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SCIENTIFIC and TECHNICAL PERSONNEL in INDUSTRY, 1967

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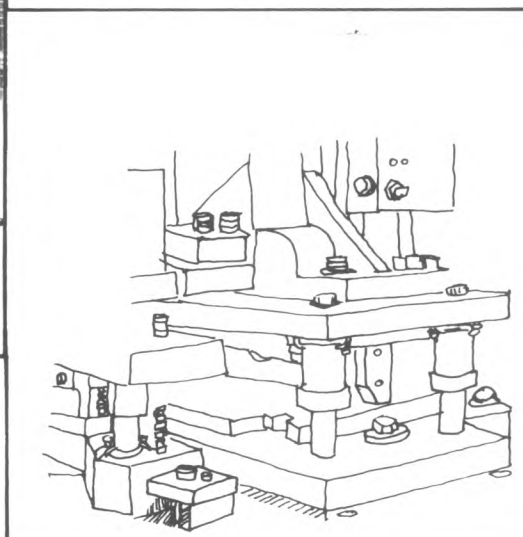

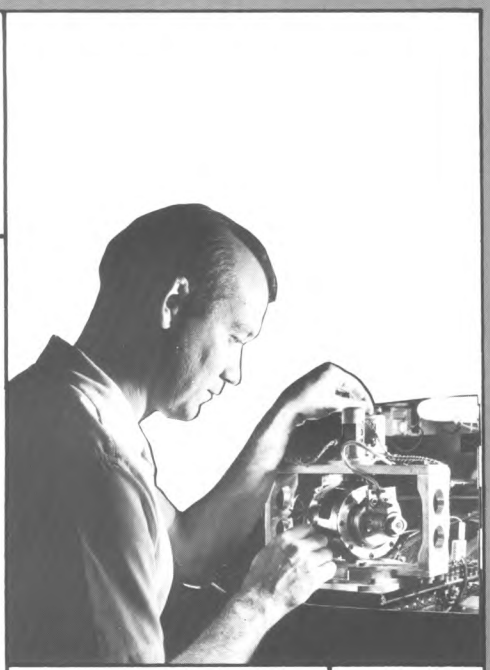

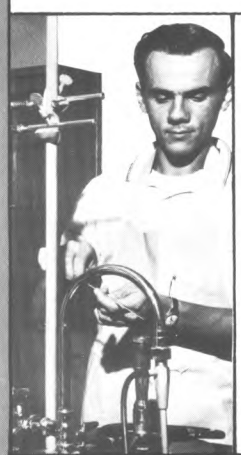

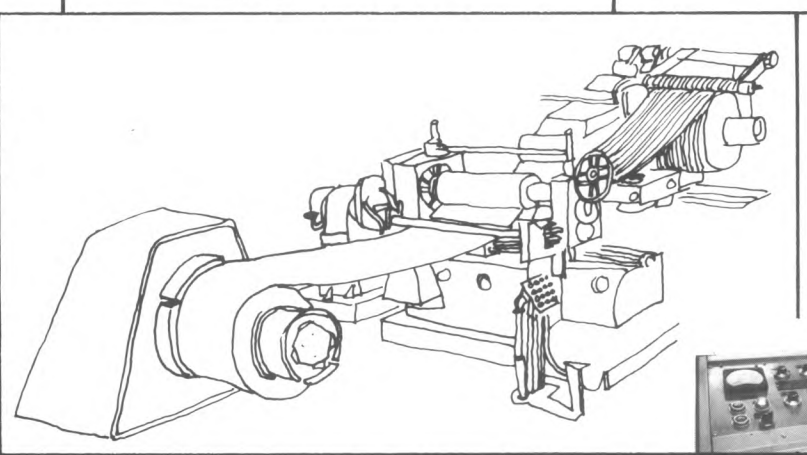

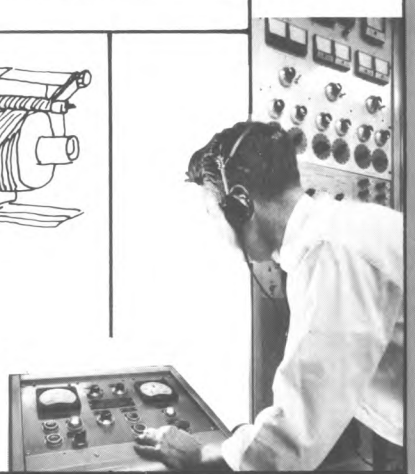

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SCIENTIFIC and TECHNICAL PERSONNEL in INDUSTRY, 1967

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U. S. DEPARTMENT OF LABOR
George P. Shultz, Secretary

BUREAU OF LABOR STATISTICS
Geoffrey H. Moore, Commissioner

1970

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Preface

This report presents the major findings of a survey on the employment of scientific and technical personnel in industry. It is part of a continuing series being conducted by the Bureau of Labor Statistics (BLS) under a comprehensive program designed to yield maximum coverage of the employment of scientists and engineers. (BLS also conducts related surveys of State government agencies biennially, and of local governments on an occasional basis.) This series of industry surveys was originally developed under the sponsorship of the National Science Foundation (NSF) which published the reports on the 1961 and earlier surveys. Data on scientists and engineers employed in Federal Government agencies, nonprofit organizations, and in colleges and universities are published by NSF from other sources and, in combination with industry and State government data, furnish a total employment picture for these occupations.

The BLS industry survey is the only one of its kind or size which attempts to relate scientific and technical personnel to their jobs on an establishment basis. Surveys performed on a company basis blur the industry classification because so many companies now operate in more than one industry. Classification by a single industry, no matter how primary the product in terms of total employment, gross output, or dollar value of product or services, can be very misleading in dealing with small ratios of highly skilled personnel and their distribution.

