

## science news OF THE WEEK

# The science budget: Modest increases

**Over-all R & D funding would rise 9 percent. Some projects cut. Radio astronomy facility budgeted**

Government budget announcements tend to be like politicians' campaign speeches: full in promise, rosy in outlook. With emphasis on the positive, the possibility that Congress may not be so effusive in the outlay of taxpayers' money is scarcely acknowledged. There is many a potential slip between budget request and legislative enactment. In research and development, for example, a comparison of what the White House said a year ago it would like to obligate for fiscal 1972 (SN: 2/6/71, p. 93) with what it now estimates will actually be obligated shows that expectations outreached actuality by a good \$290 million. With such precautions in mind, one can now plunge forthrightly into the budget proposals for 1973.

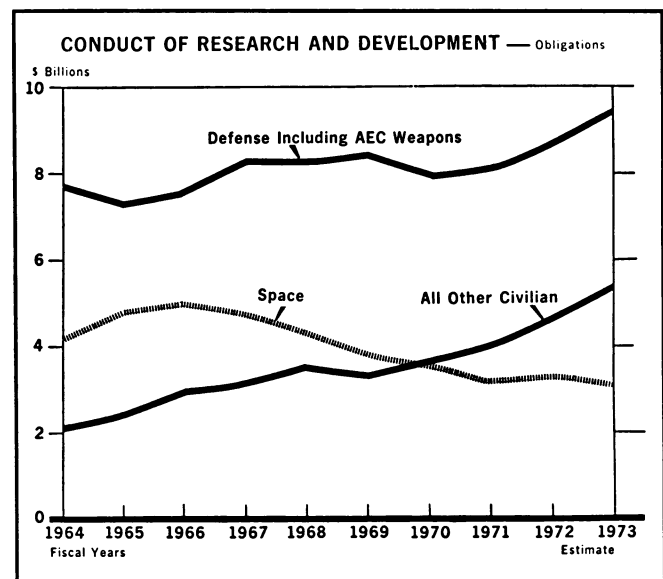
The budget proposed this week by President Nixon calls for a 9 percent increase in total Federal obligations for research and development, from \$16.4 billion this year to \$17.8 billion for fiscal '73. Over-all, this should be

the cause of few complaints in the scientific community: the increase is greater, both in percentage and in dollars, than the increase proposed last year; it should easily outpace inflation; and in comparison with the lean years 1967 to 1971, when R&D funds dropped, it looks like a virtual gold mine.

However, in selected areas there will be reason for dissatisfaction. The concept of a full set of Grand Tour missions to the outer planets in the late '70's is being downgraded to a single mission to Jupiter and Saturn. Carrying out a policy begun last year, the National Science Foundation will be eliminating its science development grants and greatly diminishing funds for graduate traineeships and institutional grants for science. The NERVA nuclear rocket program is being canceled. And some basic scientists are sure to find vaguely disquieting an Administration emphasis, in rhetoric and in funds, toward applied research.

Nevertheless, the science budget platter contains something for nearly everyone.

The radio astronomers will be especially joyful. Their long-sought goal of a very large array (VLA) radio antenna system is finally given approval. The budget requests a \$3 million obligation by NSF to begin initial development of the VLA. The system, eventually to cost a total of about \$70 million, will, as the President's science adviser, Edward E. David Jr., said, "put this country in the forefront of radio astronomy for many years to come." The system will consist of a series of antennas spaced out in a Y-shaped pattern over an area 25 miles in diameter. A site selection committee is expected to be named soon. The requirements are a site that is high, dry and isolated from radio interference. Initial studies indicate, said outgoing NSF Director William D. McElroy, that the site "will be somewhere ranging from Texas to this side



Charts: OST

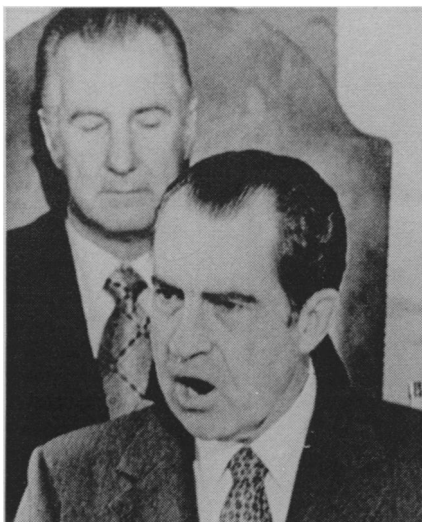
of the Rockies." Northern New Mexico may be the best bet. The VLA is the first "big science" facility budgeted since the National Accelerator Laboratory was approved a few years ago. The NAL is given \$43 million in the budget to complete construction of its 200-billion electron-volt accelerator at Weston, Ill. The first beam from that instrument is expected this year.

Fundamental research supported by NSF is to increase 10 percent. For the first time since the mid-1960's funding for high-energy physics is slated for an increase. Research and development in colleges and universities is scheduled for an over-all increase of 12 percent, to \$2.26 billion.

