Physics Today

Rise in energy R&D leads the way in 1975 science budget

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Citation: Physics Today 27(4), 121 (1974); doi: 10.1063/1.3128557
View online: http://dx.doi.org/10.1063/1.3128557
View Table of Contents: http://scitation.aip.org/content/aip/magazine/physicstoday/27/4?ver=pdfcov
Published by the AIP Publishing

Rise in energy R&D leads the way in 1975 science budget

The energy crisis may have a silver lining for many researchers as the FY 1975 Administration budget request for energy-related research has sharply increased over FY 1974 levels. Federally-sponsored research and development could be funded 10% more for FY 1975—for a total outlay of $19.6 billion. Of this, $1.8 billion would be earmarked for energy-related research and development, an 80% increase over the FY 1974 allocation of $999 million. The largest portion of this energy money would be allotted to the Atomic Energy Commission ($932 million).

The FY 1975 National Science Foundation budget request is for $788.2 million, $141.8 million more than last year. Of this increase, $137.9 million is directly in support of the accelerated national energy R&D program.

Edward Creutz, NSF assistant director for research, spoke to us about the meaning of additional energy funding. "The purpose of the increased energy-related research funding is to enhance our understanding of energy-related phenomena not only for currently conceived applications, but for future use in energy developments, only some of which are now foreseen. These are certain areas of science where it is quite clear that more knowledge would help us plan for and face problems of energy supply, transportation, transformation and use."

To coordinate energy research activity at NSF, Creutz indicated that an Energy Related General Research Office (ERG) would be formed. "This office will have no program budget itself," he said, "but will coordinate the energy-related proposals that come from outside after they have gone through the appropriate technical section office."

Large increases in research funding are budgeted for several NSF RANN programs including solar-energy research (an addition $36.8 million) and for location of geothermal resources (an added $16.6 million). The total budget for the RANN program will also be greatly enhanced, with $75.1 million for FY 1974 and $148.9 million for FY 1975.

Other projects for which NSF would provide increased funds include an additional $8 million for accelerated development of the Very Large Array for radio astronomy as part of $10 million more for the four major National Astronomy Research Centers and the National Center for Atmospheric Research. (FY 1975 request is $52.5 million.) NSF support this year is also expected for research in the polar regions, in the oceans and to provide for US participation in the 45-nation International Geodynamics Program.

The NSF physics section budget request is 23% more than for FY 1974

CREUTZ

(Table 1). This large increase, according to section head Marcel Bardon, has two major causes—the first is the $2.6 million in new money for energy-related work. This is money that did not exist last year and should provide new opportunities during FY 1975. The other major increases come in elementary-particle and intermediate-energy

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French spending on nuclei and particles holds steady

Nuclear and particle physics in France are in a steady-state situation at a time when the rest of French physics is expected to be getting increased funds. So we were told by Jean Teillac, director of IN²P³, the Institut National de Physique Nucléaire et de Physique des Particules, which controls roughly half the money spent for French nuclear and particle physics, that portion of the science budget funded through the Ministère de l'Education nationale. The other half of the French nuclear and particle-physics budget is administered by CEA, the Commissariat à l'Energie Atomique.

Chatting in his Paris office with Teillac and his assistant, Jean Yoccoz, we learned that the emphasis in particle physics these days is in preparation for the 400-GeV Super Proton Synchrotron (SPS) at CERN. In nuclear physics, two major efforts are being mounted: conversion of the Saturne accelerator from high to intermediate-energy physics and construction of a large heavy-ion accelerator.

In France the Commission de la Recherche pour la Preparation du Plan has recommended for the sixth plan (1971–75) that nuclear and particle physics increase by 5%. In fact the increase has been 6–7%, but because of inflation the real increase is 0.5–1%. For the rest of physics, the plan calls for a 10% increase, again not taking into account inflation. Teillac expects that over the next five years there will be at most an increase of 1% in the number of jobs in nuclear and particle physics. While the number of physicists will essentially remain stable, he hopes that the money for each physicist will increase. He expects that the share that nuclear and particle physics gets out of the total physics pie will remain the same.

