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DOCTORAL SCIENTISTS AND ENGINEERS IN THE UNITED STATES

1975 PROFILE

National Research Council

Board on Human-Resource Data and Analyses
Commission on Human Resources
Based on the
1975 Survey of Doctoral Scientists and Engineers

The Roster of Doctoral Scientists and Engineers
is maintained by the
National Research Council
with the support of the
National Science Foundation
and the
National Institutes of Health

NATIONAL ACADEMY OF SCIENCES
Washington, D.C.
1976

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NOTICE

This report is based on the 1975 Survey of Doctoral Scientists and Engineers, a project approved by the Governing Board of the National Research Council, whose members are drawn from the Councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The Survey project is part of the program of the Board on Human-Resource Data and Analyses.

The Board on Human-Resource Data and Analyses has reviewed this report in accordance with procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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FOR FURTHER INFORMATION

Further analysis of the data from the 1975 survey reported here is in progress, and additional reports will be forthcoming. Meanwhile, questions may be directed to:

Board on Human-Resource Data and Analyses
Commission on Human Resources
National Research Council
2101 Constitution Avenue
Washington, D.C. 20418

Other reports of the Board on Human-Resource Data and Analyses that are based on the 1973 and/or 1975 surveys are as follows:

"Doctoral Scientists and Engineers in the United States: 1973 Profile" (March, 1974)

"Field Mobility of Doctoral Scientists and Engineers" (December, 1975)

"An Evaluation of the 1973 Survey of Doctoral Scientists and Engineers" (December, 1976)

"Employment Status of Ph.D. Scientists and Engineers: 1973 and 1975" (In Press)

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ACKNOWLEDGMENTS

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The Commission's Board on Human-Resource Data and Analyses provided policy guidance for this project. J. James Brown of the National Science Foundation's Division of Science Resources Studies served as the responsible staff officer at the Foundation and, with Charles E. Falk and John A. Scopino of the Division, gave assistance and helpful advice to the project staff throughout the project.

At the National Research Council the project staff principally responsible for the writing of this report included Betty D. Maxfield, Project Director; Nancy Ahern, Research Assistant; and Andrew Spisak, Research Assistant. Doris Rogowski and Kenneth Fulton of the CHR Supporting Services Section supervised the mailing and coding of the questionnaires, Herbert Soldz and George Boyce of the CHR Data Processing Section supplied the data processing support for the project, and Lindsey Harmon gave advice in the survey design and sampling schemes. William C. Kelly and Dorothy M. Gilford provided administrative supervision.

Many members of the scientific and engineering communities have provided assistance in obtaining current mailing addresses for the survey sample. They include representatives of the professional societies,

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graduate deans, academic department chairmen and other university officials, and heads of industrial research departments and national laboratories.

Finally, the doctorate-holding scientists and engineers who responded to this survey deserve the warmest thanks. It was their efforts and cooperation that made the survey and this report a reality.

Betty D. Maxfield
Project Director

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SUMMARY

- There were 279,400 doctoral scientists and engineers in the United States in 1975 who had received their doctorates prior to July 1, 1974.
- There were 265,500 doctoral scientists and engineers in the labor force in 1975.
- Nearly 254,600 (approximately 96 percent of the labor force and 91 percent of the total population of Ph.D. scientists and engineers) were employed: 246,900 full-time and 7,700 part-time.
- Approximately 8,300 doctoral scientists and engineers (3 percent of the labor force) held postdoctoral appointments.
- The 1975 unemployment rate for doctoral scientists and engineers was 1.0 percent; that is, 2,500 people out of the labor force of 265,500 doctorate-holding scientists and engineers were unemployed and seeking employment.
- Women, although distributed in a highly selective fashion among the disciplines, constituted about 9.4 percent or 26,300 of the science and engineering doctoral population.
- Women reported an unemployment rate of 3.0 percent, whereas men reported 0.8 percent.
- Members of racial minority groups numbered about 17,600 and accounted for 6.3 percent of the total population of doctoral scientists and engineers.

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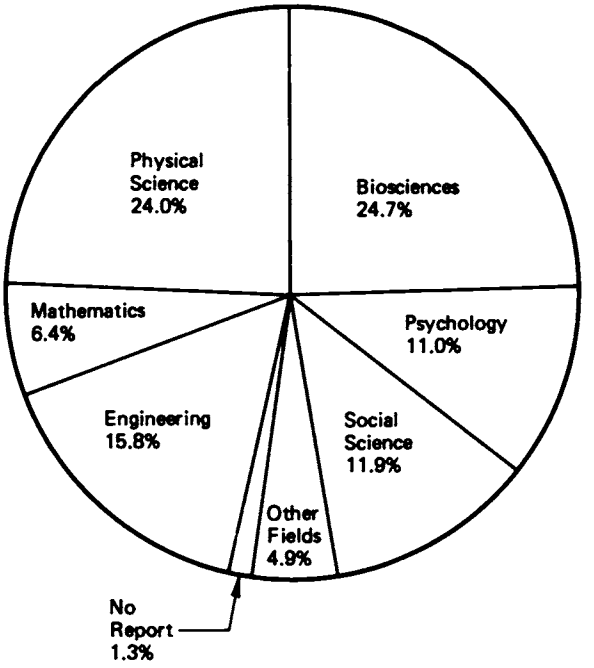
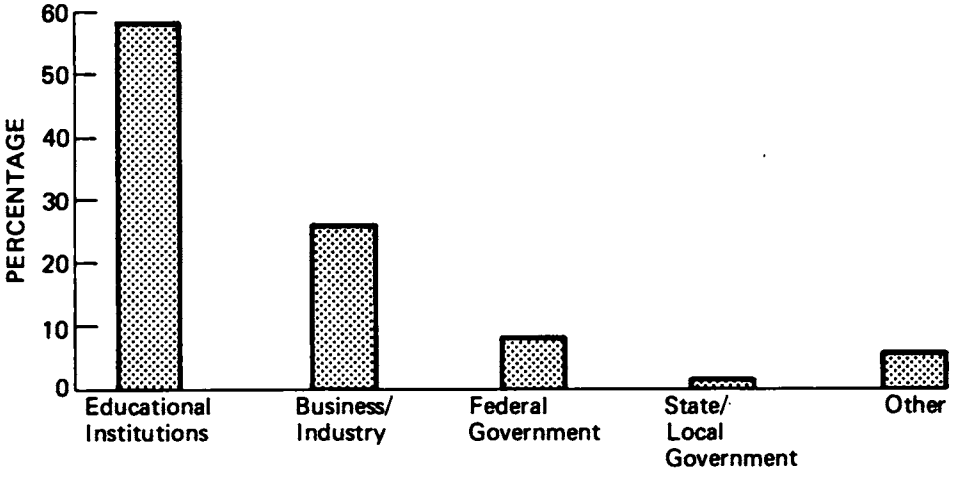
- Just under one-half of the employed doctoral scientists and engineers were working in the biosciences or the physical sciences.



Distribution of Employed Doctoral Scientists and Engineers by Field of Employment (Including Post-doctoral Appointees), 1975

- Excluding postdoctoral appointees, educational institutions employed nearly three-fifths of the working doctoral scientists and engineers.



Distribution of Employed Doctoral Scientists and Engineers by Type of Employer (Excluding Post-doctoral Appointees), 1975

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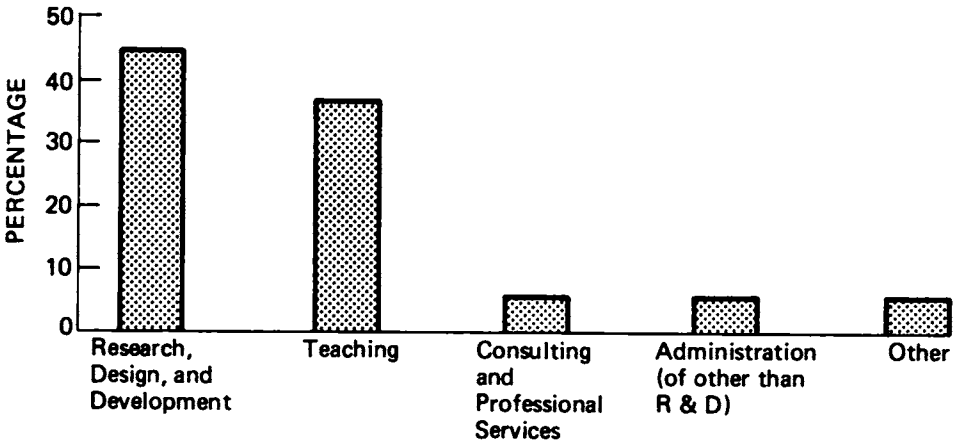
- Over two-fifths of the employed doctoral scientists and engineers were engaged primarily in research, design, and development including its administration -- slightly more than in teaching.



Distribution of Employed Doctoral Scientists and Engineers by Primary Work Activity (Excluding Post-doctoral Appointees), 1975

- The median annual salary for doctoral scientists and engineers in 1975 was $23,000 with those employed in engineering reporting the highest median salary -- $25,000.

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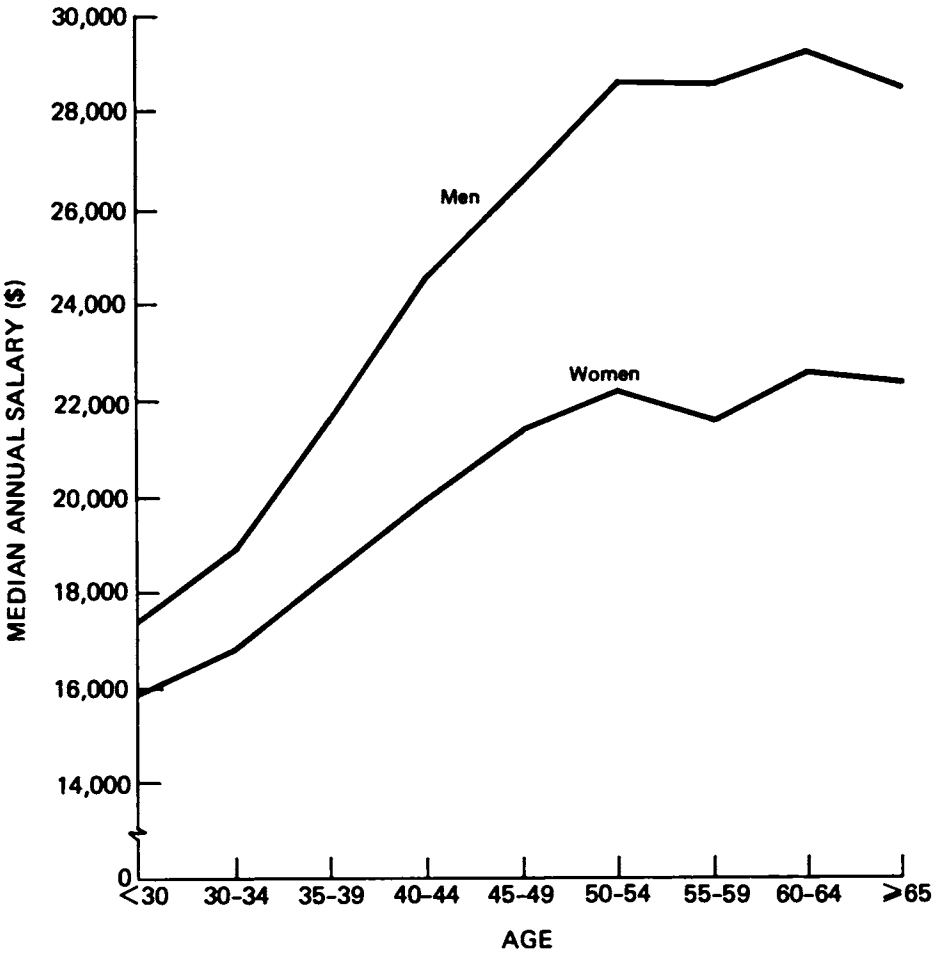
- In 1975 the median annual salary for men was greater than that for women for all age cohorts, and the difference tended to increase with age, the largest difference occurring in the 55-59 age group.



Median Annual Salaries of Doctoral Scientists and Engineers by Age and Sex, 1975

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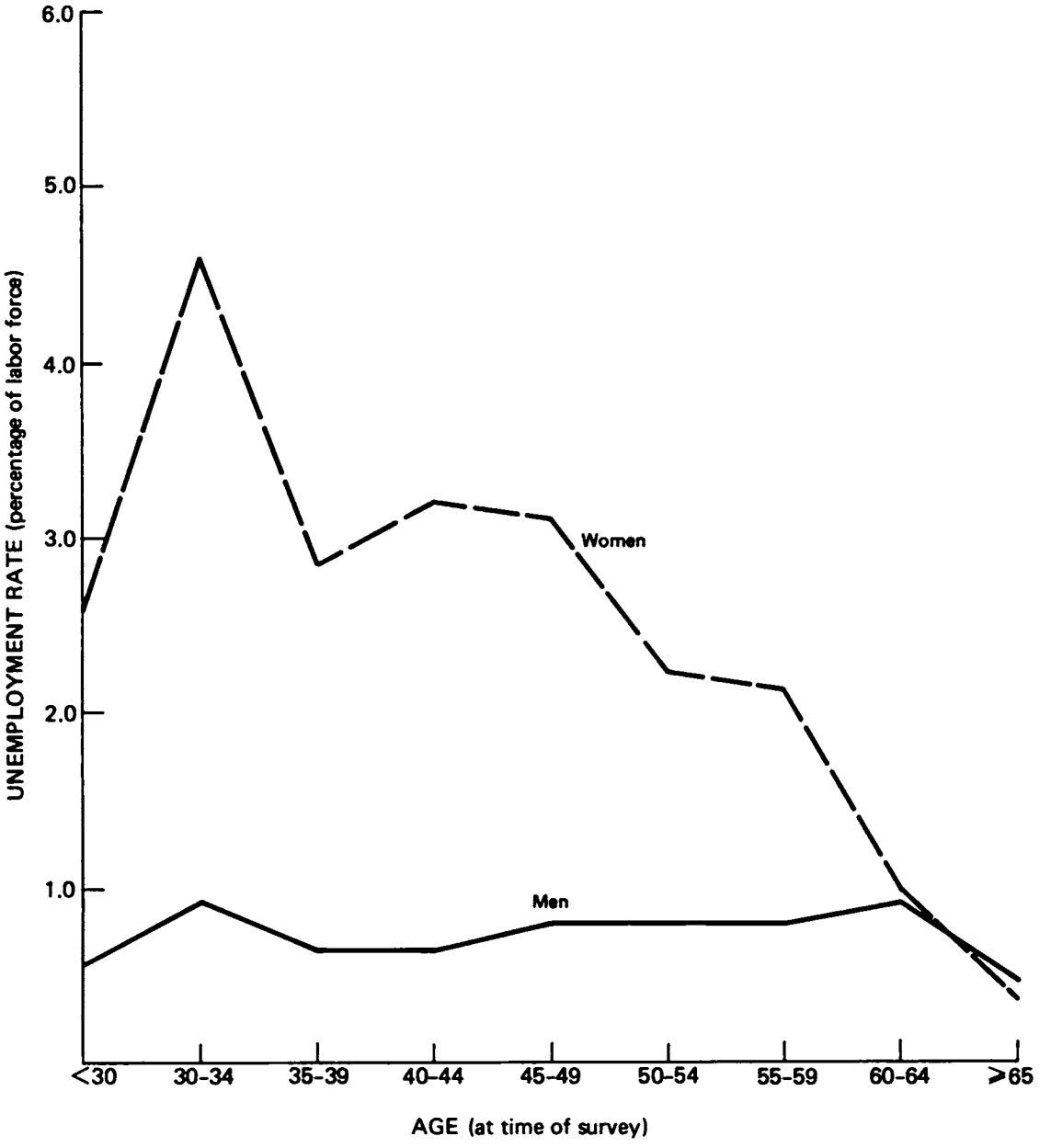
- The unemployment rate for female Ph.D. scientists and engineers was greater than that for male Ph.D.'s in virtually all age groups in 1975.



