas, they will just not move ahead.

--If there is an extended period of reduced funding of basic research in the social, economic, cognitive, and anthropological sciences, researchers presently doing basic research in these areas will not continue working in basic research.

ENCLOSURE IV

Table 3

Comparison of Funding for the Biological, Behavioral, and Social Sciences Directorate

Fiscal Years 1980, 1981, and 1982 $(Millions)

Program Description	Actual FY1980 [1]	Est. Actual FY1981 [1]	% Change FY80-FY81 [2]	Est. FY1982 [3]	% Change FY81-FY82 [2]	% Change FY80-FY82 [2]
Cellular and Physiological Biosciences	$ 27.8	$ 29.8	+ 7.4	$ 28.9	- 3.2	+ 3.9
Molecular and Genetic Biosciences	40.8	43.8	+ 7.3	42.0	- 4.0	+ 3.0
Biological Instrumentation	3.5	4.0	+ 13.4	4.1	+ 2.5	+ 16.2
Total-Physiology, Cellular, and Molecular Biology	72.1	77.6	+ 7.6	75.0	- 3.4	+ 4.0
Ecological Science	19.8	21.0	+ 6.2	20.4	- 2.9	+ 3.2
Systematic and Population Biology	19.9	20.0	+ .3	19.2	- 4.0	- 3.7
Total-Environmental Biology	39.7	41.0	+ 3.2	39.6	- 3.4	- .3
Neuroscience	20.2	20.8	+ 3.0	18.7	- 10.1	- 7.4
Cognitive Science	10.0	8.3	- 17.0	3.5	- 57.8	- 65.0
Anthropological Science	6.6	6.0	- 8.5	5.0	- 16.7	- 23.8
Total-Behavioral and Neural Sciences	36.8	35.1	- 4.7	27.2	- 22.5	- 26.1
Economics and Geography	13.8	10.4	- 24.5	4.2	- 60.1	- 69.9
Social Measurement and Analysis	10.4	8.0	- 23.4	3.8	- 52.5	- 63.6
Political and Policy Science	7.2	6.4	- 10.8	2.5	- 61.7	- 65.8
Total-Social and Economic Science	31.4	24.8	- 21.0	10.4	- 58.1	- 66.7
Information Science	3.8	4.2	+ 11.8	4.0	- 4.8	+ 6.5
Information Technology	.2	.2	- 13.8	.4	+100.0	+ 72.4
Information Impact	1.7	1.5	- 9.1	.8	- 46.7	- 51.5
Total-Information Science and Technology	5.7	5.9	+ 4.6	5.2	- 11.9	- 7.8
Total-Biological, Behavioral, and Social Sciences	$185.7	$184.4	- .7	$157.4	- 14.6	- 15.2

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Comparison in Constant FY1980 $(Millions)[4/]

Cellular and Physiological Biosciences	$ 27.8	$ 27.2	- 1.9	24.1	- 11.4	- 13.1
Molecular and Genetic Biosciences	40.8	40.0	- 2.0	35.2	- 12.1	- 13.8
Biological Instrumentation	3.5	3.7	+ 3.6	3.4	- 6.2	- 2.8
Total-Physiology, Cellular, and Molecular Biology	72.1	70.9	- 1.7	62.7	- 11.5	- 13.0
Ecological Science	19.8	19.2	- 2.9	17.1	- 11.1	- 13.7
Systematic and Population Biology	19.9	18.3	- 8.4	16.0	- 12.1	- 19.5
Total-Environmental Biology	39.7	37.5	- 5.7	33.1	- 11.6	- 16.6
Neuroscience	20.2	19.0	- 5.9	15.7	- 17.7	- 22.6
Cognitive Science	10.0	7.6	- 24.2	2.9	- 61.4	- 70.7
Anthropological Science	6.6	5.5	- 16.4	4.2	- 23.7	- 36.2
Total-Behavioral and Neural Sciences	36.8	32.1	- 12.9	22.8	- 29.1	- 38.2
Economics and Geography	13.8	9.5	- 31.0	3.5	- 63.5	- 74.8
Social Measurement and Analysis	10.4	7.3	- 30.0	3.2	- 56.5	- 69.6
Political and Policy Science	7.2	5.8	- 18.5	2.0	- 65.0	- 71.4
Total-Social and Economic Science	31.4	22.6	- 27.8	8.7	- 61.6	- 72.3
Information Science	3.8	3.8	+ 2.1	3.3	- 12.8	- 11.0
Information Technology	.2	.2	- 21.1	.3	+ 83.1	+ 44.4
Information Impact	1.7	1.4	- 17.0	.7	- 51.2	- 59.5
Total-Information Science and Technology	5.7	5.4	- 4.4	4.3	- 19.3	- 22.9
Total-Biological, Behavioral, and Social Sciences	$185.7	$168.5	- 9.3	$131.6	- 21.9	- 29.1