The establishment-base of the survey, however, contributed its own kind of problems. The volume of detail involved in the survey has lengthened the time necessary for processing the data and created an inevitable time lag in their publication. However, the data fill a vacuum as a base for projections, career counseling, manpower planning for state and industry, and guidelines for training needs to fill manpower requirements.

The present edition is likely to be the last in the series to offer so full a functional breakdown of scientific and technical employment. The detail presented, however, documents the widening range of activities in which scientists and engineers are engaged within a given industry. Management (outside of research and development) and sales and service are fast-growing new fields and, for certain industries, already are an important aspect of functional scientist and engineer employment.

The Bureau of Labor Statistics wishes to express its appreciation to the many organizations and individuals whose cooperation made this survey possible, especially to the companies that supplied data regarding their scientific and technical staff. The Bureau is also grateful to the National Science Foundation for its advice and cooperation throughout this period.

This report was prepared in the Bureau's office of Manpower and Employment Statistics, Division of Occupational Employment

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Statistics, under the general supervision of Richard E. Dempsey. Edith Wall Andrews did the major part of the writing and analysis. Maurice Moylan, who was directly responsible for the statistical tables and charts, and Verada Bluford assisted her. George Hermanson of the Bureau's Office of Data Collection and Survey Operations, was responsible for the survey's sample design, and provided great help on technical problems and statistical techniques employed in making the survey.

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Contents

Page

Chapter:

I. Introduction ---- 1
II. 1967 survey results ---- 2
III. Engineers ---- 4
IV. Scientists ---- 6
Physical scientists ---- 6
Life scientists ---- 7
Mathematicians ---- 8
V. Technicians ---- 9
VI. Research and development ---- 13

Tables:

1. Scientific and technical personnel in private industry ---- 3
2. Technicians, by occupation, in selected industry groups, 1967 ---- 10
3. Scientists and engineers in R&D, by major industrial classification and as a percent of total R&D, 1967 ---- 13

Charts:

1. Industry employment of scientists and engineers, 1961-67 ---- 2
2. Percent of scientists and engineers in manufacturing and nonmanufacturing industries, 1967 ---- 4
3. Technician employment as proportion of total scientific and technical increase in 1967 ---- 9
4. Number of technicians for each 100 scientists and engineers ---- 12
5. Percent of scientists and engineers in R&D in manufacturing and nonmanufacturing industries, 1967 ---- 13

Appendixes:

A. Statistical tables:

A-1. Scientists and engineers employed in industry, by occupation, with percent distribution 1966 and 1967 ---- 15
A-2. Technicians employed in industry, by occupation with percent distribution 1966 and 1967 ---- 15
A-3. Scientists, engineers, and technicians employed in manufacturing and nonmanufacturing industries with percent distribution, 1967 ---- 16
A-4. Industry SIC codes and minimum employment levels covered by the survey ---- 17
A-5. Employment of scientists, engineers, and technicians, by industry, 1966 and 1967, and percent change, 1966-67 ---- 18
A-6. Employment of scientists and engineers, by occupation and industry, 1967 ---- 22

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Page

Appendixes—Continued

A. Statistical tables—Continued

A-7. Employment of technicians, by occupation and industry, 1967 ---------- 24
A-8. Employment of scientists and engineers, by function and industry, 1967 ---------- 26
A-9. Employment of scientists and engineers in industry in R&D by occupation, 1966 and 1967 ---------- 29
A-10. Scientists, engineers, and technicians employed by industry, and related numbers employed in R&D, 1966 and 1967 ---------- 30
A-11. Technicians employed for each 100 scientists and engineers, and R&D technicians for each 100 scientists and engineers in R&D, by industry, 1967 ---------- 34
A-12. Scientists and engineers as percent of total employment in selected industries, 1966-67 ---------- 35
A-13. Employment and percent distribution of scientists and engineers by industry and size of establishment, 1967 ---------- 36
B. Survey methods ---------- 38
C. Questionnaire, reporting instructions, and definitions ---------- 43

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Chapter I. Introduction

The availability of scientists, engineers, and technicians plays an important role in the growth of industrial production and the level of technoogy reflected in the output. Within this framework, current estimates and trends of scientific and technical employment by occupation and industry are indicative of the direction of industrial and technological development.

The 1967 survey (as in 1966) covered total scientific and technical (excluding social scientists) employment broken down into 17 occupations distributed throughout 82 industries. It had a twofold objective, to measure the level of employment for each of the 17 occupations in a given industry, and also to give some idea of change which had occurred over the preceding 12 months.

Since 1961, a source of both strength and weakness in the survey has been its establishment base. The survey has cut through the barriers of single company reports and has tried to tie occupations directly to the establishment and the industry. For large, multi-industry companies, any other type of classification could be extremely misleading, and likewise distorting, of a total picture. However, the allocation of small numbers in distinct scientific and technical occupations for each industry involves many pitfalls. Technical problems of nonresponse and of distributing consolidated reports among the industries represented there in make any rigorous statistical analysis of year-to-year changes at an industry level difficult. In a few industries where it was believed that either the 1966 figure was not comparable with 1967, or that the percent change developed from it was misleading, the figures for 1966 have been omitted or footnoted.

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For the first time employment of scientists and engineers in private industry exceeded the 1 million mark. The results of the survey showed a total of 1,013,100 scientists and engineers on industrial payrolls in January 1967. This was an increase of 58,500 scientists and engineers over the 954,000 total in January 1966, or an increase of 6 percent. Both proportionally and absolutly, this is the largest increase for any year on record. As seen in chart 1, the upward climb had been by smaller steps until 1966.