In 1973 the total French expenditure on nuclear and particle physics, including salaries, was about 600 million francs. Of this the contribution to CERN was 180–200 million francs, IN²P³ spent 200 million and CEA another 200 million francs. For each of the two agencies the money was split about the same—half for nuclear physics and half for particle physics. Taking into account the contribution to CERN, this means that France spent about two-thirds of its nuclear and particle physics budget on high-energy physics.

Manpower distribution is a different story. IN^2P^3 supports about 230 physicists in particle physics and about 410 in nuclear physics; of these 410 about 100 do applied nuclear physics in chemistry, astrophysics and solid-state physics. In addition, IN^2P^3 supports about 2000 technicians and engineers.

In particle physics, the sixth plan gave top priority to construction of the SPS. The next highest priority was for construction of a 1.7-GeV electron-positron storage ring at Orsay, which is called DCI. It is expected to be completed this year. An earlier Orsay storage ring, ACO, is a 0.5-GeV electron–positron machine.

During the fifth plan, the emphasis was on bubble chambers, and France built Gargamelle, Mirabelle and paid for ⅓ the cost of building the Big European Bubble Chamber, BEBC. Since then, during the sixth plan, the French bubble-chamber effort has been on apparatus for scanning photographs—there are now two at IN^2P^3 and one in the CEA laboratory at Saclay. The trend of French physics, Teillac notes, is away from bubble chambers and towards electronics. Now among those working in IN^2P^3 there are 110 physicists in bubble chambers and 110 in counter physics.

Teillac is concerned about the problem of big equipment for the SPS because the French government gave considerable money for construction of the accelerator but only a small part for beams and equipment.

In nuclear physics France has seven electrostatic accelerators, one 60-MeV variable-energy cyclotron at Grenoble, a 150-MeV synchrocyclotron at Orsay, a 300–600 MeV linac at Saclay and the heavy-ion accelerator (ALICE) at Orsay. Two MP Van de Graaff accelerators, one in Orsay and one in Strasbourg, started operating last year.

In the future, French nuclear physics will concentrate on heavy-ion physics and nuclear-structure studies with particles of 0.4–2 GeV. And IN^2P^3 will join forces with CEA to run these programs as national laboratories, a trend which Teillac expects to continue.

To do nuclear-structure physics, the 3-GeV accelerator Saturne, at Saclay, will be converted from a weak-focusing to a strong-focusing synchrotron, if all goes according to plan. Although the radius will be changed, along with the magnets, the building, beam-transport and experimental areas would remain the same. Resolution and reliability would be improved and intensity would increase by a factor of ten. Teillac hopes that the reconstruction will begin this year and last three years, at a cost of 40 million francs. At present Saturne is a CEA machine but with the new plan it would be jointly operated by CEA and IN^2P^3.

The heavy-ion accelerator is proposed for the seventh plan, which begins in 1976. For the next two years technical studies will be going on. Like Saturne, the heavy-ion machine would be a national laboratory, jointly sponsored by CEA and IN^2P^3. The machine would resemble the design proposed by Oak Ridge National Laboratory (PHYSICS TODAY, July 1972, page 18). It would consist of two sector-focused cyclotrons, each of which could be used separately. In addition, one cyclotron could act as injector for the other after the beam was passed through a stripper. Eventually, it is hoped to add a tandem electrostatic accelerator, too, which would inject into one of the cyclotrons. If both cyclotrons are used, the energy available for light nuclei will be 100 MeV/nucleon; for heavier nuclei the energy drops, so that for uranium it is only 10 MeV/nucleon.

If construction begins in 1976, Teillac expects the machine would be completed in 1980 or 1981. It would cost 150–200 million francs, including the building and beam transport.

