state & society

Funds per physicist drop at PhD-granting universities

Physicists have suffered the steepest decline among US scientists and engineers—in terms of basic-research expenditures per investigator at doctorate-granting institutions—during the 1966–74 period, according to the National Science Board in its new report, *Science Indicators 1974*. Though President Gerald Ford has responded to the NSB findings with the assertion that the country's research and development enterprise "continues to be productive and competitive," only two indicators in the report portray the nation as increasing its lead over scientific and technological rivals abroad.

Expenditures per physicist for basic research dropped 40% between 1966 and 1974 at US academic institutions that bestow the doctoral degree. Despite a fall from $24 500 to $14 900 in that interval, physicists remained the most highly financed, per capita, among eight subgroups of scientific and technical researchers. The NSB ascribes a 30% loss in basic-research funding per scientist or engineer in *all* disciplines over these eight years to a proliferation of doctorate-granting institutions, to an overall reduction in Federal constant-dollar expenditures on basic-level efforts and to a modest shift since 1972 from basic to applied research.

Federal support for basic research slipped by 13% in constant dollars from its peak in 1968 to 1974. Here too the physical sciences experienced the greatest proportional cut, 25% since 1969.

Basic-research obligations at the National Aeronautics and Space Administration rocketed from $110 million in constant dollars to $507 million between 1960 and 1974. NASA obligated 24% of its 1974 R&D budget to basic research (including costs for launch vehicles and tracking equipment essential to the carrying out of basic-level projects). Of this amount, physical and environmental sciences accounted for 75%, mostly in connection with the agency's undertakings in lunar and space exploration.

Similar strides have taken place in the National Science Foundation's basic-research support. Although studies at a fundamental level fell from 91% of NSF's R&D obligations in 1960 to 79% in 1974, basic-research obligations grew from $77 million to $291 million in constant dollars during this period. Physical science made up more than 30% of this basic-level effort in 1974. The AEC (now ERDA) pumped up its basic-research spending (in constant dollars) from $118 million in 1960 to $302 million in 1967, only to watch it shrink back to $198 million by 1974. Eleven percent of Federal basic-research obligations came under the AEC in 1974, and 80% of the basic-level work was allotted to the physical sciences.

In the 1960–74 period the Department of Defense allocated only 3–4% of its R&D budget to basic research. Constant-dollar expenditures in this period rose from $191 million to a peak of $284 million in 1967, then slumped all the way back to $175 million in 1974. Research in the physical sciences accounted for only 22% of DOD's 1974 basic-level investigations.

By most NSB indicators of scientific and technological robustness, the US's post-World War II lead has deteriorated over the last two decades. The nation maintained its position as a leader in terms of absolute expenditures for R&D, but the percent of the Gross National Product so spent has steadily declined for

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Advisory group recommends test of science court

Debate on a national "scientific court" to weigh science-related assertions in public-policy disputes has focused recently on the merits of oral versus written testimony. The President's Advisory Group on Anticipated Advances in Science and Technology, which William O. Baker (president of Bell Laboratories) heads, has recommended that the court be tried on an experimental basis; a three-person task force is formulating procedural guides for operation of such a body.

The task force's chairman, Arthur Kantrowitz (head of Avco Everett Research Laboratories), told us about the latest in their struggle to produce a well defined procedure. "There is a debate taking place," he informed us, "within the task force and among other interested people, on the question of to what extent—when we finally come down to a trial—the trial itself should be in writing and to what extent oral."

Written arguments, according to Kantrowitz, would leave little opportunity for dramatic confrontations. "The issues before the court would be sufficiently dramatic in themselves," he said, "without the petty drama of verbal clashes." Kantrowitz said that a series of experiments is contemplated, in which the emphasis could be shifted between oral and written testimony. Results would be weighed to determine an effective mix of the two techniques.

He and the other task force members—Frederick Seitz (President, Rockefeller University) and Donald Kennedy (a Stanford University biologist)—and the rest of the Baker advisory group have yet to make a final decision on the written–oral question and other procedural matters.

The task-force leader said that no policy issue has yet been selected for a "trial run" of the court concept, nor does any definite timetable exist for the beginning of court operations. Kantrowitz hopes to

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have procedures established before the proposed Office of Science and Technology Policy becomes a functioning reality. The scientific court could then undergo testing in a number of experimental trials, after which it would stand ready to settle disputes brought before it. "I really think what has to happen for the first case," predicts Kantrowitz, "is that we must find an issue where both sides genuinely seek an opportunity to be heard and to cross-examine their opponents."

