state & society

US physics budget: NASA declines while DOD gains

The National Aeronautics and Space Administration is proceeding with development of the Space Shuttle, despite a budget plan for the 1977 fiscal year that lags behind inflation. However, the agency's one-year moratorium on spending for the Large Space Telescope has galvanized many astronomers into a widespread show of support for the project's rescue. Meanwhile, a continuing policy of real growth in basic-research funding at the Department of Defense bodes well for its physics programs in the coming year.

(The funding of research and development at NASA and DOD is examined in this article; ERDA's and NSF's R&D budgets were treated in PHYSICS TODAY, March 1976, page 85.)

Shuttle vs. scope? Notable boosts in FY 1977 R&D funding over the previous year's levels for the Space Shuttle (for example, for its main engine and for launch and landing operations) reflect determination at NASA to produce the shuttle as soon as possible. The FY 1977 budget request for the project (independent of payload experiments) is more than $1.28 billion, 35% of the agency's total budget plan ($3.69 billion, up just 4% from the previous year) and 46% of its R&D funding.

The LST, a 2.4-meter optical telescope to be placed aloft by the Space Shuttle in the early 1980's, was budgeted for a $12-million so-called "new start" in FY 1977, but NASA's final request includes no funding for the project. Princeton University's Lyman Spitzer (chairman, Astrophysical Sciences) and John N. Bahcall (Institute for Advanced Study) informed their colleagues of this event and urged them to express their opinions to NASA and to their congressional representatives. The astronomers sought at least $2.5 million in restored LST funds for the development of photon-counting detectors. According to Bahcall, "several congressional representatives and their staffs have been very helpful and evidenced a real understanding of the purposes of basic science." A House appropriations committee headed by Congressman Donald Fuqua (D., Fla.) has since voted to restore $3 million to the LST in FY 1977.

On completion the LST, which could observe at wavelengths from 10^{-7} to 10^{-3} meters with at least a tenfold improvement in resolution over ground-based optical telescopes, would cost $350–400 million. Its adherents are concerned that the FY 1977 funding drop might lead to termination of research efforts by disaffected industrial contractors.

Other NASA projects. The LST cut leaves the Solar Maximum Mission as the only FY 1977 new start in NASA's budget request for physics and astronomy (see Table 1). The mission craft will observe solar ultraviolet and x-ray emissions; it is designed for Delta-launch and Space-Shuttle retrieval. Space science, funded under the R&D section of NASA's budget, has fallen 13% overall, from $434 million in FY 1976 to $379 million in FY 1977.

CURRIE

Lunar and planetary exploration also suffers in FY 1977; funding in these areas has plummeted from $254 million in FY 1976 to $191 million. Among the casualties is a proposed Mariner Jupiter–Uranus mission. But the second

continued on page 79

NAS Assembly establishes procedures and priorities

The reorganization of the National Academy of Sciences–National Research Council shows signs of bearing fruit. Both the Assembly of Mathematical and Physical Sciences and its Office of Physical Sciences Advisory Board are making progress in establishing organization procedures and research priorities.

We discussed Assembly developments with D. Allan Bromley, AMPS Executive Committee member and chairman of the OPS and its Advisory Board. He told us that a primary benefit from the reorganization is that requests to the NRC, formerly channeled to a particular division of relatively narrow interests, now are presented directly to the Assembly, whose members share a much broader and more varied scientific expertise; this is in response to the increasingly interdisciplinary nature of the tasks to which the NRC directs its attention.

While it is too early for solid evidence, Bromley feels that the new system is working. He cites the repeated occurrence, when panel proposals have been brought before the AMPS Executive Committee, of promising new areas of study or new aspects of a problem being pointed out that possibly would have been missed altogether in the earlier, less variegated context. Also, he believes heightened sensitivity has led to more balanced panels, with the broader expertise on the Executive Committee promoting more immediate identification of the right participants.

The Assembly of Mathematical and Physical Sciences is one of four assemblies and four commissions (the others are the Assemblies of Behavioral and Social Sciences, Engineering, and Life Sciences, and the Commissions on Human Resources, International Relations, Natural Resources, and Sociotechnical Systems) created in the reorganization of the National Research Council (see PHYSICS TODAY, May 1975, page 69). Much of the review and

lective and shell-model theories.

The isochronous cyclotron at the University of Maryland is used primarily for investigations of nuclear structure and reaction mechanisms. Director Harry Holmgren suggests that the facility could continue to play a key role in examination of interactions in the transition region between low and medium energies, due to the cyclotron's production of protons in the 20–100-MeV range. As with the Iowa Ames Lab, all ERDA funds for the cyclotron lab's nuclear-science efforts are scheduled to run out on 30 September.