What about the rest of Europe? Teillac feels that in general, nuclear and particle physics are in a steady-state situation. England is having a revival with plans for constructing a 30-MeV electrostatic accelerator at Daresbury. In Darmstadt, West Germany, the heavy-ion accelerator UNILAC is expected to be finished in 1975. French nuclear physicists use CERN's 600-MeV synchrocyclotron, which is now being considered for shutdown, much to the dismay of some of the smaller European nations. The Swiss meson factory, SIN, is just coming on the air, but Teillac does not expect French nuclear physicists to be using it because of the high contribution needed to participate. In fact, Teillac believes that hardly any French physicists will be doing meson physics.

—GBL

US science budget

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physics. Some installations, including LAMPF, the Bates Electron Linear Accelerator and the Columbia-Nevis Synchrocyclotron, which were initiated during the 1960's are now coming into operation. Money is requested for user support for these and for users at NAL. This support would represent a major new thrust particularly in intermediate-energy physics. Additional support for atomic physics projects dropped by other agencies is also expected.

The budget proposal for the NSF Division of Materials Research (Table 2) is $45.4 million, with the largest amounts going for solid-state and low-temperature physics and materials research laboratories. Research emphases include the microscopic understanding of catalytic behavior and the development of a long-period (1-second) pulsed magnet with field capability in excess of 400 kilogauss. A more detailed breakdown of physics research in NSF's physics section and materials-research division will appear in the May issue of PHYSICS TODAY.

The NSF astronomy section is requesting an increased allocation of 20% over last year. (FY 1975 budget is $11.5 million.) The emphasis this year, according to section head Robert Fleischer, is astronomical instrumentation, in accordance with the Greenstein Committee recommendations. Specifically under investigation will be instruments put at the eyepiece of a radio or optical telescope to increase the efficiency of catching photons.

Atomic Energy Commission. The AEC basic physical research program will also be expanded in the coming year into more energy related areas (Table 3). Additional energy-related funding is expected for the molecular and materials-sciences programs. Fundamental materials-sciences projects to be pushed, according to Daniel R. Miller, deputy director of the physical research division, include radiation damage studies, high strength materials research and superconductivity (with applicability to CTR, energy transmission, storage and distribution). There will be increased molecular-sciences research in such areas as geothermal power, hydrogen systems for energy, mathematical analysis vis-à-vis energy systems, the interaction of ionizing radiation with matter and photochemical studies.

The high-energy program has a 6% higher budget for FY 1975, but the extra money will go into the Batavia accelerator, which, Miller explained, is moving from its construction phase into its operation phase. In constant-value dollars, the other parts of the high-energy program will have lower budgets.

A 55% increase in CTR allocations at AEC will allow new projects to get underway (Table 3). CTR chief Robert Hirsch described some of the planned activity for us including the start of the Doublet-III experiment at General Atomic in California—it is a scale-up of the successful Doublet II experiment there. At Princeton the Poloidal Divertor Experiment (PDX) will involve fitting the tokamak with divertors to limit impurities. Also, the Princeton Large Torus (PLT) will be completed with funds from the FY 1975 budget and begin to operate in late calendar 1975.

Table 1. NSF physics section budget

Program	FY 1974 (est.)	FY 1975 (est.)
	(millions of dollars)	
Elementary particle	14.05	15.9
Intermediate energy	4.50	7.2
Nuclear	8.20	9.5
Atomic, Molecular and Plasma	3.85	5.55
Theoretical	4.30	5.0
Gravitational	1.50	1.65
Total	**36.40**	**44.80**

Table 2. NSF materials research division budget

Program	FY 1974 (est.)	FY 1975 (est.)
	(millions of dollars)	
Solid State and Low Temperature	10.05	13.0
Engineering Materials	6.95	9.7
Solid State Chemistry and Polymer Science	2.15	2.8
National Magnet Laboratory	2.60	2.85
Materials Research Laboratories	13.5	16.75
Synchrotron Radiation Facility	0.45	0.3
Total	**35.70**	**45.40**

In the AEC plasma-research program funds are allocated to establish a CTR computer center at Lawrence Livermore Laboratory. It will utilize a class-four computer with the four major CTR laboratories, according to Hirsch, having access to it through remote job entry terminals. Hirsch also indicated that there would be an expanded effort in university plasma physics and engineering, with the emphasis on engineering.

