

rising expenditures on basic and applied research after 1976. "The US government has explicitly adopted the idea that R&D is an investment in the future—not simply the purchase of a commodity—and therefore should receive appropriate support," the report states. Constant-dollar growth in applied research spending has risen more (20%) than spending on basic research over the last ten years. The report suggests that this apparent increased reliance on applied research may be a response to heightened concern about conducting research that may have relatively short-term economic and social benefits.

Total national expenditures for basic research have grown during the period from 1976 to 1979 in constant-dollar terms following a period of reduced spending between the late 1960's and mid-1970's. Beginning in 1976, constant-dollar basic research spending by industry, which accounted for approximately 16% of the total, has advanced slightly, following a period of declining support that began in the middle-to-late 1960's. "This relatively recent, modest growth is significant because it may signal the end of the longstanding trend of decreased industrial basic research activity," the NSB concluded.

Industrial R&D. The percentage of the total R&D dollar that is provided by industry has been rising steadily since 1975. "This return to previous high funding levels," according to the National Science Board, "should relieve some of the concern that has been expressed about a decline in industrial R&D."

The Federal government's constant-dollar support of industrial R&D also began to increase in 1976, after reaching in 1975 its lowest level since 1964. This was largely because of increased interest in energy and the space program, according to *Indicators*. "However, Federal support is not expected to return soon to the high levels of the 1960's."

Science Indicators also examined the decline in the total number of patents granted annually to US inventors from 1971 to 1977. Although the report attributes this decline to a decrease in new patents owned by US corporations, it cautions against drawing unwarranted conclusions. "One hypothesis is that there has been a decline in inventive activity in the US. However, it is thought by some that an increasing number of inventions are not being patented."

"It is possible that an increased emphasis by US industry on short-term payoff and cost-cutting research rather than on long-term basic research has led to more process rather than product innovations. Since it is generally be-

lieved that process inventions are less likely to be patented than new products, it is possible that this change in research emphasis has led to the increased use of trade secrets and decreased patenting activity in some industries." This tendency of companies to refrain from patenting their inventions makes patent counts a dubious measure of inventiveness, the report states. Overall, though, the NSB concluded that, because patenting has dropped in almost all product fields, the trends appear to indicate a real decline in the rate of production of inventions by US industry from 1971 to 1977.

Some analyses have used patenting by foreign countries in the US as a means for comparing their national technical efforts with our own. The proportion of foreign-origin patents to total US patents increased from 20% in 1966 to 36% in 1977. The increases in foreign patenting in the US were due largely to the increased patent activity of Japan and West Germany. But *Indicators* points out that foreign patent activity in the US is related both to increased foreign inventive activity and to interest in the US market.

Scientific manpower. As the economy recovered from a recession between 1974 and 1976, employment of scientists and engineers increased at a faster rate than total employment. In 1976, 16% of all physical scientists were employed in non-science jobs, and the most common single reason given was that they had been promoted out. Projections developed by the National Science Foundation and others indicate that the supply of physical scientists in most fields will be more than adequate to meet anticipated demands through the 1980's. And those scientists should be well qualified. "Questions have recently been raised concerning a decline in the quality of the S/E (scientist and engineer) work force... two related measures suggest that the quality of S/E's has not decreased: experienced S/E's continue an undiminished participation in training programs; and test scores for prospective S/E graduate students... remain high and unchanged..."

Copies of *Science Indicators 1978* may be purchased from the US Government Printing Office at \$6.00 per copy. The stock number is 038-000-00416-6. —MEJ

DOE and NSF are funding appropriate technology

The National Science Foundation and the Department of Energy have both offered grants to support appropriate technology, defined as technologies that are developed in consultation with people affected by them and chosen

from a range of alternatives after consideration of the local cultural, economic, social and environmental conditions.

The DOE's Region II, encompassing New York, New Jersey, Puerto Rico and the US Virgin Islands, has awarded grants of up to \$50 000 each. For more information, contact the Regional Program Manager, Appropriate Technology Small Grant Program, US Department of Energy, Region II, P.O. Box 1098, New York, N.Y. 10008.

For more information on the NSF appropriate technology grants, write to the Directorate for Engineering and Applied Science or the Directorate for Science Education, NSF, 1800 G Street, NW, Washington, D.C. 20550.

Carter establishes radiation policy council

President Carter has announced a series of initiatives to improve the protection of the public from unnecessary exposure to ionizing radiation from medical, occupational and environmental sources. His decision came after a year-long interagency analysis conducted by the Department of Health, Education and Welfare, the President's domestic policy staff, and the Office of Science and Technology Policy.

Reaffirming the Environmental Protection Agency as the agency with key responsibility for protecting the public from radiation, Carter established a Radiation Policy Council, to be chaired by the administrator of the EPA, to advise on radiation policy, coordinate Federal activities that use or control the use of radiation, resolve problems of jurisdiction, recommend legislation, and provide a forum for public input.

An Interagency Radiation Research Committee will also be set up to review the research needed and the quality of research in this area.

Joint US-German project for coal liquefaction

Secretary of Energy Charles Duncan and West German Minister of Research and Technology Volker Hauff have signed an agreement to share the costs of constructing the first coal liquefaction demonstration plant in the US. The West Germans have agreed to pay for one-fourth of the cost of the plant, which will be built in Morgantown, West Virginia. The current estimate of the total cost of the plant is \$1.4 billion. A similar agreement is now being negotiated with the Japanese. When completed in 1984, the Morgantown plant will convert 6000 tons of coal a day into the equivalent of 20 000 barrels of oil.