Unemployment Rates of Doctoral Scientists and Engineers by Age and Sex, 1975

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INTRODUCTION

This is the second report on the composition of the nation's doctorate-level scientists and engineers[1] from a survey conducted in the spring and summer of 1975 by the National Academy of Sciences-National Research Council (NAS-NRC) under the sponsorship of the National Science Foundation (NSF) and the National Institutes of Health (NIH). The survey, which was based on the Roster of Doctoral Scientists and Engineers, is one of three sources of information about the scientific and engineering population of the United States that the National Science Foundation has been developing as part of its Manpower Characteristics System.

The 1975 Roster of Doctoral Scientists and Engineers, compiled by the National Research Council, contains data on 314,000 individuals in the United States who either received science or engineering doctorates in the years 1930-1974 or received doctorates in other fields within this time frame and were subsequently employed in science or engineering.[2] The Roster was compiled primarily from the NRC's Doctorate Records File and the NSF's National Register of Scientific and Technical Personnel;

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[1] Throughout this study the population of doctorate-holding scientists and engineers was defined to include those with doctorates in the natural and social sciences, mathematics, and engineering. A detailed list of fields included appears as part of the survey questionnaire reproduced in Appendix A.

[2] Individuals who received doctorates between January 1, 1930, and June 30, 1974, were included in the Roster. The Roster has several components of varying degrees of completeness. Over 99 percent of those awarded doctorates from United States institutions were included. It is estimated that two-thirds of those with foreign doctorates working in the United States were also included. A third and less certain component is the group of nonscience doctorate-holders working in science; some 10,000 were included.

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however, other sources such as American Men and Women of Science, and college and university catalogues, were also consulted.

The 1973 sample was updated by the addition of a sample of the 1973 and 1974 cohorts yielding a sample of 66,800 individuals for the 1975 survey. This sample was stratified according to year of doctorate, field of science or engineering degree, sex, and degree category, i.e., science and engineering doctorate recipients from United States institutions, nonscience doctorate recipients from United States institutions who subsequently switched to a science field, and similar holders of doctorates from foreign institutions.

A variable sampling ratio was used so that the sample could be used to make reliable estimates for small groups within the population, such as older people and women.

The statistics presented in this report are estimates of total populations, that is, each response was weighted so that the statistics represent, as nearly as possible, the results which would have been obtained if the entire population had been surveyed.[3]

This report focuses primarily on the 1975 employment status of 1930-1974 recipients of doctorates in science and engineering residing in the United States -- a subject of interest to the scientists and engineers themselves, to the academic community, and to government agencies concerned with this segment of the nation's human resources.

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[3]See Appendix B for details on the population, sample, and response to the 1975 survey for each of the stratification criteria. Appendix B also provides a discussion of the sampling errors in the data.

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Additional analyses have been made, developing in further detail the employment characteristics[4] and other important characteristics of the population of doctorate-holding scientists and engineers. The results of these studies will be reported in later publications.

Survey Procedures

Approximately 63,400 persons in the sample of 66,800 were eligible for the 1975 survey. The other 3,400 sample individuals were persons known to be deceased prior to the 1975 survey or individuals who responsed in 1973 that they were outside the scope of the survey.

Addresses were obtained from the Doctorate Records File (NRC), the National Register of Scientific and Technical Personnel (NSF), American Men and Women of Science, the National Faculty Directory, college and university catalogues, as well as many alumni offices, departments of individuals' baccalaureate and doctoral institutions, and several professional societies.

The initial mailing in the 1975 survey was conducted on May 31, 1975. Two follow-up mailings to those who had not yet responded took place on July 25, and November 24, 1975. It was possible to include in the results reported here all data received prior to March 31, 1976.

Response Rates

Information was collected about 43,800 individuals, 400 of whom were deceased persons. The overall response rate to the three waves of

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[4]Maxfield, B., Ahern, N., and Spisak, A. "Employment Status of Ph.D. Scientists and Engineers: 1973 and 1975." Commission on Human Resources-National Research Council (In Press).

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mailing was 69.2 percent, i.e., the total number of survey responses (43,821) divided by the number of individuals in the "active" sample (63,364). The response rate, if calculated on the basis of those in the "active" sample who were contacted (58,780), was 74.6 percent.[5] The sampling errors given in this report do not include the effect of nonresponse, which may contribute substantially to the total error.[6]

The Population of Doctorate-Holding Scientists and Engineers

Based on the 1975 survey of a sample of the 314,000 individuals in the Roster, it is estimated that there were 279,400 doctoral scientists and engineers in the United States in 1975[7] since approximately 34,600 of those in the Roster had left the United States or were deceased. Of the 279,400 doctoral scientists and engineers, 13,800 were retired, or were not in the labor force for some other reason; hence, the size of the labor force of doctorate-holding scientists and engineers was 265,500. Some 2,500 of these individuals were unemployed and seeking employment -- an unemployment rate of 1.0 percent. Of the 263,000 employed doctoral scientists and engineers, approximately 246,900 were employed full-time, 7,700 were employed part-time, and 8,300 held post-doctoral appointments.

---

[5] See Appendix B for detailed response rates.

[6] A study is planned for early 1977 to determine if nonresponse bias is present in the 1975 survey results. A sample of nonrespondents and those for whom no address was available will be surveyed to collect employment information. The results will be compared with those of the 1975 survey to determine if any significant differences exist between respondents and nonrespondents.

[7] This total excludes those persons awarded doctorates after June 30, 1974.

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The data presented in this report are based upon the total population of 279,400 as well as upon several subpopulations.[8]

[8]The numbers presented in the tables are not rounded, although the statistical significance of the last two digits in each number is low. Text discussion includes rounded figures extracted from the tables.

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TOTAL DOCTORAL POPULATION BY FIELDS

For purposes of this report, individuals in the sample are classified either by field of Ph.D. training or by field of employment as of February 1975.[9] Field of doctorate is defined as one of nine broad fields included in the specialties list in Appendix A, i.e., mathematics, physics/astronomy, chemistry, earth science, engineering, bioscience, psychology, social science, nonscience. Field of employment, which is defined in terms of the same nine broad fields, includes postdoctoral appointees and full-time and part-time employed; retired and unemployed persons are excluded. Table 1 gives the number of individuals in each broad field by field of doctorate and field of employment.

A comparison of field of doctorate and field of employment shows a substantial net influx into earth science, medical science, and nonscience employment. In physics, chemistry, biological science, and social science a substantial net loss is noted from degree field to employment field.

This apparent change from degree field to field of employment is dependent upon the way in which the fields were grouped. For example, biochemistry was defined as a subfield of both the biosciences and chemistry. A Ph.D. who earned a degree in biochemistry within the field of

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[9] The National Science Foundation has used field of identification as the basis of its classification system. Field of identification is defined, for those employed in science or engineering positions (including postdoctoral appointees), as the field of employment and, for all others (including those unemployed, those retired, housewives, those not reporting), as the field of doctorate. Appendix C gives a comparative definition of the NSF field of identification and the NRC field of employment. Also provided is a table of employment status by field of identification.

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chemistry, and reported employment in biochemistry within the bioscience field was counted as a field switcher.[10] Appendix D gives the estimated number employed in each fine field category, and shows how fine fields were collapsed into broad fields.

TABLE 1 Distribution of Doctoral Scientists and Engineers in the United States, 1930-74 Graduates by Field of Doctorate and Field of Employment, 1975

	Field of Doctorate		Field of Employment	
	N	%	N	%
All Fields	279,351	100.0	262,991+	100.0
Mathematics	15,989	5.7	16,815	6.4
Physics/Astronomy	25,085	9.0	17,880	6.8
Chemistry	43,248	15.5	33,077	12.6
Earth Sciences	8,813	3.2	12,149	4.6
Engineering	41,228	14.8	41,616	15.8
Biosciences				
Agricultural Sciences	13,145	4.7	13,170	5.0
Medical Sciences	7,347	2.6	13,329	5.1
Biological Sciences	50,085	17.9	38,294	14.6
Psychology	29,435	10.5	28,901	11.0
Social Sciences	39,273	14.1	31,380	11.9
Nonsciences	5,519	2.0	12,958	4.9
No Report	184	*	3,422	1.3

*Less than .1%
+Includes postdoctoral appointees as well as full-time and part-time employed.

[10] For a more detailed study of field switching and related issues see "Field Mobility of Doctoral Scientists and Engineers." Commission on Human Resources-National Research Council (December, 1975).

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FIELD MOBILITY OF EMPLOYED PH.D.'S

Of the approximately 279,400 doctoral scientists and engineers in the United States, nearly 263,000 were employed in 1975. Table 2A gives data on the movement of individuals from field of Ph.D. training to field of employment. Figures are provided for all Ph.D.'s who received their degrees during the years 1930-1974 as well as separate figures for the FY 1974 graduates.

The percentage of 1930-1974 Ph.D.'s who remained in their field of training ranged from 65.4 percent for physics/astronomy to 90.2 percent for psychology. The fields retaining the highest percentage of its doctorates were psychology (90.2 percent), bioscience (88.7 percent), earth science (88.0 percent), and mathematics (86.2 percent). The employment field into which Ph.D.'s in physics/astronomy moved most frequently was engineering (14.7 percent). Ph.D.'s in chemistry, another mobile group, moved most often into bioscience (6.7 percent), engineering (6.4 percent), and nonscience jobs (6.2 percent). Holders of nonscience doctorates moved primarily into psychology (60.7 percent), and to a lesser extent into the social sciences (15.3 percent).

With the exception of the earth science field, the 1974 cohort displayed nearly the same field mobility as the 1930-1974 cohorts (Table 2B). Earth sciences were among the highest retainers of their graduates for the 1930-1974 recipients yet one of the lowest retainers for the most recent graduates, 12.9 percent of whom switched to bio-sciences. It should be noted that 5.1 percent of the recent science

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and engineering Ph.D.'s held nonscience jobs one year after earning the doctorate.

TABLE 2 Field Mobility of Employed Doctoral Scientists and Engineers, 1975

A. Employed Individuals Receiving Doctorates During 1930-1974

Field of Doctorate	Total Employed	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
All Fields	262,991	6.4%	6.8%	12.6%	4.6%	15.8%	24.6%	11.0%	11.9%	4.9%	1.3%
Mathematics	15,290	86.2	.4	*	.4	4.7	2.1	.1	.8	3.5	1.8
Physics/Astronomy	23,659	4.0	65.4	1.2	5.1	14.7	2.7	.2	.6	4.7	1.3
Chemistry	40,272	.6	2.0	73.7	2.3	6.4	6.7	*	.1	6.2	1.9
Earth Sciences	8,434	.4	1.0	.7	88.0	2.9	2.3	.1	.5	3.3	.9
Engineering	40,059	3.3	3.1	1.3	1.9	84.3	1.3	.1	.3	3.8	.7
Biosciences	65,334	.2	.2	3.7	2.1	.6	88.7	.2	.6	2.6	1.3
Psychology	28,054	.3	.0	.0	.0	.3	2.5	90.2	1.5	4.7	.6
Social Sciences	36,796	1.0	*	.1	.9	.6	4.0	1.0	79.8	11.0	1.7
Nonsciences	4,914	10.7	1.6	1.6	.9	2.5	4.7	60.7	15.3	.0	1.9
No Report	179	12.3	3.9	10.6	4.5	12.3	41.9	5.6	8.4	.0	.6

*Less than .1%

B. Employed Individuals Receiving Doctorates in 1974

Field of Doctorate	Total Employed	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
All Fields	17,364	6.8%	4.8%	9.2%	4.1%	15.2%	24.3%	14.1%	15.5%	5.1%	.8%
Mathematics	1,111	88.4	.0	.0	.0	6.5	.3	.0	1.6	3.1	.2
Physics/Astronomy	1,145	6.4	69.3	2.5	4.5	9.0	3.8	1.4	.3	1.7	1.1
Chemistry	1,729	.8	.4	79.1	1.4	3.6	9.5	.0	.0	3.8	1.4
Earth Sciences	591	.0	.0	.7	77.8	3.6	12.9	.0	.0	5.1	.0
Engineering	2,736	3.7	1.3	1.3	.7	86.2	2.1	.5	.1	4.0	.1
Biosciences	4,208	.0	.1	3.8	3.1	.2	89.7	.3	.3	1.7	.8
Psychology	2,527	.1	.0	.0	.0	.0	2.5	93.1	2.7	1.0	.7
Social Sciences	3,317	.3	.0	.0	.8	.5	1.1	1.7	78.1	15.7	1.7
Nonsciences	–										
No Report	–										

*Less than .1%

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DEMOGRAPHIC CHARACTERISTICS BY FIELD OF DOCTORATE

Over 90 percent of the doctoral scientists and engineers in the United States in 1975 were male. Table 3 shows that women Ph.D.'s were most highly represented in the fields of psychology (22.3 percent), biosciences (12.8 percent), and social sciences (12.3 percent). The field of engineering had produced the fewest women doctorate recipients; only 0.5 percent of all doctoral engineers were females.