AEC laser-fusion work will be conducted in the Division of Military Applications with an estimated budget of $44.4 million. In addition plant and capital equipment items are included in the AEC budget for two high-energy laser facilities, one at Los Alamos ($22.6 million authorization) and the other at Lawrence Livermore Laboratory ($13.4 million appropriation).

NASA. Alois Schardt, NASA physics and astronomy division director described to us some of the reasons for the large budget increase (Table 4) in his division. The High-Energy Astronomy Observatory program, which was suspended last year, will be funded for over $40 million in FY 1975 with launches now planned for 1977, 1978 and 1979. Work will begin on the hardware phase of the program. Data-analysis funds have been augmented for work on the vast amounts of information derived from the Skylab project.

Preliminary instrument development will get underway this year for the Spacelab experiment. Spacelab will be a research unit under direct human control that will be carried aboard the Space Shuttle. It will be especially useful for experiments of short duration (7 to 30 days) and may be used where new, specialized equipment has not been sufficiently developed to allow its use in an automated satellite.

Another NASA project, the Large Space Telescope, is now approaching the hardware phase. Last year the definition study for the telescope assembly was started and will be continued next year; it will be augmented by

Table 3. AEC physical research and CTR operating budget

Physical Research Program	FY 1974 (est.)	FY 1975 & energy amended (est.)
	(millions of dollars)	
Batavia Accelerator	28.40	36.0
Alternating Gradient Synchrotron	24.36	24.6
Zero Gradient Synchrotron	14.50	13.9
Stanford Linear Accelerator Center	24.30	24.7
Bevatron	4.20	1.7
General research and development	29.54	31.3
Total high-energy physics	125.30	132.2
Nuclear science	65.189	73.9
Materials sciences	32.108	40.6
Molecular sciences	29.743	40.1
Total physical research	**252.340**	**286.8**
Controlled Thermonuclear Research		
Magnetic confinement systems	29.56	43.5
Development and technology	12.87	20.0
Basic plasma research	10.57	18.5
Total operating budget	53.00	82.0
Equipment Budget	3.8	19.8
General Plant Projects	0.2	0.5
Total CTR	**57.0**	**102.3**

Table 4. NASA physics and astronomy budget plan

	FY 1974 (est.)	FY 1975 (est.)
	(millions of dollars)	
Solar observatories	10.66	7.63
Astronomical observatories	2.43	2.38
High-energy astronomy observatories	5.00	40.40
Orbiting explorers	32.85	33.00
Sounding rockets	19.35	20.00
Airborne research	4.00	4.00
Balloon program	1.00	1.00
Supporting research and technology	13.33	14.39
Data analysis	4.88	6.50
Spacelab experiment definition	0.50	3.50
Large Space Telescope—advanced technology development	—	6.20
Solar maximum mission—definition study	—	1.52
Total	**94.00**	**140.52**

a spacecraft definition study and focal-point instrument development. This work will permit a start of the hardware phase in 1976.

A Solar Maximum Mission will also be defined. This 3000-pound-class spacecraft will be compatible with space shuttle launch and retrieval. It is planned for launch in 1978 or 1979, and will carry the instruments needed to continue the solar observations in UV light and x rays that were started with the Orbiting Solar Observatories.

—RAS

in brief

The Acoustical Society of America has published a report on the Conference on Acoustics and Societal Problems, which it held in June 1972. The 100-page report can be obtained from the ASA, 335 East 45th Street, New York, N.Y. 10017. A $1.00 payment for postage and handling must accompany each order.

Solid State Radiations, Inc. has acquired TRW Instruments; the new company name is Quantrad Corp.