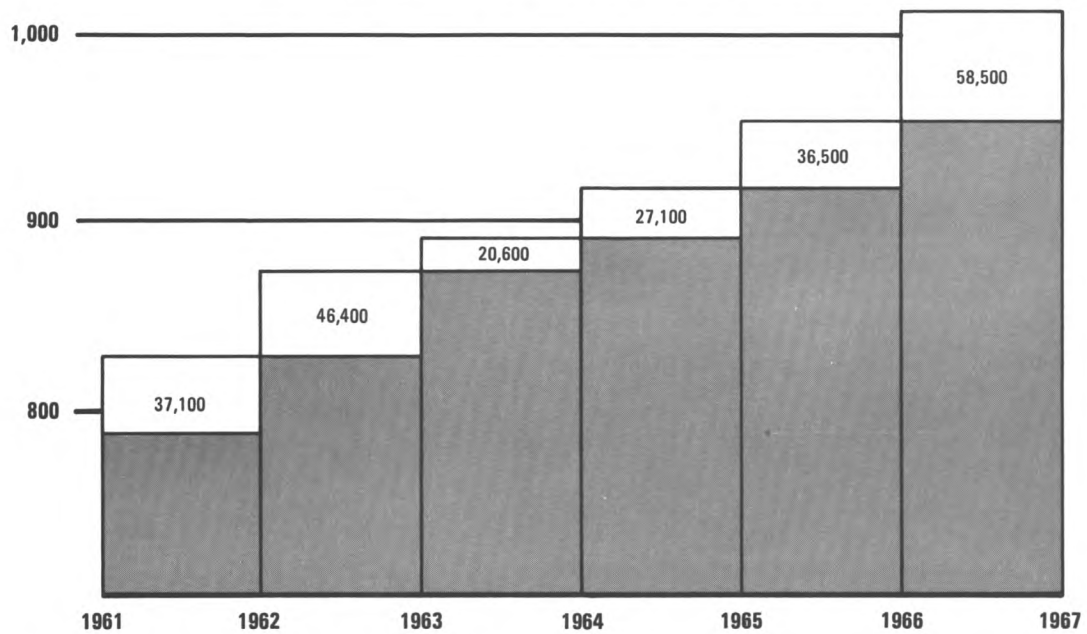
Engineers continued to outnumber scientists roughly 4 to 1 in the 1967 survey (as they have in the past) and were over 80 percent of the total increase in scientist and engineer employment.

Engineers' employment grew at about the same rate as scientists (a little more than 6 percent) and increases were reported in practically all industries. (See table 1.) In contrast, scientists' growth showed marked fluctuations by occupation and, as a total, by industry. Chemists, the largest of all science groups, increased only 1 percent for the year. There were larger changes among the small occupations, e.g., the life science group showed percent gains and losses far exceeding the average but these cancelled each other out and there was no change in employment for the life scientists' group as a whole. Employment of mathematicians has moved forward steadily and at a fast pace. Since 1961 they have doubled in number and now rank second only to chemists in employment. Much of this increase is attributed to the spectacular expansion in computer technology during the past decade.

Technicians reached a new employment high of 735,000 in private industry in January 1967, an increase of 61,000 over 1966 and equivalent to a growth rate of 9 percent in the 12-month period.

Chart 1

Industry Employment of Scientists and Engineers, 1961-67



Note: Figures at the top of each column are the actual increases over the preceding year.

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Table 1. Scientific and technical personnel in private industry

Occupation	1967	1966	1961	Percent change	
	(In thousands)			1966-67	1961-67
Total scientists and engineers	1,013.1	954.6	786.9	6.1	28.7
Engineers	824.0	776.2	640.1	6.2	28.7
Scientists	189.1	178.4	146.8	6.0	28.8
Physical scientists	135.3	128.8	111.9	5.0	20.9
Chemists	85.2	84.3	70.8	1.1	20.3
Physicists	16.2	15.1	13.8	7.3	17.4
Metallurgists	12.0	11.0	12.3	9.1	-2.4
Geologists and geophysicists	16.4	13.8	12.0	18.8	36.7
Other physical scientists	5.5	4.7	3.0	17.0	83.3
Life scientists	22.4	22.4	19.8	-	13.1
Mathematicians	31.3	27.2	15.1	15.1	107.3
Total technicians	734.7	673.2	570.0	9.1	28.9
Draftsmen	270.7	244.6	187.9	10.7	44.1
Surveyors	22.8	26.6	15.0	-14.3	52.0
Engineering and physical science technicians	328.3	299.8	269.6	9.5	21.8
Electric and electronic	161.0	150.3	-	7.1	-
Other engineering and physical science technicians	167.4	149.5	-	12.0	-
Life science technicians	29.3	28.4	21.5	3.2	36.3
Other technicians	83.6	73.7	76.1	13.4	9.9

NOTE: Detail may not add to totals due to rounding. Dashes mean data not available.

Technicians' number and growth is in many ways more difficult to measure than scientists and engineers, primarily because of differences in classification and reporting. In a period of relative skill shortage at both professional and technician levels, there may be a tendency to accelerate normal promotions from the ranks and to overclassify technicians. Many incentives exist for this practice. A prestigious title may be a device in recruiting or a means to bypass wage scales. Also, where professionals are not available to fill existing job vacancies—and where these can be broken down into easily learned parts—there is a definite advantage to hiring technicians.

Scientists and engineers were only a small proportion of total employment. Of the industries covered in the survey, the overall percentage of scientists and engineers to total employed was 3 percent in 1967, and range from about 2 percent in nonmanufacturing to 5 percent in durable goods manufacturing. These proportions of scientists and engineers as a percent of total employment showed little change between 1966 and 1967, as shown in the next tabulation.

