far-fetched. A number of persons have commented that since AIBS's missteps apparently involved little more than diverting funds to a scientific film series, it makes no difference that NSF gave it those funds for other purposes. It all went for science, this theory contends, and it is outrageous that NSF should harrass AIBS over the bookkeeping. When it is pointed out that NSF money was accepted with the understanding that it would be used for specific purposes, a number of persons have answered to the effect that if Congress is worried about misuse of money, it should devote its time to the space program.

Implicit in this sort of thinking, which does not seem to be rare, is the strong feeling that the scientific community is somehow ethically above the mass of men, and that all that Congress has to do is provide funds and let the scientists take it from there. Perhaps it is on a higher ethical plane, but Congress is not going to think so unless the scientific community demonstrates, without any exception, that it is alert and self-regulating whenever scientists go astray.

Meanwhile, one sidelight of the AIBS affair has received virtually no attention. AIBS as an organization is apparently going to emerge from this crisis in better shape than ever. But along the way, on two weeks notice and without severance pay, it laid off 36 members of its staff as an economy measure, including several who had been employees for 3 years. AIBS's financial plight provided no alternative to this move, but it is ironical that the only individuals to suffer from AIBS's financial irregularities were innocent bystanders.

—D. S. GREENBERG

As of this week, AIBS reported that its appeals for financial assistance had drawn more than 12,000 replies containing membership fees and contributions totaling $110,000. The Institute, whose difficulties were detailed in this space on 25 January, said the returns included more than 5500 direct memberships at at least $10 each. These are considered to be of critical importance for AIBS's future, since the organization's financial woes could in large part be attributed to the fact that it was organized as a society of societies, and heretofore had only a handful of direct members. Meanwhile, an audit is continuing to determine AIBS's total liability to the National Science Foundation. This has been tentatively set at $331,570, but the total seems likely to come down appreciably when detailed discussions get under way. With the exception of a small Russian translation project, all work funded through AIBS is continuing.

Manpower: Activist Administration Finds Congress Hard To Convince on Bigger Investment in People

One remedy which the problem-solvers and policy-planners of the Kennedy administration have been prescribing for a variety of political, economic, and social ills bears the academic brand name of "investment in human capital."

The idea that the national interest obliges the federal government to assure the supply of certain types of specialized manpower is at least as old as the service academies, but the effort to apply the principle much more widely seems to follow the flourishing precedent of heavy federal support of university research and graduate education in science over the last two decades.

The argument that the government is a big consumer of scientific and technical manpower and that it therefore should assist in producing such manpower has been tacitly accepted by Congress as part of the logic of the cold war. Efforts by the administration to invoke the national interest in behalf of manpower programs in other "shortage" fields, however, have met with mixed success.

Limited Acceptance

Because unemployment carries a political charge smaller only than defense in making activists of members of Congress, the administration won enactment of programs to train unemployed workers in skills for which there is a demand, both in the Area Redevelopment Act and the Manpower Retraining Act. The Juvenile Delinquency Act of 1961, which was passed on the strength of assurances that it provided a cooperative effort among federal, state, and local agencies and did not infringe upon local prerogatives, carried funds to support university training programs for youth workers and stipends for students in these programs.

In other fields, notably education, the administration has failed to convince Congress of the urgency of passing new programs to increase the supply of manpower to meet certain national needs.

Administration policy spokesmen and their speechwriters have taken great pains to assert the unity and coherence of the President's total legislative program and to demonstrate how each part contributes to two prime and interrelated purposes: assuring national security and assuring economic growth.

Though "pragmatic" seems to be the word to describe the operating style of the Kennedy administration, the working pragmatists seem to feel most comfortable when they have a theoretical sanction for policy. In their efforts to bring a variety of manpower programs in under the big umbrella of the national interest, administration spokesmen have shown at least a rough-and-ready grasp of a set of theories which describe investment in humans as a significant factor in economic growth.

These theories, which are identified with such university economists as Theodore W. Schultz of the University of Chicago and Gary S. Becker of Columbia, in general hold that the income of both individuals and nations is related not only to physical capital but to other, less-tangible resources such as education, health, on-the-job training, access to job information, and opportunity to migrate.

The economists have been seeking means to explain past economic growth and to predict future growth. Their analyses, for example, of postwar economic recovery in Europe, where human capital in terms of education and needed skills was plentiful, and of the problems of underdeveloped countries, where such human capital is relatively meager, have won wide attention over the past decade.

In simplified form, the "investment in humans" theories have percolated through the policy-making machine and are as familiar in the Labor Department and the Office of Education as in the Peace Corps and the Agency for

International Development. Policy speeches, from the President's down through those of the deputy assistant secretaries, reveal that human investment analysis has become a regular part of the justification for much legislation.