1/The FY1980 amounts have been amended to reflect program changes that occurred during FY1981.
2/The percentage change was computed using dollar amounts before rounding.
3/The budget figures shown for FY1982 are based on a projection of the budgeted rate of obligation for the first quarter of FY1982. They are used to show what the impact would be if that rate of obligation were experienced throughout the remainder of the fiscal year.
4/The GNP implicit price deflator for FY1980 is 176.72, for FY1981, 193.44, and for FY1982, 211.3.

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--Fewer scientists will be entering the fields of social, economic, cognitive, and anthropological sciences since the opportunities will be so diminished. Many graduate students receive training on grants awarded to their professors. With fewer grants there will be substantially less opportunity for this to occur.

--With fewer scientists, less basic research will be accomplished. The social, economic, cognitive, and anthropological sciences fields will suffer in the long run as there will be a reduction in the growth of basic research upon which to build.

--Less empirical research will be accomplished in the social, economic, cognitive, and anthropological sciences with more reliance on speculative analysis and analysis based on information from secondary sources. NSF provides funds for the collection of data for the analysis of U.S. societal trends, e.g., National Election Studies and the Panel Study of Family Income Dynamics. Funds for data bases such as these are being severely reduced. There is the possibility of some data bases being discontinued next year if more funds are not received. Various new data collection activities will not be started. Although the maintenance of these data bases is a top priority, not all of them can be continued if the funding levels remain at what they are now.

--In some cases, information that is not obtained now will be lost forever. For example, in anthropology, if research is not done in certain areas soon, because of civilization encroaching on sites or indigenous cultures dying out, it will never be done. While this type of work should certainly be given preference, it cannot all be done within the budget constraints. One of the projects that will not be funded by the NSF anthropology program due to the budget reductions is a project to obtain deep cores from one or more deep African lakes for the purposes of reconstructing climate and other aspects of early man's environment in these regions. Besides giving scientists information about Africa's paleoclimate and clues on petroleum formation, this project is highly significant to researchers studying the ancient African environment and ancient animal and plant life. In the area where the deep cores were to be obtained there is now evidence of major deposits of oil. Removing the oil could damage the site.

--NSF is one of the only Federal agencies whose support for basic research is not in some way mission oriented--that is, oriented towards accomplishing a specific practical goal for the agency (a cure for cancer, a

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disease resistant crop plant, etc.). Without substantial support from NSF, the long range view will be short-changed.

--Other Federal agencies are also receiving substantial reductions in the same areas as NSF, making the impact that much more severe. While DOD is receiving more funds, DOD's research is mission oriented as described above.

--There appears to be no increased support for basic research coming from the private foundations to compensate for the reductions in NSF funds. Representatives from some of the major foundations (e.g., Ford, Rockefeller, Sloan, Carnegie) all made it very clear, in a meeting with NSF officials, that they know of no foundation that would modify its plans to adjust to the reduction in NSF funds.

--Within these reduced budgets, NSF programs must also support applied research for the first time--further diminishing available funds. Previously, applied research was supported as a separate activity.

--The ability to describe, analyze, and model complex ecosystems which include human communities depends on integrating scientists from different disciplines and on gathering environmental data over time. Reduced funding will threaten potential breakthroughs in modeling ecosystems, which include human as well as nonhuman components.

--The particular expertise of anthropologists in generating information about the rural and urban societies of less developed nations and in providing new ways of seeking solutions to underdevelopment has been widely recognized by development planners in national and international development agencies. Anthropologists' participation in planning and delivering development assistance is now widely recognized as one means to provide more effective development programs. A reduction of funds will seriously jeopardize ongoing scientific analysis in demography, farm systems research, rural-urban migration, and other research areas that have contributed to improved results from our investment in international assistance programs.

