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ABSTRACT

Statistical information, based on the 1978 survey in a series of biennial surveys known as the National Sample of Scientists and Engineers, sponsored by the National Science Foundation and conducted by the Bureau of the Census is presented. Individuals in the field of physical sciences are profiled, including chemists, physicists and astronomers, and other physical scientists. Statistics in tabular form are provided which describe the composition, education and training, professional experience and growth of the field, labor force participation, and income of these scientists. Appendixes provide: (1) definitions and explanations; (2) a discussion of the reliability of the estimates and standard errors of totals and percentages; (3) a sample of the questionnaire and reference lists; (4) sources of data from the items of the questionnaire; and (5) response rates of the participants. (CS)

CURRENT POPULATION REPORTS

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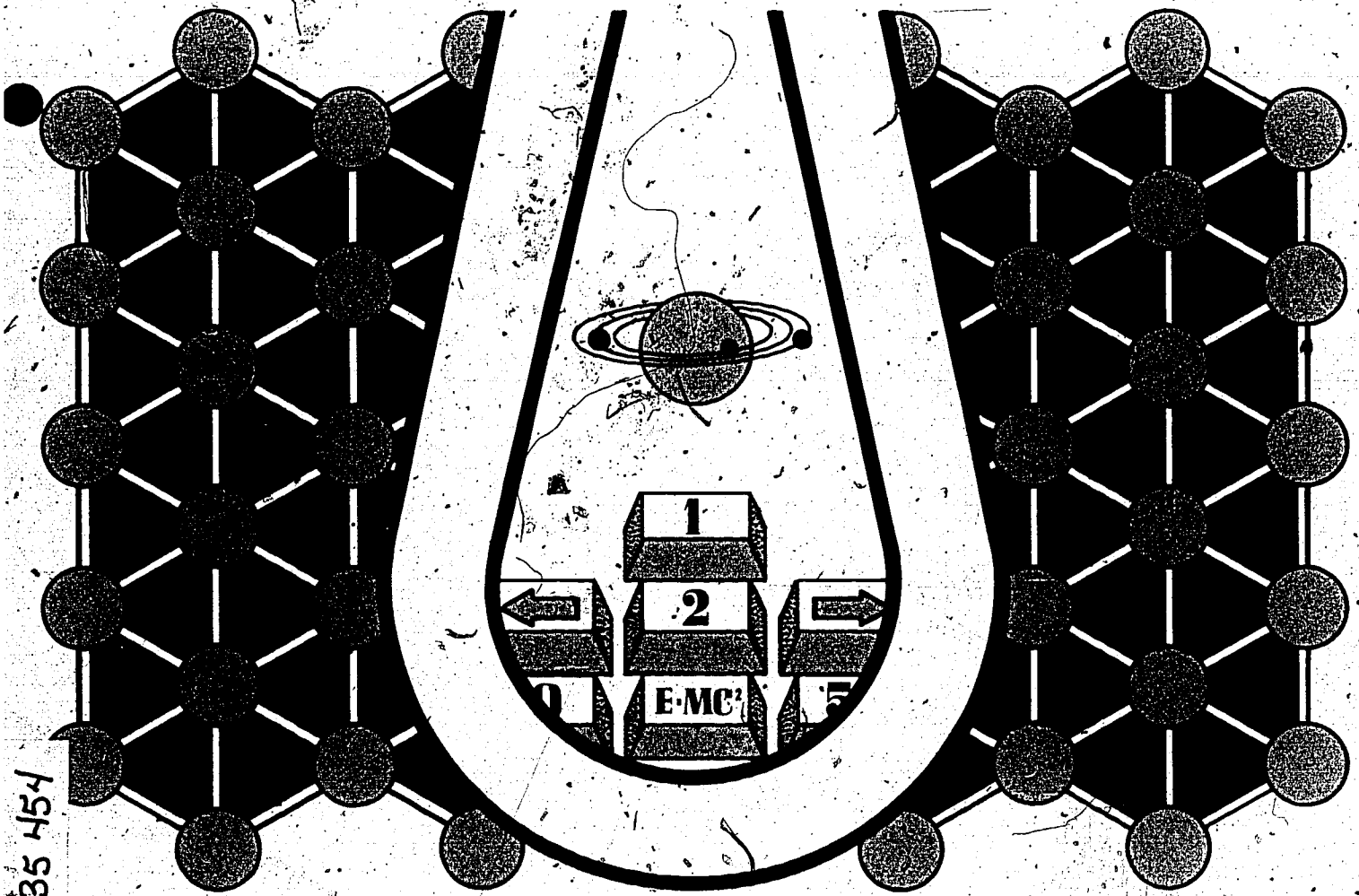
U.S. Department of Commerce
BUREAU OF THE CENSUS

Selected Characteristics of Persons in Physical Science: 1978



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Selected Characteristics of Persons in Physical Science: 1978

Issued November 1980

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for Demographic Fields

POPULATION DIVISION
Roger A. Herriot, Chief

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The principal participants for the National Science Foundation in developing and coordinating the survey were J. James Brown, Study Director, Demographic Studies Group, and Alan Fechter, Head, Scientific and Technical Personnel Studies Section, both members of the Division of Science Resources Studies. Assistance was provided by Nancy M. Conlon, Analyst, Manpower Characteristics Studies Group.

At the Bureau of the Census, Anita Chiera, Labor Force Statistics Branch, Population Division, had primary responsibility in planning and conducting the survey. This report was prepared by Thomas J. Palumbo. The systems and processing procedures and programs were developed by Ann M. Gifford and Patricia L. Marks, of Population Division. Overall direction was provided by Roger Herriot, Division Chief (Socioeconomic Statistics Programs), and Paula J. Schneider, then Chief, Labor Force Statistics Branch, Population Division.

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APPENDIX TABLES

SYMBOLS USED IN TABLES

—	Represents zero.
X	Not applicable.
Z	Less than 0.05 percent.
*	Based on fewer than 20 sample cases.
27+	The median fell in the category 27 weeks or more.

Related Materials

Statistics from a related survey, the 1972 Professional, Technical, and Scientific Manpower Survey, are found in: U.S. Bureau of the Census, *Characteristics of Persons in Engineering and Scientific Occupations: 1972*, Technical Paper No. 33, U.S. Government Printing Office, Washington, D.C. 1974; and U.S. Bureau of the Census, Current Population Reports, P-23, No. 46, *Persons in Engineering, Scientific, and Technical Occupations: 1970 and 1972*, U.S. Government Printing Office, Washington, D.C. 1973.

The Census Bureau report based on the results of the 1974 National Survey of Scientists and Engineers is: U.S. Bureau of the Census, Current Population Reports, Special Studies P-23, No. 53, *Selected Characteristics of Persons in Fields of Science or Engineering: 1974*, U.S. Government Printing Office, Washington, D.C. 1975. The Census Bureau report based on the 1976 survey is: U.S. Bureau of the Census, Current Population Reports, Special Studies, P-23, No. 76, *Selected Characteristics of Persons in Fields of Science or Engineering: 1976*, U.S. Government Printing Office, Washington, D.C.

For a list of the National Science Foundation reports based on the above-mentioned 1972 and 1974 surveys, see National Science Foundation, *Characteristics of the National Sample of Scientists and Engineers 1974, Part III* (NSF 76-300) Washington, D.C. 20402; and National Science Foundation, U.S. Scientists and Engineers: 1974 (NSF 76-329) Washington, D.C. 20402. Two National Science Foundation reports based on the results of the 1976 National Survey of Natural and Social Scientists and Engineers are: Science Resource Studies Highlights, *National Sample of Scientists and Engineers: Changes in Employment, 1972-1974 and 1974-1976* (NSF 77-322), Washington, D.C. 20550; and *Characteristics of Experienced Scientists and Engineers, 1976* (NSF 78-305), Washington, D.C. 20550. A National Science Foundation report containing results from the 1978 survey, along with other data from the Manpower Characteristics System, is: *U.S. Scientists and Engineers 1978* (NSF 90-304), Washington, D.C., 20550.

Selected Characteristics of Persons in Physical Science: 1978

INTRODUCTION

The statistics in this report are based on the 1978 survey in a series of biennial surveys known as the National Sample of Scientists and Engineers. The series was sponsored by the National Science Foundation and conducted by the Bureau of the Census. The series began with the 1972 Professional, Technical, and Scientific Manpower Survey, with followup surveys of persons from the 1972 survey conducted in 1974, 1976, and 1978. All persons in the National Sample were experienced workers who either had jobs in 1970 or were looking for jobs; new entrants into the labor force since 1970 were *not* included. In addition, the fields of science and engineering in the National Sample were limited to persons who met strict educational, occupational, and professional qualifications. For these reasons, persons in the 1978 National Sample represented approximately 1.5 million scientists and engineers, only a part of the Nation's total scientific and engineering work force. (The Department of Labor estimated that, based on occupational qualifications alone, there were 2.4 million scientists and engineers in the United States in 1978.)[1]

This report is the first in a series of reports on the characteristics of persons in the 1978 National Sample. Profiled here are persons in the field of physical science: chemists, physicists and astronomers, and other physical scientists.

COMPOSITION (Table 1)

The physical scientists in the National Sample were predominantly males. Men, in fact, made up slightly more than 9 out of 10 physical scientists (92 percent), a proportion that rose to 97 percent for the subcategory of physicists/astronomers. Women made their strongest showing among chemists, constituting 10 percent of that group.

The median age in 1978 of the physical scientists in the National Sample was 45 years.

The geographic distribution of physical scientists throughout the United States was oriented more toward the Northeast and less toward the South and North Central Regions than was the general population of the United States 25 years old and over. About 30 percent of physical scientists resided in the Northeast (New England and the Middle Atlantic States), 24 percent in the North Central Region, 26 percent in the South (South Atlantic, East and West South Central States), and 19 percent in the West (Mountain and Pacific States). Estimates from the Current Population Survey (CPS) indicate that in March 1978, 24 percent of the total U.S. population 25 years old and over lived in the Northeast, 26 percent in the North Central Region, 32 percent in the South, and 18 percent in the West (figure 1).[2]

Most members of this group of physical scientists were White (93 percent); Asian-Americans constituted 4 percent, and Blacks, 2 percent. Only about 1 percent indicated that their ethnic heritage was Hispanic.

The fields of science or engineering (S/E) in the National Sample were much more strictly defined categories than occupations. In general, to be classified into a specific field, a person had to have at least two of the following three characteristics: (1) employment in one of a set of specified occupations, (2) an academic degree among a set of specified academic disciplines, and (3) self-identification within a set of specified professions. Because of this criterion, persons in each field were distributed among a spectrum of occupations.

Not surprisingly, the majority of persons in the physical science field, about 70 percent, were in physical science occupations. Nearly one-fifth (18 percent), however, were managers and administrators, a finding that is possibly related to the fact that persons in the field of physical science are generally mature workers (median age 45 years) with many years of professional experience (a median of 19 years). The only other sizeable group of physical scientists was in the interdisciplinary occupation of biochemistry (7 percent).

EDUCATION AND TRAINING (Table 2)

Roughly one-half (49 percent) of the physical scientists possessed doctorate degrees; one-third held their highest degree of the bachelor's level, and about one-sixth (17 percent) held theirs at the master's level. About two-thirds of the physicists/astronomers held doctorates. (See figure 2.)

About 92 percent of the physical scientists held their highest degree in a physical or biological science.

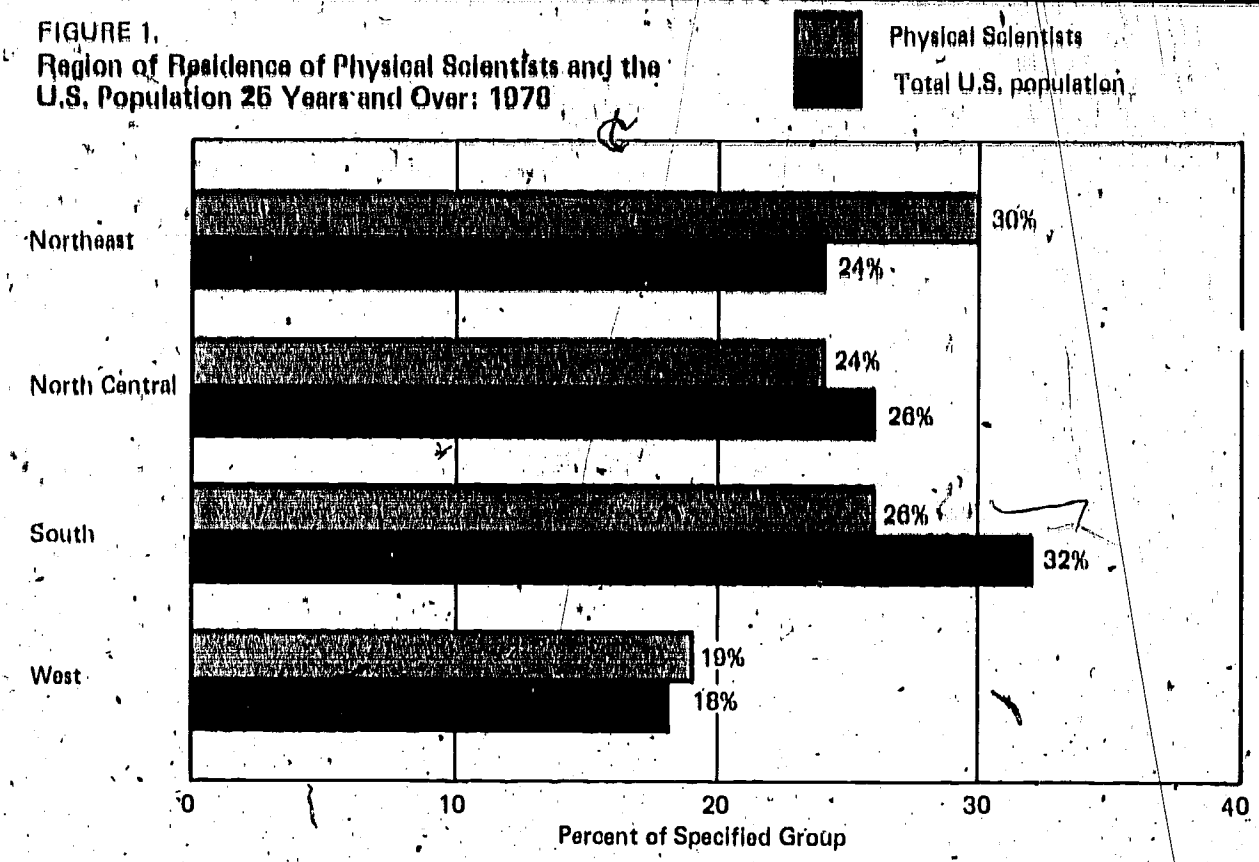
Since the median age of the physical scientists was 45 years, many members of this group received their academic degrees 20 or more years ago. To maintain or upgrade their academic skills, many physical scientists (39 percent) turned to supplemental training programs in 1977. Notable proportions of the physical scientists who received supplemental training in 1977 received it from their employers as on-the-job training (49 percent of those receiving training) or in employer training programs (37 percent of those receiving training).[3] (See figure 3).

[1] U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, Vol. 26, No. 1, January 1979.

[2] Current Population Reports, Series P-20, No. 331, *Geographical Mobility: March 1975 to March 1978*.

