

cosponsored with the New York Academy of Sciences an International Conference on Collective Phenomena in April, to take place at the Moscow home of refusenik physicist Viktor Brailovsky.

Kip Thorne, a Caltech theorist, has chosen not to interrupt a decade-old joint research program in gravity-wave research with Vladimir Braginsky of Moscow State University. "Of all the channels of communication between Russia and America, the strongest and least noisy is that between individual scientists. It is especially important, when other channels are breaking down, to keep the scientist-to-scientist channel open by maintaining a modest amount of person-to-person contact," Thorne explained.

Congress has also responded to the exile of Sakharov. Representative George Brown Jr (D-Cal.), chairman of the House subcommittee on science, research and technology, introduced legislation in January calling for a one-year halt to formal scientific exchanges with Russia. His bill would substantially curtail only official exchanges, that is, those arranged for under our bilateral agreement with the Soviets. Individual exchanges will be left to the discretion of the individuals involved, though, as one subcommittee staffer pointed out "it places the onus on the scientist who chooses to go to Russia; he is the one who should justify his actions."

The bill implicitly recognizes certain exceptional circumstances, such as the need to continue ongoing experiments. The moratorium would also not apply to

multilateral meetings, such as last month's international Scientific Forum in Hamburg.

The Scientific Forum is "a meeting of leading personalities in science" from the 35 countries that signed the 1975 Helsinki Accord, "to discuss interrelated problems of common interest and to promote the expansion of contacts, communications and exchange of information between scientific institutions and among scientists."

The American delegation to the Forum, led by Philip Handler, was under great pressure to boycott the meeting (PHYSICS TODAY, January, page 11) even before Sakharov's exile, because it was the Soviet Union's response to the Helsinki Accord that was largely responsible for the imprisonment of physicist Yuri Orlov, computer scientist Anatoly Scharansky and 18 other members of the Helsinki Watch Group (PHYSICS TODAY, July 1978, page 61). Handler explained his reasons for attending the Forum in testimony before Congressman Brown's subcommittee: "... It presents an opportunity to raise fundamental issues with Soviet counterparts and with the representatives of 33 other countries. There should be no mistaken impression that I will lead a delegation to discuss 'business as usual'... If instead, we were to boycott the Hamburg meeting, it would have little effect on the Soviet Union except to exempt them from this single opportunity for an international examination of Soviet actions in the light of the Helsinki Accords..." —MEJ



Very Large Array radio telescope. All 28 dishes have been built and are now being installed in a Y-shaped arrangement at the site near Socorro, New Mexico. When completed (probably by the end of the year), the VLA will have a maximum resolution, depending on its operating frequency, of 0.1–0.5 arc-sec. NSF expects to provide \$5.2 million in FY 1981 for the operation of the Very Large Array.

longer available to provide investigators with the resources required to carry out their research in an optimal manner. Physical scientists accepted for funding by the NSF characteristically are offered only about two-thirds of the support they request, Klemperer said, not because NSF feels the proposals are artificially inflated, but because there is not enough money to go around. While this does not prohibit the researcher from carrying out his experiment, he typically does so under less than ideal circumstances. Klemperer said that he realized that this situation can not be reversed in just one year, but his directorate will make some attempt to increase the size of the individual awards in FY 1981.

Physics. 1980 was anything but a windfall year for physics funding at NSF. A budget that was generally regarded as austere for physics was cut even lower by Congressional action and internal directives, so that the current plan for physics spending in 1980 is about 1% lower than the original budget request. All subfields except theoretical physics and gravitational physics were reduced to accommodate the lower overall total.

In the 1981 budget, real growth is planned for gravitational physics and theoretical physics, each getting a 22% boost. (See table on following page.) The \$0.7-million increase for gravitational physics will be used mainly for experimental projects, such as the development of gravitational wave receivers, prototype studies of wide-band gravitational radiation detectors, and development and production of low-noise transducers and amplifiers for narrow-band devices.