An NSF publication "Graduate Student Support and Manpower Resources in Graduate Science Education, Fall 1971" (NSF 73-304) is available from the Superintendent of Documents, US Government Printing Office, Washington, D. C. 20402 for $1.25.

Research and Development in Industry 1971, an NSF publication, is available from the US Government Printing Office, Washington, D.C. 20402 for $1.65 per copy.

the physics community

Fowler chosen as APS vice-president-elect

William A. Fowler, Institute Professor of Physics at the California Institute of Technology, is now vice-president-elect of the American Physical Society. He succeeds Chien-Shiung Wu (Columbia University), who has assumed the vice-presidency of the Society and will become president in 1975. W. K. H. Panofsky (Stanford Linear Accelerator Center) has succeeded Joseph K. Mayer (University of California, La Jolla) as APS president.

Three new members have been elected to the APS Council, and, in response to a recommendation of the Committee on the Future of the APS, Panofsky has appointed an executive aide to help him carry out his responsibilities as president. The new Council members are Marvin Goldberger, Eugene Higgins Professor of Physics at Princeton University; Vera Kistiakowsky, a professor of physics at the Massachusetts Institute of Technology, and Louis Rosen, director of the Clinton P. Anderson Meson Physics Facility at Los Alamos Scientific Laboratory. The new executive aide to the president is Thomas L. Neff, who is attached to the theory group at SLAC.

FOWLER

Fowler earned his doctorate at Cal Tech in 1936 and has remained there ever since. Now chairman of the physics section of the National Academy of Sciences, Fowler has also served as advisor and committee member for several other government agencies that deal with scientific activities, among them the National Science Foundation, the National Aeronautics and Space Administration, the Office of Naval Research and the Atomic Energy Commission. His research has included studies of nuclear forces and reaction rates, nuclear spectroscopy, the structure of light nuclei, thermonuclear sources of stellar energy and element synthesis in stars and supernovae, and the study of general relativistic effects in quasar and pulsar models.

Guttman succeeds Perlow as editor of JAP

Lester Guttman, a senior physical chemist at Argonne National Laboratory, is the new editor of the *Journal of Applied Physics*. Formerly an associate editor of the journal, he replaces Gilbert J. Perlow, who has served as editor of both JAP and *Applied Physics Letters* since 1970. Perlow will continue as editor of APL. The American Institute of Physics publishes the two journals.

Prior to joining Argonne in 1960, Guttman worked at the Institute for the Study of Metals at the University of Chicago and at the General Electric Company. He is now involved in studying the structure of glasses by computer simulation, with former research interests in low-temperature calorimetry, superfluidity, superconductivity, quantitative metallography, phase transitions, and neutron and x-ray diffraction. Guttman holds a doctorate from the University of California (1943).

Lewis Hull becomes AVS president-elect

Lewis W. Hull is the new president-elect of the American Vacuum Society. He succeeds Dorothy M. Hoffman (RCA Laboratories), who is now president of the Society. Maurice H. Francombe (Westinghouse Research Laboratories) was president during 1973.

Hull is the founder and president of the Hull Corporation in Hatboro, Pennsylvania, a manufacturer of vacuum systems. Also a founding member of AVS, he has served in various capacities in the Society over the past 15 years.

Other newly elected officers include J. Roger Young (General Electric Corporation Research and Development Center), who is the Society's treasurer for 1974, and Jack H. Singleton (Westinghouse Research Laboratories), elected secretary/clerk.

Seven SPS chapters win Marsh W. White awards

Seven chapters of the Society of Physics Students are the winners of the first Marsh W. White Awards (see PHYSICS TODAY, October, page 80). These awards are given by SPS to support student projects designed to promote interest in physics among both students and the general public.

Cash awards will be made to SPS chapters at Clark University, Worcester, Mass.; Coe College, Cedar Rapids, Iowa; Northeast Louisiana University, Monroe, La.; Old Dominion University, Norfolk, Va.; Southern University, Baton Rouge, La.; William Jewell College, Liberty, Mo., and the University of Wisconsin, Superior, Wisc. □