state & society

New Federal budget stresses applied science

Spending for physics has gone up slightly in the Administration's budget proposal for fiscal year 1973, and there are some promising programs in R&D, but overall, a boom in physics money will not be coming this year. High-energy physics money has risen for the first time since the mid-1960's, funds have been appropriated for a Very Large Array radio telescope and the Grand Tour of the outer planets has been scrapped. An informed source told PHYSICS TODAY that funds for basic research in physics in the universities will be about $140 million—up about $3 million from FY 1972.

The watchword in this year's science budget appears to be "applied." As Presidential Science Adviser Edward E. David Jr said in his presentation of the FY 1973 R&D budget, "a major objective of the Administration is to increase the contributions of science and technology to domestic problems." In line with this, total R&D funds will rise from $16.4 billion in 1972 to $17.8 billion in the coming fiscal year, stressing such areas as energy, health, education, environment, urban problems and transportation.

The Office of Science and Technology listed as policy "highlights" the following areas:

- A more strategic approach to R&D as exemplified by the Domestic Council's examination of new technological possibilities. This Executive Office study helped identify areas where government efforts could create new jobs, stimulate industrial production and innovation, improve overseas trade and "more directly meet the needs of man and the nation."
- Channeling of the total R&D effort toward civilian needs.
- The strengthening of fundamental research support to maintain "a solid foundation under the nation's applied sciences and high technology."
- Utilization of the capabilities of the "high-technology" agencies such as NASA, the Atomic Energy Commission and the National Bureau of Standards to deal with domestic problems and national long-range goals.
- Experimental incentives programs in the National Science Foundation and the National Bureau of Standards to stimulate industrial R&D and its application.

NSF has requested $653 million, a figure that does not include the $21.7 million held last year by the Office of Management and the Budget. The budget also includes $80 million for Research Applied to National Needs (RANN) (an increase of $24.1 million) and $22 million as part of $40 million to be shared with the National Bureau of Standards for research on ways to increase industrial and other nonfederal investment in R&D and to increase productivity through the application of science and technology. Another program, which would cost $2.5 million, is to study the economic effects of R&D. For Scientific Research Project Support $275.3 million is requested (see table 1).

The budget for physics (see table 2)

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NSF advisers question their role

Is the National Science Foundation leaning too heavily towards applied research? This is a question some members of the National Science Board, the Foundation's "board of directors," are asking. Such concern about the new direction for the NSF has also been expressed to PHYSICS TODAY by some physicists who serve on the advisory committees to individual segments of NSF. These advisers are distressed, too, at their general lack of effectiveness in communicating advice to the Foundation.

LEDERMAN

When the NSF was first established, it was forbidden to support applied research. Then several years ago the Daddario act changed the enabling legislation so that applied-research support was no longer forbidden. At that time the question was raised, "Are you letting the camel into the tent?"

Since the Nixon Administration took office, pressure has been put on the National Science Board and the Foundation, through the Office of Management and Budget and the Office of Science and Technology, to support more and more applied research. Others have faulted the Foundation with bending too strongly to the winds of relevance.

Leon Lederman of Columbia, who is a member of the Mathematics and Physical Sciences Advisory Committee, said that no one is objecting to well-thought-out programs in applied science. "But the philosophy that basic research has to ride on the coattails of applied physics is totally wrong. I think most of the committee believes that, and we've said more or less that in our last report."

Lederman worries that if NSF tends towards immediacy, that in time of a budget contraction, it will act the way a mission agency would—cut down or cut out of basic research. "If you want to exaggerate," he said, "NSF is turning into a quick-fix agency."

Board member Joseph Reynolds (Louisiana State University) told us

munity, giving the community a larger role in Foundation decisions that affect it.

When NSF decided to form its Division of Materials Research, for example, the Physics Advisory Panel was not consulted. Ronald Geballe (University of Washington), who recently retired as chairman, says he is quite uncertain about the fate of the Panel's advice to the Foundation. "Panel members are seldom made aware of the reception and consequences, if any, of their recommendations. And when the Panel is not even consulted before such far-reaching changes as the formation of the new Materials Research Division are made, one realizes even more vividly its impotence. Panel meetings are used by staff members as occasions to exchange information and ideas among themselves, something they don't seem able to manage without this mechanism," he said. "This materials-research affair is just one more example of the frustrating experience of serving on the Advisory Panel. It demonstrates that the internal management of the Foundation doesn't take the Panel, which represents the outside community, seriously, even though they pay us to come to Washington. It feeds us selected issues, absorbs what we say, and nothing much happens as a consequence."

The new chairman of the Physics Advisory Panel, Russell Donnelly (University of Oregon), says he took the chairman's job because he felt how ineffectual they had been during the couple of years he had served on the panel, and he wanted to try to reverse that a bit. He wants the panel to take a much more active role than before.

