

SCIENTIFIC MANPOWER STUDIES

The Government, industry, and the educational and scientific institutions, all have a vital stake in the supply of scientific manpower. Their various needs must be understood if serious shortages and conflicting demands are to be avoided.

The Office of Defense Mobilization has the responsibility, among others, for coordinating activities of Federal departments and agencies looking toward the development of programs to assure that our manpower resources keep pace with our probable needs at any level of mobilization. Since scientific and technical manpower is clearly a most important segment of the whole, the ODM has established an advisory Committee on Specialized Personnel dealing specifically with questions relating to scientific, engineering and other specialized manpower. The Committee is made up of representatives from government, industry, labor, and education.

A number of private organizations have also evinced interest in problems relating to the supply and utilization of scientific manpower. Of these groups, one of the most active is the National Manpower Council which has compiled a sizeable volume of information and opinion on these problems, and within recent months has issued *A Policy for Scientific and Professional Manpower*.

During the past year the Foundation began to accumulate and disseminate information on scientific manpower in accordance with its clearinghouse function. The program is in three parts:

1. Operation of the National Register of Scientific and Technical Personnel as a means of collecting information on individual scientists and assembling available statistics concerning manpower resources.
2. Dissemination, by bulletins and studies, of analyses of information gathered in (1).
3. Manpower studies on the characteristics, utilization, supply and demand for scientific and technical personnel.

NATIONAL REGISTER OF SCIENTIFIC AND TECHNICAL PERSONNEL

On January 1, 1953, responsibility for maintaining a register of scientific and technical personnel in the United States was transferred from the Office of Education to the Foundation. Under the operating plan developed by the Foundation, the compilation and maintenance of the registration data will be done by professional societies in the various scientific disciplines. Compilation of data regarding members of their professions is a normal function of these societies. With some modification of present procedures, they can obtain the additional data needed for national registration of scientists and technical personnel.

Some 10 to 12 scientific societies, with financial assistance from the Foundation, are setting up comprehensive registers to provide essential information on scientists and engineers in the United States. Registration of about 100,000 scientists and engineers is expected by June 1954. According to the present schedule, registers will have been established by June 1955 for all major fields of science. Meanwhile information previously collected is being analyzed and reports prepared on specific scientific fields. In case of war, registration information now being collected will facilitate the mobilization of scientists and the establishment of manpower controls.

Four societies are already well along in the work of compiling their registers: American Geological Institute, American Institute of Biological Sciences, American Veterinary Medical Association, Federation of American Societies for Experimental Biology. Other societies which will participate on the program include the American Mathematical Society, American Institute of Physics, American Chemical Society, the American Meteorological Society, and the Engineers Joint Council.

Each society will be responsible for compilation and maintenance of its respective register, registration of both members and nonmembers alike, and furnishing the supervisory, administrative, and clerical services required. The Foundation will receive duplicates of the cards produced on each register, including replacement cards as the registrants' records are brought up to date. The Foundation will not use the file for placement purposes.

The Foundation will furnish the societies with record cards, codes, coding materials, and records from previous registers in order to insure as complete and uniform registration as possible.

MANPOWER STUDIES

As registration data become available, it will be possible to continue analysis of information on the professional characteristics, training, and employment of scientists by field and to follow trends in the utilization of trained scientists and engineers. A series of reports on chemists, physicists, chemical engineers, psychologists, geologists, and sanitary engineers was issued by the National Scientific Register, Office of Education. Major studies were made in two of these fields—physics and chemistry—for the Register by the Bureau of Labor Statistics. Funds have been provided to the Bureau of Labor Statistics to produce reports from register data in mathematics, the earth sciences, and the agricultural and biological sciences. These reports will be published jointly by the Foundation and the Bureau of Labor Statistics within the next few months.

Support has been provided for the continuation of the *Studies of Doctoral Degrees* which has been made annually for a number of years by the National Research Council and financed by the Office of Naval Research. This study will provide a continuing flow of information about the recipients of degrees at the doctoral level in all fields. Reports similar to *The Baccalaureate Origins of the Science Doctorates Awarded in the United States, 1936-45*, will be published periodically.

