state & society

Physics research gains in Defense budget

President Carter's budget request for FY 1979 contains over $130 million for physics-related research to be conducted or sponsored by the Air Force, Army and Navy. This would be a 13% increase over the previous fiscal year. Overall, defense-related R&D in FY 1979 has been budgeted at $12.7 billion (about 45% of the total Federal R&D budget), an increase of $1.0 billion over FY 1978. DOD research funding is also expected to rise by 14% to $467 million.

In addition to the funds budgeted for the services, the Defense Advanced Research Projects Agency has allocated $49.1 million for its Defense Research Sciences program, as compared to $42.0 million in FY 1978. Precisely how much of this is physics-related research is uncertain, but a brief breakdown is given in the table on page 103.

The DOD High-Energy Laser Program, according to the budget, would increase from $150.0 million in FY 1978 to $184.1 million in FY 1979. The charged-particle beam technology program, funded at about $11 million since FY 1977, may receive an additional $6.0 million this year as a result of a new management plan. Both of these programs are funded by all three services, and laser research receives additional support from DARPA.

DOD has asked for $9 million to begin

DAVIS

a new Defense Science and Engineering Program designed to strengthen ties between the department and the academic research community.

The estimates summarized in the table come from several military sources. It should be realized that each service (including its office of scientific research) has different management systems and thus different ways of reporting their budget figures. Care should therefore be taken in making comparisons or overall assessments of each service's program.

For example, in-house work to be done in the Army is listed by technology area; thus exact figures were unobtainable for research to be done in separate scientific disciplines at the Army laboratories. George Gamota, in the Office of the Undersecretary of Defense for Research and Engineering, estimates that about $30 million will be allocated for physics-related work at these locations. A detailed breakdown of physics and materials research done under Army contract was also unobtainable for FY 1979, but the Army Research Office indicated that optics is expected to receive a large percentage increase, and that moderate increases were planned for work in condensed matter, electromagnetic technology and the last three categories listed under "Materials" in the table. All other programs were expected to remain at a fairly constant level.

Air Force support for physics-related research appears to have increased only to the extent of meeting cost-of living increases. A separate breakdown of in-house and contract work was unobtainable. Similar increases are budgeted for most of the Navy's physics-related efforts; small decreases are planned in the Naval

continued on page 102

New NBS director plans to restore scientific strength

New opportunities for employment of physicists at the National Bureau of Standards will occur this year if its budget for FY 1979 is approved by Congress. This is the expectation of Ernest Ambler, sworn in as the new director of NBS on 3 February. Ambler recently talked with PHYSICS TODAY about his plans for the Bureau.

The President has asked Congress to appropriate $94.4 million, a 26% or $24.2 million increase (the largest in the Bureau's history) over the FY 1978 level. (NBS's total budget for FY 1979 may reach $155 million, which includes Congressional appropriations as well as funds received from sales of goods and services and for work done for other Federal agencies and industry.) The new budget includes a program increase of $2 million as the final increment of a five-year plan for increasing basic research and rebuilding technical competence. The erosion of NBS's scientific and technical base was recently the focus of Congressional concern (PHYSICS TODAY, January 1978, page 101). At his confirmation hearings Ambler noted that NBS's efforts in mathematical modeling, computer sciences, organic chemistry, materials science and surface physics "are all presently at a level where increased resources could be applied in the national interest."

In the first year of the rebuilding period, Ambler told us, he expects that physicists will be hired to work in computer science, mathematical modeling, the study of mechanical properties of materials and the determination of properties of materials through small-angle neutron scattering using the NBS reactor. He was less certain about what new personnel he would be recruiting in future years, but believed that some physicists would be hired to strengthen the Bureau's capabilities in theory and mathematics. In addition, "there are areas of physics in which the Bureau must be pre-eminent and where there will always be opportunities, such as the fundamental limitations to the width of a resonance (which is directly linked to how well you can stabilize frequencies), and

any new kind of idea that holds promise in the area of fundamental constants. We shall be strengthening through consolidation, and possibly through expansion, our studies on the nature of critical phenomena, an area that we are strong in."

Ambler contrasted his situation with that of Edward Condon, who was director of the NBS in the immediate postwar period (1945–51) when the Bureau had a similar opportunity to strengthen its scientific capability. In Condon's time, many new fields of physics were opening up. "Now, I'm not sure whether the situation is the same. To be sure, there are areas of rapid growth; but some of these, such as high-energy physics, are just way outside our being able to afford them. Some of the best opportunities I see for physicists in the Bureau would come if they are interested in the contributions of physics to multidisciplinary problems. If physicists have a turn of mind to be interested in the broader aspects of problems, I think the future will be very bright for them." As examples of multidisciplinary problems, Ambler mentioned mathematical modeling, the nature of surfaces from the point of view of their physical, chemical and mechanical properties, non-equilibrium processes in chemical kinetics, the technology of computers, automation and sensors and the strength of materials.