One Panel member remarked that the definition of its responsibilities and powers are not clearly laid out. "The subject matter is so big and moves so fast that by the time you get caught up with everything that's happened, you've got very little time left to give much intelligent advice. And then when it's given, you don't often know what happened to it."

The outgoing chairman of the Mathematics and Physical Sciences Advisory Committee, George Vineyard (Brookhaven), says he doesn't feel that you can make a blanket statement that his committee is all dissatisfied with the Foundation's response to its recommendations. On the other hand, Lederman told us that some committee members discussed resigning because the committee had not been receiving any response to its pleas for more funds for basic physical science (which he says has not been getting anything like the increase that NSF as a whole has been getting).

A Board member agreed that there is some dissatisfaction among people on the Vineyard committee and admits that there is room for improvement. He notes that the way the NSF functions, with the lead times that are required, it is almost impossible to get advice on a live issue from one of these committees. They can serve as sounding boards, though, getting a feeling from the community of how things are going, and also providing a mechanism for transmitting information back to the scientific community. —GBL

Budget

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is slightly higher. According to an NSF official, the budget, in contrast to FY 1972, contains some support for new thrusts. Although last year's physics budget had its entire increment over FY 1971 allotted for programs that were to be picked up from other agencies, this year's budget has only a small portion set aside for agency dropouts.

An increase of $1.3 million is requested for Elementary Particle Physics. This program's funds will provide for the upgrading of the Cornell Electron Synchrotron, additional costs at Stanford and for users of high-energy accelerators.

In Nuclear Physics, the start of experiments at Columbia University's Nevis Synchrocyclotron will require an increase in money as will the Los Alamos Meson Physics Facility. NSF presently supports about one-third of the university-based experimental nuclear-physics work in the US.

In Atomic, Molecular and Plasma Physics, about one-half of the total research support will go to experimental investigations of simple atomic and molecular systems. About one-fourth of the program goes for basic plasma physics.

The Theoretical Physics program is suffering from withdrawal of funds by mission-oriented agencies. According to NSF, the Theoretical Physics program is "severely impacted by demands on it from the highly talented investigators who can no longer obtain funding."

RANN is requesting funds for work in some areas that will support physics, such as research on energy-conversion technology and particularly solar energy. Earthquake engineering and excavation and tunneling technology as well as extractive metallurgy are also being funded.

Funding for scientific research support in astronomy will be up $0.8 million to $8.8 million.

NSF has requested $3 million for the initial development of the Very Large Array radio telescope, which will consist of 27 antennas, each 82 feet in diameter, distributed along three 13-mile-long arms of a Y-shaped railroad track. According to NSF, the array will give radio astronomers as much resolution as the 200-inch Palomar optical telescope.

Table 1. NSF Scientific Research Project Support

Discipline	FY 1972 (millions of dollars)	FY 1973 (millions of dollars)
Atmospheric sciences	11.6	13.0
Earth sciences	9.2	11.1
Oceanography	12.6	14.0
Biological sciences	53.4	59.9
Physics	32.9	36.0
Chemistry	24.1	26.8
Astronomy	8.0	8.8
Mathematics	13.6	14.4
Social sciences	22.5	24.6
Engineering	25.4	29.3
Materials research	33.3	37.4
Total	246.6	275.3

Table 2. NSF Physics Budget

Program	FY 1972 (millions of dollars)	FY 1973 (millions of dollars)
Atomic, molecular and plasma physics	3.25	3.6
Elementary particle physics	14.2	15.5
National Magnet* Laboratory	2.3	2.6
Nuclear physics	11.3	12.4
Solid-state and low-temperature physics* (includes theory)	9.15	9.8
Other theoretical physics	4.15	4.5
Total	44.35	48.4

* Handled in Division of Materials Research

David briefs physics-community leaders

Presidential Science Adviser Edward E. David Jr met with representatives of AIP and its member societies in February to discuss the forthcoming Presidential message on science and technology. About 40 leaders of the physics community were present including members of AIP, the AIP Governing Board, society presidents and secretaries, the Committee on Physics and Society and the Corporate Associates Advisory Committee. The meeting was one in a series of meetings David has had with leaders from all scientific disciplines.

David summarized the R&D outlook in the new budget, noting particularly an increased emphasis on domestic and industrial programs, and he affirmed that the special message on science and technology is the start of a national science policy.

Increases in research in domestic science were welcomed by the physicists, as were the proposed industrial programs, but they pointed out the necessity of making sure that positions are found in these new programs for physicists, and as early as possible. Also discussed at the meeting were the difficulties in manpower studies introduced by the elimination of the National Register and the importance of expanding the program of public education about science.