Racial minority groups (i.e., Blacks, American Indians, and Asians) comprised a little more than 6 percent of the doctoral population. These 17,600 Ph.D.'s tended to be concentrated in certain fields. Minorities accounted for 11 percent of the engineering doctorates, the highest percentage of minorities in any field. The next largest group in terms of numbers was the biosciences where minorities made up over 6 percent of the 70,600 Ph.D.'s in this field. Participation of minorities was lowest in the fields of earth sciences and psychology. It should be noted that different minority groups were distributed differently in the various science fields. For example, the percentage of Orientals was high in engineering and low in the social sciences, whereas, a high percentage of Blacks were in social sciences.

Examining the age distribution of the doctoral scientists and engineers in the labor force, the field of mathematics had the highest percentage of Ph.D. recipients in the under 30 age group (6.6 percent), and the 30-34 age group (26.6 percent).

With reference to year of earned doctorate, psychology (13.1 percent) and the social sciences (12.6 percent) had the greatest proportion of recent (1973-74) graduates. Chemistry had the smallest percentage of 1973-74 graduates with 5.8 percent.

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Foreign citizens were well represented across all fields with the exception of psychology, where their representation was less than 2 percent.

TABLE 3 Demographic Characteristics by Field of Doctorate, 1975

Demographic Characteristics	All Fields	Field of Doctorate									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
Total Population	279,351	15,989	25,085	43,248	8,813	41,228	70,577	29,435	39,273	5,519	184
Sex	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Male	90.6	93.0	97.5	93.9	96.9	99.5	87.2	77.7	87.7	82.8	87.0
Female	9.4	7.0	2.5	6.1	3.1	.5	12.8	22.3	12.3	17.2	13.0
Racial-Ethnic Group	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
White/Caucasian	89.3	88.3	89.0	90.2	94.0	85.4	89.5	91.7	89.4	91.5	86.4
Minority Group[+]	6.3	6.5	5.9	6.3	2.8	10.9	6.3	2.7	5.6	2.4	1.1
No Report	4.4	5.2	5.0	3.5	3.3	3.6	4.2	5.6	5.0	6.1	12.5
Age	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under 30	3.6	6.6	3.0	3.9	2.2	3.4	3.3	5.5	2.6	.0	.0
30-34	20.8	26.6	23.5	19.7	16.0	23.8	20.1	22.6	18.4	3.4	1.6
35-39	20.1	23.8	23.4	17.8	21.0	26.1	18.9	17.1	18.4	11.4	22.3
40-44	15.0	13.0	14.8	14.2	20.1	17.4	14.6	14.5	14.6	15.5	15.8
45-49	12.6	9.8	11.6	12.3	13.4	11.1	13.4	13.4	13.4	17.4	19.6
50-54	10.7	7.5	10.6	11.0	10.2	9.4	10.6	11.9	11.8	15.7	13.0
55-59	7.0	4.8	5.2	9.1	6.4	4.4	7.2	6.9	8.3	12.5	7.6
60-64	4.6	3.2	3.2	5.7	4.3	2.3	5.3	3.6	5.7	10.1	8.7
Over 64	5.4	4.7	4.6	5.9	6.3	2.1	6.5	4.3	6.5	13.9	9.8
No Report	.2	*	*	.3	.0	.1	.2	.1	.4	*	1.6
Calendar Year of Ph.D.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930-34	2.0	2.1	1.7	3.1	2.8	.8	2.3	1.3	2.1	2.1	1.6
1935-39	2.7	2.2	2.9	4.5	3.1	.9	3.1	1.6	2.4	3.0	9.2
1940-44	3.1	2.2	2.4	5.8	2.3	1.6	3.8	1.5	2.5	3.3	7.6
1945-49	3.5	3.0	3.1	6.0	3.3	2.2	3.6	2.3	3.4	4.6	4.9
1950-54	9.1	6.7	10.3	11.7	7.6	6.7	9.4	9.3	8.1	11.6	16.8
1955-59	10.5	7.5	10.4	12.0	10.9	7.5	11.0	12.9	9.8	12.5	12.0
1960-64	14.6	14.0	16.0	15.2	16.2	14.4	14.5	13.7	13.1	19.5	22.8
1965-69	25.0	28.4	26.2	21.5	25.0	32.0	23.4	23.0	22.5	33.6	6.0
1970-72	19.9	22.8	18.6	14.3	19.2	23.7	19.5	21.3	23.4	9.7	4.9
1973-74	9.6	10.8	8.3	5.8	9.6	10.2	9.3	13.1	12.6	.0	.0
No Report	*	.1	*	*	*	*	.1	*	.0	.1	14.1
Citizenship	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
U.S.	94.2	93.3	92.0	94.2	93.0	91.6	94.6	98.3	94.9	98.2	46.2
Foreign	5.6	6.6	7.9	5.6	7.0	8.3	5.2	1.6	4.6	1.7	52.2
No Report	.2	.2	.1	.2	.0	.1	.2	.1	.5	.1	1.6
Category of Ph.D.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
U.S. Science	94.1	95.5	92.7	93.2	94.0	97.4	96.8	98.4	97.7	.0	.0
U.S. Nonscience	1.9	.0	.0	.0	.0	.0	.0	.0	.0	97.0	.0
Foreign	4.0	4.5	7.3	6.8	5.9	2.6	3.2	1.6	2.3	3.0	100.0
Unknown	*	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0

[+]Includes Black, American Indian, Asian, and Hispanic
*Less than .1%

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EMPLOYMENT STATUS BY FIELD OF DOCTORATE

Of the 279,400 doctoral scientists and engineers, 88.4 percent (246,900) were employed full-time. Approximately 7,700 (2.7 percent) reported part-time employment, and 8,300 (3.0 percent) indicated that they held a post-doctoral appointment (i.e., fellowship, traineeship, research associateship, etc.). Those unemployed and seeking employment (2,500), together with the full-time and part-time employed and the postdoctorates, constituted the labor force for the purposes of this report. The remaining doctoral scientists and engineers either were not seeking employment, gave no report of their employment status, or were retired.

Data in Table 4A on employment status in 1975 show that among all Ph.D. fields, engineering doctorates reported the highest level of full-time science or engineering employment (91.3 percent), followed closely by mathematicians (89.4 percent). Social scientists reported the lowest percentage in full-time science employment status (79.3 percent), and as many as 10.5 percent in full-time nonscience positions. The fields of bioscience and chemistry had relatively large percentages of Ph.D.'s who were retired (4.6 percent). In the field of psychology, 5.6 percent of the Ph.D.'s were working in science on a part-time basis only.

The results of the 1975 survey show that for the 1974 doctorates, 38.6 percent of the chemists, 33.5 percent of the bioscientists, and 32.0 percent of the physicists reported that they held postdoctoral appointments (Table 4B). It should be noted that the field of bioscience also contained the highest percentage of postdoctoral appointments (5.6 percent) across all years of degree. Mathematicians, engineers, and psychologists in the 1974 cohort each reported more than 80 percent in full-time science or engineering positions. Social scientists again were working full-time in nonscience positions in large numbers (16.2 percent of the field).

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The 1974 Ph.D.'s in physics/astronomy reported the largest percentage of unemployed and seeking work at 5.1 percent. A relatively large percentage of bioscientists were unemployed but were not seeking work in 1975 (2.8 percent). Again, a higher percentage (6.6 percent) of psychologists were working on a part-time basis than any other group of Ph.D.'s.

TABLE 4 Employment Status of Doctoral Scientists and Engineers, 1975

A. Individuals Receiving Doctorates During 1930-1974

1975 Employment Status	All Fields	Field of Doctorate									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
Total Population N	279,351	15,989	25,085	43,248	8,813	41,228	70,577	29,435	39,273	5,519	184
Employed Full-Time											
Science	83.7%	89.4%	83.2%	80.8%	87.8%	91.3%	81.8%	83.5%	79.3%	85.0%	97.3%
Nonscience	4.7	3.5	4.4	5.8	3.0	3.6	2.4	4.3	10.5	.0	.0
Employed Part-Time											
Science	2.4	1.9	1.6	1.8	3.3	1.2	2.5	5.6	2.3	3.8	.0
Nonscience	.3	.2	.4	.5	.2	.1	.2	.4	.6	.0	.0
Postdoctoral	3.0	.7	4.7	4.1	1.4	.9	5.6	1.5	.9	.2	.0
Not Employed*											
Seeking Employment	.9	.6	1.5	1.0	1.0	.7	1.0	.8	.9	.4	.0
Not Seeking	.9	.7	1.0	1.0	.3	.4	1.4	.9	.5	.4	.0
Retired	3.7	2.9	2.9	4.6	2.9	1.5	4.6	2.6	4.4	9.6	2.7
Other	.2	.1	.2	.2	.0	.1	.2	.1	.2	.3	.0
No Report	.2	.1	.1	.1	.1	.1	.2	.3	.3	.2	.0

B. Individuals Receiving Doctorates in 1974

1975 Employment Status	All Fields	Field of Doctorate									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
Total Population N	17,889	1,122	1,230	1,769	604	2,783	4,385	2,603	3,393	–	–
Employed Full-Time											
Science	71.7%	90.8%	58.0%	53.2%	75.2%	87.7%	58.6%	81.9%	75.7%		
Nonscience	5.1	3.2	1.9	4.5	5.0	4.0	1.3	.7	16.2		
Employed Part-Time											
Science	2.8	2.2	.7	1.3	5.8	2.2	2.4	6.3	2.6		
Nonscience	.2	.0	.6	.1	.0	.0	.2	.3	.6		
Postdoctoral	17.2	2.8	32.0	38.6	11.9	4.5	33.5	7.9	2.8		
Not Employed*											
Seeking Employment	1.4	.6	5.1	1.2	2.2	1.2	1.2	1.3	.8		
Not Seeking	1.4	.4	1.8	1.0	.0	.4	2.8	1.7	.9		
Retired	.0	.0	.0	.0	.0	.0	.0	.0	.0		
Other	.0	.0	.0	.0	.0	.0	.0	.0	.0		
No Report	.1	.0	.0	.0	.0	.1	.0	.0	.5		

*Percentages are *not* unemployment rates, since the percentages presented here are calculated on the total population, which includes those retired, those not seeking employment, and those not reporting status, all of whom may not be considered part of the labor force. Unemployment rates by field of doctorate are provided in the report, "Employment Status of Ph.D. Scientists and Engineers: 1973 and 1975." Maxfield, B., Ahern, N., and Spisak, A. Commission on Human Resources–National Research Council (In Press).

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TYPE OF EMPLOYER BY FIELD OF EMPLOYMENT

As shown in Table 5A, of the approximately 254,600 employed Ph.D.'s (not including postdoctoral appointees), the majority (57.7 percent) were employed by educational institutions. Business and industry, the second largest employer, accounted for 25.9 percent, while the Federal government employed 8.3 percent.

A closer examination of the distribution within each employment field shows that the largest percentages working in educational institutions were found in the social sciences (81.5 percent) and mathematics (78.7 percent) whereas chemistry (38.3 percent) and engineering (34.7 percent) had the smallest percentages. Conversely, chemistry and engineering were represented in highest proportion in business or industry (52.5 percent and 52.6 percent respectively), while only 4.8 percent of the social scientists were employed there.

The Federal government employed a substantial number of earth scientists (19.1 percent), physicists (12.4 percent), and bioscientists (11.1 percent). Outside of educational institutions, those working in psychology were most often employed by hospitals or clinics (16.2 percent), and to a lesser extent by business or industry (14.1 percent).

While educational institutions were a major source of employment for 1974 doctorate recipients, the Federal government employed a substantial percentage of physicists (23.6 percent), earth scientists (19.3 percent), bioscientists (12.7 percent), and engineers (12.0 percent) as shown in Table 5B. Earth scientists frequently found employment

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in state and local government (8.1 percent), and nearly 28 percent of the recently graduated psychologists were employed in hospitals or clinics.

TABLE 5 Type of Employer by Field of Employment for Full-Time and Part-Time Employed Doctoral Scientists and Engineers Excluding Postdoctoral Appointees, 1975

A. Individuals Receiving Doctorates During 1930-1974

1975 Employer	All Fields	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
Employed Population N	254,643	16,682	16,866	31,582	11,863	41,398	60,415	28,531	31,056	12,894	3,356
Educational Institution+	57.7%	78.7%	61.0%	38.3%	48.7%	34.7%	66.7%	58.2%	81.5%	57.6%	46.7%
Federal Government	8.3	5.2	12.4	5.2	19.1	8.9	11.1	4.2	6.3	5.2	4.2
State/Local Gov't	1.7	.2	*	.6	3.7	.8	2.1	3.9	2.2	2.4	1.6
Hospital/Clinic	2.8	.1	.5	1.0	.0	*	3.1	16.2	.1	.5	2.5
Other Non-Profit Organization	3.4	1.4	4.4	2.4	4.2	2.9	2.8	3.2	5.0	6.0	7.9
Business/Industry	25.9	14.4	21.7	52.5	24.2	52.6	14.1	14.1	4.8	28.1	29.8
Other/No Report	.2	*	.0	*	.0	*	.1	.2	.1	.2	7.3

B. Individuals Receiving Doctorates in 1974

1975 Employer	All Fields	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
Employed Population N	14,293	1,131	538	995	580	2,545	2,608	2,291	2,619	863	123
Educational Institution+	53.2%	70.5%	55.0%	23.9%	37.6%	23.3%	64.5%	49.9%	78.2%	65.4%	25.2%
Federal Government	9.4	7.8	23.6	9.3	19.3	12.0	12.7	5.1	4.8	4.3	1.6
State/Local Gov't	2.5	.3	.0	.8	8.1	1.5	2.4	5.4	2.5	1.9	.0
Hospital/Clinic	5.5	.0	.0	.5	.0	.4	3.9	27.6	.6	.3	13.8
Other Non-Profit Organization	4.2	1.4	5.2	.7	5.2	3.2	2.1	4.5	8.3	2.3	39.8
Business/Industry	25.0	20.1	16.2	64.7	29.8	59.6	14.5	7.6	4.9	25.8	19.5
Other/No Report	.1	.0	.0	.0	.0	.0	.0	.0	.6	.0	.0

*Less than .1%
+Includes Elementary and Secondary Schools as well as Higher Educational Institutions.

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PRIMARY WORK ACTIVITY BY FIELD OF EMPLOYMENT

Teaching was the primary work activity most often cited (36.8 percent) by the 254,600 employed doctoral scientists and engineers, excluding the postdoctorates (Table 6A). Research and the administration of research and development were the second and third most frequently mentioned activities (25.8 percent and 14.5 percent respectively).