Ambler stressed that in building scientific competence within the Bureau, he will be consulting with people in industry and in the universities—something he has been unable to do to any great extent while serving as acting director of the NBS since June 1975. He expects to have more time to represent the Bureau externally after he completes building his upper-level management team, which includes a new deputy director (the position which Ambler has held since 1973) and the directors of the major management units within the NBS.

Ambler has become director of the NBS at a time not only when it expects to receive a large increase in funding, but also during a period when a major reorganization along disciplinary lines will be taking place within the Bureau. At his confirmation hearings, he pointed out that "many activities that have developed a common technical discipline are now spread throughout the organization. Bringing these dispersed activities together will strengthen the organization technically."

Under the old organizational structure, the NBS was divided into four institutes: Basic Standards, Materials Research, Applied Technology, and Computer Sciences and Technology. The new structure retains the last institute as a separate unit, but the others have been reorganized into two new units. The National Engineering Laboratory will be responsible for R&D and services allied to solving national problems in engineering and applied science; the National Measurement Laboratory will be responsible for the national system of physical, chemical and materials measurement. The latter will be divided into five centers (for absolute physical quantities, radiation research, thermodynamics and molecular science, analytical chemistry, and materials science) and nine offices.

AMBLER

The largest increase in the NBS's FY 1979 budget would be in computer technology, up from 4.3 million in FY 1978 to $17.9 million. A program increase of $1.6 million (up to $19.9 million) has been requested for the program in properties and performance of materials, including nearly $1 million in additional funds for the nondestructive evaluation techniques program.

At his confirmation hearings, Ambler noted that NBS during the coming year plans to double the present power (10 megawatts) of its reactor, which functions as an experimental neutron source. The NBS linear accelerator, he admitted, is facing obsolescence and competition from more modern facilities, but studies are being made to see if possible design modification can return it to the status of a frontier instrument. He also conceded that the NBS synchrotron ultraviolet radiation facility has a smaller and less powerful beam than similar facilities elsewhere, making it less desirable for research purposes; but he noted that it has the best stability and definition of beam, allowing it to function as an absolute standard source of uv radiation.

—CBW

Staff changes at NSF physics division

The physics division of the National Science Foundation has a new director, and other staff changes have also been made within the division.

Marcel Bardon, the former deputy director of the division, became the director in November, succeeding the late William Wright in the position. Shortly before his death in March, Wright was appointed a senior planning officer to work with James A. Krumhansl, the assistant director charged with the administration of research in the physical sciences at NSF.

Other staff changes include the appointment of Howel G. Pugh, the former program director for intermediate-energy physics, to head the new nuclear science section formed within the physics division. Several new program officers were also appointed.

The new program officers are:

John Poirier of Notre Dame University, now a program officer for elementary-particle physics; Barry Holstein from the University of Massachusetts, Amherst, is now a theoretical physics program officer; Douglas Bryman of the Tri-University Meson Facility in Vancouver, Canada, who is a program officer for intermediate-energy physics; Hobson Wildenthal of Michigan State University and new program officer for nuclear physics and Norman Gelfand of the University of Chicago, who also is an elementary-particle physics program officer.

Additionally, Richard Isaacson has been named the program director for gravitational physics. Isaacson moves from being the associate program director for theoretical physics.

Defense budget for physics

continued from page 101

Research Laboratory's support of general physics and materials research.

Lasers and charged particles. For its High-Energy Laser Program DOD has requested $184.1 million in FY 1979. The funding is aimed at developing the technology base (pointing, tracking, subsystems and fire control) for potential weapons using lasers. The amount of $145.4 million has been requested for the three services and $38.7 million for the Defense Advanced Research Projects Agency. The latter agency is investigating the possible applications of high-energy lasers in space; it is thus concentrating its efforts on the development of efficient infrared chemical and visible electric laser technologies as well as the precise pointing systems and large optics that will be necessary in space.

The charged-particle beam technology program of DOD may receive in FY 1979 an additional $6 million beyond its regular funding of about $11 million per year. The possibility of extra funding, which would go to the Navy, developed after a new management plan addressing this technology was completed by Ruth M. Davis, Deputy Under Secretary of Defense for Research and Advanced Technology.

Davis testified in a Congressional hearing that "Plans for advanced development efforts have been cancelled. In-

stead a new exploratory program has been established by the Navy. Now included in this program are efforts on power switching, generation and storage that previously had been scattered as separate pieces in various projects. These changes should simplify the management of these efforts and provide for better coordination. Additionally we will be identifying a research effort in the Navy to complement the exploratory development program by concentrating on key scientific deficiencies."