A letter covering many of these points has been sent to David from the society presidents: Philip M. Morse, American Physical Society; Kenneth Ford, American Association of Physics Teachers; Aden B. Meinel, Optical Society of America; John C. Johnson, Acoustical Society of America; F. R. Eirich, Society of Rheology; Martin Schwartzschild, American Astronomical Society, and Jerome Karle, American Crystallographic Association. The letter urges David to take steps to remedy the unemployment problem among physicists and to apply money in the Domestic Council programs to university-based research. The letter noted that "federal funds expended in physics R&D, after correction for inflation, have been decreasing steadily since 1967. To continue this trend without major correction may be damaging in view of the emphasis the message places on the need for innovation and high technology." The letter applauded funding for the Very Large Array radio telescope and the Batavia accelerator. —SMH

The five NSF-sponsored National Research Centers are being given an estimated $42.3 million, an increase of $2.1 million from the FY 1972 level, but because the funds for the Very Large Array are included under the National Radio Astronomy Observatory, the Centers are experiencing a net loss of funds. The National Astronomy and Ionosphere Center at Arecibo will be funded at $3.3 million, down $0.7 million, Cerro Tololo at $2.7 million, up $0.2 million, Kitt Peak National Observatory at $8.2 million, up $0.5 million, the National Radio Astronomy Observatory (less funds for the VLA) at $7.2 million, up $0.2 million, and the National Center for Atmospheric Research at $17.9 million, down $1.1 million.

Funds for special NSF science education programs are also down in the budget request. The Institutional Improvement for Science Program experiences a drop of $4.0 to $8.0 million in Institutional Grants for Science (formula grants), and a drop of $9 million to zero is associated with the phasing-out of the Science Development Program. The latter program had supported institutions with NSF-sponsored projects that did not receive supplementary funding. Graduate-student support is provided in 500 new graduate fellowships. There is a decrease in graduate-student support of $6 million to $14 million reflecting the phase-out of the traineeship program, and, as last year, there is no funding for postdoctoral positions or for teaching-assistant summer traineeships. There is an increase of $7.8 million to $70 million for the Science Education, Development and Demonstration Program.

In the AEC, total physical-research funds requested are $282 million, a rise of $17.0 over FY 1972. This rise includes an increase of $6.55 million for the National Accelerator Laboratory's first operating expenses and an increase of about $2 million for "partial exploitation" of the modified AGS at Brookhaven. The rise in high-energy physics spending from $116.4 million to $126.4 million is the first such rise since the mid-1960's.

There is also an increased request of $2.9 million in medium-energy physics. Two new accelerators, the Los Alamos Meson Physics Facility and the MIT 400-MeV electron linear accelerator, will be helped into operation by $3.5 million. According to AEC, "other activities in medium-energy physics will be reduced to offset the difference."

AEC research oriented to solving civilian problems will cover such areas as tunneling, large energy-storage systems and cryogenic power transmission.

Work in controlled fusion is beginning to receive funding commensurate with its press coverage—funding for operating expenses is up $7 million from the currently authorized amount of $31 million.

DOD and NASA. An informed source told PHYSICS TODAY that physics research is down in NASA and the Department of Defense. DOD research is budgeted at $123 million. The important areas of interest are oceanography, biomedical research, atmospheric sciences, electronics and materials.

NASA will drop the Grand Tour outer-planets exploration, but the Administration hopes to add the space shuttle. The total budget will drop $25 million to $3302 million but, according to OST, the budget for space-science research will be increased 25% to $554 million. Programs provided for include the new Orbiting Solar Observatory, OSO-I, the Viking automated Mars lander scheduled for 1975, the last Apollo mission and Skylab. —SMH

Table 3. AEC Physics Operating Budget

Program	FY 1972 (millions of dollars)	FY 1973 (millions of dollars)
High energy	116.40	126.40
Medium energy	13.10	16.00
Low energy	25.30	25.30
Mathematics and computers	4.80	4.65
Chemistry	49.00	46.95
Metallurgy and materials (solid state physics)	25.20	24.50
Controlled fusion	31.00	38.00
Total	264.80	281.80

in brief

Engineering for Resolution of the Energy-Environment Dilemma: A Summary is available from the Committee on Power Plant Siting, National Academy of Engineering, 2101 Constitution Ave, N. W., Washington, D. C. 20418.

The American Association of Junior Colleges has established a Career Staffing Center that will serve as a clearinghouse of information both for junior and community colleges with job openings and for individuals seeking employment. Member colleges of AAJC and persons seeking positions may obtain information from the AAJC Career Staffing Center, P. O. Box 298, Alexandria, Va. 22314. □