According to Gerhart Friedlander (Chemistry Department, Brookhaven National Laboratory), who heads the Ad Hoc Panel on the Future of Nuclear Sciences within the National Research Council, the ERDA cut will cripple other nuclear-science laboratories as well: Argonne National Laboratory's CP-5 reactor, used for materials-science research as well as nuclear work, will face reduced operation; nuclear-science support for the reactor is to go to zero. A decline in reactor use at the Oak Ridge National Laboratory and at Brookhaven is anticipated as well, due to reductions in nuclear-science funds.

Large university-based facilities are expected to feel the impact of the cuts in terms of underutilization; these major facilities would have to function at only a fraction of their potential research capacity, using 50–70% of optimal operation time. Friedlander sees both national and university laboratories that do nuclear-science research suffering 10–15% decreases in productivity between 1976 and 1977, with the most serious setbacks in the low-energy area.

The National Science Foundation's FY 1977 budget request includes a $3-million increase for nuclear-science basic research, but the net increase between NSF and ERDA is only about one percent, far below predictions for inflation.

ERDA spokesmen explain the nuclear-science slump from $79 million in FY 1976 to $77 million the following year in terms of a broadened mandate that compels the agency to invest seriously in non-nuclear research efforts. Others suggest that increasing hostility to nuclear power plants has affected support for nuclear research, though ERDA's fission and fusion efforts are to be stepped up substantially—with a 42% increase over FY 1976 funding—in FY 1977.

D. Allan Bromley, head of Yale University's physics department, feels that the cut is a serious mistake in that it suggests that ERDA has adopted short-term practical results in energy research as its new funding yardstick; he worries that basic research is being systematically transferred into just one agency, NSF, and that the former close coupling between such research and the different missions to which it relates in various agencies is being lost. Bromley too predicts an effective 15% cut in the level of effort for all remaining university-based nuclear-science research programs funded by ERDA. —FCB

US physics budget

continued from page 77

Mariner Jupiter–Saturn probe, tentatively scheduled for launching in September of 1977, might recoup the loss. If the craft were still performing well when it neared Saturn in 1981, NASA would have the option of directing the probe to Uranus, which it would approach three or four years after its brush with the ringed planet.

DOD's basic-research boost. Guidelines that call for annual 10% hikes beyond inflation through 1980 for research in defense sciences at a basic level are in effect at DOD's Office of Defense Research and Engineering. Director Malcolm R. Currie, the policy's initiator, also told us of a 5% yearly increase in real dollars for exploratory development, an area that includes much basic-level work. Currie says guideline objectives are to re-invigorate defense-related basic research and to rebuild DOD's relationships with the university community. University contracts account for the greatest share of DOD's basic research efforts.

"I think we ought to be doing more," Currie says, "in basic research that relates conceptually to our defense mission." He predicts that the department's emphasis on basic research will particularly benefit physics, as well as other sciences.

Overall, DOD's FY 1977 budget request for R&D, including testing and evaluation, totals $10.9 billion, up by 15% over FY 1976. Of this total, $383 million is to be devoted to research at a basic level.

Outlook for physics. DOD's detailed plans for physics-related spending in FY 1977 were not available at this writing, but physics-related research is expected to receive emphasis. A DOD spokesman estimates that $42 million will be requested for research activities that involve substantial contributions from physics. DOD transition-quarter funds are expected to be 25% of FY 1976 levels for most items.

On the average, 40% of DOD's basic research in electronics and 15% in materials research consists of physics; thus the FY 1976 physics spending in those two areas is approximately $11 million

Table 1. NASA physics and astronomy

	(millions of dollars, estimated) FY 76	Trans. Qtr.	FY 77
Solar observatories	3.60	0.90	1.00
Astronomical observatories	2.50	0.60	2.60
High-Energy Astronomy Observatories	59.22	13.50	36.60
Orbiting Explorers	29.68	7.40	33.00
Sounding rockets	20.00	6.20	20.70
Airborne and balloon programs	4.80	1.30	5.30
Supporting research and technology	14.40	3.60	14.70
Data analysis	5.00	1.30	5.00
Skylab data analysis	6.00	1.50	4.00
Large Space Telescope—advanced technological development	5.00	2.00	0
Solar Maximum Mission	0	0	21.30
Solar Maximum Mission—advanced technological development	1.00	0.70	0
Upper atmospheric research	3.50	1.00	11.60
Spacelab science program	4.60	3.50	10.00
Total	159.30	43.50	165.80

Table 2. DOD physics-related basic research

	(millions of dollars) FY 74	FY 75	FY 76 (est.)
Physics	27.50	26.80	26.80
General	25.00	24.40	24.50
Nuclear	2.50	2.40	2.30
Astronomy, astrophysics	6.85	6.68	7.15
Electronics	25.40	26.60	27.10
Materials research	23.10	23.90	28.80

and $4 million, respectively. Moreover, some physicists are employed in other categories of DOD basic research—such as oceanography and energy conversion—for which percentages are not accessible. Therefore, totals based on data in Table 2 do not indicate the complete physics-related defense spending.
—FCB

Ford Foundation funds two nuclear studies

The Ford Foundation has authorized funds for two studies on nuclear-energy issues. A one-year nuclear-energy policy study will be financed by a $679 000 grant to the Mitre Corp, and research at Princeton University's Center for Environmental Studies on the problems associated with the development of a plutonium economy will be funded by a $170 000 grant.