The highest percentages of Ph.D.'s who reported teaching as their primary work activity were employed in the social sciences (63.6 percent) and in mathematics (60.7 percent). Research was the most frequent primary work activity of physicists (43.9 percent), bioscientists (37.5 percent), earth scientists (35.6 percent), chemists (34.7 percent) and engineers (23.1 percent) while over 22 percent of the Ph.D.'s in each of the latter two fields listed administration of research and development as their primary work activity. About 30 percent of the psychologists reported consulting/professional services as their primary activity, nearly as many as cited teaching.

Among the approximately 14,300 employed 1974 doctorates, teaching and research were the most frequently reported primary work activities, 37.6 percent and 30.0 percent respectively (Table 6B). Patterns observed for the 1930-1974 graduates differed from those of the 1974 cohort in that 20.8 percent of the 1930-74 graduates were engaged in administration compared to only 8.6 percent of the 1974 graduates.

The 1974 graduates showed patterns similar to those of the 1930-74 graduates in that the physicists/astronomers (71.4 percent) were most

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frequently engaged in research, whereas mathematicians (55.7 percent) and social scientists (63.7 percent) worked primarily in teaching. Consulting/professional services were reported by a higher percentage of the 1974 Ph.D. psychologists, 36.3 percent of whom cited this work activity category, compared to 29.8 percent for the 1930-74 cohorts.

TABLE 6 Primary Work Activity by Field of Employment for Full-Time and Part-Time Employed Doctoral Scientists and Engineers Excluding Postdoctoral Appointees, 1975

A. Individuals Receiving Doctorates During 1930-1974

1975 Primary Work Activity	All Fields	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
Employed Population N	254,643	16,682	16,866	31,582	11,863	41,398	60,415	28,531	31,056	12,894	3,356
Teaching	36.8%	60.7%	34.9%	28.0%	29.6%	22.3%	33.9%	38.7%	63.6%	31.3%	22.1%
Research	25.8	17.3	43.9	34.7	35.6	23.1	37.5	10.1	13.2	5.5	10.9
Administration of:											
–Research/Development	14.5	6.4	11.6	22.1	16.5	22.7	13.0	8.8	8.0	16.0	14.8
–Other	6.3	4.0	1.8	3.6	6.6	6.4	4.0	8.3	6.6	24.9	12.1
Consulting/Prof. Services	6.2	2.0	.9	1.5	4.6	4.2	4.3	29.8	2.0	5.3	6.1
Design/Development	4.5	6.9	3.5	4.4	1.5	16.7	1.1	.7	.5	1.9	1.4
Report/Marketing/ Production/Inspection	1.9	.5	.7	3.1	1.7	1.8	1.7	.5	1.7	5.7	7.4
Other/No Report	4.0	2.1	2.6	2.6	4.0	2.8	4.5	3.1	4.3	9.3	25.2

B. Individuals Receiving Doctorates in 1974

1975 Primary Work Activity	All Fields	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
Employed Population N	14,293	1,131	538	995	580	2,545	2,608	2,291	2,619	863	123
Teaching	37.6%	55.7%	21.4%	17.7%	25.7%	12.8%	37.3%	36.4%	63.7%	54.8%	20.3%
Research	30.0	22.9	71.4	57.1	44.5	43.3	36.3	8.8	17.3	12.6	.8
Administration of:											
–Research/Development	5.8	.9	1.3	9.4	7.1	7.3	5.3	9.2	4.5	1.4	9.8
–Other	2.8	2.0	.0	.5	5.5	3.2	2.0	4.6	1.6	6.5	.0
Consulting/Prof. Services	9.9	2.1	.0	.8	14.0	4.2	7.3	36.3	2.3	10.2	13.8
Design/Development	7.4	15.5	3.5	7.1	.5	26.0	2.7	.0	1.3	2.3	.0
Report/Marketing/ Production/Inspection	2.4	.0	1.3	5.9	2.8	.9	1.1	.7	4.8	6.4	13.0
Other/No Report	4.2	.9	1.1	1.4	.0	2.3	7.9	3.9	4.5	5.8	42.3

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SALARIES OF THE FULL-TIME EMPLOYED BY FIELD OF EMPLOYMENT

Table 7A presents salary data for the 236,400 doctoral scientists and engineers in full-time[11] employment status. The overall median annual salary was more than $23,100, and by field the median salary ranged from approximately $21,800 for mathematicians to over $25,100 for engineers. Among the science and engineering Ph.D.'s, mathematicians had the lowest 10th percentile salary ($15,200), while engineers employed full-time reported the highest salary at the 90th percentile ($36,200). The nonscience employed were atypical in their wide range of salaries between the lower and upper deciles, $14,900 to $40,200. This variability may be explained by the broad nature of the category which includes such diverse occupations as taxi drivers and secretaries as well as lawyers and corporate executives.

As shown in Table 7B, the median salary for 1974 doctorate recipients was $17,300 for all fields with the bottom and top of the median range represented again by mathematics ($15,800) and engineering ($19,300). In fact, salaries for Ph.D.'s employed in engineering were the highest of any field for all percentile levels of salaries calculated. Chemists earned the second highest median income ($18,200), and physicists/astronomers had the lowest 10th percentile figure ($10,700). A field by field comparison of the median annual salaries for individuals receiving Ph.D.'s in 1974 with the degree recipients from 1930-1974 is shown in Figure 1.

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[11] Salary data excludes individuals on active duty in the U.S. military/Commissioned Corps.

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TABLE 7 Salary by Field of Employment for Full-Time Employed Doctoral Scientists and Engineers, 1975

A. Individuals Receiving Doctorates During 1930-1974

1975 Annual Salary*	All Fields	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
10th Percentile	$16,111	$15,224	$16,417	$16,585	$16,489	$18,707	$15,678	$15,655	$15,650	$14,855	$14,947
25th Percentile	18,862	17,962	19,436	19,514	18,930	21,418	18,248	18,181	18,077	18,956	18,871
50th Percentile (Median)	23,126	21,790	23,641	23,885	23,382	25,133	22,164	22,020	21,992	24,260	24,171
75th Percentile	28,568	26,742	28,768	28,933	28,673	30,072	27,559	26,850	27,702	31,883	30,763
90th Percentile	35,165	33,202	34,102	35,565	35,650	36,162	34,283	33,291	33,919	40,184	37,797

B. Individuals Receiving Doctorates in 1974

1975 Annual Salary*	All Fields	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
10th Percentile	$13,046	$12,179	$10,670	$13,582	$13,160	$16,100	$12,557	$13,381	$13,279	$11,054	**
25th Percentile	15,941	13,838	13,450	16,167	15,134	17,938	14,595	14,878	14,939	14,044	**
50th Percentile (Median)	17,266	15,794	17,037	18,205	17,412	19,316	16,487	16,236	16,618	16,422	**
75th Percentile	19,575	18,852	19,968	19,590	19,316	21,408	18,670	18,181	18,474	20,150	**
90th Percentile	22,168	21,523	21,613	21,630	21,627	24,039	21,646	20,604	21,707	22,362	**

*Medians were computed for full-time employed civilians only. Academic salaries were multiplied by 11/9 to adjust to a full-year scale.
**Medians were not calculated for cells with less than 20 cases reported.

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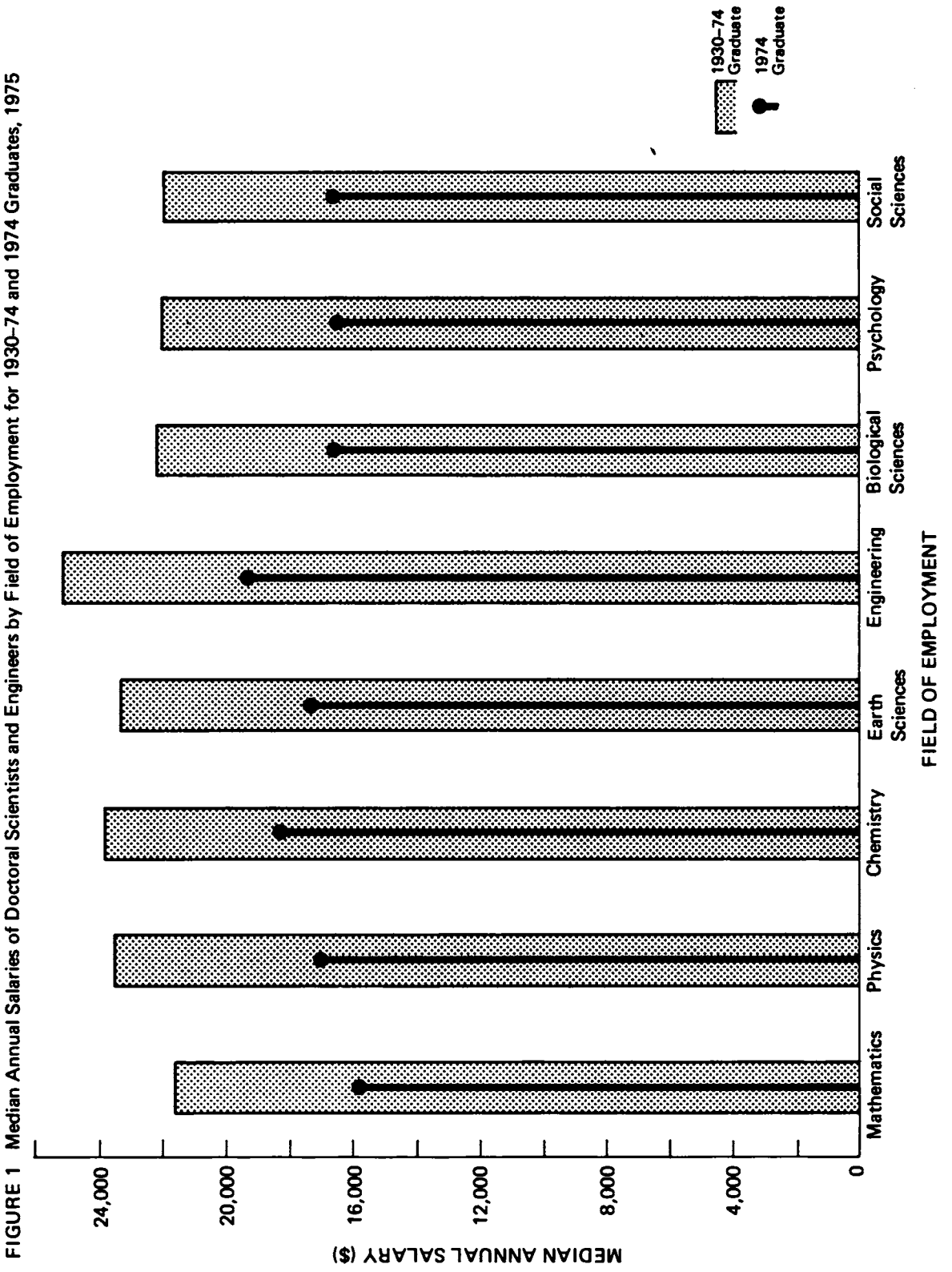

FIGURE 1 Median Annual Salaries of Doctoral Scientists and Engineers by Field of Employment for 1930–74 and 1974 Graduates, 1975

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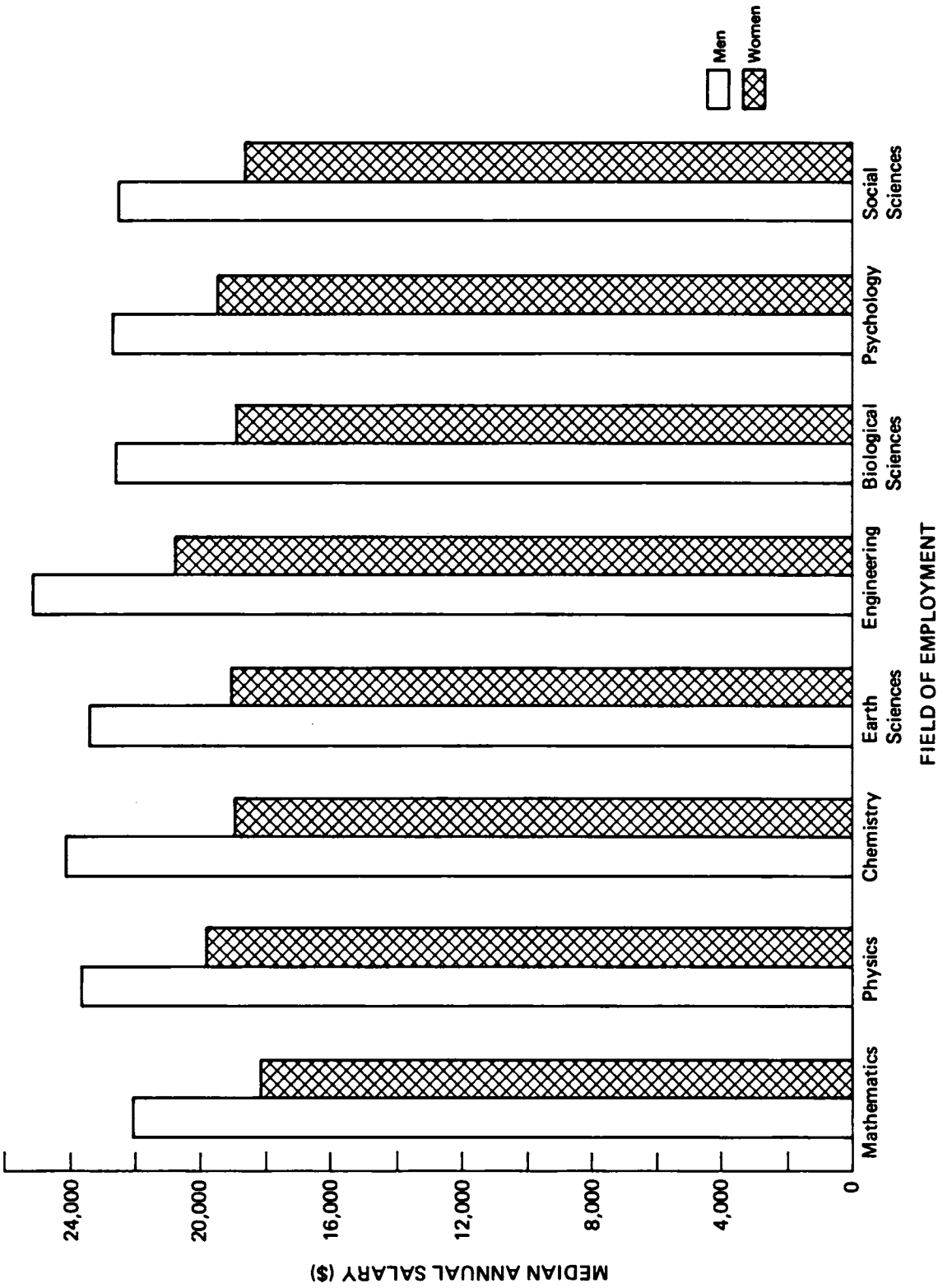

FIGURE 2 Median Annual Salaries of Doctoral Scientists and Engineers by Field of Employment and Sex, 1975

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MEDIAN ANNUAL SALARY BY SEX AND FIELD OF EMPLOYMENT, AND BY TYPE OF EMPLOYER AND FIELD OF EMPLOYMENT

For full-time employed doctoral scientists and engineers the median annual salary for men exceeded that for women in every field of employment (Table 8A and Figure 2). The disparity was greatest in the field of chemistry with a difference of over $5,000 between the medians for males and females. The smallest difference was in psychology where female Ph.D.'s reported a median annual salary of $19,600, approximately $3,000 below the $22,600 median for males.

