References and Notes

1. H. A. Marmer, *Geograph. Rev.* **15**, 438 (1925). This is an introductory description of the variability of sea level along the Atlantic Coast of the United States, as estimated by means of various averaging processes.
2. J. F. T. Saur, *J. Geophys. Res.* **67**, 2781 (1962). This article contains references to other recent work by Pattullo, Lisitzin, and others.
3. Saur's article is a recent study of sea level at six stations in the eastern North Pacific Ocean. Data on monthly mean sea level from year to year are given, corrected for changes in atmospheric pressure. A representative value for standard deviation of sea level at Honolulu for May is 5.2 centimeters, as estimated from measurements made over a 53-year period. The standard deviation is greater for winter months and at higher latitudes.
4. H. Stommel and A. H. Woodcock, *Trans. Am. Geophys. Union* **32**, 565 (1951).
5. J. Knauss, *Deep-Sea Res.* **6**, 265 (1960). This article is the main source of presently available information on the Pacific equatorial undercurrent, or Cromwell Current. The *Argo* study in the Indian Ocean is under the direction of Knauss and of B. Taft.
6. C. O. Iselin, *Papers Phys. Oceanog. Meteorol.* **8**, 1 (1940).
7. V. W. Ekman, *Geofys. Publikasjoner Norske Videnskaps-Akad. Oslo* **19**, 106, 122 (1953).
8. J. Crease, *J. Geophys. Res.* **67**, 3173 (1962). This is a brief preliminary report on the measurements of currents that were made near Bermuda.

News and Comment

Civilian Technology: Concern Over Pace of Growth Inspires Program for Research and Development Effort

Tucked away in the President's $98.8 billion budget is a relatively piddling item, $7.4 million, that is quite likely to grow manyfold and to have a profound effect on industry's relations with science and engineering.

Its origin is in the administration's increasing concern over the civilian economy's sluggishness in using new technology, and the money is intended to start a program that will promote and focus civilian-oriented research with some of the intensity that has paid off so well in military and space research. For, despite cheery assertions about the civilian by-products that are to be anticipated from the government's massive investment in these fields, the administration is becoming increasingly concerned over what it considers to be a lack of technical dynamism in major parts of the civilian economy. It is now frankly acknowledged that by-products to serve civilian needs are not springing full-grown from the military and space establishments, and that some new organizational arrangements seem to be needed to reduce the gap between advances in knowledge and new products and new ways of doing things.

The first outgrowth of this conclusion was the formation, early in the Kennedy Administration, of a panel on civilian technology as part of the White House science-advisory organization; the panel is under the guidance of Michael Michaelis, a member of the Office of Science and Technology staff, on leave as a senior associate from Arthur D. Little, Inc. This was followed last summer by the appointment, within the Department of Commerce, of an assistant secretary for science and technology, a post filled by J. Herbert Holloman, former general manager of GE's General Engineering Laboratory. And, under Holloman's direction, the department has started a Civilian Industrial Technology Program, which, in close contact with the White House panel, is now planning the initial steps for an extremely ambitious effort.

The administration has neither disclosed nor, presumably, decided on the ultimate size and scope of the program, but from what has been stated publicly it is obvious that it is not thinking in small terms; there has been some speculation from persons associated with the program that, in budgetary terms (Congress willing), it may eventually be on a par with the National Science Foundation, which received about $260 million this fiscal year.

As outlined in a speech last month by Commerce Secretary Luther H. Hodges, the program will have objectives as follows:

1) To provide financial support for university personnel to work on industrial research and development. "Through the award of research contracts," Hodges said, "we hope to provide incentives and training for research workers and educators in specific industrial fields, and, at the same time, develop new knowledge on which to base industrial innovations."

2) To stimulate industry to undertake research that it might otherwise shy away from because of costs or because the profit potential is too uncertain.

3) To develop an industry-university "extension service" patterned after the agricultural extension service, which has played a key role in developing and communicating agricultural technology for the nation's farmers.

4) To provide services for collecting and distributing technical information.

Of special concern to the administration is the fact that in many of the industries that account for substantial portions of the gross national product, relatively little is spent on research. Housing is perhaps the most conspicuous example. According to the Census Bureau, expenditures for residential housing last year totaled about $18.3 billion. Trade associations and manufacturers carry on some research in materials and construction techniques, but the home-building business is so fragmented that the effort to find new and better ways to build shelter is diminutive when compared to the economic significance of the industry. Administration officials acknowledge that finding better ways to build is not the whole answer, for the housing industry is beset by a maze of local housing codes that stifle the introduction of new materials and techniques; and the building trades unions are not eager to participate in cost-cutting efforts that mean less work. But, as one administration aide put it, "If someone can find a way to build a better house for less money, there's nothing in the long run that can stop him."