	1967	1966
Total employment	3.0	2.9
Manufacturing	4.0	4.0
Durable goods	5.2	5.2
Nondurable goods	2.3	2.2
Nonmanufacturing	1.8	1.8

Employment of scientists and engineers on the whole has grown at a faster rate than total employment between 1966-67 (6 percent and 4 percent, respectively). In nondurable goods, scientists and engineers showed more than a 3-percent increase despite an actual decline of about 1 percent for total employment in the corresponding industries. This difference in the nondurable goods manufacturing industries is the principal cause for the difference noted in the aggregate total. In the durable goods and nonmanufacturing sectors, over-the-year growth of scientific and engineering personnel and total employment closely paralled one another.

	Scientists and engineers	Total employment
Total employment	6.1	4.0
Manufacturing industries	7.1	4.7
Durable goods	8.3	8.6
Nondurable goods	3.4	-.7
Nonmanufacturing	3.9	3.2

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Chapter III. Engineers

Private industry employed 824,000 engineers in January 1967, an increase of 47,800 or approximately 6 percent for the 12-month period. This is the largest increase for engineers recorded in this survey series. In both number and percent, the 1967 increase is almost double the increase reported for 1965 and 1966.

All industries with only one exception (medical and dental laboratories) employed some engineers in 1967, but a few employed a great many, so that despite the general dispersion, there are areas of great concentration for this occupation.

Considered in the broadest terms of industry classification, engineers were employed principally in manufacturing (70 percent), and particularly in durable goods manufacturing (60 percent). (See chart 2.) Durable goods manufacturing was also the area of greatest growth (85 percent of the 1967 net increase) as well as the area of fastest growth (8 percent compared with 3 percent for nonmanufacturing).

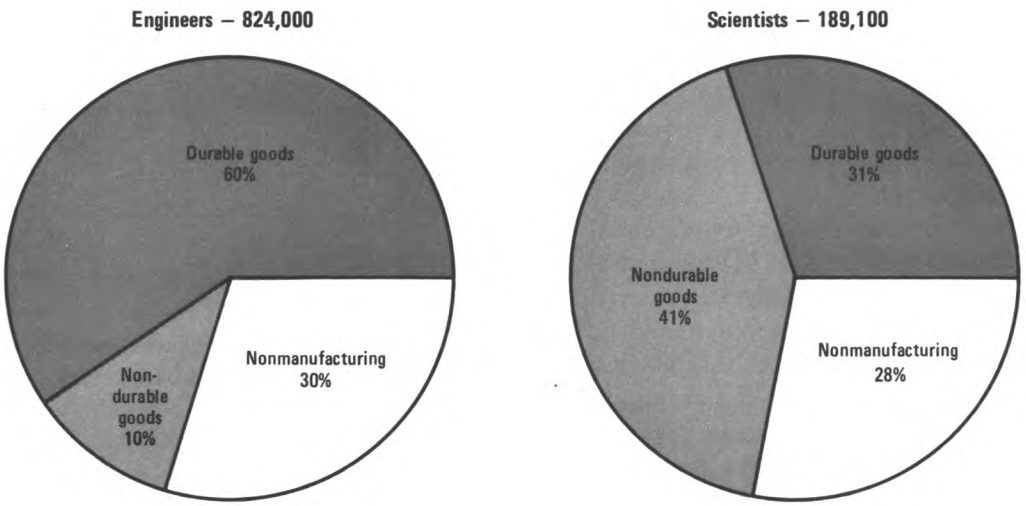
Five major industry groups employed 61 percent of all engineers in 1967, and had 50 percent of the increase in such employment in the 12 months ending January 1967, as indicated in the following tabulation.

	1967	1966
Total, all industries	824,000	776,200
Aircraft, ordnance, and missiles	136,400	127,800
Electrical machinery	142,000	135,500
Business services	103,400	97,300
Machinery, except electrical	81,500	75,100
Contract construction	43,300	46,700
Other industries	317,400	293,800

	Change, 1966-67	
	Number	Percent
Total, all industries	47,800	6.2
Aircraft, ordnance, and missiles	8,600	6.7
Electrical machinery	6,500	4.8
Business services	6,100	6.3
Machinery, except electrical	6,400	8.5
Contract construction	-3,400	-7.3
Other industries	23,600	8.0

Chart 2

Percent of Scientists and Engineers in Manufacturing and Nonmanufacturing Industries, 1967



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Aircraft, ordnance, and missiles, the largest in size, employed 136,400 engineers. Although defense orders (for the Viet Nam war as well as other national defense purposes) were the principal cause, civilian domestic airlines also substantially increased their programs and requirements for more airplanes.

Employment in machinery, except electrical showed the fastest growth rate (over 8 percent). This rate was considerably higher than the major group average of 5 percent. Contract construction was the only major industry to show a decline in engineers' employment or in total employment. The tightening of the money market, as well as the sharp rise in construction costs, had already had some effect on new housing and constructions bids generally.

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Employment data were collected for 10 scientific occupations. Nine of these are dispersed in relatively small numbers throughout private industry. One occupation, chemists, outnumbers all others (45 percent of all scientists) and is highly concentrated in one industry, chemicals and allied products. The chemical industry in 1967 employed approximately 57,000 scientists, around 30 percent of all scientists. About 70 percent of these scientists were chemists; these chemists were nearly 48 percent of all such workers employed in private industry. (See appendix table A-6.)

Seven major industry groups in 1967 had the great bulk of scientist employment (72 percent). The chemical industry employed over two and one-half times the number of scientists as its nearest competitor, although the number of scientists in this industry declined slightly (200) between 1966 and 1967. The other six major employers together had over 81 percent of the total employment gain of 10,700 scientists, as shown in the following tabulation.