The highest median annual salaries for both men and women were in the field of engineering (over $25,200 for men and approximately $20,800 for women), while the lowest were in mathematics ($22,000 for men and approximately $18,200 for women).

Examination by type of employer reveals that Ph.D.'s employed by the Federal government reported the highest median salary ($26,200). Business and industry had the second highest median salary of $26,000 and was the highest paying employer of physicists, bioscientists, psychologists, and social scientists. For doctoral mathematicians those employed by non-profit organizations or the Federal government reported the highest median salary.

State and local government employees reported the lowest median salary for all fields combined (approximately $20,800). Educational institutions, however, were the lowest paying employers of mathematicians, physicists, bioscientists, psychologists and social scientists.

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TABLE 8A Median Annual Salary* by Sex and Field of Employment, 1975

Sex	All Fields	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
Total	$23,126	$21,790	$23,641	$23,885	$23,382	$25,133	$22,164	$22,020	$21,992	$24,260	$24,171
Male	23,509	22,006	23,737	24,117	23,531	25,153	22,555	22,589	22,394	24,681	25,075
Female	19,035	18,180	19,825	18,993	19,003	20,768	18,860	19,640	18,597	19,667	18,950

TABLE 8B Median Annual Salary* by Type of Employer and Field of Employment, 1975

Type of Employer	All Fields	Field of Employment									
		Math	Phys	Chem	Earth	Engr	Biosc	Psych	SocSc	Nonsc	No Report
All Employers	$23,126	$21,790	$23,641	$23,885	$23,382	$25,133	$22,164	$22,020	$21,992	$24,260	$24,171
Educational Institution	21,370	20,740	21,977	20,513	20,907	23,476	20,843	20,851	21,004	23,254	23,009
Federal Government	26,231	26,129	25,517	26,105	27,363	26,557	25,369	26,600	28,838	33,104	**
State/Local Government	20,839	**	**	18,650	19,750	19,933	20,860	21,524	22,412	18,885	**
Hospital/Clinic	21,797	**	**	21,041	**	**	24,058	21,357	**	**	**
Other Non-Profit Organization	24,794	26,321	24,531	23,043	23,658	25,884	22,758	24,603	28,433	23,602	27,871
Business/Industry	25,999	24,482	25,969	25,762	26,239	25,957	25,559	30,577	29,329	27,498	27,195

*Medians were computed for full-time employed civilians only. Academic salaries were multiplied by 11/9 to adjust for a full-year scale.
**Medians have not been calculated for cells with less than 20 cases reported.

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EMPLOYMENT STATUS AND MEDIAN ANNUAL SALARY BY AGE AND SEX

Of the 23,200 female doctorate recipients in the science and engineering labor force, 3.0 percent were unemployed and seeking employment, compared with only 0.8 percent of the 242,300 males. Furthermore, Table 9 shows that the unemployment rates for female Ph.D.'s were greater than those for male Ph.D.'s in virtually all age groups.

The percentage of the doctoral labor force employed full-time in nonscience/nonengineering jobs because science positions were unavailable was low for both males and females (0.3 percent and 0.4 percent, respectively). A higher percentage of the female labor force, however, reported working part-time, but seeking full-time work, 2.4 percent for women compared to 0.5 percent for men.

The median annual salaries differed substantially for male and female Ph.D.'s. The median salary for full-time employed women was $19,000 compared to $23,500 for men. The discrepancy between the salaries of males and females tended to increase with age resulting in a difference of between $6,000 to $7,000 for the older cohorts.

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TABLE 9 Employment Status and Median Annual Salary by Age and Sex, 1975

Sex and Age in 1975	Total Labor Force* N	Median Annual Salary**	Employment Status+					
			Unemployed and Seeking		Full-Time Nonscience Employed/Science Not Available		Part-Time Employed, Seeking Full-Time	
			N	%	N	%	N	%
Male and Female, Total*	265,534	$23,126	2,543	(1.0)	815	(.3)	1,765	(.7)
Under 30	9,848	16,929	93	(.9)	28	(.3)	110	(1.1)
30-34	57,099	18,811	695	(1.2)	279	(.5)	443	(.8)
35-39	55,628	21,532	464	(.8)	177	(.3)	348	(.6)
40-44	41,729	24,226	354	(.8)	92	(.2)	170	(.4)
45-49	34,948	26,156	364	(1.0)	67	(.2)	234	(.7)
50-54	29,491	28,068	275	(.9)	83	(.3)	201	(.7)
55-59	18,863	28,151	172	(.9)	45	(.2)	143	(.8)
60-64	11,493	28,532	100	(.9)	34	(.3)	63	(.5)
Over 64	6,156	27,713	26	(.4)	10	(.2)	53	(.9)
Male, Total*	242,346	$23,509	1,854	(.8)	722	(.3)	1,218	(.5)
Under 30	8,246	17,224	52	(.6)	28	(.3)	47	(.6)
30-34	51,816	18,967	454	(.9)	252	(.5)	323	(.6)
35-39	51,377	21,794	356	(.7)	158	(.3)	235	(.3)
40-44	38,824	24,455	261	(.7)	69	(.2)	93	(.2)
45-49	31,886	26,552	270	(.8)	67	(.2)	170	(.5)
50-54	26,992	28,604	219	(.8)	74	(.3)	152	(.6)
55-59	17,342	28,588	140	(.8)	42	(.2)	104	(.6)
60-64	10,296	29,200	88	(.9)	22	(.2)	46	(.4)
Over 64	5,357	28,478	24	(.4)	10	(.2)	48	(.9)
Female, Total*	23,188	$19,035	689	(3.0)	93	(.4)	547	(2.4)
Under 30	1,602	15,916	41	(2.6)		(.0)	63	(3.9)
30-34	5,283	16,829	35	(4.6)	27	(.5)	120	(2.3)
35-39	4,251	18,327	118	(2.8)	19	(.4)	113	(2.7)
40-44	2,905	19,947	93	(3.2)	23	(.8)	77	(2.7)
45-49	3,062	21,276	94	(3.1)		(.0)	64	(2.1)
50-54	2,499	22,257	56	(2.2)	9	(.4)	49	(2.0)
55-59	1,521	21,627	32	(2.1	3	(.2)	39	(2.6)
60-64	1,197	22,677	12	(1.0)	12	(1.0)	17	(1.4)
Over 64	799	22,374	2	(.3)		(.0)	5	(.6)

+Percentage of labor force in 1975.
*Includes those not reporting age.
**Medians were computed for full-time employed civilians only. Academic salaries were multiplied by 11/9 to adjust to a full-year scale.

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SELECTED AREAS OF NATIONAL INTEREST BY PRIMARY WORK ACTIVITY

All but 12.3 percent of the total employed doctoral scientists and engineers indicated that they spent a significant portion of their time in an area of national interest.

Education was cited by approximately 106,000 (40.2 percent) doctoral scientists and engineers as the area of interest to which a significant portion of their professional time was devoted (Table 10). More than 40,000 (15.4 percent) individuals checked health as the most important area of concern. Energy and environmental protection were the third and fourth most frequently reported categories of national interest, 21,000 (7.9 percent) and 16,000 (6.2 percent) respectively.

Health was checked as the most important area of concern for 23.0 percent of Ph.D.'s engaged in research, and 44.2 percent of Ph.D.'s engaged in consulting or professional services. Health was also the area most often mentioned by administrators of research and development and Ph.D.'s working in technical writing, marketing, production or inspection.

Among administrators of activities other than research and development, 23.2 percent named education other than teaching as the most important area of national interest. For those Ph.D.'s engaged in design and development, 17.9 percent checked defense and 15.7 percent checked energy and fuel as the areas to which they devoted a significant portion of their professional time.

Environmental protection and food production/technology were named by more than 10 percent of the Ph.D.'s employed in report or technical

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writing, marketing, production, or inspection as an area of significant professional concern.

TABLE 10. Number of Employed Doctoral Scientists and Engineers by Selected Areas of National Interest as a Percentage of Total for Primary Work Activity, 1975

			Primary Work Activity							
Area of National Interest	Total		Teach.	Research	Administration of R & D	Administration of Other	Consult/ Prof. Services	Design/ Develop.	Report./ Market./ Prod./ Inspect.	Other/ No Report
Total Employed*	262,991		93,850	73,047	36,863	16,027	16,217	11,613	4,878	10,496
Education-Teaching	35.1%	(92,367)	80.2%	12.8%	5.7%	14.4%	5.2%	2.5%	3.3%	19.3%
Education-Other	5.1	(13,436)	2.3	3.2	8.2	23.2	7.5	1.4	3.3	6.3
Health	15.4	(40,414)	4.8	23.0	16.7	16.0	44.2	6.6	13.2	17.3
Defense	5.1	(13,306)	.5	7.6	10.3	3.5	1.5	17.9	4.7	3.4
Environmental Protection	6.2	(16,217)	2.6	8.1	9.9	7.9	6.7	5.6	11.5	6.5
Space	1.5	((3,952)	.3	2.6	2.7	.5	.2	4.5	.9	.9
Crime Prevention & Control	.8	(2,150)	.7	.5	.9	1.2	2.1	.7	1.2	1.5
Food Production & Tech.	5.1	(13,431)	1.3	8.8	7.8	3.5	3.5	3.4	10.4	8.4
Energy & Fuel	7.9	(20,852)	2.2	11.1	13.2	8.4	6.9	15.7	9.5	9.9
Other Mineral Resources	.6	(1,694)	.2	.8	1.1	1.0	.6	1.3	1.1	.9
Community Development	1.4	(3,743)	1.1	.7	1.7	3.2	4.5	.5	1.0	2.6
Housing (Planning, Design)	.3	(713)	.2	.2	.3	.8	.3	.4	.7	.4
Transportation	1.7	(4,548)	.5	1.9	3.3	1.7	1.1	7.4	1.3	1.0
Other Area	1.5	(3,871)	.5	1.9	2.2	2.3	1.8	1.4	3.0	2.6
No Report	12.3	(32,297)	2.7	16.9	16.0	12.5	13.9	30.7	34.9	19.2

*Includes postdoctoral appointees as well as full-time and part-time employed.

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REGIONAL DIFFERENCES IN UNEMPLOYMENT RATES

Out of a labor force of over 265,500 doctoral scientists and engineers, approximately 2,500 or 1.0 percent were unemployed and seeking work in 1975. Table 11 provides detailed unemployment rates by region and state. Regionally, the Pacific States reported the highest unemployment with 1.6 percent of the labor force unable to find employment. The region with the second highest unemployment rate, 1.2 percent, was New England. The East South Central region, on the other hand, had the least unemployment, 0.2 percent. Nationally, 93.0 percent of the doctoral scientists and engineers in the labor force were working full-time.

Although employment data for individual states are provided in Table 11 and Figure 3, no inferences should be drawn for particular states. In most cases, sample sizes are small, resulting in large sampling errors relative to the reported statistics. Sampling errors for national and for regional data are within acceptable limits.

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TABLE 11. Employment, Unemployment and Labor Force of Doctoral Scientists and Engineers in the U.S., 1930-1974 Graduates, by States

1975 Employment Location	Total Labor Force*	Full-Time Employed	Unemployed Seeking Employment+	Other Labor Force#
All Locations	265,534	93.0%	1.0%	6.0%
New England	20,447	90.9	1.2	7.9
Connecticut	4,844	92.8	.8	6.4
Maine	971	94.0	1.9	4.1
Massachusetts	11,628	89.3	1.4	9.3
New Hampshire	893	89.7	2.5	7.8
Rhode Island	1,292	94.5	.2	5.3
Vermont	819	94.5	1.6	3.9
Middle Atlantic	53,019	92.6	1.1	6.3
New Jersey	11,260	94.2	1.1	4.7
New York	27,121	91.4	1.1	7.5
Pennsylvania	14,638	93.6	1.0	5.3
East North Central	43,560	93.5	.8	5.6
Illinois	12,455	92.2	1.1	6.7
Indiana	5,545	94.2	.2	5.7
Michigan	9,252	94.4	.8	4.8
Ohio	11,284	94.7	.8	4.6
Wisconsin	5,024	92.1	1.1	6.8
West North Central	16,364	94.0	.6	5.4
Iowa	2,554	92.4	.7	6.9
Kansas	2,262	93.0	.7	6.3
Minnesota	4,526	94.7	.5	4.8
Missouri	4,428	93.5	.5	5.9
North Dakota	641	96.1	.8	3.1
Nebraska	1,445	95.8	.4	3.7
South Dakota	508	96.9	–	3.1
South Atlantic	46,555	94.0	.7	5.3
Delaware	3,063	95.9	.9	3.2
District of Columbia	9,191	94.4	.4	5.2
Florida	5,556	93.7	1.6	4.8
Georgia	4,386	95.4	.2	4.4
Maryland	8,484	90.6	.7	8.7
North Carolina	5,519	94.2	1.1	4.7
South Carolina	2,034	96.2	.2	3.6
Virginia	7,054	94.2	.7	5.1
West Virginia	1,268	98.9	–	1.1
East South Central	11,156	95.9	.2	3.9
Alabama	2,716	97.3	.1	2.5
Kentucky	2,373	94.8	.6	4.6
Mississippi	1,511	97.2	–	2.8
Tennessee	4,556	95.2	.1	4.7
West South Central	18,829	94.2	.7	5.0
Arkansas	1,099	95.1	–	4.9
Louisiana	3,112	96.2	.7	3.0
Oklahoma	2,497	94.9	.3	4.8
Texas	12,121	93.5	.9	5.6
Mountain	15,821	93.5	.9	5.7
Arizona	2,679	91.8	1.0	7.2
Colorado	4,919	90.9	.7	8.4
Idaho	1,045	97.4	1.1	1.4
Montana	897	91.0	1.4	7.6
New Mexico	2,922	95.4	1.5	3.0
Nevada	432	98.8	–	1.2
Utah	2,405	95.3	.2	4.5
Wyoming	522	98.9	–	1.1
Pacific	39,073	90.8	1.6	7.6
Alaska	407	89.4	3.9	6.6
California	30,414	90.8	1.6	7.6
Hawaii	1,078	90.8	.4	8.8
Oregon	2,634	89.9	1.5	8.6
Washington	4,540	91.8	1.6	6.6
U.S. Possessions	710	93.9	–	6.1

*Includes full-time and part-time employed, postdoctoral appointees, and those seeking employment.
+Dash (–) indicates none in sample reporting unemployed/seeking employment status.
#Includes part-time employed plus postdoctoral appointees.