--Since the linguistics program (contained in the cognitive science area of the Behavioral and Neural Sciences Division) operates entirely on the basis of unsolicited proposals, it is impossible to predict exactly what research opportunities will be lost as a consequence of the availability of virtually no funds for proposals during fiscal year 1982. An example of a project which ordinarily would be expected to have renewed support in fiscal year 1982,

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but will be terminated is a project on the acquisition of the properties of speech by children learning language. This is a little understood topic which, it is becoming increasingly clear, is fundamental to the language acquisition process.

--The reduced funds available in fiscal year 1982 will have a dramatic effect on the development of research in human cognition. The loss from not funding renewals that otherwise would have been funded is a major loss which ranges from a retardation of the pace of scientific progress at best to total elimination of the insights we would achieve from major areas of research at worst. While research in human cognition will not grind to a halt, the budget cuts will produce the potential for major long-term damage to the field.

--The psychobiology program (contained in neuroscience) is the primary source of Federal support for research on animal behavior. A number of relatively high-cost lines of research will be most seriously affected. Such areas include research on captive primates and other large animals, field research outside the United States, research depending on modern biochemical techniques (such as behavioral endocrinology), and relatively large, longer-term projects for which 3- to 5-year support is essential.

--With respect to social psychology (in the social and developmental psychology program in the cognitive sciences area), it will be impossible to continue funding several lines of research that have recently shown considerable promise. For example, research on social cognition has now advanced to the point at which direct links between the cognitive processes studied and overt social behavior can be established. Reductions in funding will hinder further progress along these lines. Damaging effects also will be felt in the field of social development. Much of the research conducted in this area is longitudinal in nature, i.e., it involves careful study of the same group of subjects over prolonged periods of time in order to observe systematic changes in behavior occurring during this interval. As a result of the large scheduled reductions in budget, such work will generally be brought to a close. The loss of continuity in data collection cannot be replaced even if research funds are restored at some future time.

--Research will be curtailed on how technological innovations, productivity, changing inter-industry linkages, large-scale decisionmaking, public policies, and other factors affect the geographic distribution of economic development and stagnation in different parts of the country.

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--Although contingency plans are being made to mitigate the effects of budget reductions on the social science data base, more than two decades of effort toward monitoring social change, providing data sets for research on important empirical phenomena, and generally maintaining the infrastructure of contemporary social and economic science will be greatly impaired. It is no longer easy to envision great strides in social and economic science without large scale data collections and the maintenance of facilities which "clean", store, distribute, and provide the capability for integrating the data collected in preparation for specialized analyses.

--With very limited funds, the work most likely to be fruitful for policymaking over the next 5 years--that is, the careful empirical work--will be cut back, while new conceptual (and less expensive) research will be emphasized.

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SCIENTIFIC, TECHNOLOGICAL, AND INTERNATIONAL AFFAIRS DIRECTORATE

The goals of the Scientific, Technological, and International Affairs Directorate (STIA) are to (1) link the producers of research with the users of research, (2) support research analyses and data collections on the interactions between science, technology, and public policy, and (3) facilitate the international exchange of scientific and technical information. To achieve these goals, the Directorate supports cooperative research between universities and industry, and between scientists, engineers, and the general public. Its international science programs support joint efforts with advanced and developing countries. The Directorate also supports data collections, research, analyses, and reporting on the science and technology enterprise and its impact on society. The Directorate is divided into five groups: Industrial Science and Technological Innovation, International Cooperative Activities, Policy Research and Analysis, Science Resources Studies, and Intergovernmental and Public Service Science and Technology.

Impact Highlights

Overall, the Directorate has experienced a budget reduction of 23 percent from fiscal year 1980 levels (see table 4). In Industrial Science and Technological Innovation, there has been an increase in support for Small Business Innovation over the fiscal year 1980 budget while other functions have been reduced or eliminated. Reductions have been made in areas of the Directorate where data gathering, analyses, and research of science policy issues are being undertaken. NSF's support for International Cooperative Activities for 1982 will be limited to the International Cooperative Science Program and support for the National Academy of Sciences' membership in the International Institute for Applied Systems Analysis (1982 will be the last year that NSF funds U.S. membership). The other functions of the Division will be funded elsewhere in NSF. Intergovernmental and Public Service Science and Technology has been reduced 91 percent from fiscal year 1980. Support to State and local governments will be sharply curtailed while some programs such as the Appropriate Technology, University Based Innovation Centers, and State Science and Engineering Technologies Programs will be totally eliminated.