Characteristics of Scientific Manpower

The analysis of 1951 registration data compiled by the National Scientific Register deals with the professional characteristics of American scientists. The rate of expansion of various fields is shown by the age of scientists in those fields. (See table III.) The chemical engineers were the youngest group, possibly indicating the most rapid rate of expansion in a scientific manpower sense.

Statistics on type of employment of scientists (table IV) reveals that industry hires the majority of chemical engineers, chemists, and geologists, about 40 percent of the physicists, and but relatively few mathematicians and psychologists.

Income statistics (table V) show that industrial scientists command the highest salaries with Government scientists next. There is a marked differential in income depending upon educational attainment. The median annual salary of scientists with doctor of philosophy degrees is from \$1,600 to \$2,000 greater than those with master's degrees and from \$1,800 to \$2,500 greater than those with bachelor's degrees.

TABLE III.—*Median Age of Scientists, in Selected Fields, 1951*

	<i>Doctor of Philosophy</i>	<i>Master's</i>	<i>Bachelor's</i>
Chemical engineering	37	32	31
Chemistry	39	36	33
Physics	39	35	32
Mathematics	41	34	

Source: National Scientific Register, Office of Education.

TABLE IV.—*Type of Employment of American Scientists, 1951*

<i>Degree held</i>	<i>Number reporting</i>	<i>Educational institutions (percent)</i>	<i>Government (percent)</i>	<i>Industry (percent)</i>
MATHEMATICS				
Doctor of philosophy	1, 320	88. 0	6. 1	5. 9
Other	700	76. 7	11. 4	11. 9
CHEMISTRY				
Doctor of philosophy	11, 568	32. 5	7. 4	60. 1
Master's	7, 857	20. 8	9. 4	69. 8
Bachelor's	25, 086	4. 8	8. 6	86. 6
CHEMICAL ENGINEERING				
Doctor of philosophy	854	30. 1	2. 7	67. 2
Master's	2, 329	5. 5	3. 8	90. 7
Bachelor's	8, 251	. 7	4. 1	95. 2
PHYSICS				
Doctor of philosophy	2, 784	58. 4	10. 7	30. 9
Master's	1, 620	50. 2	15. 4	34. 4
Bachelor's	1, 365	21. 4	23. 9	54. 7
GEOLOGY				
Total	6, 089	13. 6	13. 0	73. 4
PSYCHOLOGY				
Total	5, 399	55. 4	25. 6	19. 0

Source: National Scientific Register, Office of Education.

TABLE V.—*Median Annual Salary of American Scientists, 1951*

<i>Degree held</i>	<i>Colleges and universities</i>	<i>Government</i>	<i>Industry</i>	<i>Total</i>
MATHEMATICS				
Doctor of philosophy	5, 900	7, 600	9, 100	6, 200
Other	4, 100	4, 900	5, 500	4, 400
CHEMISTRY				
Doctor of philosophy	5, 600	6, 700	7, 900	7, 000
Master's	4, 000	5, 100	5, 900	5, 400
Bachelor's	3, 400	4, 400	5, 100	4, 900
CHEMICAL ENGINEERING				
Doctor of philosophy . . . . .	.....	.....	.....	7, 900
Master's . . . . .	.....	.....	.....	5, 900
Bachelor's . . . . .	.....	.....	.....	5, 400
PHYSICS				
Doctor of philosophy	6, 400	8, 000	8, 000	7, 100
Master's	4, 500	6, 000	6, 400	5, 300
Bachelor's	4, 000	5, 000	5, 800	5, 100
PSYCHOLOGY				
Doctor of philosophy	6, 300	6, 700	7, 600	6, 500
Master's	} 4, 500	} 5, 000	} 4, 800	4, 800
Bachelor's				4, 700

Source: National Scientific Register, Office of Education.