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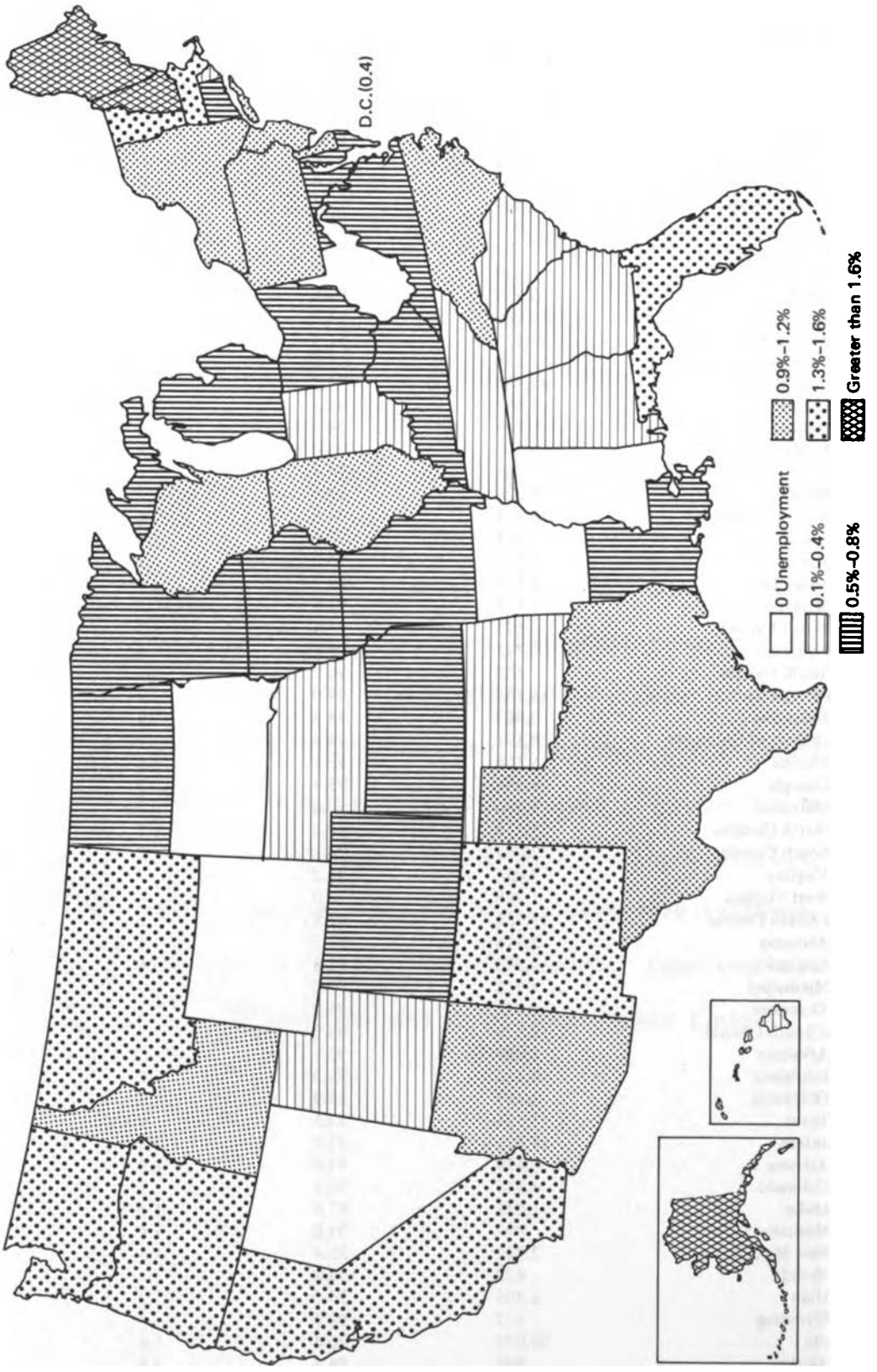

FIGURE 3 Unemployment Rates for Doctoral Scientists and Engineers, 1975

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APPENDIX A

QUESTIONNAIRE AND SPECIALTIES LIST

1975 SURVEY OF DOCTORAL SCIENTISTS AND ENGINEERS

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1975 SURVEY OF DOCTORAL SCIENTISTS AND ENGINEERS

OMB No. 099-68294

CONDUCTED BY THE NATIONAL RESEARCH COUNCIL WITH THE SUPPORT OF THE NATIONAL SCIENCE FOUNDATION

THE ACCOMPANYING LETTER requests your assistance in this biennial survey of doctoral scientists and engineers – including the fields of the natural and social sciences, mathematics, and engineering.

PLEASE READ the instructions for each question carefully and answer by printing your reply or entering an 'X' in the appropriate box.

PLEASE CHECK the pre-printed information to be certain that it is correct and complete.

PLEASE RETURN the completed form in the enclosed envelope to the Commission on Human Resources, JH 638, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

NOTE: ALL INFORMATION YOU PROVIDE WILL BE TREATED AS CONFIDENTIAL AND USED IN GROUP COMPARISONS FOR RESEARCH PURPOSES ONLY.

_____

_____

_____ (10)

If your name and address are incorrect, please enter correct information on the lines provided above. Include ZIP CODE.

If there is an alternate address through which you can always be reached, please provide it on the line below.

_____

C/O Number Street City State ZIP CODE (11)

1. Date of Birth Mo. Day Year (12-16)	2. State or Foreign Country of Birth (17-18)	3. Citizenship (19) USA: 0☐ Non-USA, specify country: 1☐ _____ (20-21)	4. Sex (22) 1☐ Male 2☐ Female

5. Racial/Ethnic Identification (23)

0 ☐ White/Caucasian
1 ☐ Black/Negro/Afro-American
2 ☐ American Indian
3 ☐ Mexican-American/Chicano
4 ☐ Puerto Rican-American
5 ☐ Oriental
6 ☐ Other Asian
7 ☐ Other, specify _____

6. List in the table below all collegiate and graduate degrees, excluding honorary degrees, that have been awarded to you. Please check the pre-printed information, including the number and name of the specialty from the list on page 3, to be certain that it is correct and complete.

Type of Degree	Granted Mo.	Granted Yr.	Major Field (Use Specialties List) Name	Major Field (Use Specialties List) Number	Institution Name	City (or campus) & State
Bachelor's						
Master's						
Doctorate						
Other, Specify						

PLEASE NOTE that in items 7-10 information is requested for both the current year, as of the week of February 9-15, 1975, and last year, as of the week of February 10-16, 1974.

7. What was your employment status as of the periods indicated? (Check only one category in each year.)

	1974	1975
Employed full-time, science or engineering related position	☐ 1	☐ 1
Employed full-time, nonscience or nonengineering related position	☐ 2	☐ 2
Employed part-time, science or engineering related position	☐ 3	☐ 3
Employed part-time, nonscience or nonengineering related position	☐ 4	☐ 4
Postdoctoral appointment (fellowship, traineeship, research associateship, etc.)	☐ 5	☐ 5
Unemployed and seeking employment	☐ 6	☐ 6
Specify number of months unemployed: _____ (66-67)		
Unemployed and not seeking employment	☐ 7	☐ 7
Retired and not employed	☐ 8	☐ 8
Specify year of retirement: _____ (68-69)		
Other, specify: _____	☐ 9	☐ 9
	(64)	(65)

7a. If you were employed full-time during February 9-15, 1975, in a position unrelated to science or engineering, what was the MOST important reason for taking the position?

1975
- Prefer nonscience or nonengineering position ☐ 1
- Promoted out of science or engineering position ☐ 2
- Pay is better ☐ 3
- Locational preference ☐ 4
- Science or engineering position not available ☐ 5
- Other, specify: _____ ☐ 6

(70)

7b. If you were employed part-time during February 9-15, 1975, were you seeking full-time employment? 1 ☐ Yes 2 ☐ No (71)

Please do not write in this space

1 1 2-9 ctr # C
10 11
12 13 14 15 16
17 18 19 20 21
22 23
B
24 25 26
27 28 29
30 31 32 33 34 35
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36 37 38
39 40 41
42 43 44 45 46 47
D
48 49 50
51 52 53
54 55 56 57 58 59
O
60 61 62 63
64 65
66 67 68 69
70 71

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8. Which category below best describes the type of organization of your principal employment OR postdoctoral appointment?

(Check only one category in each year.)

	1974	1975
Business or industry	☐ 1	☐
Junior college, 2-year college, technical institute	☐ 2	☐
Medical school	☐ 3	☐
4-year college or university, other than medical school	☐ 4	☐
Elementary or secondary school system	☐ 5	☐
Hospital or clinic	☐ 6	☐
U.S. military service, active duty, or Commissioned Corps, e.g., USPHS, NOAA	☐ 7	☐
U.S. government, civilian employee	☐ 8	☐
State government	☐ 9	☐
Local or other government, specify: _____	☐ 10	☐
International Agency	☐ 11	☐
Non-profit organization, other than hospital, clinic, or educational institution	☐ 12	☐
Other, specify: _____	☐ 13	☐
	(72-73)	(74-75)

9. What were the primary (A) and secondary (B) work activities related to your position?

(Check only one box in each column.)

	1974 A	1974 B		1975 A	1975 B	
Management or administration of:						
Research and development	☐	☐	1	☐	☐	
Other than research and development	☐	☐	2	☐	☐	
Both	☐	☐	3	☐	☐	
Basic research	☐	☐	4	☐	☐	
Applied research	☐	☐	5	☐	☐	
Development of equipment, products, systems, data	☐	☐	6	☐	☐	
Design	☐	☐	7	☐	☐	
Teaching	☐	☐	8	☐	☐	
Report or other technical writing, editing	☐	☐	9	☐	☐	
Production	☐	☐	10	☐	☐	
Consulting, specify: _____	☐	☐	11	☐	☐	
Professional services to individuals	☐	☐	12	☐	☐	
Quality control, inspection, testing	☐	☐	13	☐	☐	
Sales, marketing, purchasing, estimating	☐	☐	14	☐	☐	
Other, specify: _____	☐	☐	15	☐	☐	
	(10-13)			(14-17)		

72 73 74 75

2 1 2-9 ctr #

10 11 12 13

14 15 16 17

10. From the Degree and Employment Specialties List on page 4, select and enter both the number and title of the scientific specialty most closely related to your principal employment or postdoctoral appointment. Write in your specialty if it is not on the list.

1974 _____ (18-20)
Number Title of Specialty

1975 _____ (21-23)
Number Title of Specialty

18 19 20

21 22 23

Please answer items 11 through 13 regarding your employment during the week of February 9-15, 1975.

11. What percent of time did you devote to each of the following activities?

Management or administration of:	%	
Research and development	_____	(24)
Other than research and development	_____	(26)
Both	_____	(28)
Basic research	_____	(30)
Applied research	_____	(32)
Development	_____	(34)
Design	_____	(36)
Teaching	_____	(38)
Consulting	_____	(40)
Other, specify: _____	_____	(42)
TOTAL	100%	

12. Please give the name of your principal employer (organization, company, etc., or, if self-employed, write "self"), and actual place of employment.

_____ (44-49)
Name of Employer

_____
Number Street

_____
City State ZIP Code (50-54)

24 25 26 27 28 29

30 31 32 33 34 35

36 37 38 39 40 41

42 43

44 45 46 47 48 49

50 51 52 53 54

13. What was the basic annual salary* associated with your principal professional employment during the week of February 9-15, 1975? If you were on a postdoctoral appointment (e.g., fellowship, traineeship, research associateship), what was your annual stipend plus allowances?

$_____ per year (55-57)

55 56 57

*NOTE: Basic annual salary is your annual salary before deductions for income tax, social security, retirement, etc., but does not include bonuses, overtime, summer teaching, or other payment for professional work.

If academically employed:

a. Check whether salary was for ☐ 9-10 months or ☐ 11-12 months. (58)

58

b. Did you hold a tenured position during February 9-15, 1975? 0 ☐ Yes 1 ☐ No. (59) If yes, what year was the tenure granted? _____ (60-61)

59 60 61

c. What is the rank of your position?

1 ☐ Professor
2 ☐ Associate Professor
3 ☐ Assistant Professor
4 ☐ Instructor
5 ☐ Lecturer
6 ☐ Dean
7 ☐ President or Chancellor
8 ☐ Other, specify: _____
9 ☐ Does not apply (62)

82

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14. How many years of professional work experience, including teaching, have you had? _____ Year(s) (63-64)

63 64

15. Have you ever held a postdoctoral appointment? 0 ☐ Yes 1 ☐ No (65)

65

If yes, list below the time periods of your most recent postdoctoral appointments.

Appointment	Starting Year		Total Months	
Most Recent	_____	(66-67)	_____	(68-69)
Second Most Recent	_____	(70-71)	_____	(72-73)
Third Most Recent	_____	(74-75)	_____	(76-77)

How many other postdoctoral appointments have you held? _____ (78)

66 67 68 69

70 71 72 73

74 75 76 77

78

16. Have you ever been a full-time employee (excluding summer employment) of business or industry since earning your doctorate?

0 ☐ Yes 1 ☐ No (10)

If yes,

a. For how many years?

_____ Year(s) (11-12)

b. If you were employed by business or industry in February, 1975, check here ☐. If not, how many years ago did you leave your most recent business or industry employment?

_____ Year(s) (14-15)

17. Have you ever been a full-time employee (excluding summer employment) of an academic institution or organization since earning your doctorate?

0 ☐ Yes 1 ☐ No (16)

If yes,

a. For how many years?

_____ Year(s) (17-18)

b. If you were employed by an academic institution or organization in February, 1975, please check here ☐. If not, how many years ago did you leave your most recent academic employment?

_____ Year(s) (20-21)

18. Have you ever been a full-time employee (excluding summer employment) of government (federal, state, or local) since earning your doctorate?

0 ☐ Yes 1 ☐ No (22)

If yes,

a. For how many years?

_____ Year(s) (23-24)

b. If you were employed by government in February, 1975, check here ☐. If not, how many years ago did you leave your most recent government employment?