Underlying the administration's concern about the pace of civilian technology is the fact that the demands of the Cold War are leaving this country

relatively little scientific and engineering personnel to serve the civilian economy and support competition against other nations. Last year, Hodges noted, about $15 billion was spent in this country on research and development, but only about 25 percent of this was spent by industry for civilian purposes and only $1.5 billion was aimed at increasing productivity.

"What makes this situation doubly disturbing," he said, "is that our competitors in the world are not caught in this net. Other industrialized nations, free from the burden of large military and space commitments, are able to devote almost their entire scientific and technical effort to developing the civilian economy and their social welfare. West Germany, for instance, spends a far larger portion of its total resources on civilian needs and product development than we do. The speed with which other nations adapt scientific advance to practical use often exceeds ours, which explains, in part, why they are able to compete against us today in both price and quality."

Hodges added that since 1954, the number of scientists and engineers doing research and development in industry had risen by 160,000, "But all but 30,000 of these have been absorbed by projects for government." This year, he said, the supply of scientists and engineers for research and development is expected to rise by about 30,000, "But the increase in space R and D alone this year will require almost the entire new supply."

A curious paradox in the administration's concern over the state of civilian technology is that while some officials are lamenting the apparent lack of by-products from the space program, others are assuring the public that the space program will more than pay for itself with terrestial fruits.

For example, last June, Edward C. Welsh, executive secretary of the National Space Council, assured a San Antonio audience that "new goods and new services—significant by-products of space research—will stimulate investment and demand and expand our markets. Among these will be wrist watches accurate to the ten-thousandth of a second; new means of communication and weather forecasting; new synthetics and plastics that can be used in the home, on the farm, or in the family auto; new techniques and new instruments for use in our hospitals. . . . It is difficult to do justice to the scope of space activities—and impossible to exaggerate their potential."

However, a few weeks later, at a hearing before the House Government Operations subcommittee, Jerome B. Wiesner, the president's science adviser, observed that in the decade after World War II, military research expenditures produced developments that had direct civilian applications, but, he said, this is happening less frequently "as military requirements and civilian needs diverge. There is not nearly as direct an application of an Atlas booster to the civil economy as there was of the B-52 to the 707 [transport plane]. All through the military and space developments you see this divergence. There are going to be such very important general developments as better materials, better understanding of computers, better transistors, and better components of many kinds which will contribute to the civil economy. But in the future, there will not be nearly the same direct impact of military research on the civil economy."

This conclusion has not been lost on the National Aeronautics and Space Administration, which, under prodding from Wiesner's office, has awarded grants to several universities for research aimed at pulling more civilian applications out of NASA's space work.

In its thinking about ways to promote technical innovation in the civilian economy, the administration is gingerly approaching some difficult political and economic territory. While sluggishness in accepting new technology may be a detriment to the nation, the fact is that there are many people whose fortunes are tied to keeping things largely the way they are. One line of administration thought is that civilian technology has been lagging because industry traditionally approaches innovation on a product basis, rather than in terms of functions—for example, automobiles rather than transportation. The effect of this approach, according to a conclusion that carries weight in the administration, is that industry puts heavy emphasis on "gadgeteering" and refinements, rather than on the quest for altogether new ways to perform a certain function.

The difficulties in selling this approach to industry are illustrated by the economic and political resistance that has been thrown up against application of the functional principle to the transportation of coal. Slurry—ground coal mixed with water and transported through pipelines—offers certain advantages over transportation by rail, but political pressure, stimulated by the railroads' fears, has seriously delayed the acquisition of pipeline rights-of-way.

At present the Commerce Department's program is operating on something of a shoestring, since the Senate, in its rush to wind up business before the election, failed to complete action on a small budgetary request to get the program under way. However, neither house raised any serious objections to the principle of the federal government's promoting civilian technology, and the way seems to be clear for the program to take root and grow.

—D. S. GREENBERG

Mental Health: Kennedy Message Calls for Expanded Role for Government

Ever since President Franklin Pierce vetoed a bill for land grants to the states for the construction of mental hospitals, prime responsibility for the mentally ill has rested on the states and local communities.

Last week, however, in a special message to Congress on "Mental Illness and Mental Retardation," President Kennedy broke with tradition and requested major federal involvement both in research into the causes of mental illness and retardation and in the improvement of community-centered facilities for their treatment.

The federal research program proposed by the President includes $30 million for the construction, over 5 years, of ten centers for interdisciplinary research on human development. These centers, in addition to centralizing the study of mental illness and retardation, would train scientific personnel in these areas and demonstrate the application of new treatment techniques. The centers would be located at universities and administered by the Public Health Service. Although funds for the creation of three of the centers are included in the 1964 budget, no precise plans have yet been announced.

Congressional reaction to the President's program is expected to be favorable—in part, as the New York *Times* suggested, because an estimated 10 to 20 percent of the members of Congress have had close personal experience with mental illness in their own families.—E.L.