	Scientists	
	1967	1966
Total, all industries	189,100	178,400
Chemicals	56,900	57,100
Business services	21,200	20,500
Aircraft, ordnance, and missiles	17,900	15,400
Crude petroleum and natural gas	12,600	10,400
Electrical machinery	10,500	9,000
Wholesale and retail trade	10,100	8,600
Food and related products	7,400	6,900
Other industries	52,500	50,500

	Change, 1966-67	
	Number	Percent
Total, all industries	10,700	6.0
Chemicals	-200	-.4
Business services	700	3.4
Aircraft, ordnance, and missiles	2,500	16.2
Crude petroleum and natural gas	2,200	21.2
Electrical machinery	1,500	16.7
Wholesale and retail trade	1,500	17.4
Food and related products	500	7.2
Other industries	2,000	3.9

The survey classifies and collects data on scientists in three major groups: Physical scientists, life scientists, and mathematicians. Physical scientists are the largest of these groups in number, but since 1961 have been greatly outdistanced by mathematicians in rate of growth. Relevant figures for 1967 in percent of total and percent change are shown below.

	1967	Percent of total	Percent change, 1961-67
Total scientists	189,100	100.0	28.8
Physical scientists	135,300	71.6	20.9
Life scientists	22,400	11.8	19.7
Mathematicians	31,300	16.6	107.5

Physical scientists

Chemists were by far the largest occupation in the physical science group, numbering over 85,000 in 1967. Although found in nearly every industry, chemists were highly concentrated in nondurable goods manufacturing (55,200 or 63 percent) where the chemical industry alone employed over 40,000 in 1967. Nearly 18,000 chemists were in the durable goods manufacturing sector, and the remainder were concentrated chiefly in the trade and service industry sectors (commerical laboratories). In employment, physicists, and geologists and geophysicists were the next largest of the physical science occupations; each had over 16,000 workers in 1967. Geologists and geophysicists were highly concentrated in the crude petroleum and natural gas extraction industry, which employed over 70 percent of them. In contrast. physicists were highly dispersed, especially within the durable goods manufacturing sector, where 57 percent of these workers were employed. Smaller but important shares of physicists employment were also reported in chemicals (13 percent) and commercial laboratories (20 percent).

Most of the remaining physical scientists were metallurgists. They were largely employed (92 percent) in manufacturing, and were

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especially concentrated in the primary metal, aircraft, machinery, and other metalworking industries.

Only 5,500 workers were classified in the residual category "other" physical scientists in 1967. Included in this group are scientific specialists such as astronomers and meteorologists, as well as a number of other scientists whose work made it difficult for respondents to classify them as one of the designated physical sciences occupations. Over 80 percent of these workers were employed in manufacturing in 1967, nearly equally divided between the durable and nondurables goods sectors.

Physical scientist employment increased by 6,500 or by 5 percent between 1966 and 1967, somewhat above the average increase of nearly 4 percent experienced during the 1961-66 period. The 1966-67 employment changes varied substantially among the various physical science specialties. Chemists, the largest occupation, recorded the slowest rate of employment increase, only 1 percent, the smallest increase experienced by this occupation in the 1960's. Geologists and geophysicists showed the largest employment increase over 1966 in both number (2,600 workers) and in growth rate (19 percent). Most of this sharp rise was centered in the petroleum and natural gas extraction industry, where the employment of these scientists was concentrated. Physicists and metallurgists also experienced significant employment gains between 1966 and 1967, about 1,000 workers each. In terms of growth rates metallurgists increased by 9 percent and physicists by more than 7 percent, as can be seen in the following tabulation.

	1967	1966	Percent change, 1966-67
Total, physical scientists	135,300	128,800	5.0
Chemists	85,200	84,300	1.1
Physicists	16,200	15,100	7.3
Metallurgists	12,000	11,000	9.1
Geologists and geophysicists	16,400	13,800	18.8
Other physical scientists	5,500	4,700	17.0

Life scientists

In 1967, private industry employed 22,400 life scientists, the same as the 1966 level. In contrast to physical scientists, life scientists are more highly concentrated in a few industries. The chemical industry alone employed one-half of all life scientists; most were medical and biological scientists engaged in the research, production, or sales of drugs and medicines.

In terms of employment, biological scientists is the largest occupation in this group; there were 9,100 workers in 1967, over 40 percent of all life scientists. About two-thirds of these scientists were employed in the chemical industry. Smaller numbers were reported in medical and dental laboratories and commercial laboratories.

Agricultural scientists were the second largest life science occupation, 6,100 in 1967. Food and kindred products and wholesale and retail trade together employed about one-half of these scientists.

Medical scientist is virtually a one-industry occupation. The great majority (over 70 percent) of the 3,400 medical scientists in 1967 were in the drug industry, as shown in the tabulation below. The remainder were distributed in small numbers (100 or less) in a few other industries, for example, medical and dental laboratories and commercial laboratories.

	1967	Percent distribution
Total, life scientists	22,400	100
Medical scientists	3,400	15
Agricultural scientists	6,100	27
Biological scientists	9,100	41
Other life scientists	3,800	17

When comparing data for each of the four specific life science occupations, caution should by used in attempting to interpret year-to-year changes. (See appendix table A-1.) Though this survey does indicate the general magnitude of employment in these small-sized occupations, the survey sample is inadequate to reliably measure year-to-year employment changes.

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Mathematicians

Industry employed 31,300 mathematicians in 1967 compared with 27,200 in 1966 and 15,100 in 1961. Mathematicians are now the second largest occupation (after chemists) among scientists, and the fastest growing. Since 1961 they have more than doubled in employment. Their growth rate for the 6-year period (approxmately 108 percent) is almost 4 times the overall growth rate of all scientists and engineers for the same period (29 percent).

With a few exceptions (notably coal and metal mining, transportation services, and medical and dental laboratories), mathematicians were reported in all industries in 1967. This across-the-board pattern in many ways is more comparable with the broad distribution of engineers than any other occupation. At the same time there are distinct areas of concentration. Considered together, these patterns suggest how essential to most basic operations the mathematician has become, and in what industries the application of mathematical techniques has progressed furthest.