_____ Year(s) (26-27)

3
1 2-9 ctr #

10 11 12

13 14 15

16 17 18

19 20 21

22 23 24

25 26 27

---

19. Listed below are selected topics of critical national interest. If you devoted a significant proportion of your professional time to any of these problem areas in February, 1975, please check the box for the one on which you spent the MOST time.

Education:
1 ☐ Teaching
2 ☐ Other
3 ☐ Health
4 ☐ Defense
5 ☐ Environmental protection, pollution control
6 ☐ Space
7 ☐ Crime prevention and control
8 ☐ Food production and technology
9 ☐ Energy and fuel
10 ☐ Other mineral resources
11 ☐ Community development and services
12 ☐ Housing (planning, design, construction)
13 ☐ Transportation, communications
14 ☐ Other, specify: _____

(28-29)

28 29

---

20. Was any of your work in February, 1975, supported or sponsored by U.S. Government funds?

0 ☐ Yes 1 ☐ No 2 ☐ Don't know (30)

30

If yes, which of the following federal agencies or departments were supporting the work? (Check all that apply.)

31 ☐ NASA
32 ☐ National Science Foundation
33 ☐ Environmental Protection Agency
34 ☐ Energy Research & Development Administration (AEC)
35 ☐ Nuclear Regulatory Commission (AEC)
36 ☐ Agency for International Development
37 ☐ Department of the Interior
38 ☐ National Institutes of Health, HEW
39 ☐ Alcohol, Drug Abuse & Mental Health Administration, HEW
40 ☐ Office of Education, HEW
41 ☐ Other HEW, specify: _____
42 ☐ Department of Defense
43 ☐ Department of Commerce
44 ☐ Department of Agriculture
45 ☐ Department of Transportation
46 ☐ Department of Justice
47 ☐ Department of Housing and Urban Development
48 ☐ Other agency or department, specify: _____
49 ☐ Don't know source agency

31 32 33 34

35 36 37 38

39 40 41 42

43 44 45 46

47 48 49

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DEGREE AND EMPLOYMENT SPECIALTIES LIST

MATHEMATICAL SCIENCES

000 - Algebra
010 - Analysis & Functional Analysis
020 - Geometry
030 - Logic
040 - Number Theory
052 - Probability
055 - Math, Statistics (see also 544, 670, 725, 729)
060 - Topology
080 - Computing Theory & Practice
082 - Operations Research (see also 477)
085 - Applied Mathematics
089 - Combinatorics & Finite Mathematics
091 - Physical Mathematics
098 - Mathematics, General
099 - Mathematics, Other*

ASTRONOMY

101 - Astronomy
102 - Astrophysics

PHYSICS

110 - Atomic & Molecular Physics
120 - Electromagnetism
130 - Mechanics
132 - Acoustics
134 - Fluids
135 - Plasma Physics
136 - Optics
138 - Thermal Physics
140 - Elementary Particles
150 - Nuclear Structure
160 - Solid State
198 - Physics, General
199 - Physics, Other*

CHEMISTRY

200 - Analytical
210 - Inorganic
215 - Synthetic Inorganic & Organometallic
220 - Organic
225 - Synthetic Organic & Natural Products
230 - Nuclear
240 - Physical
245 - Quantum
250 - Theoretical
255 - Structural
260 - Agricultural & Food
265 - Thermodynamics & Meterial Properties
270 - Pharmaceutical
275 - Polymers
280 - Biochemistry (see also 540)
285 - Chemical Dynamics
298 - Chemistry, General
299 - Chemistry, Other*

EARTH, ENVIRONMENTAL & MARINE SCIENCES

301 - Mineralogy, Petrology
306 - Geochemistry
310 - Stratigraphy, Sedimentation
320 - Paleontology
330 - Structural Geology
341 - Geophysics (Solid Earth)
350 - Geomorph., Glacial Geology
360 - Hydrology
370 - Oceanography
381 - Atmospheric Chemistry & Physics
382 - Atmospheric Dynamics
391 - Applied Geology, Geol. Engr., Econ. Geol.
398 - Environmental Sciences, General
399 - Environmental Sciences, Other*
397 - Marine Sciences, Other*
398 - Earth Sciences, General
399 - Earth Sciences, Other*

ENGINEERING

400 - Aeronautical & Astronautical
410 - Agricultural
415 - Biomedical
420 - Civil
430 - Chemical
435 - Ceramic
440 - Electrical
445 - Electronics
450 - Industrial, Manufacturing
455 - Nuclear
460 - Engineering Mechanics
465 - Engineering Physics
470 - Mechanical
475 - Metallurgy & Phys. Met. Engr.
477 - Operations Research, Systems (see also 082)
479 - Fuel Technology, Petrol Engr.
480 - Sanitary/Environmental
486 - Mining
497 - Materials Science Engr.
498 - Engineering, General
499 - Engineering, Other*

AGRICULTURAL SCIENCES

500 - Agronomy
501 - Agricultural Economics
502 - Animal Husbandry
504 - Fish & Wildlife
505 - Forestry
506 - Horticulture
507 - Soils & Soil Science
510 - Animal Sciences
511 - Phytopathology
517 - Food Science & Technology (see also 573)
518 - Agriculture, General
519 - Agriculture, Other*

MEDICAL SCIENCES

520 - Medicine & Surgery
522 - Public Health
523 - Veterinary Medicine
524 - Hospital Administration
527 - Parasitology
534 - Pathology
536 - Pharmacology
537 - Pharmacy
538 - Medical Sciences, General
539 - Medical Sciences, Other*

BIOLOGICAL SCIENCES

540 - Biochemistry (see also 280)
542 - Biophysics
543 - Biomathematics
544 - Biometrics, Biostatistics (see also 055, 670, 725, 729)
545 - Anatomy
546 - Cytology
547 - Embryology
548 - Immunology
550 - Botany
560 - Ecology
562 - Hydrobiology
564 - Microbiology & Bacteriology
566 - Physiology, Animal
567 - Physiology, Plant
569 - Zoology
570 - Genetics
571 - Entomology
572 - Molecular Biology
573 - Food Science & Technology (see also 517)
574 - Behavior/Ethology
578 - Biological Sciences, General
579 - Biological Sciences, Other*

PSYCHOLOGY

600 - Clinical
610 - Counseling & Guidance
620 - Developmental & Gerontological
630 - Educational
635 - School Psychology
641 - Experimental
642 - Comparative
643 - Physiological
650 - Industrial & Personnel
660 - Personality
670 - Psychometrics (see also 055, 544, 725, 729)
680 - Social
698 - Psychology, General
699 - Psychology, Other*

SOCIAL SCIENCES

700 - Anthropology
703 - Archeology
708 - Communications*
709 - Linguistics
710 - Sociology
720 - Economics (see also 501)
725 - Econometrics (see also 055, 544, 670, 729)
729 - Social Statistics (see also 055, 544, 670, 725)
740 - Geography
745 - Area Studies*
750 - Political Science, Public Administration
755 - International Relations
770 - Urban & Reg. Planning
775 - History & Phil. of Science
798 - Social Sciences, General
799 - Social Sciences, Other*

ARTS & HUMANITIES

841 - Fine & Applied Arts (including Music, Speech, Drama, etc.)
842 - History
843 - Philosophy, Religion, Theology
845 - Languages & Literature
846 - Other Arts and Humanities*

EDUCATION & OTHER PROFESSIONAL FIELDS

938 - Education

882 - Business Administration
883 - Home Economics
884 - Journalism
885 - Speech and Hearing Sciences
886 - Law, Jurisprudence
887 - Social Work
891 - Library & Archival Science
898 - Professional Field, Other*

899 - OTHER FIELDS*

*Identify the specific field in the space provided on the questionnaire.

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APPENDIX B

SAMPLING PROCEDURES

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TABLE B-1

POPULATION, SAMPLE AND SURVEY RESPONSE - 1975

1930-74 DOCTORAL SCIENTISTS AND ENGINEERS

	DOCTORAL ROSTER TOTAL* N	TOTAL SAMPLE N	TOTAL SURVEY RESPONSES# N	RESPONSE (A) %	RATES+ (B) %
TOTAL	314002	66779	43821	69.2	74.6
FIELD OF PHD/EMPLOYMENT					
MATHEMATICS	18646	5011	3173	67.7	72.1
PHYSICS/ASTRONOMY	27936	5810	3825	68.4	73.5
CHEMISTRY	47278	8821	5967	70.6	76.6
EARTH SCIENCES	9758	2194	1535	73.4	78.0
ENGINEERING	45228	7352	4861	67.7	73.8
BIOSCIENCES	79409	19433	13371	71.4	76.7
PSYCHOLOGY	36195	7910	5083	68.8	74.1
SOCIAL SCIENCES	48276	9397	5613	65.0	70.2
NONSCIENCES/UNKNOWN	1276	851	393	63.0	74.2
YEAR OF PHD					
CY 1930-35	10070	2386	1263	67.1	75.6
CY 1936-41	12386	2782	1687	71.4	77.0
CY 1942-45	6592	1773	1165	72.9	77.7
CY 1946-49	10245	2351	1561	72.5	77.6
CY 1950-53	22063	4256	2857	72.0	77.1
CY 1954-57	25267	4839	3331	73.0	76.8
CY 1958-FY61	26416	5729	3808	69.7	73.8
FY 1962-63	17943	4692	3117	69.3	73.6
FY 1964-65	22654	5486	3544	67.4	73.1
FY 1966-67	27667	6245	4055	68.0	73.9
FY 1968-69	33587	6976	4556	68.1	73.6
FY 1970-71	39541	7553	5026	68.9	73.7
FY 1972	19827	3731	2607	70.0	76.0
FY 1973-74	39053	7666	5125	66.9	73.6
UNKNOWN	691	314	119	40.9	51.7
CATEGORY OF PHD					
U.S. SCIENCE	291397	56488	38168	69.6	74.5
U.S. NONSCIENCE	10036	4965	2573	74.3	77.4
FOREIGN	12569	5326	3080	60.8	72.4
RACIAL/ETHNIC IDENTIFICATION					
PRE-FY1973-74 PHD**	274989	59148	38723	69.5	74.7
WHITE/CAUCASIAN	26469	3492	2667	76.4	81.1
ORIENTAL	3341	1381	749	54.3	60.9
OTHER MINORITIES	1087	842	524	62.3	68.0
UNKNOWN	8116	1916	1158	60.5	70.4
SEX					
MALE	284721	53352	35149	69.4	74.6
FEMALE	29281	13427	8672	68.3	74.4

*FIGURES INCLUDE THOSE DECEASED AND THOSE EMPLOYED IN FOREIGN COUNTRIES AND HENCE EXCEED THE TOTAL POPULATION FIGURES REPORTED IN VARIOUS TABLES .

#FIGURES INCLUDE THE NUMBER KNOWN DECEASED FROM THE 1975 SURVEY.

+RATE "A" IS THE NUMBER OF 1975 SURVEY RESPONSES DIVIDED BY THE TOTAL SAMPLE MINUS "INACTIVE" SAMPLE MEMBERS. THE "INACTIVE" SAMPLE INCLUDES PERSONS KNOWN DECEASED PRIOR TO THE 1975 SURVEY, AND INDIVIDUALS WHO RESPONDED IN 1973 THAT THEY WERE OUTSIDE OF THE SCOPE OF THE SURVEY. RATE "B" IS THE NUMBER OF 1975 SURVEY RESPONSES DIVIDED BY THE TOTAL SAMPLE MINUS THOSE "INACTIVE" AND THOSE NOT CONTACTED.

**RACIAL/ETHNIC DATA ARE NOT AVAILABLE FOR THE PRE-FY1973-74 PH.D. RECIPIENTS.

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Sampling Error

Statistics presented in the report were obtained from a stratified random sample. Estimates of population values are therefore subject to sampling error. To assist in evaluating the data in this report, sampling errors for various statistic values and sample sizes have been calculated assuming a simple random sample and are summarized in Table B-3. The reader can construct the confidence interval deemed appropriate for interpretation of the data.

Comparisons can be made between sampling errors computed on the basis of a simple random sample and those which take stratification into account. Variances were calculated for a number of statistics cited in a recent report on the employment status of doctoral scientists and engineers.[1] The statistics in the employment study and the 1975 Profile Report were both based on results of the 1975 survey which was conducted in terms of the stratified sample outlined in Table B-1. The formulas used in estimating sample variances were:

a) simple random sample

$$\sigma_p = \left[\frac{p(1-p)}{n} \cdot \frac{(N-n)}{(N-1)}\right]^{\frac{1}{2}}$$

b) stratified random sample

$$\sigma_p = \left[\frac{1}{N^2} \cdot \sum_h N_h^2 \cdot \frac{(N_h-n_h)}{(N_h-1)} \cdot \frac{p_h \cdot (1-p_h)}{n_h}\right]^{\frac{1}{2}}$$

---

[1] Maxfield, B., Ahern, N., and Spisak, A. "Employment Status of Ph.D. Scientists and Engineers: 1973 and 1975." Commission on Human Resources-National Research Council (In Press).

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In these formulas, p denotes the estimated proportion of the whole population, N denotes the size of the population, and n denotes the sample size. Where the same symbols appear with the subscript h, the reference is to stratum h rather than to the whole population or sample.

In this report, as well as in the employment study, many of the estimates are proportions whose base is the estimated labor force or other subgroup in a specified variable-designated category (e.g., female physics/astronomy Ph.D.'s). Such estimates are thus ratios of random variables, i.e., estimates based on the sample. The formulas given above are not strictly applicable to these estimates. Operational and time constraints precluded the computation of the more complex formula for the sampling error appropriate to ratio estimates. However, a useful approximation is provided by formula (b) by omitting the finite population correction $(N_h-n_h)/(N_h-1)$ and reinterpreting p to denote the estimated proportion of the specified category that has a given characteristic, N to denote the population number in the specified category, and n to denote the number in the sample with the given characteristic, with the subscript h again denoting a restriction to stratum h.

Table B-2 presents the two sampling error estimates. For most variables the difference between the two errors is small. When the strata are taken into account, sampling errors exceed those calculated ignoring stratification for 10 of the 30 statistics. All but two cases involve female and/or physics/astronomy Ph.D.'s. This effect is largely explained by the omission of the finite population correction factor which has a deflating effect on the heavily sampled female strata. With the fpc included, the sampling errors assuming

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stratification exceed those for a simple sample by more than 0.1 percent in only two (presumably largely overlapping) cases (female Ph.D.'s under 30 and female 1973-74 Ph.D.'s). Variances computed with the formula for stratified samples were lower than those calculated for simple samples for 7 statistics, all of which involved Ph.D.'s in small employment categories.

