

Latest budget cuts arouse concern and recommendations

The National Academy of Sciences, in an attempt to respond creatively to the Administration's latest budget-cut proposal, held a convocation of approximately 100 distinguished scientists, government policy-makers, national lab directors, university administrators and industry research executives on 26-27 October in Washington. Frank Press, president of the Academy, initiated the conference for the primary purpose of "providing a dialogue with key government officials" and to use this opportunity "to suggest alternatives for the wise allocation of limited resources to try to control the damage to the United States scientific and technological enterprise."

The meeting began in an atmosphere of anxiety as administrators of research and development programs contemplated what the impact would be on their part of the enterprise, if President Reagan's 30 September proposal of an additional 12% cut to his March budget request were to be enacted by Congress.

Willis Shapley, a consultant to the American Association for the Advancement of Science and principal author since 1977 of AAAS reports on R&D funding, began by putting the proposed cut in a factual framework. He calculated the changes from actual FY 1980 amounts that would be produced in the R&D portion of FY 82 agency budgets. The table is the result of his calculations. (The effect on funding of basic research is a conservative approximation as \$285 million of the Department of Defense R&D cut has not yet been allocated.) Shapley and subsequent government speakers emphasized, however, that a final decision had not yet been made on the 30 September cuts. Negotiations are now underway between the Administration and Congress, and there are many steps remaining in the budget process. "The long-term outlook nevertheless includes reductions in FY 83 and FY 84 budgets," Shapley said.

Shapley's talk was followed by discussions between the audience and several panels led by the representatives of government agencies. From these discussions several principal concerns



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arose and the need to articulate them to the Administration was expressed by many representatives of the scientific community.

One of the most clearly expressed and often reiterated concerns was that the "mismatch" between budgetary planners in government and those responsible for planning budgets to meet research needs might lead to more serious damage to scientific research and education than the reduction of research dollars necessitates. The panel discussions indicated that there is a "mismatch" in the perception of what effect this reduction in funding is going to have on science.

Fred Khedouri (associate director for natural resources, energy and science in the Office of Management and Budget) said that science was "flourishing"

relative to other programs and that the Federal government was "not reducing its budget for science but that science would experience a slight reduction in its rate of growth over the next few years." George Keyworth, the President's science adviser, while acknowledging the Federal government's commitment as the "primary supporter of basic research" said that "science is healthy today" and that the scientific community should "evaluate its direction with an eye toward increasing excellence."

These comments produced a sharp reaction in the audience. Expressing concern for the future health of science, Paul Gray (president of MIT) said that there were "substantial elements of weakness in the health of science research, due in part, to a ten- to twelve-year decline in support" and cited the "lack of support, for example, of instrumentation and facilities."

The director of SLAC, W. K. H. Panofsky, said flatly that "there has been no growth in Federal support of basic research in the ten years preceding 1978, in contrast to foreign countries." He went on to articulate the reductions in both staff and programs caused by budget cuts earlier this year and the apparent underestimation by government of the impact a 12% cut, repeated over several years, will have on research facilities. Panofsky and others indicated that the timing of the cuts, being imposed after the fiscal year has started and without adequate notice or planning, will put great additional stress on the system.

Another concern that was repeatedly expressed was the need to protect basic research, in particular, from further harm. Part of the scientists' concern seemed to be generated by a sense that the government budget planners did not appear to realize fully the connection between the support and vitality of basic research and attaining the stated goals of the Reagan Administration to increase both national security and economic strength. As Harold T. Shapiro (president, University of Michigan) expressed it, "the decline in the proportion of resources allocated for

Total estimated Federal R&D expenditures

	Actual FY80 (billion \$)	Reagan budget FY81 (billion \$)	March request FY82 (billion \$)	Reagan Sept. request FY82 (billion \$)	Change from FY80 to Sept. FY82
DOD	14.02	16.33	18.61	17.73	+ 26%
NASA	5.24	5.21	5.15	4.85	- 7%
DOE	5.77	5.54	4.65	4.09	- 29%
HHS	3.80	3.75	3.51	3.09	- 19%
NSF	.91	.88	.85	.76	- 17%
Other	3.30	3.15	2.75	2.39	- 28%
TOTALS	33.04	34.86	35.52	32.91	0%
Invested in basic research	4.71	4.60	4.66	4.17	- 11%

Constant 1980 dollars, assuming an inflation rate of 9% per year

science hits at the very goals of the country—economic growth, productivity and defense.”