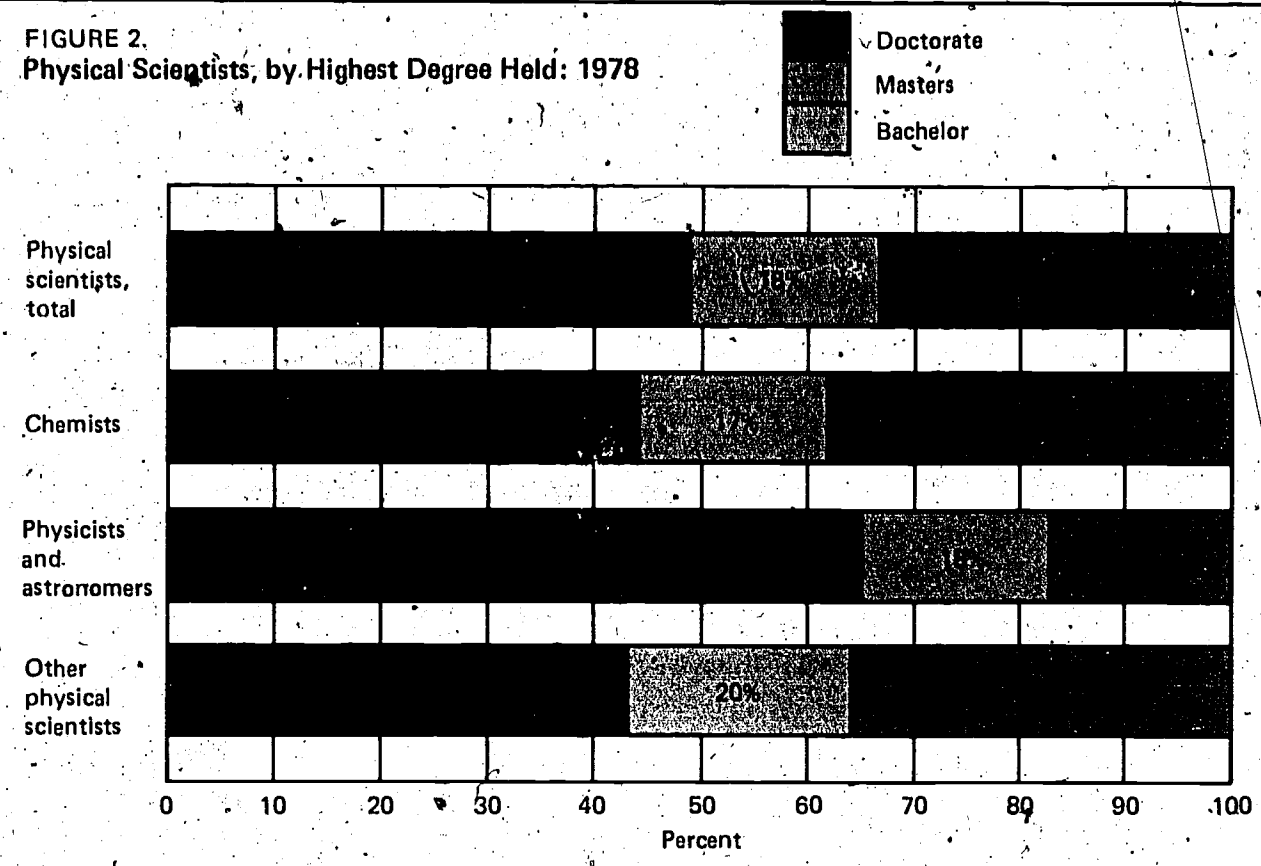
[3] Note that the categories of supplemental training are not mutually exclusive: the same person may have more than one kind of supplemental training.

FIGURE 1.
Region of Residence of Physical Scientists and the U.S. Population 25 Years and Over: 1978



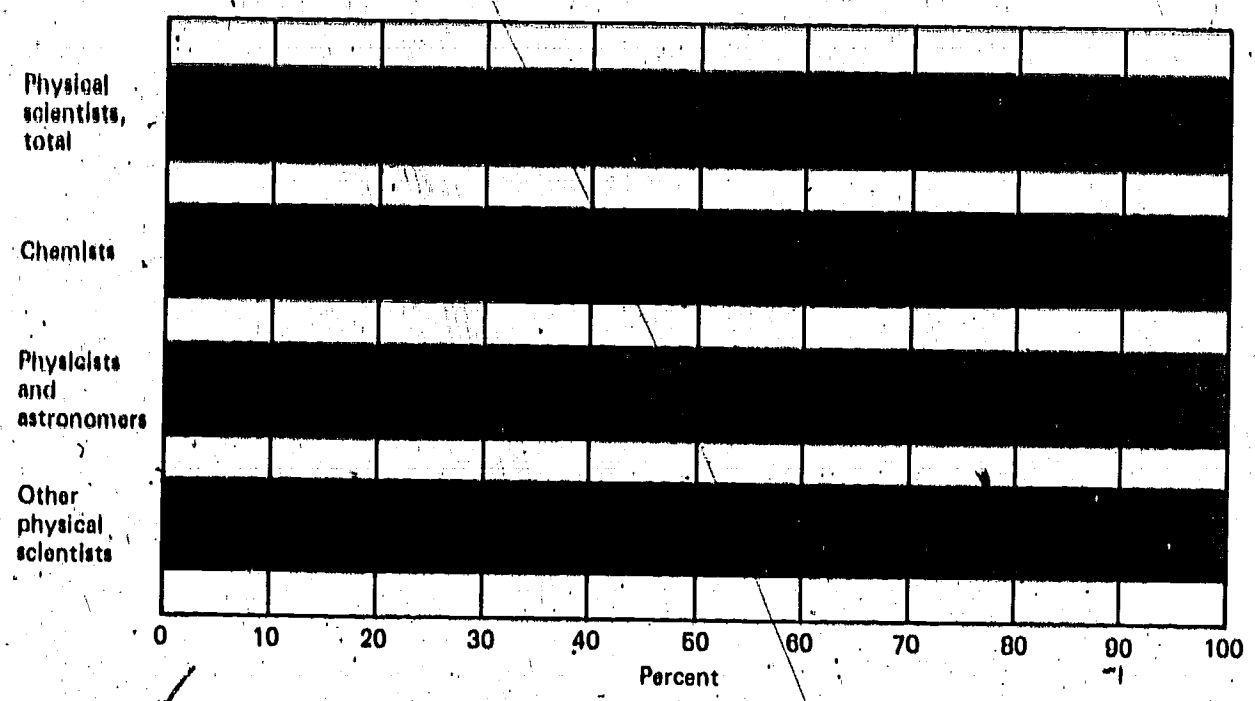
Source: Table 1 and Current Population Reports, Series P-20, No. 331, *Geographical Mobility: March 1975 to March 1978.*

FIGURE 2.
Physical Scientists, by Highest Degree Held: 1978



Source: Table 2.

FIGURE 3.
Physical Scientists in 1978, by Supplemental Training Received in 1977



Source: Table 2.

PROFESSIONAL EXPERIENCE AND GROWTH OF THE FIELD (Table 3)

Most of these physical scientists have been involved in professional-level work, though not necessarily in the physical sciences, for a number of years. The median number of years of professional experience for the group was 19 years. About 94 percent had more than 5 years of professional experience, 79 percent had over 10 years, and a little over 40 percent had more than 20 years.

Column 3 of the upper percent distribution of table A shows how the stock of physical scientists in 1978 was created from the flow of persons from each component of the 1976 National Sample of Scientists and Engineers. These figures reveal that about 88 percent of the physical scientists in 1978 were also physical scientists in 1976; about 6 percent of the 1978 group entered from other S/E fields in 1976, notably engineering (3 percent), while the remainder came from outside S/E or from among persons who did not report their S/E status in 1976. The lower percent distribution in table A shows the flow of persons from the components of the 1976 National Sample into the components of the 1978 National Sample. Both percent distributions of table A reveal a noteworthy movement of persons between engineering and the physical sciences, which may be related to the involvement of engineering in practical applications of physical science.

About one-fourth of the physical scientists employed in both February 1978 and February 1976 changed jobs[4] during the 2-year period; among these job changers, about one-third changed their detailed occupation at the time that they changed jobs. Of those employed in both February 1978 and January 1974, nearly two-fifths (38 percent) changed jobs during the 4-year period; of these, about two-fifths (39 percent) changed detailed occupations as well. Finally, of those employed in February 1978 and 1972, one-half (49 percent) had a different job at the end of the 6-year period than at the beginning; of these, 40 percent changed detailed occupations.[5] Thus, job changers increased from one-fourth of the physical scientists in 2 years, to two-fifths in 4 years, to one-half in 6 years. (See figure 4).

LABOR FORCE PARTICIPATION (Table 4)

In February 1978, 93 percent of the physical scientists were in the labor force. Of those not in the labor force, 82 percent were retired.

The unemployment rate (that is, the number unemployed as a percent of those in the labor force) for physical scientists

[4] That is, changed employers or remained with the same employer, but had a significant change in their duties, level of responsibility, or occupation.

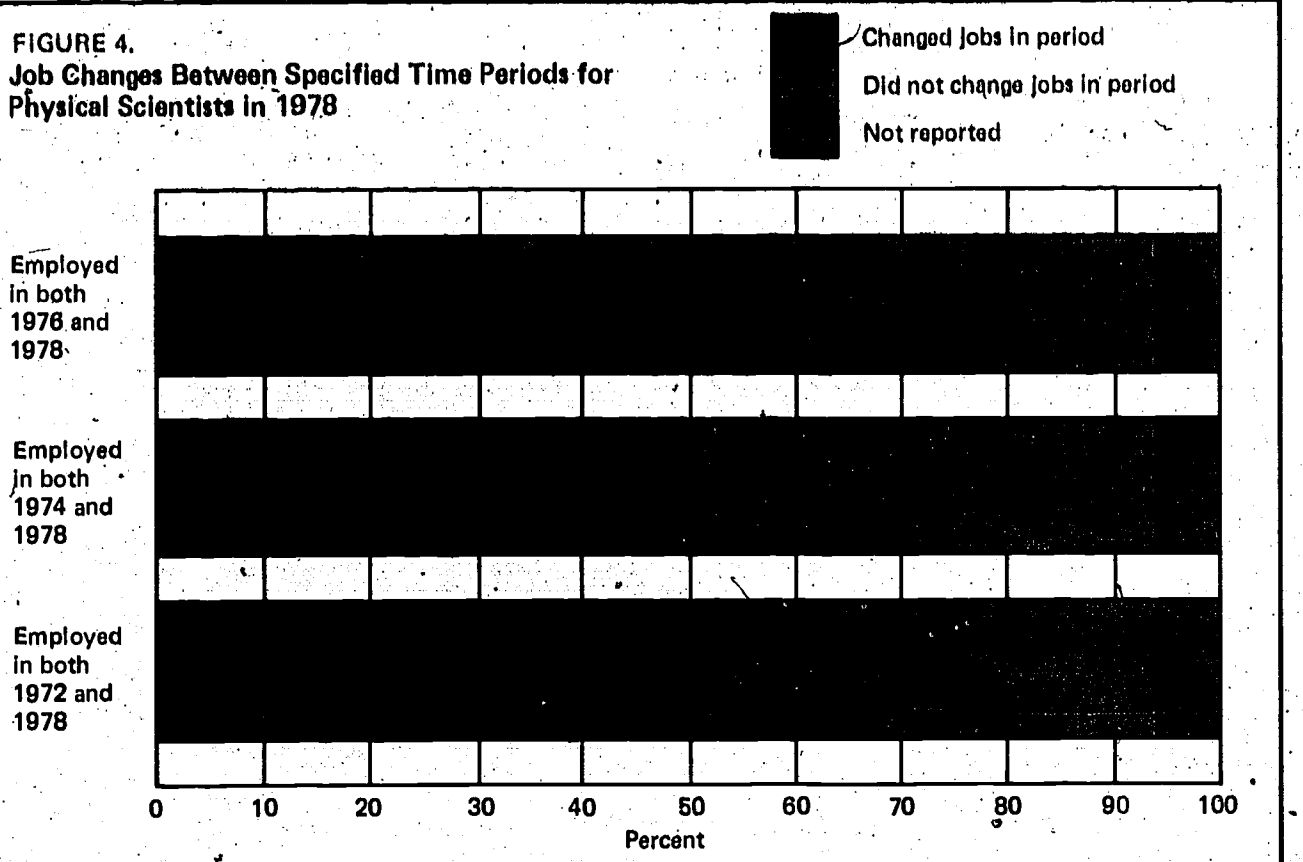
[5] The difference between this 40 percent and the above-mentioned 39 percent of persons who changed occupations between 1974 and 1978 is not statistically significant.

Table A. Field of Science or Engineering in 1978 by Field of Science or Engineering in 1976

(Numbers in thousands)

Field of science or engineering in 1976	Total National Sample in 1978	In field of science or engineering in 1978				Not in S/E field in 1978
		Total	Physical scientists	Other S/E field		
				Total	Engineering	
Total National Sample in 1976...	1,350	1,138	130	1,008	721	211
In S/E field in 1976.....	1,119	1,029	122	908	660	90
Physical scientists.....	130	122	114	9	4	8
Other S/E field.....	989	906	8	899	655	82
Engineering.....	707	660	4	656	649	47
Not in S/E field in 1976.....	173	64	4	60	32	109
Did not report in 1976.....	57	45	4	41	30	12
PERCENT DISTRIBUTION						
Total National Sample in 1976...	100.0	100.0	100.0	100.0	100.0	100.0
In S/E field in 1976.....	82.9	90.4	93.6	90.0	91.5	42.5
Physical scientists.....	9.7	10.8	87.6	0.8	0.6	3.8
Other S/E field.....	73.3	79.6	6.0	89.2	90.9	38.7
Engineering.....	52.4	58.0	3.3	65.0	90.0	22.3
Not in S/E field in 1976.....	12.8	5.6	3.3	5.9	4.4	51.7
Did not report in 1976.....	4.2	4.0	3.1	4.1	4.1	5.8
Total National Sample in 1976...	100.0	84.3	9.6	74.7	53.4	15.7
In S/E field in 1976.....	100.0	92.0	10.9	81.1	58.9	8.0
Physical scientists.....	100.0	93.8	87.3	6.6	3.3	6.2
Other S/E field.....	100.0	91.7	0.8	90.9	66.3	8.3
Engineering.....	100.0	93.3	0.6	92.7	91.8	6.7
Not in S/E field in 1976.....	100.0	36.9	2.5	34.4	18.5	63.1
Did not report in 1976.....	100.0	78.6	7.0	71.6	51.6	21.4

FIGURE 4.
Job Changes Between Specified Time Periods for Physical Scientists in 1978



Source: Table 3

was a very low 1.1 percent in February 1978. The national unemployment rate (seasonally adjusted) for persons 25 years and over in February 1978 was 3.9 percent, that for males 25 years and over was 3.4 percent, and that for professional, technical, and kindred workers was 2.5 percent[6] (table B).

About 3 percent of the physical scientists were unemployed at some time in calendar year 1977. Unemployed physical scientists spent a median of 15 weeks jobseeking; about one-third of the unemployed searched for 27 weeks or more.

Nearly all of the employed physical scientists (97 percent) worked at full-time jobs. (See table C.)

Most of the physical scientists who worked at part-time jobs apparently did so voluntarily, since about 80 percent indicated that they were not seeking full-time jobs. (See table D.)

The finding that a relatively small number of the employed physical scientists were seeking full-time jobs while they worked at part-time jobs seems to indicate that underemployment is not much of a problem among the National Sample's physical scientists. Furthermore, fewer than 1 percent of the physical scientists employed full-time indicated that they were working in non-scientific or non-engineering positions either because scientific or engineering positions were not available or because the pay was better in other positions. Around 98 percent of the full-time employed physical scientists were working in scientific or engineering positions.