Data on Impact

The following information was provided to us by NSF officials. Because of the short timeframe for completion of our work, we were not able to verify the accuracy of the data.

--The projected end-of-year onboard strength for the Directorate, for September 30, 1982, is 171 full-time permanent positions. On December 31, 1981, the staff

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level was 177 positions. The Directorate may have to RIF as many as six positions by the end of the fiscal year.

--During March 1981 a reorganization caused the transfer of several personnel both into and out of the Directorate. The staff level was 190 on March 8, 1981. Since March the staff level has decreased to the current level of 177. This was accomplished through 13 voluntary terminations and retirements.

--As of January 1, 1982, approximately 220 continuing grants and planned commitments at a level of about $11 million have not been met because of lack of funds. Other planned commitments have been scaled back.

NSF Staff Opinions

This information represents opinions of NSF staff including their views on the impact of NSF's funding cuts on the communities and objectives they serve. The information has not been verified and does not necessarily represent an agency position on the subjects addressed.

--The cuts are so severe that entire functions have been totally deleted. The philosophy behind this has been to try to maintain essential basic activities that are unique, rather than spreading the money too thinly on all the functions previously supported.

--The Directorate is now at the minimum level at which the activities now being funded can remain viable.

--The budget reductions raise the question of whether NSF is reduced to a concern for only academic disciplinary research support. It is a serious policy question that should be decided before cuts such as these are made--not after.

Industrial Science and Technological Innovation

--The principal objective of the Innovation Processes Research Section is to improve understanding of the processes by which technological innovation occurs and those processes are affected by Federal objectives and actions. A new program announcement was to go into effect during fiscal year 1982. Among the topics addressed in this announcement were research on small business innovation, university-industry interaction, and the dissemination and implementation of manufacturing technology. The proposed budget cut for fiscal year 1982 would preclude new research from being funded as remaining funds will be used mostly to honor past commitments.

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Table 4

Comparison of Funding for the Scientific, Technological, and International Affairs Directorate

Fiscal Years 1980, 1981, and 1982 $(Millions)

Program Description	Actual[1/] FY1980	Est. Actual FY1981	% Change[2/] FY80-FY81	Est.[3/] FY1982	% Change[2/] FY81-FY82	% Change[2/] FY80-FY82
Industry/University Cooperative Projects	$ 5.1	$ 8.1	+ 60.4	$ 5.0	- 38.3	- 1.0
Small Business Innovation	2.0	5.0	+142.0	4.5	- 10.0	+117.8
Industry/University Cooperative Centers	1.3	1.5	+ 19.7	1.0	- 33.3	- 20.2
University Based Innovation Centers	.5	1.2	+127.3	0.0	-100.0	-100.0
Innovation Process Research	1.5	1.1	- 26.9	.5	- 54.5	- 66.8
Total-Industrial Science and Tech. Innovation	10.4	16.9	+ 62.5	11.0	- 34.9	+ 5.8
Scientific Cooperation with Western Europe	1.5	1.1	- 30.2	2.2	+111.5	+ 47.7
Scientific Cooperation with Eastern Europe	3.3	2.1	- 36.6	1.9	- 10.8	- 43.5
Scientific Cooperation with Asia	2.6	2.5	- 3.1	2.9	+ 15.1	+ 11.5
Scientific Cooperation with Africa and Latin Am.	1.7	1.0	- 45.6	1.3	+ 39.8	- 24.0
International Travel Grants	.7	.7	+ .3	0.0	-100.0	-100.0
International Scientific Orgs. and Resources	3.9	2.7	- 30.0	2.0	- 26.2	- 48.3
Total-International Cooperative Activities	13.7	10.1	- 27.0	10.3	+ 2.8	- 25.0
Socioeconomic Effects of Science and Technology	1.3	1.9	+ 53.2	1.7	- 13.2	+ 20.4
Technology Assessment and Risk Analysis	1.3	1.4	+ 10.0	1.2	- 14.3	- 5.7
Environment, Energy, and Resources	.9	1.1	+ 23.0	.8	- 22.7	- 4.9
Total-Policy Research and Analysis	3.5	4.4	+ 24.4	3.7	- 15.9	+ 4.6
Scientific and Technical Personnel	2.0	1.5	- 23.3	1.6	+ 3.3	- 20.8
Funding of Science and Technology	.7	.9	+ 38.5	.7	- 22.2	+ 15.4
Modeling and Special S&T Indicators	.8	.7	- 16.9	.4	- 42.9	- 52.5
Total-Science Resources Studies	3.5	3.1	- 10.1	2.7	- 12.9	- 21.7
Intergovernmental Programs	4.5	2.0	- 55.7	.5	- 75.0	- 88.9
Public Service Science and Technology	1.0	.5	- 50.6	0.0	-100.0	-100.0
Total-Intergovernmental and Pub. Svc. S&T	5.5	2.5	- 54.8	.5	- 80.0	- 91.0
Total-Scientific, Technological, and Int. Affairs	$ 36.6	$ 37.0	+ 1.8	$ 28.2	- 23.6	- 23.0