Kenneth Prewitt (president, Social Science Research Council) demonstrated the relationship between economic growth and the growth in scientific knowledge by plotting growth curves. He showed that the sharpest increase in knowledge occurs when there is investment in both basic and applied research and the flattest curves result when only applied research is supported. The connection between economic health and support of research was further strengthened by Press, who referred to Ed Mansfield's (University of Pennsylvania) work in this area. According to Press, the results of this study showed that 40% of increased productivity over a 20-year period is due to new technology or information.

Charles Slichter (University of Illinois-Urbana) articulated the need for those at the Academy meeting “to make a real statement of what has happened in constant dollars to basic research support and contrast it with what has happened to the GNP.” He also pointed out that “the number of Federal dollars (corrected for inflation) spent on basic research in 1980 is virtually identical to the amount spent in 1967.” The president of Caltech, Marvin Goldberger, got unanimous consent when he asked that the group go on record as finding the 12% cuts detrimental to Reagan's announced goals of revitalization of the economy and national security and reminding the Administration that other groups, such as DOD, were exempted from these cuts because of similar priorities.

Again differences in perceptions about industry's role and the protection of basic research became apparent in discussion. In response to questions about the decline of Federal support for education, Keyworth asserted the government's intention “not to retreat from their support of basic research,

and to continue to support R&D and certainly university research in the US” and called for increased industry support of university research.

The representatives of industry gave their whole-hearted support to, and expressed their dependence on, the scientific research conducted by the national laboratories and at universities, but stated that their most critical concern was that there be no decrease in the production of skilled manpower.

Herman Feshbach (MIT) calculated the effect on physics manpower of a 12% budget cut per year over the next three years. By comparing data for PhDs produced versus research dollars invested from 1960 to 1979, he was able to determine a correlation factor. Using this factor and applying it from 1980 to 1983 he determined that the cuts would reduce manpower in physics to levels that existed in 1962. Furthermore, he said, graduate-student production, which has been decreasing for the last ten years, would return to pre-Sputnik levels if these cuts are imposed, and this loss of young people would be particularly serious for the future of research.

Edward E. David (president of Exxon

Research and Engineering and a former presidential science adviser) took issue with the Administration's assumption that industry could fill the gap left by withdrawn Federal funds. He stated “even if we succeed in encouraging increased investment by industry in research and scientific education and industrial support tripled over the next decade, this increase would only equal the proposed cuts in the Federal budget for one year.” He also emphasized that the distribution of funds spent by industry would be different and that the priority for basic research might not be met adequately. He reiterated industry's dependence on the strength of institutions and research programs that train and produce graduates.

Alvin Trivelpiece (director, DOE Office of Energy Research) was asked whether any of the responsibility for basic research could be accommodated by DOD increases. Trivelpiece felt that “it was unlikely that increases in the DOD budget will show up in 6.1 or 6.2 funds [the government classification for basic research funding]” but suggested the question more properly be directed to Richard De Lauer of DOD. John B. Slaughter (NSF director) was asked what the prospects were for DOD to use its increased budget to support universities or basic research. Slaughter replied that there was “little likelihood for significantly increased university research support at DOD and certainly nowhere near the level to take up the slack.”

Flexibility in the application of budget cuts was a further concern at this meeting. The discussion revolved around the ability to protect critical programs (such as the Space Telescope) and basic research, and the repeated request by the scientific community that it have a voice in these decisions. Khedouri had said that it was the intent of OMB to safeguard key areas of research and mentioned that high-energy physics had been protected. How-



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ever, when Trivelpiece was asked how much freedom he had in shifting funds within DOE to protect basic research he replied that he had "essentially no flexibility. A directive was issued to take 12% off each appropriation line item."

Another aspect of the flexibility issue was explained by Leon Lederman (director of Fermilab). He stated that "flexibility has been squeezed out of the national lab budgets—60–70% is for salaries, 15–20% for electrical power and another 5–10% is committed in miscellaneous fixed operational expenses." This reduced flexibility pertains to many institutions and was discussed throughout the meeting. The consensus seemed to be that it was due, at least in part, to one of the "mismatches" between government and science planners. Research program planners work in a long time frame, with most of their money committed to ongoing projects and operations. But government budget cutting can be abrupt, and short-term decisions can cause long-term damage to basic research.