Large proportions of employed physical scientists were in particular industry groups in February 1978: manufacturing (43 percent), especially of chemicals and allied products (25 percent); educational institutions (24 percent), particularly colleges and universities (20 percent); and research institutions (15 percent). A notable 4 percent of the physical scientists were employed in manufacturing electronic machinery and other computing equipment; 5 percent were in public administration.

The 1978 National Sample survey asked persons to describe the type of organization of their principal employment or post-doctoral appointment. Among physical scientists employed in February 1978, 55 percent specified their employer's organization as a (private) business or industry, 26 percent as an educational institution. Around 14 percent were employed in government, of which three-fourths (72.2 percent) were employed by the Federal Government.

Research and development (R/D) or management and administration were the primary work activities of the largest proportion of employed physical scientists (68 percent). About 42 percent were primarily involved in R/D itself, and another 17 percent were primarily involved in the management or administration of R/D. About 10 percent were primarily involved in other kinds of management or administration.

[6] U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, Vol. 25, No. 3, March 1978

Table B. Employment Status in February 1978 of Physical Scientists in 1978

Employment status	Total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total in labor force in February 1978.....	120,220	100.0	83,860	100.0	30,318	100.0	6,041	100.0
Employed.....	118,936	98.9	82,773	98.7	30,135	99.4	6,028	99.8
Unemployed.....	1,283	1.1	1,087	1.3	183	0.6	13	0.2

Source: Table 4.

Table C. Full- and Part-Time Work Status of Physical Scientists in 1978 Employed in February 1978

Full/part-time work status	Total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total employed in February 1978.....	118,936	100.0	82,773	100.0	30,135	100.0	6,028	100.0
Full time.....	115,132	96.8	79,964	96.6	29,424	97.6	5,744	95.3
Part time.....	3,755	3.2	2,773	3.4	699	2.3	284	4.7
Full or part time not reported.	49	(Z)	37	(Z)	12	(Z)	-	-

Z Less than 0.05 percent.
- Represents zero.

Source: Table 4.

Table D. Desire for Full-Time Work of Physical Scientists in 1978 Employed Part Time in February 1978

Desire for full-time work	Total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total employed part time in February 1978	3,755	100.0	2,773	100.0	699	100.0	284	100.0
Seeking full-time work	771	20.5	547	19.7	204	29.2	20	7.0
Not seeking full-time work	2,969	79.1	2,210	79.7	496	67.1	264	93.0
Not reported	15	0.4	15	0.5	–	–	–	–

– Represents zero.

Source: Table 4.

Among physical scientists directly involved in research and development, 30 percent were in basic research, 39 percent in applied research, and 30 percent in development.

Persons in the National Sample were asked to select, from a list of areas of critical national interest, the problem areas in which they devote the largest proportion of their professional time. For physical scientists, 13 percent selected health; 13 percent, education (mostly teaching); 13 percent, environmental protection and pollution abatement; 10 percent, national defense; 11 percent, energy and fuel, and one-fifth indicated that the inquiry was not applicable to them.

The U.S. Government supported or sponsored at least some of the work of 40 percent of the physical scientists. Chief Government sponsors were the Department of Defense (which provided funds for 12 percent of the physical scientists), the Energy Department (which funded 10 percent), the Department of Health, Education, and Welfare (which funded 8 percent), and the National Science Foundation (which funded 6 percent).

INCOME (Table 5)

The median basic annual salary in February 1978 of the physical scientists employed full-time in February 1978 was $27,329. The median for chemists was $26,525; that for physicists/astronomers was $29,052, and that for other physical scientists was $28,390.[7] The median earnings in 1977, as estimated from the CPS,[8] for male professional, technical, and kindred workers 14 years old and over working year round full time was $18,224; the comparable figure for women was $11,995. Male year-round, full-time workers 25 years old and over with 4 or more years of college (regardless of occupation) had a median income in 1977 of $20,626; those with 5 or more years of college had a median income of $27,041. It should be noted that the CPS figures are not strictly comparable with those for the physical scientists in the National Sample.[9]

Results from the 1976 survey of the National Sample showed that the median basic annual salary in February 1976 of physical scientists employed full time in February 1976 was $23,132. Thus, between February 1976 and February 1978, the median basic annual salary of full-time physical scientists rose by $4,197 to $27,329. However, when these figures are adjusted for inflation (i.e., when both the 1976 and 1978 basic annual salaries are expressed in constant 1977 dollars), the increase is approximately $1,284 or about 2.4 percent per year. Note that the 1976-78 comparisons in terms of constant or 1977 dollars must be approached cautiously. Problems are introduced into the comparisons by, among other things, the way the basic annual salary data are defined and collected, the differences between the nonresponse adjustment procedures of the 1976 and 1978 surveys, and the difficulty of establishing appropriate time periods for the constant dollar computations.

[7] The apparent differences between the median earnings of chemists and physicists/astronomers and that of physical scientists, total, are not statistically significant.

[8] U.S. Department of Commerce, Bureau of the Census, Current Population Reports, *Money Income in 1977 of Families and Persons in the United States*, Series P-60, No. 118.

[9] The CPS concepts "earnings" and "income" include more sources of financial support than does the National Sample concept of "basic annual salary"; there are also other differences between the National Sample's basic annual salary concept and the CPS earnings and income concepts, as well as differences between the National Sample and the CPS in reference periods and data collection procedures. CPS figures for 1977 are cited because 1977 is the full year most nearly comparable with the reference year for the National Sample question on basic annual salary.

Table 1. Occupation, Professional Identification, and Selected Characteristics of Physical Scientists: 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Occupation, professional identification, and selected characteristics	Physical scientists, total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
Male	119,651	92.1	82,886	90.1	30,798	97.4	5,967	94.8
Female	10,267	7.9	9,115	9.9	825	2.6	327	5.2
Under 30 years	880	0.7	646	0.7	233	0.7	-	-
30 to 34 years	15,734	12.1	10,977	11.9	4,235	13.4	521	8.3
35 to 39 years	26,225	20.2	17,006	18.5	7,736	24.5	1,483	23.6
40 to 44 years	22,122	17.0	14,992	16.3	5,893	18.6	1,236	19.6
45 to 49 years	19,404	14.9	13,253	14.4	5,255	16.6	896	14.2
50 to 54 years	16,164	12.4	11,723	12.7	3,400	10.8	1,041	16.5
55 to 59 years	13,062	10.1	10,526	11.4	2,064	6.5	471	7.5
60 to 64 years	8,584	6.6	6,657	7.2	1,535	4.9	392	6.2
65 to 69 years	5,244	4.0	4,387	4.8	674	2.1	183	2.9
70 years and over	2,501	1.9	1,834	2.0	596	1.9	71	1.1
Median age	45	(X)	46	(X)	43	(X)	45	(X)
RESIDENCE IN 1978								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
United States	128,601	99.0	91,208	99.1	31,112	98.4	6,281	99.8
Northeast	39,238	30.2	29,091	31.6	8,702	27.5	1,445	23.0
New England	9,557	7.4	6,225	6.8	2,966	9.4	365	5.8
Middle Atlantic	29,682	22.8	22,866	24.9	5,736	18.1	1,080	17.2
North Central	31,156	24.0	24,719	26.9	5,220	16.5	1,216	19.3
East North Central	23,925	18.4	18,926	20.6	4,120	13.0	879	14.0
West North Central	7,231	5.6	5,793	6.3	1,100	3.5	338	5.4
South	33,847	26.1	23,820	25.9	7,891	25.0	2,137	34.0
South Atlantic	20,316	15.6	13,803	15.0	4,838	15.3	1,675	26.6
East South Central	4,534	3.5	3,139	3.4	1,149	3.6	245	3.9
West South Central	8,998	6.9	6,877	7.5	1,903	6.0	217	3.4
West	24,359	18.7	13,578	14.8	9,299	29.4	1,482	23.5
Mountain	6,151	4.7	3,227	3.5	2,281	7.2	642	10.2
Pacific	18,209	14.0	10,351	11.3	7,018	22.2	840	13.4
Outlying areas	32	(Z)	-	-	32	0.1	-	-
Foreign countries	1,284	1.0	792	0.9	479	1.5	13	0.2
Not reported	-	-	-	-	-	-	-	-
RACE								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
White	121,346	93.4	85,467	92.9	29,894	94.5	5,985	95.1
Black	2,262	1.7	2,156	2.3	105	0.3	-	-
American Indian	192	0.1	192	0.2	-	-	-	-
Chinese, Japanese, Korean	5,279	4.1	3,408	3.7	1,589	5.0	281	4.5
All other races	839	0.6	777	0.8	34	0.1	28	0.5
HISPANIC HERITAGE								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
Hispanic	1,468	1.1	1,163	1.3	305	1.0	-	-
Not Hispanic	123,720	95.2	87,523	95.1	30,060	95.1	6,137	97.5
Not reported	4,730	3.6	3,315	3.6	1,258	4.0	157	2.5
OCCUPATION IN 1978								
Total employed in February 1978	118,936	100.0	82,773	100.0	30,135	100.0	6,028	100.0
Computer specialists, total	450	0.4	70	(Z)	380	1.3	-	-
Computer systems analysts	118	(Z)	29	(Z)	89	0.3	-	-
Computer scientists	120	0.1	-	-	120	0.4	-	-
Computer programmers	72	(Z)	-	-	72	0.2	-	-
Other computer fields	140	0.1	41	(Z)	99	0.3	-	-
Engineers, total	1,971	1.7	817	1.0	1,154	3.8	-	-
Aeronautical and astronautical	32	(Z)	-	-	32	0.1	-	-
Agricultural	-	-	-	-	-	-	-	-
Chemical	308	0.3	283	0.3	25	(Z)	-	-
Civil and architectural	-	-	-	-	-	-	-	-
Electrical and electronic	664	0.6	60	(Z)	603	2.0	-	-
Industrial	113	(Z)	25	(Z)	89	0.3	-	-
Mechanical	30	(Z)	-	-	30	(Z)	-	-
Metallurgical and materials	154	0.1	154	0.2	-	-	-	-
Mining, petroleum, and geological	58	(Z)	43	(Z)	16	(Z)	-	-
Nuclear	90	(Z)	-	-	90	0.3	-	-
Environmental and sanitary	92	(Z)	92	0.1	-	-	-	-
Operations research/systems	115	(Z)	44	(Z)	72	0.2	-	-
Other engineering fields	314	0.3	117	0.1	198	0.7	-	-

Table 1. Occupation, Professional Identification, and Selected Characteristics of Physical Scientists: 1978—Continued

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Occupation, professional identification, and selected characteristics	Physical scientists, total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
OCCUPATION IN 1978--Continued								
Mathematicians and statisticians, total	202	0.2	86	0.1	117	0.4	-	-
Mathematicians	63	(Z)	-	-	63	0.2	-	-
Statisticians	54	(Z)	54	(Z)	-	-	-	-
Actuaries	20	(Z)	-	-	20	(Z)	-	-
Operations research	66	(Z)	32	(Z)	34	0.1	-	-
Life scientists	9,500	8.0	9,438	11.4	62	0.2	-	-
Agricultural scientists	189	0.2	176	0.2	13	(Z)	-	-
Biological scientists	343	0.3	330	0.4	13	(Z)	-	-
Biochemists	8,400	7.1	8,400	10.1	-	-	-	-
Biophysicists	124	0.1	108	0.1	16	(Z)	-	-
Medical scientists	376	0.3	356	0.4	20	(Z)	-	-
Other life scientists	67	(Z)	67	(Z)	-	-	-	-
Physical scientists, total	82,289	69.2	54,933	66.4	21,998	73.0	5,357	88.9
Chemists	54,626	45.9	54,626	66.0	-	-	-	-
Physicists and astronomers	21,788	18.3	12	(Z)	21,761	72.2	16	0.3
Other physical scientists	5,874	4.9	295	0.4	238	0.8	5,342	88.6
Environmental scientists, total	447	0.4	233	0.3	213	0.7	-	-
Earth scientists	306	0.3	179	0.2	127	0.4	-	-
Atmospheric scientists	68	(Z)	26	(Z)	43	0.1	-	-
Oceanographers	73	(Z)	29	(Z)	44	0.1	-	-
Psychologists	13	(Z)	-	-	-	-	13	0.2
Social scientists, total	-	-	-	-	-	-	-	-
Economists	-	-	-	-	-	-	-	-
Sociologists and anthropologists	-	-	-	-	-	-	-	-
Other social scientists	-	-	-	-	-	-	-	-
Health occupations	188	0.2	174	0.2	13	(Z)	-	-
Physician or surgeon	-	-	-	-	-	-	-	-
Dental technician	-	-	-	-	-	-	-	-
Medical technician	103	(Z)	103	0.1	-	-	-	-
Other health occupations	85	(Z)	71	(Z)	13	(Z)	-	-
Technicians and technologists, except medical	45	(Z)	29	(Z)	15	(Z)	-	-
Teachers[1]	796	0.7	498	0.6	174	0.6	124	2.1
Administrators and managers	21,794	18.3	15,385	18.6	5,876	19.5	533	8.8
Other occupations	1,083	0.9	984	1.2	99	0.3	-	-
Not reported	159	0.1	124	0.2	35	0.1	-	-
PROFESSIONAL IDENTIFICATION IN 1978								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
Computer specialists	250	0.2	-	-	228	0.7	22	0.3
Engineers	2,199	1.7	862	0.9	1,290	4.1	46	0.7
Mathematicians and statisticians	96	(Z)	96	0.1	-	-	-	-
Life scientists	11,122	8.6	11,077	12.0	31	(Z)	13	0.2
Physical scientists	97,116	74.8	65,639	71.3	25,846	81.7	5,631	89.5
Environmental scientists	192	0.1	73	(Z)	105	0.3	13	0.2
Psychologists	-	-	-	-	-	-	-	-
Social scientists	19	(Z)	-	-	19	(Z)	-	-
Health occupations	125	(Z)	110	0.1	16	(Z)	-	-
Technicians, except medical	211	0.2	179	0.2	32	0.1	-	-
Teachers	300	0.2	180	0.2	82	0.3	37	0.6
Administrators	16,003	123	11,874	12.9	3,655	11.6	474	7.5
All other occupations	355	0.3	321	0.3	35	0.1	-	-

[1]College or university teachers of science or engineering are excluded from teachers and included in occupation corresponding to subject taught.