The charged-particle beam technology program involves all three services. In FY 1979, the Army expects to receive $4.3 million for its efforts, the Air Force $1.3 million for theirs, and the Navy $5.6 million in addition to the possible extra funding.

DOD expects that if major R&D difficulties can be overcome, the technology will have applications not only for projected beams, but also for fusion-plasma heating, inertial fusion, advanced simulation, laser pumping, radiation-cone electronic countermeasures and microwave generation.

Academic research. DOD hopes to restore some of its weakened ties with academic scientists by the initiation in FY 1979 of a new Defense Science and Engineering Program. The President has

Defense Department physics-related R&D

(estimated budget authorizations in millions of dollars)

	FY 1978		FY 1979	
Air Force (In-house and contract work)				
Physics				
Optical physics	3.9		4.2	
Plasma physics	1.8		2.0	
Electricity and magnetism	1.2		1.3	
Atomic and molecular physics	1.5		1.7	
Quantum physics	1.4		1.6	
Charged-particle beams	1.1		1.3	
Radiation interaction with matter	0.5		0.5	
Physical evaluation of materials	2.8		3.1	
Total physics		14.2		15.7
Electronics				
Optical electronics	2.9		3.2	
Electron devices	3.4		3.8	
Electromagnetic propagation	3.1		3.4	
Electronic materials	3.8		4.2	
Non-destructive evaluation	0.6		0.7	
Total electronics		13.8		15.3
Materials				
Superconductivity	0.9		0.9	
Optical materials	3.9		4.3	
Total materials		4.8		5.2
Total Air Force		32.8		36.2
Army Research Office (Contract work only)				
Physics				
Atomic and molecular physics	0.5			
Optics	0.6			
Electrical phenomena	0.2			
Condensed matter	1.3			
Electromagnetic technology	0.8			
Total physics		3.4		4.1
Electronics				
Physical electronics	0.6		0.7	
Electron devices	0.6		0.7	
Antennas and electromagnetic detection	0.6		0.7	
Circuits, networks and related systems	0.5		0.5	
Signal processing, communications and related systems	0.5		0.6	
Computers and information processing	0.2		0.6	
Total electronics		3.0		3.8
Joint Services Electronics Program		2.0		2.1
Materials				
Studies of factors affecting degradation & reactivity	0.7			
Mechanical behavior	0.7			
Effects of structure, defects & composition	0.7			
New methods of synthesis and processing	0.7			
New concepts in testing, analysis and simulation	0.3			
Total materials		3.1		3.5
Total Army Research Office		11.5		13.5

(estimated budget authorizations in millions of dollars)

	FY 1978		FY 1979	
Navy (In-house and contract work)				
General physics				
Office of Naval Research				
Solid-state physics	1.0		1.2	
Surface & interface physics	0.5		0.6	
Atomic physics	0.7		0.8	
Molecular physics	0.6		0.7	
Lasers and electro-optics	2.0		2.3	
Radiation transport	0.6		0.7	
Radiation interaction	0.8		1.0	
Laser applications	0.5		0.6	
Physical acoustics	0.8		1.0	
Plasma physics	0.4		0.5	
Superconductivity	0.9		1.1	
Total ONR		8.8		10.5
Naval Research Laboratory		10.1		9.9
Total general physics		18.9		20.4
Electronics				
Office of Naval Research				
Antennas and propagation	0.7		1.0	
Space radiation effects	1.2		1.4	
Physical electronics	2.1		2.5	
Electronic interactions	0.3		0.3	
Solid-state electronics	1.3		1.5	
Radiation solids	0.9		1.0	
System theory	1.2		1.5	
Total ONR		7.7		9.2
Naval Research Laboratory		3.3		3.4
Naval Air System Command		1.2		1.3
Naval Electronic System Command		0.9		1.0
Total electronics		13.1		14.9
Materials				
Office of Naval Research				
Properties of metals	1.7		2.0	
Ceramics	1.7		1.8	
High-temperatures & special events	1.4		1.7	
Corrosion mechanisms	1.2		1.7	
Total ONR		6.0		7.2
Naval Research Laboratory		5.7		5.5
Naval Air Systems Command		2.7		2.9
Total materials		14.4		15.6
Total Navy		46.4		50.9
Defense Advanced Research Projects Agency				
Defense research sciences				
Materials sciences	15.7		16.6	
Cybernetics sciences	4.7		5.0	
Computer and communications sciences	17.6		17.2	
Advanced geophysical concepts	0.5		0	
Unconventional detection research	3.5		6.1	
Nuclear test detection	0		4.2	
Total DARPA defense research sciences		42.0		49.1

requested $9 million this year for the program, which would be managed separately from the regular Defense Research Science Program. It would initially have direct oversight by Davis's office, which would be responsible for coordinating the program among each of the various services.

