

state & society

NSF asks for 23% budget increase as agency research support drops

About \$94 million worth of support for fundamental research will probably have been dropped by various Federal agencies in the two-year period ending on 30 June, according to William D. McElroy, NSF director. At the NSF authorization hearing before the House Subcommittee on Science, Research and Development held in late March, McElroy and other NSF officials discussed their budget request of \$622 million for fiscal year 1972, an increase of 23% over the preceding year.

McElroy said that over the past 18 months there has been a continuing and growing shift in research emphasis by various Federal agencies, as they have concentrated more emphasis on specific mission objectives. The major impact has been felt in physics, astronomy, biology and engineering. In fiscal year 1970, \$30 million worth of research projects were dropped. On top of that, through mid-January of this year an additional \$28 million were dropped. Besides that, he said, NSF has indications that about \$36 million in additional projects will be dropped before the end of June. He said that NSF's authorization request provides for a substantial increase (\$40 million) so that NSF can partially meet the research-support needs caused by changes in other agency programs.

He assured the committee that NSF would review each proposal formerly supported by the other agencies; he said that each such proposal must compete with other applicants for support.

Edward Creutz, NSF assistant director for research, noted that the large increase in the physics and chemistry programs of NSF (from \$30.8 million to \$43.0 million and from \$19.5 million to \$27.7 million, respectively) represents an attempt to stabilize the national level of effort. But one educated guess is that federal funds for university-based physics research will be down about \$5 million from fiscal 1971. In contrast the decisive increases in the social sciences, engineering, biological sciences and oceanography programs are designed to bring about a significant increase nationally, Creutz said.

McElroy elaborated on NSF plans to cut some educational programs. NSF has suspended indefinitely its university and departmental development pro-

grams, which since 1965 gave over \$200 million to about 100 universities. He said that these programs have generally achieved their objective, upgrading the capability of our institutions to do fundamental research and train scientists and engineers.

Major decreases in the NSF Science Education Program are in student development support. He explained that at this particular time, NSF feels that its first priority is to support research, both the traditional disciplinary type and the problem-oriented type. NSF can help use the talent of unemployed scientists and engineers by increasing its support for research, he said.

"When faced with the difficult priority decision of support for the production of more scientists and engineers or the utilization of more of the available manpower, we favored the latter." In addition he noted that "no special financial stimulation appears to be required to attract additional young people into science and engineering."

The outlook for new PhD's is grim. Junior and senior postdoctoral fellowships and summer traineeships for teaching assistantships are being eliminated, according to Lloyd G. Humphreys, NSF assistant director for education. The largest single reduction is in

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Columbia reactor gets "thumbs down"

The AEC Atomic Safety and Licensing Board has denied permission to Columbia University to operate its Mark II Triga research reactor. This is the first time an operating license has been denied for a research reactor. In fact, operation of a research reactor has never before been the subject of a public hearing and review by an atomic safety and licensing board because until the Columbia case no one had ever formally contested the issuance of an operating license for such a reactor.

Seven years ago Columbia was granted permission to construct the reactor on its campus, in the heart of one of the most densely populated areas in the nation. Since then some community opposition to the reactor developed. Hearings were held by the board in November 1969, and six political officials were among the opponents. The board requested additional data from the parties involved, and additional hearings took place in July 1970. On 6 April 1971 the board finally handed down its decision, denying approval to operate the reactor.

The Mark II Triga reactor is designed to operate at steady state at power levels up to 250 kW and can be pulsed for several milliseconds to peak powers of about 250 000 kW. By the end of last year, AEC licenses had been granted to 22 Triga reactors, some of them in highly populated areas. Among those with



Mark II Triga reactor at Columbia University has been denied permission to operate. Core is viewed from top of installation through 16 feet of water. Grid plates that hold the fuel are seen at bottom.

steady-state power levels between 250 and 1500 kW are three at Gulf General Atomic (in San Diego), which manufactures the reactors, one at the University of California in Berkeley, one at the University of Texas in Austin, and one at the University of Wisconsin.

Over the last eleven years Columbia has received \$670 000 from AEC and NSF to build the reactor and associated equipment, according to William W. Havens Jr, who is director of the division of nuclear science and engineering in Columbia's School of Engineering and Applied Science.