The Mitre Corp is a private, nonprofit consulting firm. The nuclear-energy policy study will be headed by Spurgeon Keeny, formerly assistant director of the US Arms Control and Disarmament Agency, and now with Mitre Corp.

Members of the study group are: Kenneth J. Arrow (Harvard University), Harold Brown (California Institute of Technology), Albert Carnesale (Harvard), Abram Chayes (Harvard), Hollis B. Chenery (International Bank for Reconstruction and Development), Paul Doty (Harvard), Philip J. Farley (Brookings Institution), Richard L. Garwin (IBM), Marvin L. Goldberger (Princeton University), Carl Kaysen (Institute for Advanced Study), Hans H. Landsberg (Resources for the Future), Gordon J. MacDonald (Dartmouth College), Joseph S. Nye (Harvard), Wolfgang K.H. Panofsky (SLAC) Howard Raiffa (Harvard), George W. Rathjens (MIT), John C. Sawhill (New York University) and Thomas C. Schelling (Harvard).

The study at Princeton's Center for Environmental Studies will be headed by Frank von Hippel, a theoretical physicist.

the physics community

AAS elects Code as vice-president

Arthur D. Code, professor of astronomy at the University of Wisconsin-Madison, has been elected to a two-year term as a vice-president of the American Astronomical Society. He will take office 23 June and serve with Donald E. Osterbrock (University of California, Santa Cruz), who has been a vice-president for one year and will serve for another. The new councillors that were voted in at the same time are Frank D. Drake (Cornell University), Philip Morrison (Massachusetts Institute of Technology) and Edward P. Ney (University of Minnesota, Minneapolis). The AAS elects three councillors to three-year terms each year.

Code has been a member of the staff of the Mt Wilson and Palomar Observatories and currently is the Joel Stebbins Professor of Astronomy on the Madison campus. He has taught at the University of Wisconsin-Madison since 1969 and his research interests include the photoelectric spectrophotometry of stars and nebulae and space astronomy.

Jack Knox takes office at Society of Rheology

At the October 1975 annual meeting, Jack R. Knox took office as the newly-elected president of the Society of Rheology. Knox, a research associate in polymer properties at Amoco Chemical Corp and formerly vice-president of the Society of Rheology, succeeded Ronald S. Rivlin in the two-year position. Also taking office was Irvin M. Krieger as vice-president (see PHYSICS TODAY, January, page 103).

After receiving his master's from Louisiana State University in 1952, Knox spent eight years with E.I. du

KNOX

Pont de Nemours and Co and three years with Avisun Corp. He completed his PhD in physical chemistry at the University of Delaware in 1963 and then returned to Avisun Corp (which was purchased by Amoco Chemical Corp in 1968).

The Society of Rheology is currently the smallest member society of AIP; Knox told us that during his term as president, he hopes to increase the membership by organizing joint meetings with other societies and encouraging other physicists doing rheology-related work to participate in the society.

AAPM moves its offices to Chicago

The American Association of Physicists in Medicine has moved its offices, as of 1 January, from New York City to Chicago. The association's new mailing address is 111 East Wacker Drive, Chicago, Illinois 60601, and their phone number is (312) 644 6610. All inquiries and information previously sent to Ethel Snider, the association's New York administrative secretary, should now be referred to the attention of S. Pierce at the Chicago office.

AAPT has films on Skylab activities

The American Association of Physics Teachers is making available 12 films, in which scientific activities under free-fall conditions aboard the National Aeronautics and Space Administration's Skylab are displayed. Produced in cooperation with NASA, these single-concept Super 8-mm films include such topics as human momenta and mass measurement, reference frames and gyroscopes.

Novel Experiments II, a new volume containing descriptions of 45 different undergraduate-level laboratory experiments, is also available from the association. The Skylab films are obtainable at $14.75 per film for AAPT members ($21 for non-members), and the book sells for $6.30 to members, $9.00 to others. Information on both the films and the book is available from the AAPT Executive Office in the Graduate Physics Building at the State University of New York at Stony Brook, New York 11794.

in brief

The National Science Foundation has published *Graduate Science Education: Student Support and Postdoctorals* (NSF 74-318), available for $2.15 from the Superintendent of Documents, Washington, D.C. 20402.