In 1967, six major industry groups employed 80 percent of all mathematicians in industry. These industries were evenly divided between manufacturing (aircraft, ordnance, and missiles; electrical machinery; and machinery) and nonmanufacturing (finance, insurance, and real estate; business services; and wholesale and retail trade). Although the overall employment growth rate in 1966-67 for these six groups averaged nearly 15 percent, this average masked extremes that ranged from declines of 2 percent for both business services and finance, insurance, and real estate to an increase of almost 42 percent for electrical machinery. What is perhaps most significant is that the "all other industries," the residual over the six industry groups, had an average growth rate of 17 percent for the year, higher than for the six industries. This exceptionally high growth rate for mathematicians in areas where they are employed by still relatively small users gives added depth and support to the expansion potential of this occupation. The following tabulation shows mathematicians employed in selected industries.

	1967	1966
Total, all industries	31,300	27,200
Aircraft, ordnance, and missiles	7,300	5,900
Finance, insurance, and real estate	4,500	4,600
Business services	4,400	4,500
Electrical machinery	3,400	2,400
Machinery, except electrical	3,200	2,700
Wholesale and retail trade	2,300	1,800
All other industries	6,200	5,300

	Change, 1966-67	
	Number	Percent
Total, all industries	4,100	15.1
Aircraft, ordnance, and missiles	1,400	23.7
Finance, insurance, and real estate	-100	-2.2
Business services	-100	-2.2
Electrical machinery	1,000	41.7
Machinery, except electrical	500	18.5
Wholesale and retail trade	500	27.8
All other industries	900	17.0

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Chapter V. Technicians

A total of 734,700 technicians were reported in private industry in January 1967, an increase, as shown in the tabulation below, of 61,500 or 9 percent over 1966. This is the largest increase recorded in this series. Also, for the first time, the rate of growth of technicians exceeded that of scientists and engineers. (See chart 3.)

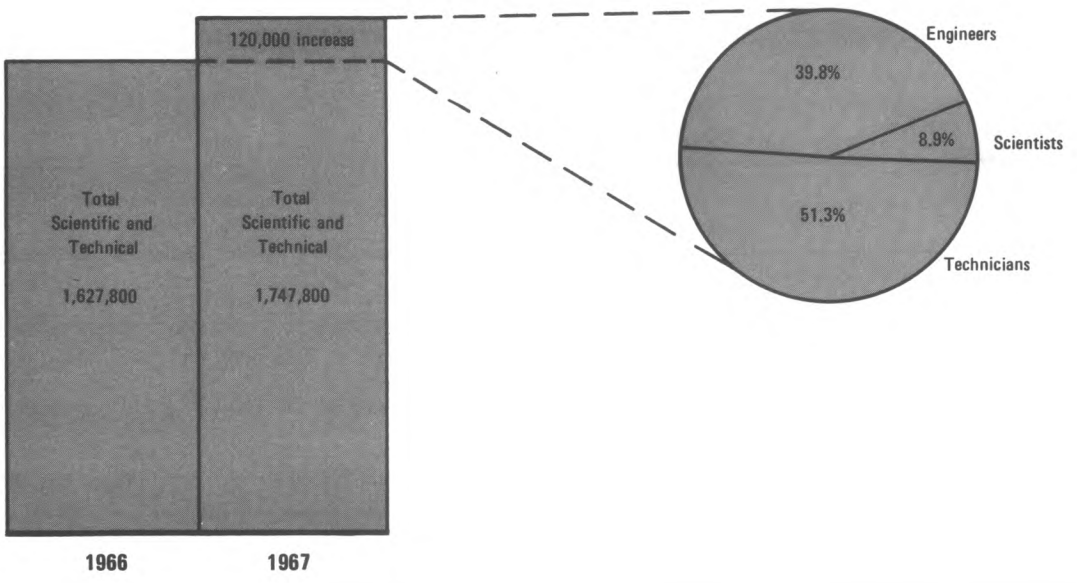
	Scientists and engineers	Technicians
1967	58,500	61,500
1966	36,500	26,700
1965	27,100	10,000
1964	20,600	17,500
1963	46,400	29,500
1962	37,100	19,500

In the survey, persons were counted as technicians if (a) they were actually engaged in technical work, but at a level which required technical training less extensive than a 4-year college course, and (b) if they had some formal post-high school training at a technical institute or junior college, or the equivalent through on-the-job training or experience. By such definition technicians occupied a midway point between (1) scientists and engineers, for whom they provided assistance and "backstop," and (2) craftsmen and skilled workers, such as machinists and electricians.

In their overall pattern of distribution by broad category of industry, technicians show more similarity to the pattern set for all occupations (total employment) than for engineers, scientists, or the combination scientists and engineers. (See percent distribution in appendix table A-3.) Within their own ranks, technicians are fairly evenly divided in employment between manufacturing and nonmanufacturing industries (47 and 44 percent, respectively). However, in manufacturing nondurable goods employed slightly under 10 percent of all technicians in

Chart 3

Technician Employment as Proportion of Total Scientific and Technical Increase in 1967



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1967. The proportions of this distribution pattern have been relatively stable over past few years and 1967 did little to change them.

Although technicians are widely dispersed, five major industry groups employed 62 percent of their total. These five industry groups covered a wide range in the size of their technician employment. The ratio was roughly 4:1 between the largest technician-employing industry, business services (172,500), and the smallest of these five, chemicals (40,800), as shown in the following tabulation.