A recent example is to be found in the President's message on youth, earlier this month, when he said, "The most direct, rewarding and important investment in our children and youth is education. A high rate of investment in education is essential for our national economic growth, our scientific advancement and our national security. Maintaining the broadest possible opportunities in education is essential to the maintenance of democratic government and to the attainment of our social, cultural and economic aspirations."

But Congress is only half persuaded. The legislators are willing, in the cause of national security, to support with federal funds the development of scientific and engineering manpower, and the specter of automation wreaking economic and political havoc in their constituencies has moved them to finance trial programs to help with hard-core unemployment. But Congress has resisted extension of manpower programs into areas—particularly education—where criticism on the score of federal intervention or "planning" is likely to be leveled.

Modern manpower policy in the United States emerged during World War II when the shotgun wedding of science and government made scientists and engineers as important a national resource as the oil reserves; manpower policy rapidly acquired limits, which have altered very little since.

The new dependence on scientists and engineers which developed during the war persisted into the postwar years, and a shortage of scientific and technical manpower has been a problem which successive administrations have struggled with but not solved.

From the outset, one fundamental difficulty in dealing with the shortage of scientists and engineers has been simply to find out how many we have and how many we need. It is generally acknowledged that reckoning this supply and demand is a legitimate function of the federal government, and for more than 15 years the government has been striving to perform the task, which has proved as tricky as counting eels in a basket.

A new federal study on the long-range demand for scientists and engineers is under review and should be appearing at about the time that the Congressional appetite for statistics on professional manpower is reaching a seasonal peak.

This year the interest in reliable statistics is likely to be sharper than ever because Congress, particularly since the space effort burgeoned, has been told incessantly that the demand for scientists and engineers is outrunning the supply and the gap can only get wider unless Congress does something decisive. In this session, specifically, the legislators will have to decide what to do about the President's request for substantially increased funds to support graduate education in the sciences and engineering (*Science*, 8 Feb.).

The timely new study on long-range demand has been done by the Labor Department's Bureau of Labor Statistics (BLS) for the National Science Foundation, agencies which in alliance have done more than any others to gather data and make projections of future demands for scientific and technical manpower, an effort which has proved to be as difficult as counting eels in a basket.

Irksome Qualifications

When it comes out, the NSF–BLS study is sure to carry the notation, which past studies have borne, that many of the data needed are currently unavailable or inadequate. These qualifications and reservations are sure to irk the legislators, who in general sympathize with the proposition that what is good for science is good for the United States, but are most responsive to programs in which manpower needs are expressed roundly—preferably in hundreds of thousands or millions—and justified directly in terms of national security.

The major difficulty in giving the legislators what they want arises because meaningful statistics on scientific manpower require not a nose count but a head count. Scientists are not interchangeable nor are engineers. Fashioning occupational definitions which fit reality has been a trying task for manpower experts and one which is far from completed. Is an engineer who works as a salesman or an administrator still an engineer? This sort of question lurks behind every generalization on manpower. Also, the projection of future manpower needs, in which there is avid interest inside and outside government, has required the development of a new methodology, which its formulators admit is still highly imperfect.

Quantities of useful data are available. The Census Bureau furnishes basic population data and the National Office of Vital Statistics provides fertility and mortality figures. The Office of Education reports enrollment and graduation statistics and other data obtained from schools and institutions of higher education. The National Research Council has a growing file on recipients of earned doctorate degrees. Professional organizations, such as the Engineering Manpower Commission of the Engineers Joint Council and the National Education Association, conduct studies and surveys in their own fields.

But apparently the status of manpower information can still be summed up as it was in 1958 in the influential NSF report, "A Program for National Information on Scientific and Technical Personnel," produced by a panel—headed by Philip M. Hauser of the University of Chicago—of the President's Committee on Scientists and Engineers:

"In general it may be concluded that many data are available on easily measured characteristics of the supply of scientific and technical personnel, but these data are not sufficiently intensive and precise. On the other hand, quantitative information on supply characteristics of a more qualitative type is scanty. Thus no quantitative data are known for determining the degree of skill, the exact character of training and the innate capacities of these personnel."

Both the importance of manpower statistics and their present inadequacy was underscored by President Kennedy a year ago when he announced that at his request the National Academy of Sciences would shortly begin a new study of scientific and technical manpower utilization.

In the year that has passed since the announcement, the original chairman, Dr. James R. Killian, chairman of the corporation of M.I.T., resigned because of illness and was replaced by Dr. Clark Kerr, president of the University of California. Last month a grant of $200,000 from the Ford Foundation to finance the study was announced, and with a staff being recruited and one meeting of the committee of 16 distinguished members on the record, the study appears to be gaining momentum.

According to Academy president Dr.

Frederick Seitz, the committee's goal is to "develop guidelines and suggest measures that will enable this vital supply of specialized manpower to work most creatively and productively."