Table 2. Selected Educational Characteristics of Physical Scientists: 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Selected educational characteristics	Physical scientists, total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
HIGHEST DEGREE HELD								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
With a degree	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
Associate	-	-	-	-	-	-	-	-
Bachelor's	42,779	32.9	35,210	38.3	5,283	16.7	2,286	36.3
Master's	22,779	17.5	15,817	17.2	5,687	18.0	1,274	20.2
Doctorate	64,106	49.3	40,719	44.3	20,653	65.3	2,734	43.4
Professional/medical	254	0.2	254	0.3	-	-	-	-
Other	-	-	-	-	-	-	-	-
No degree	-	-	-	-	-	-	-	-
Not reported	-	-	-	-	-	-	-	-
MAJOR FIELD OF STUDY FOR HIGHEST DEGREE HELD								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
Computer science and systems analysis	57	(Z)	32	(Z)	26	(Z)	-	-
Engineering	3,762	2.9	2,099	2.3	961	3.0	702	11.1
Mathematical sciences	503	0.4	256	0.3	87	0.3	160	2.5
Agricultural sciences	915	0.7	532	0.6	-	-	384	6.1
Biological sciences	10,954	8.4	10,724	11.7	44	0.1	186	3.0
Medical sciences	662	0.5	555	0.6	58	0.2	49	0.8
Chemistry	75,139	57.8	74,045	80.5	237	0.8	856	13.6
Physics and astronomy	33,133	25.5	922	1.0	29,349	92.8	2,841	45.1
Earth, space, and marine sciences	591	0.5	173	0.2	99	0.3	318	5.1
Psychology	59	(Z)	29	(Z)	30	(Z)	-	-
Economics	-	-	-	-	-	-	-	-
Sociology and anthropology	60	(Z)	37	(Z)	13	(Z)	10	0.2
Other social sciences	437	0.3	27	(Z)	58	0.2	352	5.6
Business and commerce	686	0.5	619	0.7	46	0.1	21	0.3
All other fields	2,427	1.9	1,553	1.7	460	1.5	415	6.6
All fields below BA	79	(Z)	66	(Z)	14	(Z)	-	-
Field not reported	475	0.4	333	0.4	142	0.4	-	-
SUPPLEMENTAL TRAINING IN 1977[1]								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
With supplemental training in 1977	50,397	38.8	37,589	40.9	9,895	31.3	2,913	46.3
On-the-job training	24,931	19.2	19,088	20.7	4,060	12.8	1,783	28.3
Military training applicable to civilian occupations	508	0.4	266	0.3	242	0.8	-	-
Extension or correspondence courses	4,814	3.7	3,680	4.0	953	3.0	181	2.9
Employer training programs	18,536	14.3	14,265	15.5	3,419	10.8	853	13.6
Adult education center	6,206	4.8	4,425	4.8	1,338	4.2	443	7.0
Other training	13,450	10.4	9,895	10.8	2,682	8.5	872	13.9
No supplemental training in 1977	66,520	51.2	44,777	48.7	19,107	60.4	2,635	41.9
Not reported	13,001	10.0	9,635	10.5	2,620	8.3	746	11.9

[1]Sum of types of training may exceed total with training because of multiple response.

Table 3. Years of Professional Experience, Field of Science or Engineering in 1976, and Job Mobility of Physical Scientists in 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Professional experience, field in 1976, and job mobility	Physical scientists, total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
YEARS OF PROFESSIONAL EXPERIENCE								
Total persons	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
With years of professional experience reported	126,825	97.6	89,592	97.4	31,027	98.1	6,205	98.6
Less than 1 year	355	0.3	179	0.2	176	0.6	-	-
1 to 5 years	4,652	3.6	3,368	3.7	1,139	3.6	151	2.4
6 to 10 years	20,014	15.4	12,230	13.3	6,598	20.9	1,187	18.9
11 to 15 years	25,945	20.0	18,155	19.7	6,708	21.2	1,081	17.2
16 to 20 years	20,856	16.1	14,183	15.4	5,480	17.3	1,193	18.9
21 to 25 years	17,995	13.9	12,576	13.7	4,600	14.5	820	13.0
26 to 30 years	17,118	13.2	13,025	14.2	3,029	9.6	1,064	16.9
31 to 35 years	7,634	5.9	6,202	6.7	1,224	3.9	208	3.3
36 to 40 years	7,933	6.1	6,259	6.8	1,293	4.1	381	6.1
41 years or more	4,323	3.3	3,416	3.7	785	2.5	122	1.9
Median years of professional experience	19	(X)	20	(X)	17	(X)	19	(X)
Years of professional experience not reported	29,619	2.6	1,057	1.8	20,149	2.8	591	2.0
FIELD OF SCIENCE OR ENGINEERING IN 1976								
Total persons	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
Computer specialists	321	0.2	79	0.1	225	0.7	17	0.3
Engineers	4,297	3.3	1,905	2.1	1,897	6.0	495	7.9
Mathematical specialists	84	0.1	28	(Z)	43	0.1	13	0.2
Mathematicians	84	0.1	28	(Z)	43	0.1	13	0.2
Statisticians	-	-	-	-	-	-	-	-
Life scientists	2,067	1.6	1,638	1.8	137	0.4	292	4.6
Agricultural scientists	231	0.2	93	0.1	-	-	138	2.2
Biologists	1,405	1.1	1,217	1.3	50	0.2	138	2.2
Medical scientists	430	0.3	328	0.4	86	0.3	16	0.3
Physical scientists	113,785	87.6	83,017	90.2	26,350	83.3	4,418	70.2
Chemists	83,342	64.1	82,504	89.7	70	0.2	768	12.2
Physicists and astronomers	26,351	20.3	163	0.2	25,466	80.5	722	11.5
Other physical scientists	4,092	3.1	350	0.4	814	2.6	2,928	46.5
Environmental scientists	948	0.7	38	(Z)	702	2.2	208	3.3
Earth scientists	700	0.5	38	(Z)	482	1.5	180	2.9
Atmospheric scientists	218	0.2	-	-	205	0.6	13	0.2
Oceanographers	30	(Z)	-	-	15	(Z)	15	0.2
Psychologists	-	-	-	-	-	-	-	-
Social scientists	129	0.1	-	-	19	0.1	110	1.7
Economists	19	(Z)	-	-	19	0.1	-	-
Sociologists and anthropologists	-	-	-	-	-	-	-	-
Other social scientists	110	0.1	-	-	-	-	110	1.7
Not in a field in 1976	4,285	3.3	2,726	3.0	1,062	3.4	497	7.9
Did not report in 1976	4,005	3.1	2,571	2.8	1,190	3.8	244	3.9
JOB MOBILITY								
Total employed in February 1978	118,936	100.0	82,773	100.0	30,135	100.0	6,028	100.0
Employed in February 1976	113,243	95.2	79,031	95.5	28,441	94.4	5,772	95.7
Job change since 1976	30,441	25.6	21,143	25.5	7,791	25.9	1,507	25.0
Occupation change	10,370	8.7	6,593	8.0	3,120	10.4	657	10.9
No occupation change	19,870	16.7	14,404	17.4	4,616	15.3	850	14.1
Occupation change not reported	201	0.2	146	0.2	55	0.2	-	-
Same job in 1976 and 1978	75,795	63.7	52,399	63.3	19,523	64.8	3,873	64.3
Not reported	7,007	5.9	5,488	6.6	1,127	3.7	392	6.5
Not employed or employment status not reported in February 1976	5,693	4.8	3,742	4.5	1,695	5.6	256	4.3
Employed in January 1974	112,466	94.6	78,631	95.0	28,072	93.2	5,763	95.6
Job change between 1974 and 1978	44,894	37.7	30,281	36.6	11,636	38.6	2,977	49.4
Occupation change	17,428	14.7	10,611	12.8	4,549	15.1	2,268	37.6
No occupation change	27,342	23.0	19,546	23.6	7,087	23.5	709	11.8
Occupation change not reported	124	0.1	124	0.2	-	-	-	-
Same job in 1974 and 1978	60,483	50.9	42,735	51.6	15,281	50.7	2,467	40.9
Not reported	7,088	6.0	5,614	6.8	1,156	3.8	319	5.3
Not employed or employment status not reported in February 1974	6,471	5.4	4,142	5.0	2,063	6.8	265	4.4
Employed in 1972	114,264	93.9	79,704	96.3	28,650	95.1	5,910	98.0
Job change between 1972 and 1978	58,405	49.1	40,262	48.6	14,510	48.1	3,633	60.3
Occupation change	23,038	19.4	13,935	16.8	6,283	20.8	2,820	46.8
No occupation change	35,223	29.6	26,203	31.7	8,207	27.2	813	13.5
Occupation change not reported	144	0.1	124	0.2	20	(Z)	-	-
Same job in 1972 and 1978	48,528	40.8	33,668	40.7	12,975	43.1	1,886	31.3
Not reported	7,331	6.2	5,774	7.0	1,165	3.9	392	6.5
Not employed or employment status not reported in 1972	4,672	3.9	3,069	3.7	1,486	4.9	118	2.0

Table 4. Employment Status and Selected Job-Related Characteristics of Physical Scientists: 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text.)

Employment status and selected job-related characteristics	Physical scientists, total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
EMPLOYMENT STATUS IN FEBRUARY 1978								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
In labor force	120,220	92.5	83,860	91.2	30,318	95.9	6,041	96.0
Employed	118,936	91.5	82,773	90.0	30,135	95.3	6,028	95.8
Full time	115,132	88.6	79,964	86.9	29,424	93.0	5,744	91.3
Part time	3,755	2.9	2,773	3.0	699	2.2	284	4.5
Seeking full-time work	771	0.6	547	0.6	204	0.6	20	0.3
Not seeking full-time work	2,969	2.3	2,210	2.4	496	1.6	264	4.2
Not reported	15	(Z)	15	(Z)	-	-	-	-
Full or part time not reported	49	(Z)	37	(Z)	12	(Z)	-	-
Unemployed	1,283	1.0	1,087	1.2	183	0.6	13	0.2
Not in labor force	9,698	7.5	8,140	8.8	1,305	4.1	253	4.0
Retired	7,904	6.1	6,598	7.2	1,090	3.4	216	3.4
Student	308	0.2	250	0.3	57	0.2	-	-
Family responsibilities	1,330	1.0	1,256	1.4	38	0.1	37	0.6
Could not find work	28	(Z)	-	-	28	(Z)	-	-
Other	129	(Z)	37	(Z)	92	0.3	-	-
FULL-TIME EMPLOYMENT IN SCIENCE OR ENGINEERING IN 1978								
Total employed full time in February 1978	115,132	100.0	79,964	100.0	29,424	100.0	5,744	100.0
In science or engineering	113,004	98.2	78,239	97.8	29,135	99.0	5,630	98.0
Not in science or engineering	2,128	1.8	1,725	2.2	289	1.0	114	2.0
Preferred nonscience or nonengineering	203	0.2	136	0.2	67	0.2	-	-
Promoted out of science or engineering	1,133	1.0	919	1.1	116	0.4	97	1.7
Pay better in nonscience or nonengineering	90	(Z)	90	0.1	-	-	-	-
Locational preference	174	0.2	174	0.2	-	-	-	-
Science or engineering position not available	235	0.2	163	0.2	472	0.2	-	-
Other reason	258	0.2	208	0.3	34	0.1	17	0.3
Reason not reported	35	(Z)	35	(Z)	-	-	-	-
UNEMPLOYMENT IN CALENDAR YEAR 1977								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
Unemployed in calendar year 1977	4,032	3.1	3,117	3.4	640	2.0	276	4.4
1 to 4 weeks	497	0.4	480	0.5	18	(Z)	-	-
5 to 10 weeks	686	0.5	624	0.7	42	0.1	20	0.3
11 to 14 weeks	717	0.6	556	0.6	97	0.3	64	1.0
15 to 26 weeks	656	0.5	570	0.6	72	0.2	13	0.2
27 weeks or more	1,293	1.0	778	0.8	391	1.2	124	2.0
Median weeks of unemployment	*15	(X)	14	(X)	27+	(X)	*27+	(X)
Weeks of unemployment not reported	184	0.1	109	0.1	20	(Z)	54	0.9
Not unemployed in calendar year 1977	123,445	95.0	86,920	94.5	30,563	96.6	5,961	94.7
Not reported	2,441	1.9	1,964	2.1	420	1.3	57	*0.9
INDUSTRY IN 1978								
Total employed in 1978	118,936	100.0	82,773	100.0	30,135	100.0	6,028	100.0
Agriculture, forestry, and fisheries	861	0.7	732	0.9	16	(Z)	113	1.9
Mining and petroleum extraction	511	0.4	318	0.4	145	0.5	48	0.8
Construction	189	0.2	63	(Z)	126	0.4	-	-
Manufacturing, total	50,954	42.8	43,335	52.4	6,080	20.2	1,539	25.5
Primary metal industries	1,093	0.9	1,035	1.3	59	0.2	-	-
Fabricated metal industries	549	0.5	422	0.5	83	0.3	44	0.7
Machinery, except electrical	237	0.2	172	0.2	66	0.2	-	-
Electrical machinery equipment and supplies	1,016	0.9	611	0.7	391	1.3	14	0.2
Electronic machinery and computing equipment	5,009	4.2	1,863	2.3	2,905	9.6	241	4.0
Aircraft and aircraft parts	1,058	0.9	457	0.6	460	1.5	141	2.3
Motor vehicles and motor vehicle equipment	1,172	1.0	896	1.1	215	0.7	61	1.0
Ordnance	1,234	1.0	634	0.8	489	1.6	112	1.9
Chemicals and allied products	29,490	24.8	28,779	34.8	292	1.0	419	6.9
Petroleum refining and related industries	3,024	2.5	2,683	3.2	301	1.0	40	0.7
Other manufacturing	7,072	5.9	5,784	7.0	820	2.7	468	7.8
Transportation, communications, and other public utilities	1,233	1.0	671	0.8	548	1.8	14	0.2
Wholesale and retail trade	274	0.2	258	0.3	16	(Z)	-	-
Finance, insurance, and real estate	238	0.2	177	0.2	20	(Z)	41	0.7
Educational institutions, total	28,104	23.6	16,232	19.6	10,870	36.1	1,002	16.6
College or university	23,240	19.5	12,690	15.3	9,663	32.1	887	14.7
Other	4,864	4.1	3,542	4.3	1,207	4.0	115	1.9

Table 4. Employment Status and Selected Job-Related Characteristics of Physical Scientists: 1978—Continued