The theoretical-physics budget will increase also, as the Institute for Theo-

NSF requests 16% boost for physics

In his Fiscal Year 1981 budget request President Jimmy Carter continued his administration's policy of strong support for basic research. Support for all R&D is expected to total \$36.1 billion in 1981, an increase of \$4.2 billion over FY 1980, and obligations for basic research are estimated to be \$5.1 billion in 1981, an increase of \$543 million. Even subtracting the government's 9% estimate of cost-of-research increases in that period, this still translates into a real growth of 3% for basic research and 4% for all R&D.

In his briefings on the new budget, Presidential science adviser Frank Press noted that, with the inclusion of the 1981 budget, the increase in support of Federally funded basic research since Carter has been president amounts to 40%, or about 9% growth above increased costs. Press also pointed out, however, that over the 13-year period 1967–80, support for basic research in the physical sciences dropped 14% in constant dollars while support for basic life-sciences research grew 19%. "To compensate for the real contractions in the support of physical sciences and mathematics since 1967," he

said, "special attention has been paid to budgets for these activities in several Departments and agencies."

Basic research support in the new budget would increase by 17% in the National Science Foundation, 13% in the Department of Energy, and 21% in the Department of Defense.

NSF. Obligations for the conduct of R&D in the NSF are estimated to total \$1.06 billion in 1981, including \$952 million for the support of basic research. To compensate for the real contraction in the support of the physical sciences and mathematics since 1967, NSF support in these areas would increase by 17% in 1981. In the physics division, support would increase 16%.

Within the Mathematical and Physical Sciences directorate, NSF will try to increase the average size of the awards made to investigators, including young researchers and postdoctoral fellows. William Klemperer, Assistant Director for Mathematical and Physical Sciences, told PHYSICS TODAY that support for research in his directorate has eroded to the point where adequate funding is no

retical Physics (PHYSICS TODAY, March 1979, page 125) enters its first full year of operation at the planned level. The Institute will receive \$1.2 million from the physics and the materials research divisions.

In elementary-particle physics, the planned increase of \$3.4 million will be divided into \$0.7 million for the Cornell Electron Storage Ring (bringing the total to \$7.4 million for the newly converted e^+e^- colliding-beam facility), and \$2.7 million to "restore the vitality of university-based user groups by providing instrumentation and technical support which was restricted during the CESR conversion." During the past three years, heavy emphasis was given to preparing CESR and PEP for experiments. Accordingly, the base users program was reduced and improvements in instrumentation were postponed. The increase of \$2.7 million will be used mainly to provide instrumentation such as fast mini-computers and to develop data links to central computers. The increase for CESR is in anticipation of higher power costs and other items due to inflation. The facility will still be operating at only about 70% of its capability, however.

In intermediate-energy physics, the increase of \$1.5 million will be used primarily to improve electron accelerators at Stanford University and the University of Illinois, bringing the estimated total for these two projects to \$4.6 million in FY 1981. The Indiana University Cyclotron Facility will receive a cost-of-living increase. Reductions in other areas of intermediate energy physics will be partly offset by shifting funds from the University of Maryland Cyclotron, which is expected to be shut down or significantly cut back in FY 1981.

The nuclear-physics budget requests an increase for Michigan State University to support research at the newly completed (Phase I) 500-MeV heavy-ion cyclotron. This money will support the in-house research program on Phase I and will provide equipment and manpower to make the facility accessible to outside users as well as to the resident staff. The installation of a superconducting linear accelerator for heavy ions at SUNY, Stony Brook, will proceed as planned. The anticipated output energy of the linac, which will act as a booster for Stony Brook's tandem Van de Graaff, will range from 12 MeV/A for oxygen ions to 5 MeV/A for bromine at an accelerating gradient of 2.5 MV/m. The Stanford tandem will be closed down, with the funds being redistributed among the remaining laboratories.

The \$1.2-million increase for atomic, molecular and plasma physics will allow little expansion. Enthusiasm for new research techniques in atomic physics that represent both a greater level of sophistication and a greater cost, such as accelerator-based work, is putting a strain

on the atomic, molecular and plasma physics budget (traditionally a rather small part of the NSF physics budget) that will have to be addressed in future years.