In its decision the licensing board declined to decide the issue of whether the reactor operation will be harmful to the health and safety of the public. It did say that there is reasonable assurance that operation in both steady-state and pulsed modes can be conducted without endangering the public. It cited the absence of substantive criteria from the AEC concerning accidents for

research reactors and of "convincing objective standards of the regulatory staff." It said that it should not decide whether a reactor accident could endanger the public just on the basis of a single proceeding and its own personal views.

The board specifically urged that the AEC regulatory staff ought to sponsor a new experiment to resolve a conflict in Gulf General Atomic data on what fraction of fission products would be released under postulated accident conditions. Figures from two experiments, one conducted in 1960 and one in 1966, differed by a factor of 3000.

Any party to the proceeding could appeal the decision until 10 May.

Members of the Atomic Safety and Licensing Board are Valentine B. Deale, chairman, a Washington lawyer, Hood Worthington, a nuclear scientist of Wilmington, Del., and Eugene Greuling, physics professor at Duke University. —GBL

San Francisco museum stresses involvement

A novel experiment in science education for the general public is underway in San Francisco. It is a museum of science and technology called the "Exploratorium," which first opened its

doors to the public in Sept. 1969. The director of the Exploratorium, Frank Oppenheimer, is a particle physicist currently on leave from the University of Colorado.

Instead of static exhibits or push-button experiments, the new museum demonstrates basic principles with dynamic experiments that are designed to challenge the perceptions and affect the senses of the operator as well as his intellect. Interaction between the museum guest and the experiments is the rule at the Exploratorium. Professional artists have contributed to many of the exhibits.

Experiments and demonstrations at the Exploratorium include a photo-activated harp, lasers, a synthetic-odor display, a SLAC spark chamber for cosmic-ray demonstrations, stroboscopes, optical-illusion displays and many others. There is a holography exhibit and several displays of optical art, as well as a computer-poetry display and models of spacecraft. The visitor can operate a large gyroscope or manipulate a bar magnet to affect a cathode-ray-tube image.

Admission is free at the Exploratorium; there are no guards; high-school students also serve in the museum program as part-time "explainers." The museum has received a National Science Foundation grant to enable secondary-school students to participate in the construction of experiments.

According to Oppenheimer, there is a great need for museums of this type. The Exploratorium is an attempt to integrate the museum into the educational structure, not as a replacement for the classroom experience but as a

teaching environment to supplement it.

The museum is housed in the Palace of Arts and Sciences, which was constructed for the 1915 Panama-Pacific International Exposition. The building was extensively renovated in 1964-67. A board of directors, including physicists Edward U. Condon, Edwin McMillan and Wolfgang Panofsky as well as many other notables, sponsors the museum. The Exploratorium is entirely supported by foundation grants and gifts from private individuals. GLM

James Fletcher becomes new director of NASA

The new director of NASA is James C. Fletcher, formerly president of the University of Utah. He succeeds Thomas O. Paine, who resigned in September.

After earning his PhD in physics from the California Institute of Technology in 1948 Fletcher joined Hughes Aircraft Company. In 1954 he became associate director and then director of electronics in the guided-missile research division of Ramo-Wooldridge Corp. Four years later Fletcher and an associate organized the Space Electronics Corp, which later merged with the spacecraft division of Aerojet General Corp to form the Space General Corp; Fletcher became its first president. Later he became chairman of the board of Space General and Systems Vice President of Aerojet General. In 1964 he resigned to become president of the University of Utah.

Fletcher has been a member of the President's Science Advisory Committee.

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graduate-student traineeships, where NSF proposes no new starts (as it did last year). The predoctoral fellowship program is being somewhat reduced in terms of numbers of fellowships available. Humphreys said, "We believe that the increase in funding for research, both in the Foundation and nationally, will provide for manpower needs in the immediate future without the special incentives obtained from these traineeships and fellowship programs." —GBL

Model-cities program for engineers and scientists

A pilot program to place 400-600 unemployed engineers and scientists in staff positions in state, county and local government has been approved to be instituted by the US Department of Housing and Urban Development and the Department of Labor (see *physics today*, February, page 61). It is ex-



Stereo sound at the Exploratorium allows visitor to vary the arrival time of a tap on a vacuum-cleaner hose.