As the scientific court is now envisioned, it would consider only the validity of scientific findings relevant to a policy decision, to the exclusion of all value-related aspects of the problem. Some past and present issues which might lend themselves to this approach include nuclear-reactor safety, the use of pesticides and the fluorocarbon–ozone question. The process might be assumed to take place as follows:

- A Government body, faced with the need to choose between opposing scientific arguments in order to reach a policy decision, sponsors and pays for an inquiry by the scientific court.
- Advocates for conflicting scientific views frame the question in a manner acceptable to all and impanel judges (themselves scientists but *not* experts in the area under dispute) to examine the evidence of scientific observation and experiment.
- The court embarks on a systematic process of elimination. The "facts" claimed by opposing contenders undergo study by judges and advocates to narrow the field of debate to essential disagreements.
- After the testimony of witnesses and cross-examination by advocates of both sides end, the judges report what they regard as the scientific facts to be taken into account by policy makers.

Kantrowitz believes the scientific court could be valuable because it would not be just one more panel of experts to be decried by detractors as biased toward an "establishment" view. Rather, the advocates of all sides would contest each other's assertions by due process. Because the court would eschew value judgments, Kantrowitz expects it could receive the widespread acceptance essential to democratic control of the nation's technological future. —FCB

ERDA realigns fission and fusion programs

Extensive realignment of ERDA's fission and fusion programs has produced three new divisions in a reshuffling of people and responsibilities within the agency. C. Martin Stickley, Douglas C. Bauer and Eric S. Beckjord join the ranks of ERDA's division directors.

Stickley heads the recently created Division of Laser Fusion. Under ERDA's Assistant Administrator for National Security, the new director will be responsible for laser and electron-beam fusion programs formerly carried on within the Division of Military Application. Stickley, who earned his doctorate in 1964 at Northeastern University, headed the laser-physics branch of the Air Force Cambridge Research Laboratories and served as Director of the Materials Sciences Office at the Advanced Research Projects Agency prior to assuming his present post.

Bauer is the new Director of the Division of Nuclear Research and Applications. He comes to ERDA from the Federal Energy Administration, where he was Associate Assistant Administrator for Utilities Programs. He will direct advanced nuclear research and development and space nuclear systems, including all reactors except the Liquid Metal Fast Breeder Reactor. Bauer's division also takes charge of the laser isotope-separation program previously assigned to DMA. In the past, Bauer has worked at the Bettis Atomic Power Laboratory. He received his doctorate in nuclear engi-

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New ERDA assistant administrator

Robert L. Hirsch has been confirmed by the Senate as the new Assistant Administrator for Solar, Geothermal and Advanced Energy Systems at ERDA. Hirsch succeeds John M. Teem, who resigned the post in January. Meanwhile Edwin E. Kintner is acting director of the Division of Controlled Thermonuclear Research in Hirsch's stead.

After he received his doctorate in nuclear engineering from the University of Illinois in 1964, Hirsch spent four years as a research physicist at ITT Industrial Laboratories, where he directed the nuclear-engineering and plasma-physics department. In 1968 he joined the Atomic Energy Commission's CTR program. He rose to the position of director of the CTR division in November, 1972, and continued in that role when ERDA was formed.

From 1971 to 1973 Hirsch acted as vice-chairman and later chairman of the American Nuclear Society's Technical Group for Controlled Nuclear Fusion; he was elected an ANS director in 1975. In 1972 Hirsch headed the Fusion Power Task Force, part of an energy-R&D goals study conducted that year by the Federal Council on Science and Technology. He led the US membership of the US–USSR Joint Commission on Scientific and Technical Cooperation in 1973.

Kintner, who left an AEC-associated naval reactor program in 1965 to join the agency, holds MS degrees in naval architecture and marine engineering and in nuclear physics. He served as assistant director and later deputy director of the reactor-engineering division. Kintner has been substantially involved with the Liquid Metal Fast Breeder Reactor Project at ERDA and has completed his first year in the CTR division.

Washington Bulletins

★ **A $3-million allocation for the Large Space Telescope,** included in the House's FY 1977 authorization bill for NASA, has been omitted from the Senate's corresponding measure. The Senate turned down funds for the project despite the LST's designation by Senator Barry M. Goldwater (R.-Ariz.) as "one of the most important programs ever proposed in the field of astronomy" and a plea by Senator Charles McC. Mathias Jr (R.-Md.) to follow the House's action. A Congressional conference committee must resolve the matter.

★ **The NSF has weathered authorization proceedings in the House** with fair success. As well as authorizing an FY 1977 budget of $811 million for the agency, the Congress defeated by substantial margins amendments that would have required the NSF's director to answer within 15 days any request by any Member of Congress concerning agency activities and would have reduced the curriculum-development program in favor of summer institutes for teachers. The House bill, which trimmed $10 million for research from the Administration's request but added $9 million for science education, now goes to the Senate.

★ **Dixy Lee Ray's State-Department post,** officially unfilled since last summer (when she resigned the job as lacking in influence) will be occupied at last. The Senate has confirmed the nomination of Frederick Irving, an officer in the US Foreign Service, to be Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs.

★ **Funds for ERDA received approval in the Senate,** which passed without amendment an authorization bill for the agency's FY 1976 and transition-quarter budgets.