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TABLE B-2. COMPARISON OF SAMPLING ERRORS FOR SELECTED EMPLOYMENT STUDY STATISTICS

Variables	Statistics	Sampling Error: Simple	Sampling Error: Stratified (Omitting fpc)
Sex, Field of Ph.D.			
Female, Physics/Astronomy	7.3[a]	0.9	1.2
" "	2.7[b]	0.5	0.8
Female, Chemistry	3.7[a]	0.5	0.6
Both Sexes, "	1.0[a]	0.1	0.1
Sex, Age			
Female, 29 or Under	3.9[b]	0.8	1.2
Sex, Cohort			
Female, 1973-74 Ph.D.	3.1[a]	0.5	0.7
" "	3.5[b]	0.5	0.7
Male, "	1.1[a]	0.2	0.2
Field of Ph.D., Cohort			
Physics/Astronomy, All Yrs. of Ph.D.	1.6[a]	0.2	0.2
" "	0.6[c]	0.1	0.1
Chemistry, "	1.0[a]	0.1	0.1
Earth Science, "	1.1[a]	0.3	0.3
Mathematics, "	0.6[a]	0.1	0.1
Physics/Astron, 1973-74 Ph.D.	4.0[a]	1.1	1.3
" "	0.3[b]	0.3	0.3
Type of Employer			
Business/Industry	49.8[d]	4.6	2.0
"	25.1[f]	0.2	0.2
Educational Institution	32.0[d]	4.3	1.9
"	58.4[f]	0.2	0.3
Government	2.6[e]	0.8	0.6
"	10.2[f]	0.2	0.2
Field of Ph.D., Primary Work Activity			
All Fields, Production/Q.C./Sales/ Professional Services	1.7[c]	0.3	0.3
" Report, Tech. Writing/ Consulting	2.7[b]	0.5	0.5
" Mgmnt, Admin./Prod./Q.C./ Sales/Professional Services	53.4[d]	4.6	1.5
All Fields, Teaching	42.7[e]	2.5	1.5
" Research/Development/ Design	22.2[e]	2.1	1.8
Physics/Astron., Report, Tech. Writing/Consulting	10.4[b]	4.3	4.6
" Prod./Q.C./Sales/ Professional Services	9.3[c]	4.3	2.6
Chemistry, Report, Tech. Writing/ Consulting	4.9[b]	2.0	2.3
" Prod./Q.C./Sales/Professional Services	5.2[c]	1.5	1.5

a Percentage of labor force unemployed and seeking work
b Percentage of labor force working part-time and seeking full-time employment
c Percentage of labor force working full-time in nonscience, nonengineering positions because science/engineering not available.
d Percentage of total nonscience/nonengineering employed in variable category.
e Percentage of total part-time employed in variable category
f Percentage of total employed in variable category

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TABLE B-3.

APPROXIMATE SAMPLING ERRORS*
FOR VARIOUS STATISTICS AND SAMPLE SIZES

Proportion	Sample Size			
	40,250	21,840	8,025	2,300
.01 or .99	.00049	.00067	.00111	.00207
.05 or .95	.00109	.00147	.00243	.00454
.10 or .90	.00150	.00203	.00335	.00626
.25 or .75	.00216	.00293	.00483	.00903
.50	.00249	.00338	.00558	.01043

*Errors were computed with the formula $\sigma_p = \left[\frac{p(1-p)}{n}\right]^{\frac{1}{2}}$

The finite population correction factor has negligible effect on most statistics, $\left[\frac{N-n}{N-1}\right]^{\frac{1}{2}} \geq .90$, and has been omitted from the calculations.

The populations for variable-designated categories are provided in the tables presented in this report. The sample sizes can be approximated by multiplying the population figures by the weighting fraction, which is the sampling fraction corrected for nonresponse. The mean weighting fraction is .144; for women, .305; for racial-ethnic minorities, .174.

Example: In Table 4B, the population for all fields is 17,889. Multiplying by .144, the approximate sample size is 2,576. The reader can estimate the sampling error of a reported statistic (for instance

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full-time employed in science, 71.7%) using the formula for σ_p directly or consulting Table B-3 using rough approximations of the sample size and percentage in proportion form. In this case, $\sigma_p = \left[\frac{.717 \cdot (1-.717)}{2576}\right]^{\frac{1}{2}} =$ .009 or 0.9%. Similarly, the figure in the table under 2,300 for .75 is .009.

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APPENDIX C

NRC AND NSF FIELD CLASSIFICATIONS

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DEFINITION OF NSF AND NRC FIELD CLASSIFICATIONS: 1975

NSF Field of Identification	Specialty Code *
Mathematical scientists	000 to 060 082 to 099
Mathematicians	000 to 052 060, 082 to 099
Statisticians	055
Computer specialists	080
Physical scientists	101 to 299
Physicists and astronomers	101 to 199
Chemists	200 to 299
Environmental scientists	301 to 399
Earth scientists	301 to 360 388 to 391 398, 399
Oceanographers	370, 397
Atmospheric scientists	381, 382
Engineers	400 to 499
Life scientists	500 to 579
Biological scientists	540 to 579
Agricultural scientists	500 to 519
Medical scientists	520 to 539
Psychologists	600 to 699
Social scientists	700 to 799
Economists	720, 725
Sociologists/ Anthropologists	700, 710
Other social scientists	703, 708, 709, 729, 740 to 799

NRC Field of Employment	Specialty Code *
Mathematics	000 to 099
Physics	100 to 199
Chemistry	200 to 299
Earth sciences	300 to 399
Engineering	400 to 499
Biosciences	500 to 579
Psychology	600 to 699
Social sciences	700 to 799
Nonsciences	841 to 938

* See Degree and Employment Specialties List provided in Appendix A.

NOTE: The NSF "field of identification" includes individuals employed in the given specialties in 1975 plus individuals who earned doctorates in those specialties but were not working in science or engineering in 1975.

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TABLE C-1. NSF FIELD OF IDENTIFICATION BY EMPLOYMENT STATUS

Field of Identification[+]	Employment Status in 1975									
		Full-Time		Part-Time		Post-Doct. Appt.	Unemployed		Retired	Other/ No Report
	Total	Science/ Engr.	Non-Science	Science/ Engr.	Non-Science		Seeking Empl.	Not Seek Empl.		
	N	%	%	%	%	%	%	%	%	%
Total	279,351	83.7	4.7	2.4	.3	3.0	.9	.9	3.7	.4
Mathematical Scientists	14,664	88.5	3.6	1.9	.2	1.0	.7	.7	3.2	.3
Mathematicians	12,845	87.7	3.9	1.9	.2	1.0	.8	.7	3.5	.3
Statisticians	1,819	94.4	1.5	2.1	*	.8	.1	.4	.7	*
Computer Specialists	3,662	97.4	.8	1.5	*	.1	*	*	*	.1
Physical Scientists	59,811	80.5	6.1	1.7	.5	4.3	1.3	.8	4.6	.3
Physicists/ Astronomers	20,615	81.2	5.4	1.6	.5	5.1	1.8	.8	3.6	.2
Chemists	39,196	80.1	6.4	1.7	.5	3.9	1.1	.9	5.1	.3
Environmental Scientists	12,891	89.5	2.0	3.1	.1	2.2	.7	.2	2.0	.1
Earth Scientists	10,180	88.8	2.5	3.5	.2	1.7	.7	.2	2.4	.1
Oceanographers	1,353	93.1	.7	1.8	*	1.9	1.8	.1	.1	.4
Atmospheric Scientists	1,358	90.9	.1	1.4	*	6.5	*	.6	.4	*
Engineers	44,534	92.1	3.4	1.3	.1	.5	.7	.3	1.4	.2
Life Scientists	72,831	81.4	2.4	2.4	.2	6.1	.9	1.7	4.5	.4
Biological Scientists	44,133	77.9	2.8	2.4	.3	7.6	1.3	1.5	5.6	.5
Agricultural Scientists	14,377	89.4	2.5	1.9	.1	1.2	.4	.3	3.8	.4
Medical Scientists	14,321	84.0	.8	3.2	.1	6.1	.3	3.6	1.6	.4
Psychologists	31,770	84.6	4.0	5.5	.3	1.2	.7	.8	2.4	.5
Social Scientists	38,502	78.9	10.7	2.4	.6	.9	.9	.6	4.5	.5
Economists	11,176	76.3	13.4	1.8	.6	.4	.3	.2	6.6	.5
Sociologists/ Anthropologists	8,845	83.8	4.9	2.6	.3	1.1	1.7	1.0	4.4	.4
Other Social Scientists	18,481	78.2	11.9	2.7	.8	1.1	.9	.6	3.2	.6
No Report	686	12.0	*	1.7	*	*	3.4	3.4	78.1	1.4

[+] The "field of identification" includes individuals employed in the field in 1975 plus those who hold doctorates in the field but were not working in science or engineering in 1975.

* Less than .1%.

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APPENDIX D

FINE FIELDS OF EMPLOYMENT

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FINE FIELDS OF EMPLOYMENT OF DOCTORAL SCIENTISTS AND ENGINEERS IN THE U.S., 1975

1975 Fine Field of Employment	Est. N
Total Population	279,351
Mathematics Total	16,815
Algebra	1,389
Analysis & Func. Anal.	2,186
Geometry	310
Logic	277
Number Theory	367
Probability	386
Math Statistics	1,767
Topology	983
Computing Theory	3,618
Operations Research	834
Applied Mathematics	1,578
Combinatorics & Applied Math	295
Physical Mathematics	166
Mathematics, General	2,295
Mathematics, Other	364
Physics/Astronomy Total	17,880
Astronomy	775
Astrophysics	1,079
Atomic & Molecular	1,149
Electromagnetism	464
Mechanics	88
Acoustics	502
Fluids	506
Plasma Physics	1,013
Optics	1,191
Thermal Physics	201
Elementary Particles	1,407
Nuclear Structure	1,147
Solid State	3,114
Physics, General	2,847
Physics, Other	2,397
Chemistry Total	33,077
Analytical Chemistry	3,742
Inorganic Chemistry	1,602
Synth. Inorg. & Organomet.	553
Organic Chemistry	5,695
Synth. Org. & Nat. Prod.	2,018
Nuclear Chemistry	459
Physical Chemistry	3,662
Quantum Chemistry	163
Theoretical Chemistry	336
Structural Chemistry	345
Agricultural & Food	718
Thermodyn. & Materl. Prop.	448
Pharmaceutical	1,324
Polymers	4,304
Biochemistry	2,154
Chemical Dynamics	397
Chemistry, General	2,247
Chemistry, Other	2,900
Earth, Envir. & Mar. Sci.Total	12,149
Mineralogy, Petrology	661
Geochemistry	644
Stratigraphy, Sedimen.	694
Paleontology	614
Structural Geology	272
Geophysics (Sol. Earth)	1,066
Geomorph., Glacial Geol.	243
Hydrology	445
Oceanography	845
Atmos. Chem. & Physics	968
Atmospheric Dynamics	374
Environ. Sciences, Gen.	1,444
Environ. Sciences, Other	1,064
Applied Geology, etc.	1,175
Marine Sciences, Other	465
Earth Sciences, General	590
Earth Sciences, Other	585
Engineering Total	41,616
Aero- & Astronautical	1,956
Agricultural Engr.	645
Biomedical Engineering	1,046
Civil Engineering	2,408
Chemical Engineering	5,133
Ceramic Engineering	593
Electrical Engineering	4,074
Electronics Engineering	4,285
Industrial, Manufac.	721
Nuclear Engineering	1,726
Engineering Mechanics	1,902
Engineering Physics	1,028
Mechanical Engineering	3,980
Metallurgy & Phys. Met.	2,166
Oper. Research, Systems	2,475
Fuel Tech., Petrol. Engr.	759
Sanitary/Environmental	1,311
Mining	232
Materials Science Engr.	1,878
Engineering, General	1,015
Engineering, Other	2,283
Biosciences	
Agricultural Sciences Total	13,170
Agronomy	1,687
Agricultural Economics	1,976
Animal Husbandry	512
Fish & Wildlife	602
Forestry	1,058
Horticulture	1,191
Soils & Soil Science	978
Animal Sciences	1,519
Phytopathology	1,294
Food Sci./Tech.	1,100
Agriculture, General	426
Agriculture, Other	827
Medical Sciences Total	13,329
Medicine & Surgery	1,761
Public Health	1,111
Veterinary Medicine	745
Hospital Administration	272
Parasitology	518
Pathology	870
Pharmacology	2,734
Pharmacy	956
Medical Sciences, Gen.	725
Medical Sciences, Other	3,637
Biological Sciences Total	38,294
Biochemistry	6,180
Biophysics	1,245
Biomathematics	112
Biomatrics, Biostatis.	940
Anatomy	1,522
Cytology	973
Embryology	586
Immunology	1,543
Botany	1,693
Ecology	1,987
Hydrobiology	295
Microbiol. & Bacteriol.	3,929
Physiology, Animal	3,820
Physiology, Plant	1,014
Zoology	1,647
Genetics	2,049
Entomology	1,952
Molecular Biology	2,081
Food Sci./Tech.	480
Behavior/Ethology	331
Biological Sci., General	1,905
Biological Sci., Other	2,010
Psychology Total	28,901
Clinical Psychology	11,024
Counseling & Guidance	2,026
Developmental & Geron.	1,536
Educational Psychology	1,584
School Psychology	1,124
Experimental Psychology	2,859
Comparative Psychology	191
Physiological Psych.	1,054
Industrial & Personnel	1,702
Personality	458
Psychometrics	531
Social Psychology	1,873
Psychology, General	1,147
Psychology, Other	1,792
Social Sciences Total	31,380
Anthropology	2,012
Archeology	457
Communications	718
Linguistics	1,166
Sociology	5,646
Economics	8,214
Econometrics	461
Social Statistics	432
Geography	1,751
Area Studies	245
Political Sci., Public Adm.	6,876
International Relations	1,270
Urban & Reg. Planning	686
History & Phil. of Sci.	227
Social Sciences, General	405
Social Sciences, Other	814
Arts & Humanities Total	1,100
Fine & Applied Arts	189
History	156
Phil., Religion, Theol.	271
Languages & Literature	408
Other Arts & Humanities	76
Educ. & Other Prof. Fields Tot.	11,858
Education	4,458
Business Administration	3,003
Home Economics	105
Journalism	173
Speech & Hearing Sci.	86
Law, Jurisprudence	418
Social Work	123
Library & Archival Sci.	202
Professional Field, Other	521
Other Fields	2,769
No Report	3,422
Not Employed	16,360

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