	1967	1966
Total, all industries	734,700	673,200
Business services	172,500	156,200
Electrical machinery	104,400	100,900
Machinery, except electrical	77,800	67,400
Aircraft, ordnance, and missiles	59,100	53,700
Chemicals and allied products	40,800	38,300
All other industries	280,100	256,700

	Change, 1966-67	
	Number	Percent
Total, all industries	61,500	9.1
Business services	16,300	10.4
Electrical machinery	3,500	3.5
Machinery, except electrical	10,400	15.4
Aircraft, ordnance, and missiles	5,400	10.1
Chemicals and allied products	2,500	6.5
All other industries	23,400	9.1

Growth rates over the 12 months ending January 1967 varied considerably among these five major industry groups. Machinery, except electrical, third in size of employment, was first in rate of growth (greater than 15 percent), while electrical machinery was second in size but rated last for growth (about 4 percent). However, the overall growth rate was remarkably consistent, an average 9 percent for the occupation as a whole for the five major groups and for "all other industries."

Technician distribution for each of the five industry groups, is shown in table 2. With the exceptions of life science technicians and "other" technicians, concentration by occupation corresponds closely to the percent of total technician employment centered in these industry groups, i.e., around 65 percent.

Draftsmen totaled 270,700 in 1967, an increase of 26,100 or nearly 11 percent over 1966. This occupation is widely distributed, and increases were noted in practically all industries. These increases were more or less in line with the concurrent expansion of other scientific and technical occupations in the same industries. However, conspicuous increases were noted in two: Commercial laboratories added 6,000 draftsmen bringing the total to 16,600, an increase of 57 percent over 1966, and engineering and architectural services reported 77,300 draftsmen, an increase of 9,200 or 13 percent over 1966. Both of these increases are of exceptional magnitude and combined

Table 2. Technicians, by occupation, in selected industry groups, 1967

Major industry groups	Draftsmen	Surveyors	Engineers and physical science technicians	Life science technicians	Other technicians
Total, all industries	270,700	22,800	328,300	29,300	83,600
Services	94,000	14,100	33,600	[1]19,600	11,100
Electrical machinery	29,900	400	66,600	200	7,300
Machinery, except electrical	39,100	100	30,500	200	7,900
Aircraft, ordnance, and missiles	15,900	-	37,700	300	5,200
Chemicals and allied products	4,200	100	25,600	3,900	7,000
All other industries	87,600	8,100	134,300	5,100	45,100

[1] 18,800 in medical and dental laboratories.

NOTE: Due to rounding, detail may not add to totals.

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(19,100) were over 70 percent of the total increase in draftsmen. This growth is a significant commentary on the increasing importance of business services as an industry, specifically contract technical services.

Surveyors totaled 22,800, a decline of 3,800 over the 12 months. This decrease of 14 percent is conspicuous compared with the overall average increase of 9 percent for all technicians. Most surveyors are employed in engineering and architectural services, and this industry also had most of the employment decline, from 16,800 surveyors employed in 1966 to 14,000 in 1967, a decrease of 2,800 or an even larger percent decline (17 percent) than that for the surveyors' occupation as a whole. Surveyor employment is closely tied to trends and developments in contract construction, but the declines suffered by the occupation are considerably greater than any noted thus far within that industry. The explanation, however, is partially one of timing. Surveyors are employed primarily in the planning which precedes construction and this area of the industry has felt the effect of credit restrictions and higher borrowing rates earlier and even more than the construction industry as a whole which to some extent has been carried forward by the momentum of work-in-progress.

Engineering and physical science technicians are a composite of two distinct categories, both of which are found in all the major industries, but each in different degrees of concentration. Electrical and electronic technicians are centered particularly in the electrical machinery group (47,400), communications (21,000) and wholesale and retail trade (17,000). Other engineering and physical science technicians are also employed in the same industries, but in smaller numbers. They have a primary position in other industries, notably, chemicals (24,000), primary metal industries (8,500), fabricated metals (5,100), and aircraft and parts (13,900). Together, the two categories totaled 328,300, 45 percent of all technicians. Between the two, other engineering and physical science technicians were slightly larger (167,400 compared with 161,000) and had increased at a considerably faster rate than the electrical and electronic group (12 and 7 percent, respectively) over the 1966-67 period. (See appendix table A-2.)

Life science technician is also a composite of two distenct groups. Medical and dental technicians, who make up almost 75 percent of the combined total, are highly concentrated in one industry, medical and dental laboratories, where they perform their work with a minimum of contact with scientists. There were 18,800 life science technicians working with 1,600 scientists in such laboratories in 1967, or a ratio of almost 13 technicians to each scientist. This ratio contrasts with the all-industry average of less than one technician for each scientist and engineer. (See chart 4.) The number of medical and dental technicians showed a small decline (1 percent) over the 1966-67 period. Biological and agricultural technicians, the remaining 25 percent of the total, increased their number by 1,100 or almost 18 percent over 1966 levels. They work almost exclusively in three industries, chemicals, food and kindred products, and commercial laboratories. In all three industries, they work closely with life scientists.

All other technicians is a loose, hard-to-define category which totaled 83,600 in 1967, an increase of 9,900 or 13 percent over 1966. Probably much of the 1967 increase in attributable to the increased employment of computer programers. This would correlate with the sizable increases reported for mathematicians concerned with the application of mathematical techniques and systems analysis to an ever-widening number of fields in industry.