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Employment status and selected job-related characteristics	Physical scientists, total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
INDUSTRY IN 1978--Continued								
Health services	2,886	2.4	2,518	3.0	325	1.1	43	0.7
Services, except education and health, total	20,835	17.5	9,694	11.7	9,396	31.2	1,744	28.9
Engineering and architectural services	1,154	1.0	350	0.4	731	2.4	73	1.2
Research institutions	17,399	14.6	7,770	9.4	8,074	26.8	1,554	25.8
Other	2,282	1.9	1,574	1.9	591	2.0	117	1.9
Public administration	5,943	5.0	3,738	4.5	1,289	4.3	916	15.2
Federal	2,423	2.0	1,358	1.6	810	2.7	254	4.2
Other	3,394	2.9	2,270	2.7	463	1.5	662	11.0
Military	126	0.1	110	0.1	16	(Z)	-	-
Other industries	6,351	5.3	4,631	5.6	1,168	3.9	553	9.2
Not reported	657	0.5	406	0.5	138	0.5	13	0.2
TYPE OF EMPLOYER IN 1978								
Total employed in February 1978	118,936	100.0	82,773	100.0	30,135	100.0	6,028	100.0
Business or industry	65,923	55.4	52,570	63.5	10,967	36.4	2,387	39.6
Educational institutions, total	29,634	24.9	16,848	20.4	11,509	38.2	1,276	21.2
Junior or 2-year college, technical institute	2,196	1.8	1,051	1.3	1,073	3.6	72	1.2
Medical school	2,654	2.2	2,580	3.1	18	(Z)	56	0.9
4-year college or university, except medical school	24,387	20.5	12,898	15.6	10,342	34.3	1,147	19.0
Elementary or secondary school system	397	0.3	319	0.4	77	0.3	-	-
Hospital or clinic	1,070	0.9	904	1.1	136	0.5	30	0.5
Nonprofit organization	4,015	3.4	2,055	2.5	1,785	5.9	175	2.9
U.S. military service/commissioned groups	243	0.2	212	0.3	31	0.1	-	-
Government, total	16,893	14.2	9,495	11.5	5,252	17.4	2,146	35.6
Federal	12,189	10.2	6,186	7.5	4,534	15.0	1,468	24.4
State	1,555	1.3	1,242	1.5	154	0.5	159	2.6
Local or other	3,149	2.6	2,066	2.5	564	1.9	519	8.6
International agency	74	(Z)	-	-	74	0.2	-	-
Other	144	0.1	86	0.1	58	0.2	-	-
Not reported	941	0.8	603	0.7	324	1.1	14	0.2
PRIMARY WORK ACTIVITY IN 1978								
Total employed in February 1978	118,936	100.0	82,773	100.0	30,135	100.0	6,028	100.0
Research and development	49,886	41.9	34,351	41.5	12,735	42.3	2,800	46.5
Basic research	15,018	12.6	9,298	11.2	5,199	17.3	522	8.7
Applied research	19,390	16.3	13,166	15.9	4,907	16.3	1,317	21.9
Development	14,841	12.5	11,760	14.2	2,148	7.1	933	15.5
Design	637	0.5	127	0.2	482	1.6	28	0.5
Management or administration, total	31,085	26.1	21,787	26.3	7,648	25.4	1,650	27.4
Research and development	19,699	16.6	13,459	16.3	5,115	17.0	1,125	18.7
Other	11,386	9.6	8,328	10.1	2,533	8.4	524	8.7
Teaching and training	17,096	14.4	9,743	11.8	6,653	22.1	700	11.6
Production and inspection	12,362	10.4	11,183	13.5	791	2.6	388	6.4
Quality control	8,598	7.2	8,077	9.8	386	1.3	135	2.2
Operations	2,838	2.4	2,300	2.8	301	1.0	237	3.9
Distribution-sales	926	0.8	806	1.0	104	0.3	15	0.3
Consulting	2,269	1.9	1,593	1.9	455	1.5	221	3.7
Clinical diagnosis	378	0.3	348	0.4	30	(Z)	-	-
Consulting	1,892	1.6	1,245	1.5	425	1.4	221	3.7
Report writing, statistical work, and computer applications	3,204	2.7	1,916	2.3	1,113	3.7	174	2.9
Report writing	2,151	1.8	1,691	2.0	316	1.0	144	2.4
Statistical work	134	0.1	103	0.1	31	0.1	-	-
Computer applications	918	0.8	122	0.1	766	2.5	30	0.5
Other activities	1,750	1.5	1,513	1.8	156	0.5	80	1.3
Not reported	1,286	1.1	688	0.8	584	1.9	14	0.2

Table 4. Employment Status and Selected Job-Related Characteristics of Physical Scientists: 1978—Continued

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Employment status and selected job-related characteristics	Physical scientists, total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
NATIONAL INTEREST TOPICS[1]								
Total	129,918	100.0	92,001	100.0	31,623	100.0	6,294	100.0
Health	17,002	13.1	15,577	16.9	1,048	3.3	377	6.0
Education, total	17,129	13.2	19,758	10.6	6,733	21.3	639	10.1
Teaching	15,738	12.1	8,880	9.7	6,229	19.7	629	10.0
Other	1,390	1.1	877	1.0	504	1.6	9	0.1
Environmental protection pollution control	16,408	12.6	14,523	15.8	981	3.1	904	14.4
Space	3,591	2.8	491	0.5	2,591	8.2	510	8.1
National defense	12,246	9.4	3,065	3.3	7,900	25.0	1,281	20.4
Crime prevention and control	813	0.6	641	0.7	97	0.3	75	1.2
Food production and technology	4,957	3.8	4,847	5.3	53	0.2	57	0.9
Energy and fuel	13,818	10.6	8,790	9.6	4,474	14.1	554	8.8
Other mineral resources	1,027	0.8	834	0.9	81	0.3	113	1.8
Community development and services	372	0.3	227	0.2	13	(Z)	132	2.1
Housing	206	0.2	85	(Z)	64	0.2	57	0.9
Other	4,895	3.8	3,293	3.6	1,170	3.7	432	6.9
Not applicable	26,457	20.4	21,665	23.5	3,906	12.4	886	14.1
Not reported	10,996	8.5	8,204	8.9	2,513	7.9	279	4.4
FEDERAL SUPPORT IN 1978[2]								
Total employed in February 1978	118,936	100.0	82,773	100.0	30,135	100.0	6,028	100.0
With Federal support	47,421	39.9	24,715	29.9	19,161	63.6	3,545	58.8
Department of Agriculture	2,309	1.9	1,905	2.3	178	0.6	226	3.8
Department of Commerce	1,388	1.2	555	0.7	670	2.2	163	2.7
Department of Defense	14,688	12.3	4,809	5.8	8,765	29.1	1,114	18.5
Department of Energy	11,788	9.9	4,953	6.0	6,130	20.3	705	11.7
Department of Health, Education, and Welfare	9,257	7.8	8,177	9.9	863	2.9	217	3.6
Department of Housing and Urban Development	341	0.3	69	(Z)	141	0.5	131	2.2
Department of the Interior	1,503	1.3	955	1.2	115	0.4	433	7.2
Department of Justice	599	0.5	365	0.4	129	0.4	75	1.2
Department of Labor	258	0.2	149	0.2	109	0.4	–	–
Department of Transportation	777	0.7	557	0.7	122	0.4	97	1.6
Agency for International Development	380	0.3	367	0.4	13	(Z)	–	–
Environmental Protection Agency	3,364	2.8	2,828	3.4	341	1.1	195	3.2
NASA	5,589	4.7	1,458	1.8	3,544	11.8	587	9.7
National Science Foundation	7,518	6.3	3,482	4.2	3,733	12.4	304	5.0
Nuclear Regulatory Commission	933	0.8	470	0.6	407	1.4	56	0.9
Other Department or agency	2,075	1.7	1,412	1.7	485	1.6	178	3.0
Agency not known	499	0.4	338	0.4	147	0.5	14	0.2
Agency not reported	642	0.5	493	0.6	57	0.2	92	1.5
No Federal support	65,836	55.4	53,764	65.0	9,853	32.7	2,219	36.8
Federal support not known	4,305	3.6	3,301	4.0	827	2.7	177	2.9
Not reported	1,374	1.2	993	1.2	294	1.0	87	1.4

[1]Area of national concern in which persons devoted the largest proportion of professional time.
[2]Sum of individual agencies support may exceed total with Federal support because of multiple response.

Table 5. Basic Annual Salary Rate of Full-Time Employed Physical Scientists: 1978

(Detail may not add to total because of rounding. For meaning of symbols, see text)

Salary	Physical scientists, total		Chemists		Physicists and astronomers		Other physical scientists	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total employed full time in February 1978	115,132	100.0	79,964	100.0	29,424	100.0	5,744	100.0
With salary[1] reported	109,631	95.2	75,935	95.0	28,273	96.1	5,423	94.4
Less than $8,000	275	0.2	112	0.1	163	0.6	-	-
$8,000 to $9,999	192	0.2	153	0.2	39	0.1	-	-
$10,000 to $14,999	3,429	3.0	2,807	3.5	521	1.8	101	1.8
$15,000 to $19,999	13,622	11.8	11,263	14.1	2,014	6.8	346	6.0
$20,000 to $24,999	23,055	20.0	17,078	21.4	5,111	17.4	866	15.1
$25,000 to $29,999	25,233	21.9	16,059	20.1	7,402	25.2	1,772	30.8
$30,000 to $39,999	30,858	26.8	19,741	24.7	9,280	31.5	1,837	32.0
$40,000 to $49,999	9,636	8.4	6,366	8.0	2,841	9.7	429	7.5
$50,000 and over	3,330	2.9	2,357	2.9	901	3.1	72	1.3
Median salary (dollars)	27,329	(X)	26,525	(X)	29,052	(X)	28,390	(X)
Salary not reported	5,501	4.8	4,028	5.0	1,151	3.9	321	5.6

[1]Refers to salary for job held during the week of February 12-18, 1978.

Appendix A. Definitions and Explanations

The 1978 National Survey of Natural and Social Scientists and Engineers was the fourth survey based on the 1970 population of scientists and engineers. It was conducted by the Bureau of the Census for the National Science Foundation. The first survey, the 1972 Professional, Technical, and Scientific Manpower Survey,[1] was conducted among a nationwide sample of approximately 150,000 persons who were recorded in the 1970 Census of Population as being in the experienced civilian labor force in 1 of 63 engineering, scientific, or related occupations. The survey also included a small sample of persons who had completed 4 or more years of college, but were not in any of the specified occupations. Based on responses in the 1972 survey and on criteria established by the National Science Foundation, approximately 50,000 persons from the 1972 survey sample (excluding the small sample of college graduates) were chosen as the sample for the series of longitudinal surveys known as the National Sample of Scientists and Engineers. The 1978 National Survey of Natural and Social Scientists and Engineers was the third survey in this longitudinal series; it was preceded by surveys in 1976 and 1974.[2]

Questionnaires for the 1978 survey were mailed in February 1978. After all data collection activities, 81 percent of the sample (approximately 40,800 persons) completed their questionnaires. The 19 percent who did not complete their questionnaires included persons who refused to participate, the deceased, and persons who returned questionnaires with insufficient information to permit processing. For an analysis of response, see appendix E.

The estimates derived for this survey were prepared by using a ratio estimation procedure and an adjustment for nonresponse in 1978. For each sample case for which a completed questionnaire was obtained, the information from the 1978 survey was matched with the 1972 survey data and the 1970 census data for the same person. Weights applied to sample cases in the 1972 survey were then used to weight the resultant matched data file. The weighting procedure for the 1972 survey involved first the preparation of a preliminary estimate by weighting the results for each sample person by the reciprocal of the probability of selection. As a second step, these weights were adjusted by applying a factor for certain age-sex-race cells within each occupation category. Within each of the cells, the factor was computed as the ratio of the 1970 census count to the preliminary estimate. The final 1972 weight was this factor multiplied by the inverse of the probability of selection for each person. To the extent that the data being tabulated and the estimated count of persons in the cells are positively correlated, the ratio estimate procedure will improve the reliability of the estimate. A discussion of the reliability of the estimates, including a description of the standard errors of totals and percentages, is presented in appendix B.

A nonresponse adjustment was done in 1978 to reduce the bias in the survey estimates due to the high nonresponse rate in 1978. This adjustment was done separately for in-scope[3] and out-of-scope[4] persons, and included an adjustment for the mortality in the longitudinal sample from 1972 to 1978. The first step in the nonresponse adjustment was to adjust the nonrespondents for mortality from 1972 to 1978 by means of mortality tables for age-race-sex groups. The second step was to determine the estimated proportion of nonrespondents that were in-scope and out-of-scope. To estimate these proportions, an intensive follow-up was conducted to obtain interviews for a subsample of the 1978 nonrespondents. This follow-up showed that approximately 80 percent of the nonrespondents were in-scope and the remaining 20 percent were out-of-scope. The final step was to determine a nonresponse adjustment factor for different age-race-sex cells. Within each of the cells, the factor was computed as the ratio of the weighted count, using the 1972 weights, of the estimated total (i.e., respondent and nonrespondent) in-scope or out-of-scope persons, divided by the weighted count of the respondent in-scope or out-of-scope persons.

The final weight for the 1978 survey was the product of the 1972 weight and the appropriate 1978 nonresponse adjustment factor.

The definitions for many of the characteristics shown in this report are self-explanatory or can best be understood by referring to the appropriate 1978 questionnaire items or reference lists (appendixes C and D). An explanation of the other subjects is provided below.

Age in 1978. The reference period for age in 1978 was April 1978. The age classification is based on the age of the person at his or her last birthday. The median age is that age that

[1] For a description of the 1972 survey and related matters, see U.S. Bureau of the Census, *Characteristics of Persons in Engineering and Scientific Occupations: 1972*, Technical Paper No. 33, U.S. Government Printing Office, Washington, D.C., 1974.

[2] Results from the 1974 survey were published in U.S. Bureau of the Census, *Current Population Reports*, Series P-23, No. 53, *Selected Characteristics of Persons in Fields of Science or Engineering: 1974*, U.S. Government Printing Office, Washington, D.C., 1975; results from the 1976 survey were published in U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 76, *Selected Characteristics of Persons in Fields of Science or Engineering: 1976*, U.S. Government Printing Office, Washington, D.C., 1978.

[3] "In-scope" means "in a field of science or engineering."

[4] "Out-of-scope refers to the category "not in a field of science or engineering."

divides the distribution into two equal parts, one-half being older than the median age and one-half younger. Median ages were divided from an estimation process that distributed the subject populations into 5-year age groups.

Race. The data on race are based on responses in the 1970 Census of Population. The "other races" category includes all races not included in the specific categories listed.

Divisions of the United States. The divisions of the United States comprise the following States:

New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont

Middle Atlantic: New York, New Jersey, Pennsylvania

East North Central: Illinois, Indiana, Michigan, Ohio, Wisconsin.

West North Central: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota.

South Atlantic: Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia.

East South Central: Alabama, Kentucky, Mississippi, Tennessee.

West South Central: Arkansas, Louisiana, Oklahoma, Texas.

Mountain: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming.

Pacific: Alaska, California, Hawaii, Oregon, Washington.

Outlying areas of the United States include Puerto Rico, Guam, Virgin Islands, American Samoa, and Canal Zone.

Fields of science and engineering. Science or engineering (S/E) fields are categories established by the survey sponsor, the National Science Foundation, to identify persons who could be classified as engineers or scientists under most definitions. In general, to be classified into one of the fields, a person had to have at least two of the following three characteristics: (1) employment in the field, (2) attainment of a specified educational level in an academic discipline related to the field, or (3) self-identification, based upon total education and experience, as being in the field. More detailed information on the criteria for membership in a scientific and technical field is given in U.S. Bureau of the Census, Current Population Reports, Series P-23, No. 76, *Selected Characteristics of Persons in Fields of Science or Engineering: 1976,* U.S. Government Printing Office, Washington, D.C., 1978.

Highest degree held. Highest degree held in 1978 refers to the highest academic degree awarded to the respondent in 1978 or earlier. Data on highest degree held were derived as follows: The level and the year of award of the highest degree received by the respondent between January 1972 and 1978 surveys (this degree will be referred to as degree "A") were compared with the level and year of award, determined from the 1976, 1974, and 1972 surveys, of the previously-designated highest degree held by the respondent (this is referred to as degree "B"). If degree A was at the same level or at a higher level than degree B, and if its date of award was later than that of degree B, degree A was designated as the highest degree held in 1978; otherwise, degree B was designated as the highest degree held in 1978.

The "other degree" category includes persons whose highest academic degree was one of the following: RN, LLB, MD, and academic degrees other than those shown in the tables.

Major field of study for highest degree held. The data on major field of study refer to the major subject associated with the highest degree held in 1978 determined by the method described above. For persons who received their highest degree held in 1978 after January 1972, the data are derived from question 3 of the 1978 questionnaire (see appendix C), or question 1, part b of the 1976 questionnaire or from question 2, part b5 of the 1974 questionnaire. For persons who received their highest degree in 1971 or earlier, the data on major subject are based on the 1972 survey.

Employment status. Employed persons are those who reported that they were employed, either full time or part time, on vacation, or otherwise temporarily absent from a job for health or personal reasons during the reference week (February 12-18, 1978). The unemployed are persons who marked the "unemployed and seeking work" category (box 3) of item 5a of the 1978 questionnaire (see appendix C), or who indicated in item 7 that they were on layoff from a job. All other persons were classified as "not in the labor force."

Unemployment in 1977. The data on unemployment in 1977 relate to the occurrence of unemployment during the entire calendar year rather than just during a reference week. Medians are based on the intervals shown in the tables.