The materials research budget for 1981 shows a determined emphasis on research project support rather than the large national facilities. While the overall division increases average about 15%, funding for the synchrotron radiation facilities at Stanford University and the University of Wisconsin is being held essentially constant as construction activities are completed and increased levels of operation and instrumentation are implemented. Support for half-time dedicated operation of SPEAR at Stanford, which will add capabilities in the x-ray region in 1981, continues at a level of \$2.0 million. Support for the Materials Research Laboratories is increased by \$2.8 million, to a total of \$22.2 million. The budget also calls for a modest increase in the current level of effort at the National Magnet Laboratory.

The Foundation's Engineering and Applied Science Directorate was formed last summer by combining the engineer-

ing activities with the Applied Science and Research Applications Directorate. The 1981 budget request for this directorate is \$137 million. This directorate will support the National Submicron Facility at Cornell University and provide research on microfabrication techniques using ion beams and composite materials systems for electronic devices.

In astronomy, \$5.2 million are earmarked for the operation of the Very Large Array radio-astronomy facility at Socorro, New Mexico, scheduled for completion next January. The astronomy budget also provides \$1.7 million for detailed design and specifications for a new 25-meter diameter, millimeter-wave telescope, to be located atop the Mauna Kea mountain in Hawaii. The telescope, which will require an additional \$27 million in Fiscal Years 1982-84, will be able to receive wavelengths at least as short as 1 mm.

An additional \$2.8 million for the astronomy centers will cover inflated operating costs and provide for some new instrumentation. This brings the operating budget to \$3.2 million in FY 1981. The budget also calls for a 7% increase in astronomy project support, making a total

NSF physics-related research

	(in millions of dollars)	
	FY 1980 (current plan)	FY 1981 (estimate)
MATHEMATICAL AND PHYSICAL SCIENCES DIRECTORATE		
Mathematical sciences	24.9	29.3
Computer research	18.2	23.3
Physics		
Elementary particle	22.8	26.2
Intermediate energy	11.1	12.6
Nuclear	11.8	13.5
Atomic, molecular and plasma	7.1	8.3
Theoretical	7.4	9.0
Gravitational	3.2	3.9
Total Physics	63.4	73.5
Chemistry	51.4	59.5
Materials Research		
Solid-state physics	8.1	9.6
Solid-state chemistry	4.7	5.6
Low-temperature physics	4.6	5.4
Condensed-matter theory	4.6	5.5
Metallurgy	7.1	8.3
Ceramics	3.6	4.2
Polymers	4.1	4.9
Materials research laboratories	19.4	22.2
National Magnet Laboratory	4.0	4.6
Synchrotron radiation	7.9	8.0
Small-angle neutron scattering	0.4	0.4
Total materials research	68.5	78.6
Total	226.4	264.2
ASTRONOMICAL, ATMOSPHERIC, EARTH AND OCEAN SCIENCES DIRECTORATE		
Astronomical sciences		
National astronomy centers	39.1	41.0
Research project support	17.9	19.2
Total astronomical sciences	57.0	60.2
Atmospheric sciences	63.2	71.1
Earth sciences	25.3	27.9
Ocean sciences	66.6	76.0
Arctic research program	5.8	6.1
Total	217.9	241.3

of \$19.2 million in the 1981 budget.

Several new themes permeate the 1981 NSF budget. New and strengthened programs to stimulate industrial innovation, as prescribed by Carter last year (PHYSICS TODAY, January, page 119), are planned. For example, the Foundation will increase its support of industry/university cooperative research programs by more than \$20 million. NSF is also moving to strengthen opportunities for small businesses to contribute to the national research effort; an increase of \$10 million is requested for the Small Business Innovation Research Program, bringing the total budget for this program to about \$13.0 million.

Another special effort is to upgrade university research laboratories, many of which, NSF notes, have outdated facilities that bring less than optimal return on the Federal dollar investment. NSF will

make a start on alleviating this problem with a \$14.3 million matching-grant program to improve such facilities.

Science education. Two NSF science-education programs, the Minority Institutions Science Improvement program and the Elementary School Science Teacher Training program, have been transferred to the new Department of Education (PHYSICS TODAY, December, page 88), but NSF continues to be the key agency responsible for strengthening science education at all academic levels. In FY 1981, the Foundation will continue to concentrate efforts at the junior high school level, because experience has shown that large numbers of students, especially minorities and women, drop out of science courses at this level. The FY 1981 budget request for science education at NSF is \$85.7 million, a 10% increase over last year.