But the main new emphasis in the budget is the application of science and technology to domestic problems—what President Nixon calls science in the service of man. Nixon's thinking on the subject was outlined in his State of the Union address on Jan. 20, four days before this week's budget message: "America must continue with strong and sensible programs of research and development for defense and for space. I have felt for some time, however, that we should also be doing more to apply our scientific and technological genius directly to domestic opportunities. Toward this end, I have already increased our civilian research and development budget by more than 40 percent since 1969 and have directed the National Science Foundation to give more attention to this area."

He listed a number of areas for "new or accelerated activities," and the budget fleshes them out with dollar amounts:

- A 46 percent increase in R&D on safe, efficient and pollution-free transportation, up \$210 million to \$666 million for fiscal '73.
- A 46 percent increase in research



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to reduce loss of life and property from fires, earthquakes, severe storms, floods and other natural disasters, up \$43 million to \$136 million. David calls this "the apocalypse package."

- A 39 percent increase in advanced work on educational research and development by the Department of Health, Education and Welfare, up \$55 million to \$197 million.

- A 27 percent increase for additional cancer research, up \$93 million to \$430 million. This augments the additional \$100 million approved for fiscal '72 that brought last year's anti-cancer funding to \$337 million.

- A 22 percent increase in R&D toward clean, abundant energy sources, up \$88 million to \$480 million.

The transportation package will include work to develop personal mass

transit facilities "to offer means of getting large numbers of people from one place to another quickly and safely." There will also be a study of dual-mode facilities, in which a user would travel part of his route in a personal vehicle and then hook on to a guideway.

The energy package will accelerate ongoing efforts on breeder reactors (SN: 1/22/72, p. 55), coal gasification, sulfur-oxide control technology, nuclear fusion and magnetohydrodynamics. New thrusts will be given to solar energy, dry cooling towers for power plants, high-energy storage batteries and advanced underground electric transmission lines.

These diverse efforts in domestic-related R&D result in increases in proposed obligations for R&D for 16 of the 17 Government departments and agencies that conduct or support research. Only the National Aeronautics and Space Administration shows a drop in funds for R&D, and it is only 1 percent. Of course the large percentage increases for some of the domestic agencies (56 percent for Office of Economic Opportunity, 28 percent for Department of Transportation) reflect their small previous R&D base.

David says there was considerable input into the budget from the recently completed exploration of new technological possibilities begun last year by the White House's Domestic Council and headed by William M. Magruder (SN: 1/1/72, p. 5). According to OST, the effort "helped identify possibilities where government efforts could create new jobs, stimulate industrial production and innovation, enhance overseas trade, and more directly meet the needs of man and the nation." Yet it is difficult to determine specific inputs, and Nixon himself in his State of the Union address seemed to be pointing to the problem: "One important conclusion we have reached is that much more needs to be known about the process of stimulating and applying research and development."

Such lack of knowledge about the processes led to the decision to include in the budget \$40 million in funds for a special experimental program to test incentives to stimulate private investment in research and development. NSF and the National Bureau of Standards will collaborate in the study. NSF's share, \$24.5 million, includes \$2.5 million for a special national research and development assessment program to learn more about how R&D affects economic growth and productivity and enhances the nation's international competitive position. All these efforts reflect the Administration's concern over the lagging national economy, the worsening bal-

*Sixteen of 17 agencies would have their R & D programs increased.*

CONDUCT OF RESEARCH AND DEVELOPMENT (MILLIONS)					
	FY 71	FY 72	FY 73	FY 73-72	%Change
DOD	7,423	8,013	8,756	+743	+ 9
NASA	3,284	3,327	3,302	- 25	- 1
HEW	1,466	1,769	2,012	+243	+ 14
AEC	1,303	1,308	1,375	+ 67	+ 5
NSF	337	453	525	+ 72	+ 16
DOT	220	296	380	+ 84	+ 28
USDA	318	356	370	+ 14	+ 4
DI	185	216	250	+ 34	+ 16
DC	143	169	229	+ 60	+ 35
EPA	137	176	186	+ 10	+ 6
VA	64	70	78	+ 8	+ 11
OEO	84	50	78	+ 28	+ 56
PO	40	68	74	+ 6	+ 9
HUD	48	53	63	+ 10	+ 19
DJ	10	27	30	+ 3	+ 11
DL	23	27	31	+ 4	+ 15
Smithsonian	17	23	29	+ 6	+ 26
All Other	42	49	52	+ 3	+ 6
	<b>15,143</b>	<b>16,447</b>	<b>17,819</b>	<b>1,372</b>	<b>+ 8</b>

## Defense R&D continues its domination

In a budget proposal in which most of the rhetorical emphasis about research is on "science and technology in the service of man," military-related research once again dominates. Figures issued by the Office of Science and Technology (they differ slightly from the official budget document's) make this clear. Defense matters, including Atomic Energy Commission military-related programs, will receive \$9.4 billion of the \$17.8 billion of proposed Federal obligations for research and development in the fiscal 1973 budget.

In fact, as was the case last year, just the proposed increase of \$800 million (or \$761 million, depending on which figures you use) in the defense R&D budget is larger than the entire budget of the National Science Foundation.