Primary work activity in 1978. The data on primary work activity in 1978 were derived, in general, from answers to question 11b of the 1978 questionnaire. In certain instances of nonresponse to question 11b, however, the data were derived from an imputation procedure that used responses to question 11a.

Type of employer. The data on type of employer in 1978 are based entirely on responses to question 12 of the 1978 questionnaire.

Basic annual salary rate. The statistics on salary refer to the basic annual salary associated with the job held in February 1978. The figures relate to salary before deductions for income tax, Social Security, retirement, etc., but do not include bonuses, overtime pay, or earnings from secondary jobs. For employees of educational institutions whose salary was for 9 or 10 months, the salary rate was adjusted to a 12-month basis. Median salaries were derived by an estimation process that distributed the subject population into $1,000 intervals.

Job and occupational mobility in 1976 and 1978. The data on mobility between 1976 and 1978 were derived from answers on both the 1976 and 1978 questionnaires. Persons were classified as with a "job change between 1976 and 1978" if they were employed in both 1976 and 1978 and reported in the 1978 survey that their current job began in 1976 or later. Persons were classified as "same job in 1976 and 1978" if the beginning date of their most recent job was in 1975 or earlier, and as "not reported" if they did not report the beginning date of the most recent job. For persons with a job change, the detailed occupation of the 1978 job was compared with that of the 1976 job, and persons were classified as with the same or a different occupation or as "occupation change not reported."

Job and occupational mobility in 1974 and 1978 and in 1972 and 1978. The data on mobility between 1974 and 1978 and between 1972 and 1978 were derived from answers on the 1974 and 1978 questionnaires and 1972 and 1978 questionnaires, respectively. The procedure was analogous to that described for the data on job and occupational mobility in 1976 and 1978.

Years of professional experience. Median years of professional experience are based on 1-year intervals.

Symbols. A dash (—) represents zero, and "X" means "not applicable." The symbol "Z" means less than 0.05 percent. The symbol "*" means based on fewer than 20 sample cases. For the characteristic "Unemployment in Calendar Year 1977," the symbol "27+" means that the median fell in the category "27 weeks or more."

Appendix B. Reliability of the Estimates and Standard Errors of Totals and Percentages

There are two types of possible errors associated with estimates based on data from a sample survey—sampling and nonsampling error. The following is a description of the sampling and nonsampling errors associated with the 1978 Survey of Scientists and Engineers.

SAMPLING ERRORS

The particular sample used for this survey is one of a large number of possible samples of the same size that could have been selected using the same sample design. Even if the same schedules and instructions were used, estimates from each of the different samples would differ from each other. The deviation of a sample estimate from the average of all possible samples is defined as the sampling error. The standard error of a survey estimate attempts to provide a measure of this variation among the estimates from the possible samples, and thus, is a measure of the precision with which an estimate from the sample approximates the average result of all possible samples.

As calculated for this survey, the standard error also partially measures the variation in the estimates due to response errors (nonsampling errors), but it does not measure, as such, any systematic biases in the data. Therefore, the accuracy of the estimates depends on both the sampling and nonsampling errors, measured by the standard error, and biases and some additional nonsampling errors not measured by the standard error.

The figures presented in the tables B-1 to B-4 below are approximations to the standard errors of the various estimates for this survey. A number of approximations and generalizations have been used so that the standard errors would be applicable to a wide variety of characteristics and still be prepared at a moderate cost. Thus, the standard errors in the following tables provide an indication of the order of magnitude rather than precise measurements of the standard errors.

Standard errors on totals. Table B-1 presents the standard errors applicable to estimated totals for characteristics of physical scientists. Linear interpolation can be used to determine standard errors for estimated totals not specifically shown in table B-1. In addition, standard errors for estimated numbers not shown in these tables may also be computed directly from the following standard error formula:

$$\text{standard error of } x = \sqrt{ax^2 + bx}$$

The "a" and "b" parameters for each physical scientist group are:

Field	"a" parameter	"b" parameter
Physical scientists, total	.0000552	31.7
Chemists	.0000585	34.5
Physicists and Astronomers	.000549	31.6
Other physical scientists	.00476	28.6

For example, there are an estimated 7904 physical scientists, total, who were retired in 1978. The above table shows that a = .0000552 and b = 31.7 for physical scientists, total. Thus, the estimated standard error of 7904 is

$$\sqrt{(.0000552)\ (7904)^2 + (31.7)\ (7904)} = 504$$

Standard errors on percentages. The reliability of an estimated percentage, computed by using sample data for both the numerator and the denominator, depends upon both the size of the percentage and the size of the total upon which the percentage is based. Estimated percentages are relatively more reliable than the corresponding estimates of the numerators of the percentage, particularly if the percentages are 50 percent or more.

Tables B-2 to B-4 present the standard errors of estimated percentages for physical scientists. Two-way linear interpolation can be used to determine standard errors for estimated percentages not specifically shown in tables B-2 to B-4. In addition, the standard errors for percentages not shown in these tables can also be computed directly from the following formula[1]:

$$\text{standard error of the percentage p on a base of y} = \sqrt{(p)\ (100\text{-}p)\ \frac{b}{y}}$$

For example, an estimated 2.9 percent of the 129,918 physical scientists, total, worked part-time in 1978. The above table shows that b = 31.7 for physical scientists, total.

[1] The tables for the standard errors of percentages for most scientific and engineering fields (SEF's) were combined. The tables of standard errors given for such collapsed groups are always conservative, i.e., the table for the SEF with the largest standard errors was chosen to represent all the SEF's in the group. Because of this, the standard errors calculated directly from the formula may differ slightly from those found in the tables.

Thus, the standard error for the 2.9 percent on a base of 129,918 is

$$\sqrt{\frac{(2.9)\ (100-2.9)\ (31.7)}{129,918}} = .26 \text{ percent}$$

Standard error intervals. The sample estimate and its estimated standard error enable one to construct interval estimates that include the average result of all possible samples with a known probability. For example, if all possible samples were selected, each of these surveyed under identical conditions and an estimate and its estimated standard error were calculated from each sample, then:

1. Approximately 68 percent of the intervals from one standard error below the estimate to one standard error above the estimate would include the average result of all possible samples;
2. Approximately 90 percent of the intervals from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate would include the average result of all possible samples;
3. Approximately 95 percent of the intervals from two standard errors below the estimate to two standard errors above the estimate would include the average result of all possible samples.

The average result of all possible samples either is or is not contained in any particular computed interval. However, for a particular sample one can say with specified confidence that the average result of all possible samples is included within the constructed interval.

For example, of the 129,918 physical scientists, total, in 1978, 17.5 percent have the Master's degree as the highest degree held in 1978. The standard error of this percent as computed from table B-2 is .6 percentage points. Based on these data, we may conclude that the percentage of physical scientists, total, with the Master's degree as the highest degree held in 1978 lies between 16.3 percent and 18.7 percent with 95 percent confidence, i.e., within 2 standard errors.

All the statements of comparison appearing in the text of this report are significant at a level of more than 2.0 standard errors. This means that for the differences cited in the text, the estimated difference is greater than twice the standard error of the difference.

Standard errors of differences between estimates. The figures in these tables are not directly applicable to standard errors of differences between two sample estimates. The standard error of the estimated difference between two figures may be approximated by the square root of the sum of the squares of the standard error of each estimate. This approximation will yield an exact result when the two characteristics are uncorrelated. If the two characteristics are positively (negatively) correlated, the approximation will overestimate (underestimate) the standard error of the difference. For a difference between two sample estimates, one of which represents a subclass of the other, the table can be used with the difference considered as the sample estimate.

For example, of the 129,918 physical scientists, total, in 1978, 49.3 percent have the PH.D. as the highest degree held in 1978. The standard error of this percent as computed from table B-2 is .8 percentage points. The standard error of the difference between the percentage of those with Master's degrees and the percentage of those with Doctorates (i.e., 49.3 - 17.5 = 31.8 percent) is then approximately

$$\sqrt{(.6)^2 + (.8)^2} = 1 \text{ percentage point}$$

Based on these data, we may conclude with 95-percent confidence that the average estimate of the difference of the percentages derived from all possible sample lies within the interval 29.8 percentage points to 33.8 percentage points.

Table B-1. Standard Errors of Totals

Size of estimate	Chemists; physical scientists, total	Physicists and astronomers	Other physical scientists
100	60	60	50
200	80	80	80
500	130	130	120
700	160	150	150
1,000	190	180	180
2,500	290	290	320
5,000	420	410	510
10,000	590	610	870
25,000	950	1,060	-
50,000	1,370	1,720	-
75,000	1,710	-	-
100,000	2,010	-	-
150,000	2,450	-	-

- Represents zero.

Standard errors of medians. The figures in these tables are not directly applicable to standard errors of estimated medians. The sampling variability of an estimated median depends upon the size of the base as well as on the distribution from which the median is determined. An approximate method for measuring the reliability of a median is to determine an interval about the estimated median, such that there is a stated degree of confidence that the median based on all possible samples lies within the interval. The following procedure may be used to estimate confidence limits of a median based on sample data:

1. Determine the standard error of a 50-percent characteristic from the appropriate standard error table (tables B-2 to B-4) using the appropriate base;
2. Add this standard error to 50 percent to obtain an upper boundary percentage and subtract this standard error from 50 percent to obtain a lower boundary percentage;

3. Using the cumulative distribution from which the median is derived, read off the numbers corresponding to the percentages. The interval between these two numbers (i.e., the confidence limits) will be the 68-percent confidence interval. A 95-percent confidence interval may be determined by finding the values corresponding to 50 percent plus or minus twice the standard error in step (1).

Table B-2. Standard Errors of Percentages for Physical Scientists, Total, and Physicists/Astronomers

(68 chances out of 100)

Base of percentage	1 or 99	2 or 98	5 or 95	10 or 90	15 or 85	25 or 75	50
100	5.7	8.0	12.5	17.2	20.5	24.8	28.7
200	4.0	5.7	8.8	12.2	14.5	17.6	20.3
500	2.6	3.6	5.6	7.7	9.2	11.1	12.8
700	2.2	3.0	4.7	6.5	7.7	9.4	10.8
1,000	1.8	2.5	4.0	5.4	6.5	7.9	9.1
2,500	1.1	1.6	2.5	3.4	4.1	5.0	5.7
5,000	0.8	1.1	1.8	2.4	2.9	3.5	4.1
10,000	0.6	0.8	1.3	1.7	2.0	2.5	2.9
25,000	0.4	0.5	0.8	1.1	1.3	1.6	1.8
50,000	0.3	0.4	0.6	0.8	0.9	1.1	1.3
75,000	0.2	0.3	0.5	0.6	0.7	0.9	1.0
100,000	0.2	0.3	0.4	0.5	0.6	0.8	0.9
150,000	0.1	0.2	0.3	0.4	0.5	0.6	0.7

Table B-3. Standard Errors of Percentages for Other Physical Scientists

(68 chances out of 100)

Base of percentage	1 or 99	2 or 98	5 or 95	10 or 90	15 or 85	25 or 75	50
100	5.3	7.5	11.7	16.0	19.1	23.2	26.7
200	3.8	5.3	8.2	11.3	13.5	16.4	18.9
500	2.4	3.3	5.2	7.2	8.5	10.4	12.0
700	2.0	2.8	4.4	6.1	7.2	8.8	10.1
1,000	1.7	2.4	3.7	5.1	6.0	7.3	8.5
2,500	1.1	1.5	2.3	3.2	3.8	4.6	5.3
5,000	0.8	1.1	1.6	2.3	2.7	3.3	3.8
10,000	0.5	0.7	1.2	1.6	1.9	2.3	2.7
25,000	0.3	0.5	0.7	1.0	1.2	1.5	1.7
50,000	0.2	0.3	0.5	0.7	0.9	1.0	1.2

Table B-4. Standard Errors of Percentages for Chemists

(68 chances out of 100)

Base of percentage	1 or 99	2 or 98	5 or 95	10 or 90	15 or 85	25 or 75	50
100	5.9	8.3	12.9	17.7	21.1	25.6	29.6
200	4.2	5.9	9.1	12.5	14.9	18.1	20.9
500	2.6	3.7	5.8	7.9	9.4	11.4	13.2
700	2.2	3.1	4.9	6.7	8.0	9.7	11.2
1,000	1.9	2.6	4.1	5.6	6.7	8.1	9.3
2,500	1.2	1.7	2.6	3.5	4.2	5.1	5.9
5,000	0.8	1.2	1.8	2.5	3.0	3.6	4.2
10,000	0.6	0.8	1.3	1.8	2.1	2.6	3.0
25,000	0.4	0.5	0.8	1.1	1.3	1.6	1.9
50,000	0.3	0.4	0.6	0.8	0.9	1.1	1.3
75,000	0.2	0.3	0.5	0.6	0.8	0.9	1.1
100,000	0.2	0.3	0.4	0.6	0.7	0.8	0.9

For example, the data for 1978 indicate that the estimate of the median age for chemists is 45.9 years. The distribution of chemists by age is shown in the following table:

Age (years)	Percentage	Cumulative distribution
Under 30	0.7	0.7
30 to 34	11.9	12.6
35 to 39	18.5	31.1
40 to 44	16.3	47.4
45 to 49	14.4	61.8
50 to 54	12.7	74.5
55 to 59	11.4	85.9
60 to 64	7.2	93.1
65 to 69	4.8	97.9
70 and over . . .	2.0	99.9

From standard error table B-4, the standard error of a 50-percent characteristic with a base of 92,001 is 1.0 percentage points. From the table of cumulative age distribution, the percentage point that corresponds to 45 years is 47.4 percent and to 50 years is 61.8 percent. The lower confidence limit corresponding to 49.0 percent (50 percent minus 1.0 percent) is found by linear interpolation between 45 years and 50 years to be 45.6 years, i.e.,

$$45 + [(50-45)\left(\frac{49.0-47.4}{61.8-47.4}\right)] = 45.6$$

Similarly, the upper confidence limit corresponding to 51.0 percent (50 percent plus 1.0 percent) is found to be 46.3 years. Consequently, the 68-percent confidence interval, as shown by the data, is from 45.6 years to 46.3 years. Likewise, we could conclude that the 95-percent confidence interval is from 45.2 years (the distribution point corresponding to 48.0 percent) to 46.6 years (corresponding to 52.0 percent).

NONSAMPLING ERRORS

In general, nonsampling errors can be attributed to many sources: inability to obtain information about all cases; definitional difficulties; differences in the interpretation of questions; inability or unwillingness to provide correct information on the part of the respondents; mistakes in recording or coding the data; and other errors of collection, response, processing, coverage, and estimation for missing data. As the above list indicates, nonsampling errors are not unique to sample surveys, since they can, and do, occur in complete censuses as well.

The primary source of nonsampling error in the 1978 National Sample survey is probably the high nonresponse rate. An adjustment in the estimation procedure for the 23-percent noninterview rate in the 1972 survey and the additional 19-percent nonresponse rate in 1978 was made, but there still remains some unknown bias in the estimates due to differences in the characteristics of those who were interviewed in 1978 and those who were not.

It should also be pointed out that estimates for this survey do not represent those who have entered the labor force in scientific and engineering fields since 1970. In particular, this survey does not include the large numbers of graduates produced since 1970. This causes significant biases for such items as the relative distributions of sex, age, and race and the unemployment figures if the results are assumed to be indicative of the current scientific and engineering fields including new entrants since 1970.