According to Davis, the program "will emphasize research that relates to broad problem areas characterized by scientific and engineering uncertainties which can best be resolved by the expertise resident within the academic research community." As examples of possible research problems Davis mentioned the study of physical properties (such as superconductivity and magnetic characteristics) occurring at near absolute-zero temperature, erosion-resistant materials science, surface physics and chemistry, non-destructive evaluation processes and beam propagation (particle and light) through natural media.

The formation of this program, designed to encourage the interest of academic scientists in problems of national defense, was one of the recommendations of the 1976 Defense Science Board Task Force on Fundamental Research in Universities, headed by Ivan L. Bennett Jr (PHYSICS TODAY, February 1978, page 77). To implement the program, several mechanisms are under consideration. According to William J. Perry, Under Secretary of Defense for Research and Engineering, they include workshops on high-priority problems, small "starter" programs to expedite novel basic research ideas, and establishment of cooperative research efforts within universities on selected problems. —CBW

the physics community

Crystallographers elect Glusker vice-president

Jenny P. Glusker, a member of the Institute for Cancer Research in Philadelphia and on the faculty of the University of Pennsylvania, has been elected the vice-president of the American Crystallographic Association. She succeeds Philip Coppens, professor of chemistry at the State University of New York at Buffalo, in the position. Coppens is now the president of the Association for 1978, himself succeeding Carroll K. Johnson of Oak Ridge National Laboratory.

GLUSKER

Glusker, a native of Great Britain, received her education at Oxford University, earning a BA in 1953 and a PhD degree in 1957. She was appointed a research fellow in x-ray crystallography at the California Institute of Technology in 1955, and remained at the Institute until 1956. In that year she took up her work at the Institute for Cancer Research and continues there at present.

Her primary research interests include work in physical biochemistry and x-ray crystallography, and within these fields she has done extensive research in infrared spectroscopy and the study of molecular structures. In addition, she has worked in the area of enzyme reactions, particularly the mechanisms of reactions induced by x rays, and x-ray crystallographic studies of enzymes.

Her cancer-related work is directed towards investigations of polycyclic mutagens and carcinogens and the metabolic products of such carcinogens.

IRS challenges tax status of societies

The Internal Revenue Service has proposed the revocation of the Federal income-tax exemption of the American Institute of Physics and the American Chemical Society under Section 501(c)(3) of the Internal Revenue Code. These proposals appear to have resulted from a systematic review by the IRS of the tax-exempt status of various nonprofit organizations.

Four other societies (The American Physical Society, the American Society of Mechanical Engineers, The American Society of Civil Engineers and the American Institute of Chemical Engineers) have received proposed modifications of tax status from 501(c)(3) to 501(c)(6). The former is a charitable, educational or scientific organization, whereas the latter is a business league or trade association. As applied to scientific societies, the principal difference between the two is that 501(c)(3) is concerned with the advancement of a science (for example, physics), whereas 501(c)(6) is concerned with the advancement of scientists (for example, physicists). Examples of 501(c)(6) include the American Medical Association and the American Bar Association.

The AIP and the APS have filed formal protests against the proposed revocation and modification of their tax-exempt status.

Five colleges win Marsh White Awards

Society of Physics Students chapters at five colleges and universities received cash awards to support student-originated projects designed to promote interest in physics among both students and the general public. Sponsored by the American Institute of Physics, the 1978 Marsh W. White Awards were presented to the following institutions:

- The University of Arkansas for use by the "University of Arkansas' Metric Class for the Public."
- Creighton University in Omaha, Nebraska, for their "Creighton University Physics Field Day."
- The University of Dayton for their "Foucault Pendulum Day at the University of Dayton."
- Morehouse College's "Society of Physics Students' Lectureship Program."
- West Georgia College's "Instructional Movie of Changing Electric Magnetic Fields Using a Computer."

The awards are named in honor of Marsh W. White for his 40 years of service to Sigma Pi Sigma, the physics honor society within the SPS. White served as its executive secretary from 1930 through 1967 and as its president from 1968 to 1970. He is at present an emeritus professor of physics at Pennsylvania State University and is a past president of the American Association of Physics Teachers.

Chapters of the Society of Physics Students are eligible for the awards.

in brief

Manpower Resources for Scientific Activities at Universities and Colleges January 1976 (NSF 77-308) may be purchased for $2 per copy from the US Government Printing Office, Washington, D.C. 20402.

Chinese Astronomy, a translation journal of *Acta Astronomica Sinica* , is available from Pergamon Press for $105 per year (institutional price). Subscription inquiries should be sent to Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, England. □