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Comparison in Constant FY1980 $(Millions)[4]

Industry/University Cooperative Projects	$ 5.1	$ 7.4	+ 46.5	$ 4.2	- 43.5	- 17.2
Small Business Innovation	2.0	4.5	+121.1	3.8	- 17.6	+ 82.2
Industry/University Cooperative Centers	1.3	1.4	+ 9.3	.8	- 39.0	- 33.3
University Based Innovation Centers	.5	1.1	+107.6	0.0	-100.0	-100.0
Innovation Process Research	1.5	1.0	- 33.2	.4	- 58.4	- 72.2
Total-Industrial Science and Tech. Innovation	10.4	15.4	+ 48.4	9.2	- 40.4	- 11.5
Scientific Cooperation with Western Europe	1.5	1.0	- 36.2	1.8	+ 93.7	+ 23.5
Scientific Cooperation with Eastern Europe	3.3	2.0	- 42.1	1.6	- 18.3	- 52.7
Scientific Cooperation with Asia	2.6	2.3	- 11.5	2.4	+ 5.3	- 6.8
Scientific Cooperation with Africa and Latin Am.	1.7	.8	- 50.3	1.1	+ 27.9	- 36.4
International Travel Grants	.7	.6	- 8.5	0.0	-100.0	-100.0
International Scientific Orgs. and Resources	3.9	2.5	- 36.0	1.7	- 32.4	- 56.8
Total-International Cooperative Activities	13.7	9.2	- 33.3	8.6	- 5.9	- 37.2
Socioeconomic Effects of Science and Technology	1.3	1.7	+ 26.6	1.4	- 20.5	+ .7
Technology Assessment and Risk Analysis	1.3	1.3	+ .5	1.0	- 21.5	- 21.1
Environment, Energy, and Resources	.9	1.0	+ 12.4	.7	- 29.3	- 20.5
Total-Policy Research and Analysis	3.5	4.0	+ 13.6	3.1	- 23.0	- 12.5
Scientific and Technical Personnel	2.0	1.4	- 30.0	1.3	- 5.4	- 33.7
Funding of Science and Technology	.7	.8	+ 26.6	[illegible]	- 23.8	- 3.5
Modeling and Special S&T Indicators	.8	.6	- 24.1	.4	- 47.6	- 60.2
Total-Science Resources Studies	3.5	2.8	- 17.9	2.3	- 20.3	- 34.5
Intergovernmental Programs	4.5	1.8	- 59.5	.4	- 77.1	- 90.7
Public Service Science and Technology	1.0	.5	- 54.9	0.0	-100.0	-100.0
Total-Intergovernmental and Pub. Svc. S&T	5.5	2.3	- 58.7	.4	- 81.7	- 92.4
Total-Scientific, Technological, and Int. Affairs	$ 36.6	$ 33.7	- 7.9	$ 23.6	- 30.0	- 35.6

1/The FY1980 amounts have been amended to reflect program changes that occurred during FY1981.
2/The percentage change was computed using dollar amounts before rounding.
3/The budget figures shown for FY1982 are based on a projection of the budgeted rate of obligation for the first quarter of FY1982. They are used to show what the impact would be if that rate of obligation were experienced throughout the remainder of the fiscal year.
4/The GNP implicit price deflator for FY1980 is 176.72, for FY1981, 193.44, and for FY1982, 211.3.