At an advance budget press briefing last weekend, OST Director Edward E. David Jr., scoffed at a re-

porter's suggestion that it might be difficult to justify the expenditure of such a large amount for weapons-related research and development at a time when the nation has so many pressing domestic problems. The defense R&D budget "needs no excuses," he said. David pointed to President Nixon's stated belief that more sophisticated weapons technologies are needed to insure lasting peace. In his budget message Nixon said, "... we have strengthened our defense research and development capability to insure that the country will not face the possibility of technological surprise or lack the deterrent power necessary to protect our national security."

Nevertheless, critics of the Administration's defense expenditures are sure to include the defense R&D budget among their targets. Increases in defense R&D expenditures tend to herald much larger increases in bud-

gets for procurement of hardware in future years. And even though research accounts for only one-fifth of the money in the defense R&D budget (development accounts for the other four-fifths), critics of the science establishment will have a continuing source of ammunition for their charges of cozy relations between scientists and the military.

Among the development programs allotted additional funds, particular emphasis will go toward improvement of the country's sea-based nuclear deterrent (especially the ULMS giant missile-firing nuclear submarine). Other programs include the B-1 aircraft, the subsonic cruise armed decoy (SCAD), the airborne warning and control system (AWACS) for air defense and the Safeguard and prototype Hardsite antiballistic missile defense systems. Increases will also go for the F-15 and A-X fighters and the SAM-D air missiles.

ance-of-trade situation, and the rapid advance of such countries as Japan and West Germany in developing and marketing new products in competition with American private industry.

The new effort assigned to NSF to, in effect, conduct research on the processes of research and development and their links with the economy, accounts for a large share of NSF's proposed increase in obligations. NSF's total budget would increase to \$674.7 million in fiscal '73. This is \$73.6 million more than the agency's 1972 obligation level, but it includes \$21.7 million in funds that were to have been obligated in fiscal '72 but were impounded by the Office of Management and Budget (SN: 9/18/71, p. 186). So the actual increase amounts to just over \$50 million.

Congressional supporters of a more central role of NSF in the funding of the nation's R&D had been pushing for an NSF budget in excess of \$700 million. NSF's McElroy declined to say he was disappointed in the level of the agency's proposed budget, pointing out that it does include increases in nearly all areas of basic research. But he did note that he had often said he hoped to see an NSF budget of \$1 billion by now. At any rate, McElroy's NSF budget battles are over. The day after the advance budget briefing last weekend, McElroy left for California to begin his new duties as chancellor of the University of California at San Diego. His successor, H. Guyford Stever (SN: 11/20/71, p. 341), starts Feb. 1. □

## Space: Grand Tour a victim of shuttle

The intention of the NASA budget for fiscal year 1973 is loud and clear—back to work making hardware for unemployed aerospace engineers and technicians.

That at least seems to be the general purpose of the new obligational authority requested for NASA. The \$3.37 billion total—up \$82.9 million over fiscal '72's obligations—reflects increases for aeronautical research—quiet engine, short take-off and landing aircraft (SN: 4/17/71, p. 269)—and the reusable space shuttle (SN: 1/15/72, p. 36).

Lost somewhere in the scramble to build this new generation space vehicle were Apollo 15 and 19. Now, as expected (SN: 10/9/71, p. 246), the Grand Tour of the outer planets in the late 1970's and two orbiting solar observatories have been dropped. Although the scientific community (as reflected by National Academy of Sciences' studies) couldn't really decide what priority to give to the \$700 million tour of the outer planets (SN: 1/30/71, p. 77), they were unanimous in their disapproval of Apollo cuts (SN: 9/12/70, p. 215).

The reason for all of this, says NASA, is that something had to give in order to build the shuttle and yet stay within the budget limits of this decade—a figure for NASA that appears to be an annual \$3.3 billion.

Another cut is in funds for NERVA—the nuclear-engine rocket vehicle. In-

stead the agency will concentrate on building a smaller nuclear-propulsion unit that could be used for unmanned exploration of the outer planets.

In place of the Grand Tour that would have sent a highly sophisticated self-repairing spacecraft past Jupiter, Uranus, Saturn, Neptune and Pluto, NASA will concentrate on one or two planets—Jupiter and Saturn—with Pioneer- or Mariner-type spacecraft.

One scientific program that didn't get the hatchet was HEAO—a high-energy astronomy observatory. Only one new start (the beginning of funding) is in the science budget—TIROS N, a third generation weather satellite to fly in 1976.

The remaining flight activity for NASA through 1976 will be unchanged. Apollo 16 and 17 will be launched this year and Skylab next year. Then, unless a joint U.S.-U.S.S.R. docking mission is approved for the middle of this decade, there will be no more manned space flights until the shuttle is operational—around 1978. Still scheduled in the unmanned program is one more solar observatory, OSO 1; a joint U.S.-German satellite, HELIOS, to study the sun; the Mariner Venus/Mercury flight in 1973; the Pioneer to Jupiter (SN: 11/13/71, p. 330); the Viking Mars Landers for launch in 1975; one more astronomical observatory and a host of small scientific satellites.

The applications flight schedule includes experimental weather satellites, advanced technology satellites, earth resources satellites and an earth physics and oceanography satellite. □