SURVEY OF JUNE 1951 COLLEGE GRADUATES

Another important area in which more complete information is needed is in the relationship between undergraduate and graduate specialization in terms of "college majors" as well as between college and university specialization and subsequent employment. The Foundation supported a study under the direction of the National Scientific Register, Office of Education, to gather data on a sample of graduates who received bachelor's and master's degrees in June 1951.

The survey of 1951 graduates was conducted about one year after the recipients received their degrees. It was conducted by questionnaires addressed to a third of those who had received master's or second professional degrees and one out of five who had been granted bachelor's or first professional degrees and included graduates in all major subjects from all degree-granting institutes in the United States. Nearly 50,000 graduates returned usable questionnaires.

One year after receiving their degrees, 61 percent of the men with bachelor's degrees and 77 percent of those with master's degrees were employed; 16 percent of bachelors and 12 percent of masters were full-time graduate students; and 21 percent of the bachelors and 8 percent of the masters were on active military duty. Of the women 74 percent with bachelor's and 84 percent with master's degrees were employed, 13 percent of bachelors and 9 percent of masters were housewives, and 8 percent and 3.5 percent, respectively, were continuing graduate studies.

While the relationship between college specialization and employment is probably not a true measure of the effectiveness of the educational system, such information is of importance in estimating changes in the supply of specialized manpower.

Table VI shows the types of employment reported by graduates who specialized in various areas of study. Of employed persons with bachelor's degrees specializing in health fields during college, 96 percent report that they are employed in the same fields. At the other extreme only 7 percent of the employed individuals who majored in psychology report that they are now working in this field. In the case of those receiving master's degrees, there is in general a closer correlation between the field of employment specialization and the field of college specialization.

TABLE VI.—*Field of employment entered by 1951 college graduates by field of specialization in college*
 [In percent of total graduates in each field of college specialization]

Field of specialization in college	Field of employment at time of survey										Total*
	Natural Science	Engineering	Psychology	Applied Biology	Health Fields	Social Sciences	Humanities	Education	Business and Commerce	Other ²	
Natural sciences.....	46	10	.....	1	6	1	(¹)	21	14	1	100
Engineering.....	3	93	.....	(¹)	(¹)	(¹)	(¹)	(¹)	3	(¹)	100
Psychology.....	2	2	7	(¹)	2	5	2	21	52	7	100
Applied biology.....	3	1	.....	40	1	1	(¹)	34	19	1	100
Health fields.....	1	(¹)	.....	(¹)	96	(¹)	(¹)	(¹)	2	(¹)	100
Social sciences.....	1	2	(¹)	1	1	6	4	24	53	8	100
Humanities.....	1	1	(¹)	(¹)	(¹)	1	14	43	34	5	100
Education.....	1	2	(¹)	2	1	1	6	77	11	1	100
Business and commerce.....	(¹)	3	.....	1	(¹)	2	(¹)	4	89	1	100
Other ³	2	3	.....	1	1	3	3	7	23	57	100

BACHELOR'S DEGREES

MASTER'S DEGREES

Natural sciences.....	69	7	.....	1	2	1	(1)	14	5	1	100
Engineering.....	3	93	.....	(1)	.....	(1)	.....	2	1	(1)	100
Psychology.....	3	(1)	44	(1)	1	4	1	23	23	1	100
Applied biology.....	4	1	.....	63	1	2	.....	19	8	1	100
Health.....	7	2	(1)	.....	87	.....	.....	2	2	.....	100
Social sciences.....	1	2	1	2	(1)	23	4	30	26	11	100
Humanities.....	1	(1)	(1)	(1)	.....	1	38	41	13	5	100
Education.....	1	(1)	2	1	1	2	6	79	6	1	100
Business and commerce.....	1	6	(1)	.....	.....	4	1	9	78	1	100
Other ².....	.....	2	.....	(1)	.....	2	1	4	4	87	100

¹ Less than 0.5 percent.

² Includes social work, library science, law, architecture, journalism, and statistics.

³ The total percent of professionally employed graduates from each field of college specialization equals 100.

Source: Commission on Human Resources and Advanced Training.