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--University Based Innovation Centers have been eliminated. These centers developed and trained entrepreneurs and inventors in bringing ideas to market and starting new businesses. Two other programs in the section, the Industry/University Cooperative Projects and the Industry/University Cooperative Centers have received budget reductions. The Industry/University Cooperative Projects sponsor cooperative projects to strengthen research ties between universities and industry researchers and thereby improve the effectiveness of the Nation's science and technology enterprise. One of the effects of the cuts will be to discourage future planned research cooperation sponsored by NSF between industry and universities. The objective of the Industry/University Cooperative Centers Program is to create research centers where industrial and university scientists and engineers may carry out work jointly on technologies that have potential applications across a number of sectors of the economy. Over time, NSF support for individual centers will decrease and industry support will increase. After 5 years, NSF support ends. The fiscal year 1982 request will allow the phased support of five operating centers, no starts for centers from existing planning grants, and no new planning grants.

--The following is an example of the type of work that the Industry/University Cooperative Centers Program funds. One project is designed to develop specialized solid-state chips to examine outputs for a number of different types of signals under the same kind of circumstances. Sensory devices will examine changes as they occur and readjust other mechanisms to compensate for them. For example, these chips could be used to analyze all the various functions an airplane pilot must take into account and to adjust them as necessary simultaneously instead of analyzing each function separately. This would reduce the time necessary to accomplish the tasks and be more effective and efficient than analyzing each situation separately. The reduction in time necessary to accomplish these actions could quite possibly be life-saving in tight time situations.

--Due to the budget reductions in the Industry/University Cooperative Projects and Industry/University Cooperative Centers Programs, there will be less opportunity for scientists in industry and the universities to work together. There will be less chances for industry to learn more about the capabilities and advantages of university research, and less chances for universities to learn about the research needs of industry. This funding is useful in exploring mechanisms for longer term collaborative efforts, most of which are not funded by NSF. With the reductions, there

will be less collaboration between industry and universities and less work to determine what types of collaboration mechanisms work in different circumstances. With less cooperation, there will be less advancement of the scientific and technological base. While the work being done does not have immediate commercial application, it may have commercial application within 4 to 5 years.

--In projects funded by the Industry/University Cooperative Projects Program, advances have been made in joining industry and university research in instances when the research might not otherwise be undertaken. The research is often one of the critical steps necessary in order for a certain area of technology to advance. For example, one of these critical steps was to try to design a catalyst to make a hydrogen-oxygen fuel cell technically feasible. An organometallic compound has been discovered and this finding can be expanded upon. The eventual goal is commercial use for hydrogen fuel (made from water and electricity) which could have profound economic importance in the long term. An example of a project that the program will not be able to support at the level of funding proposed for fiscal year 1982 is work on new tools that sputter atoms layer by layer onto a surface to build up semiconductor chip bases. Refinement of sputtering sources is important to these new tools. These chip bases are one of the cornerstones of the next generation of circuits. It would improve the quality and reduce the cost of these circuits. If the project had been funded, knowledge from the project would have likely impacted the design of commercially available molecular beam epitaxy tools within the next 3 to 5 years.

International Cooperative Activities

--After calendar year 1982, only one of the functions of this Division will be funded by STIA--the International Cooperative Science Program. This program, which funds bilateral research projects under formal agreements and other formal and informal arrangements, has had some budget reductions. Most present commitments will be honored, but almost all the bilateral programs will be reduced below that planned for fiscal year 1982. Funds for U.S. membership and involvement in the International Council of Scientific Unions and its member unions (international linking of professional and scientific associations or persons within a technical discipline or professional area from the various member countries) will be funded from other areas of NSF. American scientists requesting travel funds to attend international conferences must now compete for funds against research proposals in the same discipline throughout all NSF Directorates. Dues for calendar year 1982 must be paid for U.S. membership and involvement in the International

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Institute for Applied Systems Analysis (IIASA). However, NSF will not provide any further funds for membership. 1/

--The International Cooperative Science Program, subdivided on table 4 into Scientific Cooperation with Western Europe, Eastern Europe, Asia, and Africa and Latin America has absorbed about as many reductions as it can sustain without abrogating international agreements. Some bilateral agreements in process will have to be deferred. These agreements have provided national benefits. For example, one cooperative research project under the U.S.-Japan Cooperative Science Program pioneered the development and applications of high voltage electron microscopy in materials science. This cooperative program is particularly important for U.S. researchers because it allows direct involvement with pioneering work by the Japanese in the materials fields with high voltage electron microscopy. Also, this agreement gives American scientists access to the well-equipped technical staff and accessory and support facilities of the Japanese. Although the U.S. recently established a National Center for Electron Microscopy, the Japanese facilities are said to be better equipped than U.S. facilities.