At a press conference held the next day, the meeting participants' recommendations, arrived at by consensus at a closed session were presented. Among the key recommendations were:

- ▶ Consider R&D across the entire government instead of agency by agency and allocate funds between R&D to maintain basic science.
- ▶ "Instruct departments and agencies to maintain the strength of science in cuts to agency budget allocations."
- ▶ Direct a large part of the increased national security budget to fund basic research as it "is essential to that security."
- ▶ Recognize that science has "suffered a decade of little or no growth" and needs to be strengthened "to maintain competence in the national labs."
- ▶ Recognize the link between science education and research and "continue graduate student support."
- ▶ "Recognize the need to revitalize the instrumentation and facility base on which future technological advance depends."
- ▶ A strong mechanism is needed to allow the scientific community to "advise on resource allocations and analyze the impacts of budget strategies."
- ▶ A review of "the institutional system for the support of R&D" is timely, with input from all sources of the science community. This review should "look across departments and agencies to achieve the most productive use of resources."
- ▶ It is a national priority to insure the continued flow of scientists and engineers. To accomplish this, policies in support of science education must be established at all levels of government.

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Regional network of Puerto Rican scientists

Seventy-five Puerto Rican scientists, engineers and students meeting last April set up regional networks and called for the formation of an organization to serve their interests. A national association may be organized at next January's AAAS meeting.

The April meeting was held under the auspices of AAAS and sections of NIH. S. Maria Hardy, a physiologist from Louisiana State University, chaired the conference. General Enrique Mendez, deputy surgeon general of the US Army, spoke on the absence, in chronicles of American history, of coverage of the long tradition of Hispanic culture in the US. Zora Griffo and William Raub of NIH and Manuel Gomez Rodriguez, dean of natural science at the University of Puerto Rico, also spoke.

Participants decried federal budget cuts, which they see in conflict with their goals, and made the following recommendations:

- ▶ encouraging Puerto Rican students to study science by producing materials to publicize achievements of Puerto Rican scientists and publicizing travel-

ing exhibits that offer students "hands on" experience in science,

- ▶ updating and computerizing a directory of Puerto Rican scientists for use in role-model projects, network creation and peer review assignments by science agencies,
- ▶ starting career orientation programs that inform Puerto Rican (and other) students on graduate school application, financial aid, and the availability of academic resources,
- ▶ increasing research experience opportunities for undergraduate students,
- ▶ promoting student attendance at scientific meetings as a way to acquaint them with how scientists conduct their business and to provide them with contacts,
- ▶ using churches, Puerto Rican clubs, and Spanish language media to disseminate information about science and scientists.

Persons interested in further information can contact the Office of Opportunities in Science at AAAS, 1776 Massachusetts Ave., N. W. Washington, DC 20036.

NSF committee on equal opportunities

The NSF Committee on Equal Opportunities in Science and Technology held its first meeting late this Spring. Under the leadership of Cora B. Marrett, professor of sociology at the University of Wisconsin, the group will advise NSF on ways to encourage the full participation of women and members of minority groups in science and engineering. NSF Director John B. Slaughter has

asked the Committee to explore the nature of barriers that inhibit women and members of minority groups in science and engineering research.

Among the members of the group are Carol Jo Crannell, an astrophysicist at the NASA Goddard Space Flight Center, and Carl Spight, Vice-President for Corporate Research at AMAF Industries, Columbia, Maryland.

in brief

Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1978 presents data from fourteen Federal agencies that supported research and development in academic and other nonprofit institutions. Copies, \$5.50, are available from the Superintendent of Documents, Washington, DC 20402. (stock number 038-000-00-451-14.)

NSF has published *Academic Science: 1972–77*, which presents data collected from academic institutions in surveys of research and development expenditures, employment of scientists and engineers, and graduate enrollment in science and engineering. Copies may be purchased for

\$4.25 from the Superintendent of Documents, Washington, DC 20402 (stock number 038-000-00452-2).

MIT has established the Stratton Professorship of Electrical Engineering and Physics, honoring Julius Stratton, the eleventh president of MIT, with a gift from William Hewlett, chairman of the executive committee of Hewlett-Packard Co. The chair will be occupied alternately by a faculty member from the Department of Electrical Engineering and Computer Science and the Department of Physics. James R. Melcher, director of MIT's High Voltage Laboratory, has been named the first Stratton Professor.