Represented on the committee are the three sectors of national life which have direct and sometimes conflicting interests in the production and utilization of specialized manpower—government, industry, the universities. The design of the study has not yet been fully developed but it appears that the committee will examine the allocations of scientific manpower with a view to judging how effectively the present stock is being utilized. The committee is also expected to consider such matters as whether federal contracting procedures and management practices in both government and industry are wasteful of scarce talents.

Despite the leisurely start and the complexities of the questions confronting it, the committee apparently hopes to make some preliminary observations by summer and to start delivering substantive recommendations by the end of the year.

The major purpose of studies such as the NAS committee's work on manpower utilization is to provide a firmer foundation for policy decisions. But even if the present supply of, and future need for, specialized manpower could be established with perfect accuracy, there are severe limits to what the government can do to meet the needs.

The assumption is that if Congress is shown statistics clearly stating future needs for professional manpower in industry, government, and the universities, legislation to help meet these needs will be forthcoming. Manpower statistics of another kind have been published to assist in the process of informing and persuading: statistics on the education and use of scientists, engineers, and technicians in the Soviet Union.

It was no accident that the President's mention of the NAS manpower study and his instructions to a panel of the President's Science Advisory Committee to recommend ways to increase the supply of scientists and engineers coincided with the publication of the second edition of a study of Soviet professional manpower financed by NSF.

The book, *Education and Professional Employment in the Soviet Union,* by Nicholas DeWitt, a Harvard-trained researcher now at Indiana University, can be fairly said to have had at least as much impact on the United States policy makers as any study on American manpower.

DeWitt's book exhaustively documents the Soviet's heavy investment in science and engineering education and bears evidence that the Soviets are outproducing us in engineering graduates, though many questions of comparative quality and utilization are left hanging.

The Russian education system is directly geared to the Soviet central planning effort, and the concentration on educating scientists and engineers reflects Soviet theories on how to insure their own national security and economic growth.

What Government Does

Those responsible for American manpower policy cannot utilize the machinery of central planning and are thus limited in power and protected from the mistakes of rigid manpower planning. Industry and professional associations have done much in this country to call attention to manpower needs and to provide positive programs to fill them, but if current projections of manpower needs are correct, it is clear that the problem is not self-adjusting.

Direct federal measures to increase the number of scientifically and technically trained persons and to raise the quality of their training are limited largely to providing support to graduate education through research grants and fellowships and to financing projects for curriculum improvement, such as the NSF-financed project to revise the high school physics curriculum. The National Defense Education Act provides loans for undergraduates and a variety of programs to upgrade the teaching of science, mathematics, and foreign languages in the schools.

Political roadblocks have kept other avenues closed. For example, scholarship assistance to undergraduates is opposed by a majority of Republicans and Southern Democrats in the House. No major school-aid legislation will be passed unless a formula can be found to neutralize the church-state issue. Federal support for medical students is not given a chance while the present opposition of the medical associations continues.

For the immediate future, therefore, it appears that the federal investment in human beings will be concentrated on those at the extremes of the manpower spectrum—the low-skilled unemployed and those seeking advanced scientific and technical education.

—JOHN WALSH

Congress and Science: Senate Seeks Review of Government's Program in Fields of Science and Technology

The Senate, long uneasy about the rapid expansion of federal programs in science and technology, and about its failure to equip itself for a role in this field, has once again been offered legislation for reform.

The proposal (S. 816) originating in the Senate Committee on Government Operations, calls for the appointment of a "Hoover-type" commission to review the whole spectrum of federal involvement in the sciences. The commission would consider whether a federal department of science is advisable, and if so, what its function and structure might be. The fact that the committee's proposals have become, over the years, both more sophisticated and more modest—in earlier years they called for the outright establishment of such a department—has not increased the chance that anything will come of them. It is expected that the Senate's newest plan will follow the path of its predecessors from passage on the Senate floor to extinction in the House Committee on Science and Astronautics, which has its own reasons for sitting tight.

Last year the Senate Committee heard testimony from ten witnesses. Eight of these concurred with its belief that, at the very least, as Senator Javits (Rep.-N.Y.) said, "the boat needs a little rocking"—that federal science programs have been too much insulated from public discussion. While withholding advance commitment to the idea of a federal department, this strong majority welcomed an impartial study.

The remaining two witnesses, however, the Deputy Director of the Bureau of the Budget and the Director of the National Science Foundation, opposed the creation of such a commission. They argued that the newly-created Office of Science and Technology in the Executive Office would soon be able to cope with what the committee called the "disorganized Federal science programs," and that within 2 or 3 years the need for either an additional agency or an investigation would have vanished. These same witnesses, appearing before the committee in 1959, had testified in a similar way, maintaining then that the President's Science Advisor, the Federal Council on Science and Technology, and the President's Ad-