Appendix C. Questionnaire and Reference Lists

O.M.B. No. 99-S770031 Approval Expires December 31, 1978

FORM PMS-26D (10-28-77)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

1978 NATIONAL SURVEY OF NATURAL AND SOCIAL SCIENTISTS AND ENGINEERS

NOTICE – Your report to the Census Bureau is confidential. It may be seen only by sworn Census employees and may be used only for statistical purposes.

Please read instructions carefully before answering questions.

Answer as accurately as you can by printing your reply clearly or by entering an "X" in the box next to the appropriate reply.

When the instructions for a question direct you to enter a code and description from a list, please refer to the reference list attached to this questionnaire.

PLEASE COMPLETE AND RETURN TO: Bureau of the Census, 1201 East Tenth Street, Jeffersonville, Indiana 47132

A. Do you currently live in the State (or foreign country) printed in the above mailing label?

1 ☐ Yes, same State (or foreign country)

2 ☐ No, different State (or foreign country) – *Please enter your current State (or foreign country) of residence* _____ 3 ☐☐

FROM THE DIRECTOR
BUREAU OF THE CENSUS

This is the final questionnaire for the series of surveys known as the National Sample of Scientists and Engineers. The National Science Foundation, the project sponsor, and the Bureau of the Census wish to thank you for your invaluable contribution to this program. Each of the biennial surveys has given policymakers and planners an increasingly clearer view of the dynamics of the educational system and the job market for one of the Nation's central resources—highly trained persons. The goal of this final survey is to complete the picture for the decade of the 1970's.

Thus, we are asking you to provide one final report on your employment and related topics. The quesionnnaire is much shorter than previous ones. Please note that the sample includes many kinds of highly trained persons in addition to scientists and engineers. For the survey to be successful and yield truly representative information, it is important that each person fill out and return the questionnaire.

Please complete the questions which follow on pages 2 through 4 and return your questionnaire in the enclosed preaddressed envelope. For some questions you are instructed to enter a code and description from Reference List A, B, or C. These lists are attached to the questionnaire.

This information is being collected under the authority of the National Science Foundation Act of 1950, as amended. The information you provide is confidential and may be seen only by sworn employees of the Bureau of the Census. The information cannot be used for anything but statistical purposes and cannot be given to any other Government agency, private concern, or individual. The data will be released only in the form of statistical summaries from which it will be impossible to identify information about any particular person. Your response is entirely voluntary, and your failure to provide some or all of the requested information will in no way adversely affect you.

Thank you for your cooperation.

Sincerely,

MANUEL D. PLOTKIN

Enclosure

PART I – EDUCATION AND TRAINING

1. Since January 1972 have you attended any college, university, or other post high school institution?

1 ☐ Yes – *Continue with question 2a*
2 ☐ No – *Skip to question 4*

2a. What is the highest degree you have RECEIVED since January 1972?

Mark only one box

1 ☐ Associate
2 ☐ Registered Nurse (R.N.)
3 ☐ Bachelor's
4 ☐ Master's
5 ☐ First Professional Non-Medical (J.D., LL.B., Th.B.)
6 ☐ First Professional Medical (D.D.M., D.D.S., D.O., D.V.M., M.D.)
7 ☐ Doctorate
8 ☐ Other – *Specify* _____
9 ☐ None – *Skip to question 4*

b. When was this degree awarded?

If you received more than one degree at the same level (e.g., two master's degrees), enter the year of award of the most recent one.

19 ____

3. What was the major field of study of the degree you described in question 2?

Enter code and description from Reference List A.

Code ☐☐☐ Description from Reference List A _____

4 Aside from formal education, which of the following types of training did you receive in 1976 or 1977?

Mark the appropriate year for each type of training you have received.

	a. 1976	b. 1977
(1) On-the-job training	1 ☐	1 ☐
(2) Military training applicable to civilian occupations	2 ☐	2 ☐
(3) Extension or correspondence courses	3 ☐	3 ☐
(4) Courses at employer's training facility	4 ☐	4 ☐
(5) Courses at adult education center	5 ☐	5 ☐
(6) Other training	6 ☐	6 ☐
(7) None	7 ☐	7 ☐

PART II – EMPLOYMENT STATUS

5a. What was your employment status during the week of February 12–18, 1978?

1 ☐ Employed full time (including self-employed full time) – *Skip to 6a*
2 ☐ Employed part time (including self-employed part time) – *Answer 5b*
3 ☐ Unemployed and seeking work – *Go to Part III*
4 ☐ Not employed and not seeking work – *Skip to 7*

b. If you worked part time, were you seeking full-time work?

1 ☐ Yes
2 ☐ No

6a. Were you working in a position related to science or engineering during the week of February 12–18, 1978?

1 ☐ Yes – *Go to Part III*
2 ☐ No – *Answer 6b*

b. What was the most important reason for taking this position?

Mark only one box

1 ☐ Preferred nonscience or nonengineering position
2 ☐ Promoted out of science or engineering position
3 ☐ Pay was better in nonscience or nonengineering position
4 ☐ Locational preference
5 ☐ Science or engineering position not available
6 ☐ Other – *Specify* _____

(Go to Part III)

7. If you were not employed and not seeking work during the week of February 12–18, 1978, what was your most important reason for not seeking work?

Mark only one box

1 ☐ On vacation or otherwise temporarily absent from a job for health or personal reasons
2 ☐ On layoff from a job
3 ☐ Retired
4 ☐ Student
5 ☐ Tending to family responsibilities
6 ☐ Could not find work or believed no jobs available in my particular field
7 ☐ Other – *Specify* _____

(Go to Part III)

PART III – JOB ACTIVITIES

INSTRUCTIONS

a. Complete questions 8–15 for the job held during the week of February 12–18, 1978, or, if you did not hold a job during that week, complete these questions for your most recent job prior to that week.

b. If you held more than one job, please report only the job at which you worked the greatest number of hours.

Job held during the week of February 12–18, 1978, or most recent prior job.

8. Where did you work?

Write in city and State or foreign country of company, business, agency, or other employer.

City

State or foreign country

9. What kind of business was this?

Enter code and description from Reference List B.

Code | Description from Reference List B

10. What was your occupation?

Enter code and description from Reference List C.

Code | Description from Reference List C

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

Entries should sum to 100%.

PLEASE NOTE

Basic research is study directed toward gaining scientific knowledge primarily for its own sake.

Applied research is study directed toward gaining scientific knowledge in an effort to meet a recognized need.

Development is direction of the knowledge gained from research toward production of useful materials, devices, systems, and methods.

01	%	Management or administration of research and development
02	%	Management or administration of other than research and development
03	%	Teaching and training – preparing and teaching courses, guiding and counseling students or trainees
04	%	Basic research
05	%	Applied research
06	%	Development – product, process, and technical development
07	%	Report and technical writing, editing, information retrieval
08	%	Clinical diagnosis
09	%	Design of equipment, processes, models
10	%	Quality control, testing, evaluation, or inspection
11	%	Operations – production, maintenance, construction, installation
12	%	Distribution – sales, traffic, purchasing, customer and public relations
13	%	Statistical work – survey work, forecasting, statistical analysis
14	%	Consulting
15	%	Computer applications
16	%	Other activities – *Specify* _____

TOTAL=100%

b. Among all these activities, which was your primary and which was your major secondary work activity?

Fill in the appropriate code numbers (01–16) from question 11a.

Code (01–16 from Question 11a).

Primary work activity

Secondary work activity

12. Which category best describes the type of organization of your principal employment or postdoctoral appointment?

Mark only one box

- 01 ☐ Business or industry, including self-employed
- 02 ☐ Junior college, 2-year college, technical institute
- 03 ☐ Medical school
- 04 ☐ 4-year college or university, other than medical school
- 05 ☐ Elementary or secondary school system
- 06 ☐ Hospital or clinic
- 07 ☐ Non-profit organization, other than hospital, clinic, or educational institution
- 08 ☐ U.S. military service, active duty, or Commissioned Corps, e.g., USPHS, NOAA
- 09 ☐ U.S. Government, civilian employee
- 10 ☐ State government
- 11 ☐ Local or other government – *Specify* _____
- 12 ☐ International agency
- 13 ☐ Other – *Specify* _____

PLEASE CONTINUE TO DESCRIBE THIS JOB ON PAGE 4 →

PART III – JOB ACTIVITIES – Continued

13. What was the basic salary associated with this position? (If not working during February 12–18, report ending salary of most recent prior job.)

If you were on a postdoctoral appointment, include stipend plus allowances. (Basic salary refers to salary before deductions for income tax, social security, retirement, etc. but does not include bonuses, overtime, summer teaching, or other payment for secondary jobs.)

Job held during week of February 12–18, 1978, or most recent prior job

a. $ _____ .00

b. 1 ☐ Per year
2 ☐ Per month
3 ☐ Per week

c. If academically employed, mark whether salary is for –
1 ☐ 9–10 months
2 ☐ 11–12 months

14. Between what dates did you hold this position? *Enter month and year.*

Consider a change in positions to have occurred if there were significant changes in your duties, level of responsibility, or occupation, even if you continued to work for the same employer.

a. Beginning month and year: _____

b. Ending month and year: _____ OR ☐ Present

15a. Was ANY of your work supported or sponsored by U.S. Government funds?

1 ☐ Yes – *Continue with 15b*
2 ☐ No
3 ☐ Don't know } *Skip to 16a*

b. Which of the following agencies or departments were supporting the work? *Mark as many as apply*

01 ☐ AID (Agency for International Development)
02 ☐ Department of Agriculture
03 ☐ Department of Commerce
04 ☐ Department of Defense
05 ☐ Department of Energy
Department of Health, Education, and Welfare
06 ☐ Alcohol and Drug Abuse Mental Health Administration
07 ☐ NIH (National Institutes of Health)
08 ☐ Office of Education
09 ☐ Other HEW – *Specify* _____
10 ☐ Department of Housing and Urban Development
11 ☐ Department of the Interior
12 ☐ Department of Justice
13 ☐ Department of Labor
14 ☐ Department of Transportation
15 ☐ EPA (Environmental Protection Agency)
16 ☐ NASA (National Aeronautics and Space Administration)
17 ☐ NSF (National Science Foundation)
18 ☐ Nuclear Regulatory Commission
19 ☐ Other agency or department – *Specify* _____
20 ☐ Don't know source agency or department

PART IV – OTHER INFORMATION

16a. At anytime during calendar year 1977 were you without a job AND actively seeking employment?

1 ☐ Yes – *Continue with 16b*
2 ☐ No – *Skip to question 17*

b. For how many weeks were you seeking employment?

1 ☐ 1 to 4 weeks
2 ☐ 5 to 10 weeks
3 ☐ 11 to 14 weeks
4 ☐ 15 to 26 weeks
5 ☐ 27 weeks or more

17. How many years of professional experience, including teaching, have you had? *Enter number of years.*

_____ Years

18. Based on your total education and experience, what do you regard yourself as professionally? *Enter code and description from Reference List C.*

Code | Description from Reference List C

19. Listed at the right are selected topics of critical national interest. If you devote a significant proportion of your professional time to any of these problem areas, please mark the box for the one on which you spend the MOST time. *Mark only one box*

01 ☐ Health
02 ☐ Environment protection, pollution control
Education:
03 ☐ Teaching
04 ☐ Other
05 ☐ Space
06 ☐ National defense
07 ☐ Crime prevention and control
08 ☐ Food production and technology
09 ☐ Energy and fuel
10 ☐ Other mineral resources
11 ☐ Community development and services
12 ☐ Housing (planning, design, construction)
13 ☐ Other – *Specify* _____
14 ☐ Does not apply

20a. Are you physically handicapped?

1 ☐ Yes – *Continue with 20b*
2 ☐ No – *Skip to question 21*

b. What is the nature of your handicap(s)? *Mark as many as apply*

1 ☐ Visual
2 ☐ Auditory
3 ☐ Orthopedic
4 ☐ Other – *Specify* _____

21. Is your ethnic heritage Hispanic? (Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture).

1 ☐ Yes
2 ☐ No

22. In the event that it is necessary to contact you to clarify some of the information you provided, may we contact you by telephone?

☐ Yes – *Enter number(s) on which you can be reached* → Area code | Telephone number
Area code | Telephone number
☐ No

23. Please print your name here. Date prepared

FORM PMS-260 (9-26-77)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1977– 756-548

REFERENCE LIST A – MAJOR FIELDS OF STUDY

This list is to be used in answering question 3 about the field in which you have obtained study or training. It is divided into two sections: Section I is a list of fields of academic study generally leading to bachelor's or higher degrees; Section II is a list of fields of study and training below those generally leading to a bachelor's degree.

Please scan the entire list, choose the appropriate answer for the question and then enter the code and description in the appropriate section of question 3. If none of the categories listed below adequately describes what you were studying or being trained in, use the "Other" category (code 600 or 625) and enter a brief description of what you were studying in the space provided on the questionnaire.

Section I – FIELDS OF ACADEMIC STUDY LEADING TO BACHELOR'S OR HIGHER DEGREES

Code	Description
	Biological and Agricultural Sciences and Related Fields
501	Agriculture, business
502	Agriculture, general
503	Agronomy, field crops
504	Anatomy and histology
505	Animal physiology
506	Animal science
507	Bacteriology, virology, mycology, parasitology
508	Biochemistry
509	Biology, general
510	Biophysics
511	Botany, general
512	Dairy science (dairy husbandry)
513	Entomology
514	Farm management
515	Fish and game or wildlife management
516	Food science (food technology and processing, dairy manufacturing and technology, food industry)
517	Forestry
518	Genetics
519	Horticulture
520	Immunology
521	Microbiology
522	Plant pathology
523	Plant physiology
524	Soil science (soil management, soil conservation)
525	Zoology, general
526	Biological and agricultural sciences, other fields
	Education
527	Biological sciences education
528	Mathematics education
529	Physical sciences education
530	Trade and industrial training
531	Education, other fields
	Engineering
532	Aerospace, aeronautical, astronautical, and related fields
533	Agricultural
534	Architectural
535	Chemical, petroleum refining
536	Civil, construction, transportation
537	Electrical, electronics
538	Engineering sciences, mechanics, physics
539	Engineering technology
540	Environmental/sanitary engineering
541	General or unified
542	Industrial
543	Mechanical
544	Metallurgical, materials, ceramics
545	Mining, mineral, geological
546	Naval architecture and marine engineering
547	Nuclear
548	Operations research/systems engineering
549	Petroleum
550	Engineering, other fields
	Health Fields
551	Medicine or premedicine, and clinical medical sciences
552	Nursing (4 year or longer program)
553	Pathology
554	Pharmacology
555	Pharmacy
556	Health professions, other fields (4 year or longer program)
	Mathematical Sciences
557	Mathematics
558	Statistics and actuarial sciences
559	Computer sciences and systems analysis
560	Operations research/management science
	Physical Sciences
560	Astronomy
561	Chemistry
563	Geography
564	Meteorology
565	Physics
566	Physical sciences, general
567	Geology and geophysics
568	Oceanography
	Physical sciences, other fields
	Psychology
569	Clinical
570	Educational
571	General psychology
572	Psychology, other fields
	Social Sciences
573	Anthropology
574	Area studies, regional studies
575	Economics, agricultural
576	Economics, except agricultural
577	Foreign service programs
578	Geography
579	History
580	Industrial relations
581	International relations
582	Political science or government
583	Public administration
584	Social sciences, general
585	Social work, social administration, social welfare
586	Sociology
587	Social sciences, other fields
	Arts, Humanities, and Other Specialties
588	Arts, general
589	Business and commerce, including accounting, hotel and restaurant administration, and secretarial studies
590	English and journalism
591	Fine and applied arts, all fields
592	Foreign language and literature, all fields
593	Geography
594	Home economics, all fields
595	Law or prelaw
596	Library science
597	Military science, including merchant marine deck officer
598	Philosophy, all fields
599	Religion and theology, all fields
600	Other *(Describe briefly under the applicable item on the questionnaire.)*

Section II – FIELDS OF ACADEMIC STUDY AND OCCUPATIONAL TRAINING RELATED TO PROGRAMS BELOW THE BACCALAUREATE

Code	Description
	Data Processing-related fields of study or training
601	Computer programming
602	Computer operating
603	All other data processing fields of study or training
	Engineering-related fields of study or training
604	Drafting and design, all fields
605	Aeronautical technology
606	Architectural or building technology
607	Chemical technology
608	Civil technology
609	Electrical and electronics technology
610	Industrial technology
611	Mechanical technology
612	All other engineering-related fields of study or training
	Science-related fields of study or training
613	Agriculture
614	Forestry
615	Other science-related fields of study or training
	Other fields of study or training
616	Business and commerce-related fields of study or training
617	Craft (skilled) occupations-related fields of study or training (such as carpentry, bricklaying, tool and die making, etc.)
618	Educational-related fields of study or training
619	Home economics
620	Nursing and other health service-related fields of study or training
621	Operative occupations-related fields of study or training (such as machine operation, driving, inspecting, etc.)
622	Police technology or law enforcement
623	Sales and marketing-related fields of study or training
624	Service occupations-related fields of study or training (such as cook, beautician, firefighter, etc.)
625	All other fields of study or training *(Describe briefly under the applicable item on the questionnaire.)*

PLEASE DETACH BEFORE RETURNING YOUR COMPLETED QUESTIONNAIRE

REFERENCE LIST B – KINDS OF BUSINESSES

This list is to be used in answering question 9 about the kind of business or industry for which you worked. Please scan the entire list, choose the appropriate answer for the question and enter the code and description from this list. If none of the categories listed below adequately describes the kind of business for which you worked, use the "Other" category (code 731).