Funding for the Foundation's Regional Instrumentation Facilities program will drop \$1.8 million in FY 1981 to \$3.0 million. No new facilities will be funded in 1981 in order that NSF can evaluate the success of the experimental program. Fourteen regional laboratories have been set up since the program was initiated two years ago (PHYSICS TODAY, February, page 22).

The NSF's largest new start in FY 1981 will be a 10-year Ocean Margin Drilling Program, using the government-owned ship, *Glomar Explorer*, and an advanced deep-ocean drilling system. The program should result in new information on continental drift and the history of the continental margins. OMDP is expected to cost \$700 million, which will be shared evenly with several petroleum companies. NSF has requested \$10 million for this program in FY 1981.

—MEJ

the physics community

ACA elects Johnson as vice-president

American Crystallographic Association members have elected Quintin C. Johnson, associate department head of chemistry and materials science at Lawrence Livermore Laboratory, as their vice-president for 1980. In addition, Robert A. Sparks of California Scientific Systems, Sunnyvale, Cal., was selected to be the Association's treasurer for the next three years beginning in July.

Johnson took his BA from St. Olaf's



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College, Northfield, Minnesota in 1957. Four years later, the University of California, Berkeley granted him his doctorate in chemistry. From 1960 to the present, he has worked at the Livermore facility as a crystallographer doing high-pressure crystallography and flash x-ray

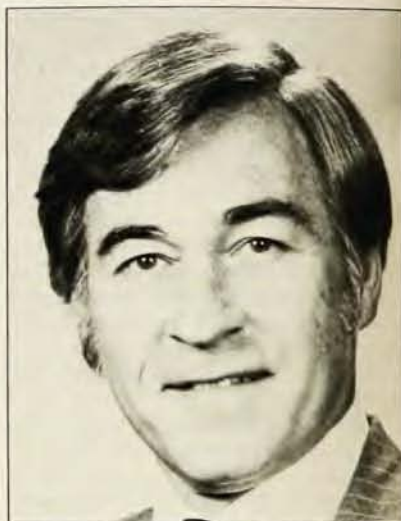
diffraction studies, and developing methods to automate powder diffraction analysis. Johnson succeeds Harold W. Wyckoff (Yale University), who moves up to the presidency. Wyckoff in turn succeeds Jenny P. Glusker (Institute for Cancer Research, Philadelphia, Pa.).

Madden chosen as OSA vice-president

The Optical Society of America has elected Robert P. Madden to the office of vice president. Madden will become president-elect in 1981 and president the following year. The 1979 president-elect, Warren Smith (Infrared Industries Inc., Santa Barbara, California), has succeeded Dudley Williams (Kansas State University) to the presidency and Anthony DeMaria (United Technologies Research Center, East Hartford, Conn.), will become president-elect. All of these officers serve on the OSA board of directors.

Madden, who is chief of the far ultraviolet physics section, optical physics division, National Bureau of Standards, earned a BS at the University of Rochester in 1950. Johns Hopkins University granted him a PhD in physics six years afterwards. He was a staff member at the Laboratory for Astrophysics & Physical Meteorology, Johns Hopkins University, from 1953 to 1958. For the next three years Madden served as a physicist and section chief at the US Army Engineering Research Laboratories, Ft Belvoir, Virginia. In 1961, he joined the NBS where he currently conducts and manages vacuum-ultraviolet and soft x-ray radiation studies on atoms, molecules, solids and surfaces.

OSA members have also elected three



MADDEN

directors-at-large to three-year terms. They are Alexander J. Glass (Lawrence Livermore Laboratory), John L. Hall (Joint Institute for Laboratory Astrophysics, NBS) and Walter P. Siegmund (American Optical Corporation).

in brief

Two panel studies conducted by the Council on Materials Science of the Department of Energy have now been published. The panel reports, *High Temperature Ceramics*, chaired by H. Kent Bowen of MIT, and *Theory of Surfaces*, chaired by Donald R. Hamann of Bell Laboratories, are available from Donald K. Stevens, Division of Materials Sciences, Department of Energy, Washington, D.C. 20545. □