--While membership dues in all the unions which make up the International Council of Scientific Unions are now being paid, there is some concern that in the future some of the unions not directly covered under specific NSF programs will not be joined.

--With the cancellation of the International Travel Grants program, there will be no set budget specifically for attendance of American scientists at international conferences as there has been in the past. Funds for attending these conferences will be competing directly with research proposals by discipline and officials feel that the net result will be fewer Americans attending international conferences. Further, since the requests for travel grants will not be competing against each other across disciplines, the most worthwhile travel grants will not necessarily be funded.

Policy Research and Analysis

--The Division of Policy Research and Analysis (PRA) supports external research and analyses on public policy issues that have substantial science and technology

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1/After the budget reduction was made, an incident occurred which raised the possibility that the United States may have withdrawn support for IIASA dues anyway.

content. This work provides a source of knowledge and information for use by Federal decisionmakers in the Executive Office of the President, Federal agencies, the Congress, and by the general public. Although the fiscal year 1982 funding is actually slightly higher than the actual fiscal year 1980 budget, the 1982 figure contains approximately $600,000 for the International Economic Program, which was not included in the fiscal year 1980 figures. Excluding this $600,000, this Division has been reduced by 12.4 percent from the fiscal year 1980 budget figure. As a result of the reductions, a significant portion of the funds in science and technology policy research will be allocated to continuing grants and those submitted in fiscal year 1981; long-term grants in international economic policy will be reduced by about 25 percent; Technology Assessment and Risk Analysis will only be able to support one new technology assessment project; and intramural policy studies for policymakers in the Executive Office of the President will have to be cut back. One example of past work in the Division has been funding projects to estimate and assess the relationships between Federal research and development expenditures in industry and industry research and development funding. A question frequently raised in discussions about Federal research and development funding is whether these funds increase or decrease industry research and development funding. These studies all indicate that Federal spending in this area complements rather than substitutes for private spending. With the budget reductions, other issues of importance to decisionmakers will not be able to be researched as completely; it will take longer to provide answers to policy questions and these answers will not be analyzed as completely. For example, due to lack of funds, there will be less research done on the issue of tax policy and its impact on innovation. There is not much evidence available now to determine whether more money will be invested in research and development if there are faster tax write-offs. Work on this issue could help provide needed answers.

Science Resources Studies

--The Division of Science Resources Studies provides for the development, collection, maintenance, analysis, and interpretation of timely and comprehensive information on the Nation's science and technology resources. It carries out an ongoing program of surveys and studies in science and technology. The Program for the Analysis of Science Resources will probably fund only 3 out of

approximately 36 proposals. This reduction will curtail the development of output and impact science and technology indicators and analyses of science and technology resource data by the academic community. Commissioned studies for special topics for Science Indicators--1982 will be sharply cut. The national conference on innovation indicator development will be eliminated. Survey-related activities will be reduced so that there will be less ability to provide information for special requests and studies.

Intergovernmental and Public Service Science and Technology

--The Intergovernmental Programs Section has been drastically reduced. Program objectives are to strengthen the capacities of State and local governments to make more effective use of scientific and technical resources. The congressionally-mandated State Science, Engineering, and Technology program has been eliminated. This program was intended ultimately to make grants to both the executive and legislative branches of all 50 States, to strengthen their capacities to use scientific, engineering, and technical resources in their policy planning and administrative management. At this point, planning awards have been made to all 50 States and first-year implementation awards to 15 States; the remainder cannot be funded. The Local Government Programs planned to provide support to 13 statewide and regional innovation networks. At this point, five existing regional networks will continue to receive NSF support at a reduced level; the remaining eight will not be supported. The other programs in the section have also been reduced. The Public Service Program Section will be terminated.

--The Division of Intergovernmental and Public Service Science and Technology provided leadership and coordination in establishing links between scientific and technical resources and important user communities (State and local governments, intermediary organizations, and public interest groups). The aid to State and municipal governments in these areas was considered to be important by these governments. However, they probably will not start up new projects by themselves. Regional networks cannot be expanded without the linkage and organization NSF provides. Thus, specific State and local governments will have less opportunity to learn from the experiences of other governments. Terminating the Public Service Science and Technology Program Section will hamper knowledgeable citizen participation in the resolution of public issues involving science and technology.

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