Code	Description
	Manufacturing
701	Aircraft, aircraft engines, aircraft parts
702	Chemicals and allied products
703	Electrical machinery, equipment and supplies for the generation, storage, transformation, transmission, and utilization of electrical energy
704	Electronic apparatus, radio, television and communication equipment and parts
705	Electronic computers, accounting, calculating and office machinery and equipment
706	Fabricated metal products (except ordnance, machinery and transportation equipment)
707	Machinery (except electrical) including engines and turbines, farming and construction machinery, mining, metalworking and other manufacturing and service industry machines
708	Motor vehicles and motor vehicle equipment including trucks, buses, automobiles, railroad engines and cars
709	Ordnance, including manufacture of arms, ammunition, tanks, and complete guided missiles, space vehicles and equipment
710	Petroleum refining and related industries
711	Primary metal industries, including smelting, refining, rolling, drawing, alloying, and manufacture of castings, forgings and other basic metal products
712	Professional and scientific equipment and supplies
713	Other manufacturing including printing and publishing
	Educational Institutions
714	College or university (offering at least a bachelor's degree)
715	Junior college or technical institute
716	Medical school
717	Other educational institutions
	Health Services
718	Hospital or clinic
719	Other medical and health services

Code	Description
	Other Kinds of Business
720	Agriculture, forestry, and fisheries
721	Business, personal, and professional services
722	Construction
723	Engineering or architectural services
724	Finance, insurance, or real estate
725	Mining and petroleum extraction
726	Private, nonprofit organizations other than educational institutions and hospitals
727	Professional and technical societies
728	Research institutions
729	Retail and wholesale trade
730	Transportation, communication, or other public utilities
731	Other *(Describe briefly under the applicable item on the questionnaire.)*
	Public Administration (Include only uniquely governmental activities, such as the U.S. Postal Service, U.S. Air Force, State court, Department of Motor Vehicles, city building inspection, or city public welfare. For example, if you work for the U.S. Postal Service use code 733, Federal public administration; on the other hand, if you work at a Veterans' Administration Hospital, use code 718, Hospital or clinic; if you work at a State university, use code 714, College or university; if you work for a county road building agency, use code 722, Construction; if you work in a Defense Department research laboratory, use code 728, Research institution.)
732	Uniformed military service
733	Federal public administration
734	State public administration
735	Local public administration (city, county, etc.)
737	Regional government
736	Other government

REFERENCE LIST C – OCCUPATIONS

This list is to be used in answering questions 10 and 18 about your occupational classification. Please scan the entire list, choose the appropriate entry and enter the code and description from this list. If you cannot find exactly the right entry, please choose the one that comes nearest to it. If none of the entries is at all appropriate, use the "Other" category (code 475) and enter a brief description in the space provided on the questionnaire.

Code	Description
	Engineers, including college professors and instructors
401	Engineer, aeronautical and astronautical
402	Engineer, agricultural
403	Engineer, chemical
404	Engineer, civil and architectural
405	Engineer, electrical and electronic
406	Engineer, industrial
407	Engineer, mechanical
408	Engineer, metallurgical and materials
409	Engineer, mining, petroleum, and geological
410	Engineer, nuclear
411	Engineer, environmental and sanitary
412	Engineer, operations research/systems
413	Engineer, other fields *(Describe briefly under the applicable item on the questionnaire.)*
	Computer Specialist, including college professors and instructors
414	Computer programmer
415	Computer systems analyst
416	Computer scientist
417	Other computer specialist *(Describe briefly under the applicable item on the questionnaire.)*
	Mathematicians and Statisticians, including college professors and instructors
418	Actuary
419	Mathematician
420	Statistician
421	Operations research analyst
	Physical Scientists, including college professors and instructors
422	Chemist
423	Earth scientists including geologists, geophysicists, etc.
424	Physicist, astronomer
425	Atmospheric scientist, meteorologist
426	Oceanographer
427	Other physical scientist *(Describe)*
	Biological Scientists, including college professors and instructors
428	Agricultural scientists, including foresters and conservationists
429	Biological scientist
430	Biochemist
431	Biophysicist
432	Medical scientist, excluding persons who are primarily medical practitioners; see Health Occupations
433	Other biological scientist *(Describe)*
	Social scientists, including college professors and instructors
434	Economist
435	Psychologist
436	Sociologist or anthropologist
437	Other social scientist *(Describe briefly under the applicable item on the questionnaire.)*

Code	Description
	Health Occupations, including persons who are primarily practitioners. Persons engaged primarily in medical research, teaching, and similar activities use code 432, Medical scientist.
438	Physician or surgeon
439	Technician, dental
440	Technician, medical
441	Other health occupation *(Describe briefly under the applicable item on the questionnaire.)*
	Technicians and Technologists, except medical
442	Designer, electronic parts and machine tools
443	Designer, industrial
444	Designer, other
445	Draftsman
446	Surveyor
447	Technician, biological and agricultural
448	Technician, electrical and electronic
449	Technician, construction, highways, and architectural
450	Technician, mechanical
451	Technician, other engineering
452	Technician, physical science
453	Technician, other fields *(Describe briefly under the applicable item on the questionnaire.)*
	Teachers
454	Teacher, elementary school
455	Teacher, secondary school
456	Teacher, college and university, excluding engineering and science *(Engineering and science teachers see codes 401–437 above.)*
	Administrators, Managers, and Officials, excluding farm
476	Urban and regional planner
457	College president or dean
458	Administrator or manager, scientific and technical research and development
459	Administrator or manager, production and operations
460	Administrator, manager, or official, all other, excluding self-employed
461	Self-employed proprietor
	All Other Occupations
462	Accountant
463	Attorney or judge
464	Sales worker
465	Clerical worker (such as bookkeeper, secretary, etc.)
466	Clergy
467	Craft worker (such as baker, carpenter, electrician, mechanic, repair worker)
468	Farmer (owner, manager, tenant, or farm laborer)
469	Fire fighter or police
470	Laborer, except farm
471	Librarian
472	Merchant or shopkeeper, self-employed
473	Operative (such as assembler, factory worker, miner, welder, truck driver, etc.)
474	Postal worker
475	Other occupations, not specified above *(Describe briefly under the applicable item on the questionnaire.)*

Appendix D. Source of Data

Characteristic	Table number	Item number on 1978 questionnaire
Age in 1978*	1	(From the 1970 census response)
Sex	1	(From the 1972 survey response, if available; otherwise from the 1970 census response)
Race*	1	(From the 1970 census response)
Residence in 1978	1	A, page 1
Professional identification	1	Part IV, 18
Hispanic heritage	1	Part IV, 21
Occupation in 1978	1	Part III, 10
Highest degree held*	2	2a; otherwise from 1976, 1974, or 1972 survey response
Major field of study for highest degree held*	2	3; otherwise from 1976, 1974, or 1972 survey response
Type of supplementary training: 1977	2	Part I, 4b
Job and occupational mobility: 1976, 1978*	3	1976 survey response and Part III, 10, 14
Job and occupational mobility: 1974, 1978*	3	1974 survey response and Part III, 10, 14
Job and occupational mobility: 1972, 1978*	3	1972 survey response and Part III, 10, 14
Years of professional experience*	3	Part IV, 17
Type of employer	4	Part III, 12
Federal support	4	Part III, 15a, 15b
Unemployment status: 1977	4	Part IV, 16a, 16b
Employment status: February 1978*	4	Part II, 5a, 5b, 7
Full-time employment in science or engineering: February 1978	4	Part II, 6a, 6b
National interest topics	4	Part IV, 19
Kind of business	4	Part III, 9
Primary work activity*	4	Part III, 11b
Annual salary rate: 1978	5	Part III, 13

*For more information, see appropriate subject in appendix A.

Appendix E. Response Rates

Table E-1 presents response rates of various components of the sample for the 1978 National Survey of Natural and Social Scientists and Engineers. The characteristics presented here are based on the 1970 census or on the 1978, 1976, 1974, or 1972 surveys. Since the percentages in table E-1 are based on a complete count of the sample cases, no reference to the standard error tables is necessary.

Note that table E-1 contains data for 362 respondents whose data are not represented in the tables and text in the body of this report. Future pamphlets in this series will present the data in table E-1 exclusive of these 362 cases.

Table E-1. 1978 National Sample, by Field of Science or Engineering in 1976, 1974, and 1972, Age in 1978, and Sex, by Response in the 1978 National Survey

(Unweighted)

Sex, age in 1978, and field of science or engineering in 1976, 1974, and 1972	Response in 1978			
	Total			
	Number	Percent	Respondents	Nonrespondents
Total	50,093	100.0	82.1	17.9
SEX				
Male	46,877	100.0	82.3	17.7
Female	3,216	100.0	79.2	20.8
AGE IN 1978				
Under 30 years	287	100.0	76.7	23.3
30 to 34 years	6,264	100.0	76.3	23.7
35 to 39 years	9,226	100.0	78.7	21.3
40 to 44 years	8,075	100.0	82.1	17.9
45 to 49 years	7,644	100.0	84.0	16.0
50 to 54 years	6,994	100.0	85.8	14.2
55 to 59 years	5,183	100.0	86.5	13.5
60 to 64 years	3,193	100.0	86.0	14.0
65 to 69 years	1,930	100.0	82.8	17.2
70 years and over	1,297	100.0	76.9	23.1
FIELD OF SCIENCE OR ENGINEERING IN 1976				
Respondents in 1976	42,644	100.0	92.4	7.6
Total in-scope in 1976	37,602	100.0	92.7	7.3
Computer specialists	2,064	100.0	91.8	8.2
Engineers	19,922	100.0	92.0	8.0
Mathematical specialists	1,486	100.0	93.2	6.8
Life scientists	3,800	100.0	94.4	5.6
Physical scientists	4,695	100.0	94.1	5.9
Environmental scientists	1,749	100.0	92.8	7.2
Psychologists	1,936	100.0	92.7	7.3
Social scientists	1,950	100.0	93.0	7.0
Total out-of-scope in 1976	5,042	100.0	90.6	9.4
Nonrespondents in 1976	7,449	100.0	23.0	77.0
FIELD OF SCIENCE OR ENGINEERING IN 1974				
Respondents in 1974	44,158	100.0	89.5	10.5
Total in-scope in 1974	39,473	100.0	89.8	10.2
Computer specialists	2,291	100.0	88.1	11.9
Engineers	20,814	100.0	89.3	10.7
Mathematical specialists	1,612	100.0	89.8	10.2
Life scientists	4,026	100.0	91.5	8.5
Physical scientists	4,824	100.0	91.8	8.2
Environmental scientists	1,867	100.0	89.0	11.0
Psychologists	1,989	100.0	89.5	10.5
Social scientists	2,050	100.0	89.9	10.1
Total out-of-scope in 1974	4,685	100.0	86.9	13.1
Nonrespondents in 1974	5,935	100.0	27.3	72.7
FIELD OF SCIENCE OR ENGINEERING IN 1972				
Respondents in 1972	50,093	100.0	82.1	17.9
Total in-scope in 1972	50,093	100.0	82.1	17.9
Computer specialists	3,391	100.0	77.6	22.4
Engineers	25,797	100.0	81.9	18.1
Mathematical specialists	2,185	100.0	82.6	17.4
Life scientists	4,891	100.0	84.8	15.2
Physical scientists	6,248	100.0	84.7	15.3
Environmental scientists	2,095	100.0	82.9	17.1
Psychologists	2,488	100.0	80.5	19.5
Social scientists	2,998	100.0	80.2	19.8

*U S GOVERNMENT PRINTING OFFICE: 1980 340-988/91

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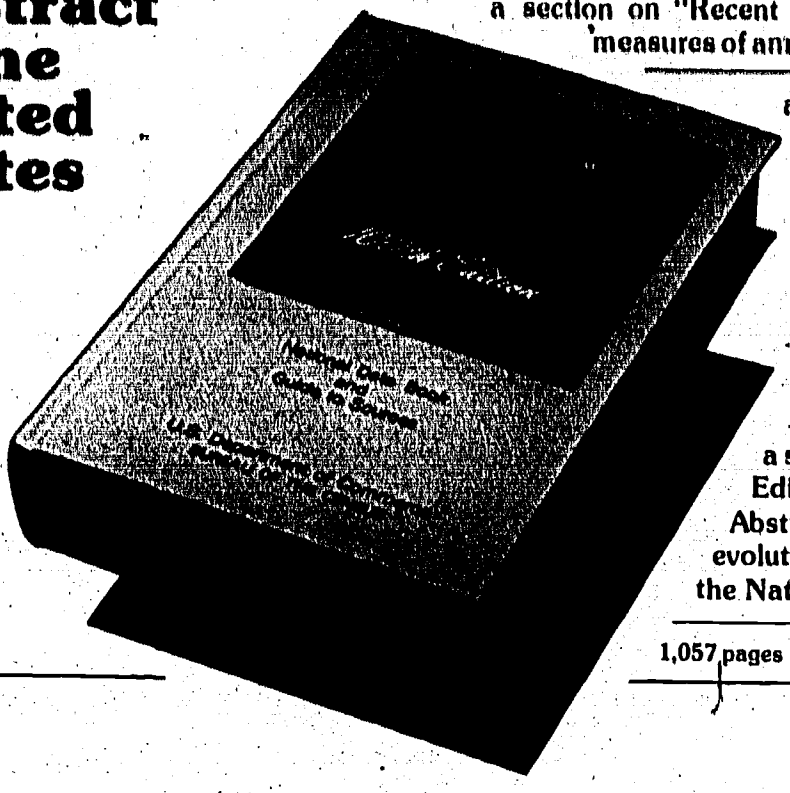

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