Ratios of technicians to scientists and engineers are often used as an indication of the extent of technician support for scientists and engineers. This practice is valid only in varying degrees. In some industries with high proportions of technicians and fewer scientists and engineers, much of the work performed by such technicians is relatively independent of scientist or engineer supervision and only remotely contributes to or assists scientific or engineering work. Conspicuous examples are medical and dental technicians in medical and dental laboratories, draftsmen and surveyors in engineering and architectural services, and technicians in the public utility service industries. Data on this subject for 1967 within each industry in available from appendix table A-11 (Technicians employed for every 100 scientists and

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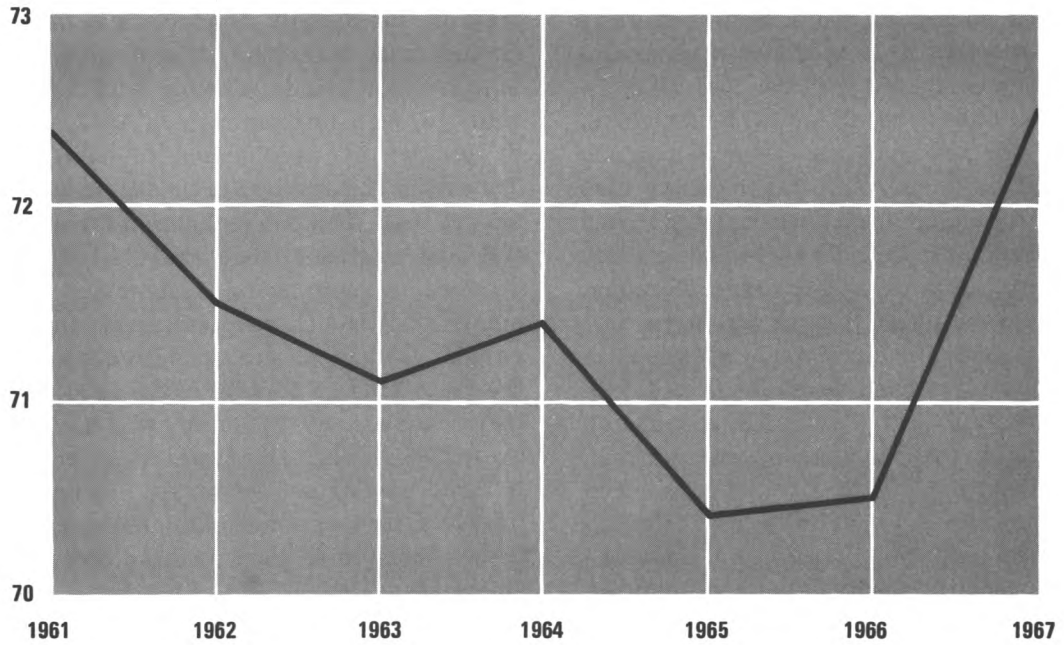
Chart 4

Number of Technicians for Each 100 Scientists and Engineers



engineers, and R&D technicians for every 100 Scientist, and Engineers in R&D, by industry, 1967).

The technician average runs low in those industries where the ratio of scientists and engineers to total employment is high and where, in terms of maximum utilization of the most skilled and shortest in supply, it should also run high, for example, ordnance, aircraft and parts, communications equipment, chemicals. (See appendix table A-12.)

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Out of a total of 1,013,100 scientists and engineers employed in industry in 1967, 382,300 were engaged in R&D activities. They constituted approximately 40 percent of the total. This high proportion is itself indicative of the importance given R&D by private industry.

The overall distribution pattern of R&D scientists was similar to that for total employment. (See appendix table A-3.) But the distribution pattern for R&D engineers differed considerably from the same total. These differences are attributed to the smaller ratio that R&D engineers bear to the total compared with R&D scientists. As shown in table 3, engineers in R&D were highly concentrated in durable goods manufacturing and were around 87 percent of all scientists and engineers employed in R&D in that sector. Scientists engaged in R&D were much more widely distributed; nondurable goods manufacturing employed the largest share (44 percent) of the total, followed by durable goods manufacturing (35 percent), and nonmanufacturing (21 percent). (See chart 5.)

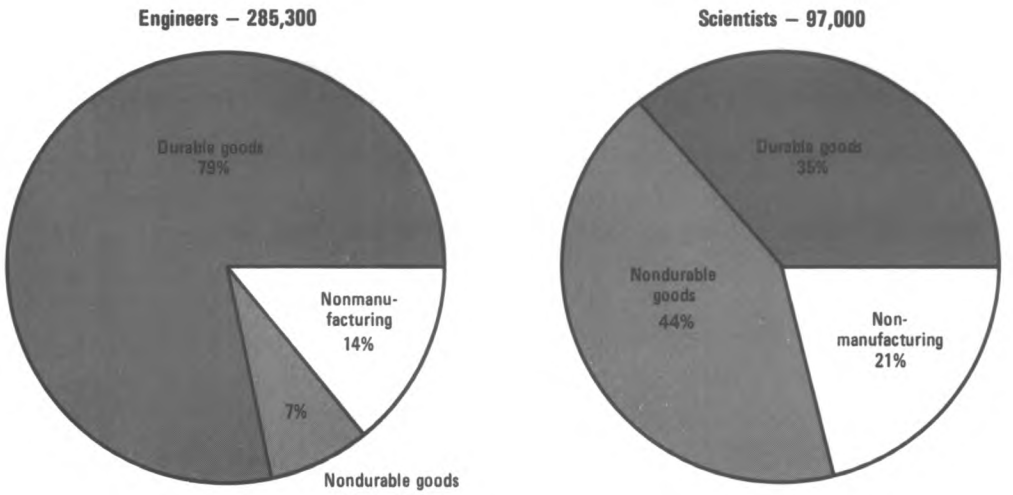
Table 3. Scientists and engineers in R&D, by major industrial classification and as a percent of total R&D, 1967

Industry group	In R&D		
	Total	Engineers	Scientists
Total, all industries	382,300	285,300	97,000
Manufacturing	322,600	245,500	77,100
Durable goods	259,000	225,000	34,000
Nondurable goods	63,600	20,500	43,100
Nonmanufacturing	59,700	39,800	19,900
	Percent distribution		
Total, all industries	100.0	100.0	100.0
Manufacturing	84.5	86.0	79.5
Durable goods	68.0	78.8	35.0
Nondurable goods	16.5	7.2	44.3
Nonmanufacturing	15.5	14.0	20.5
Total, all industries	100.0	75.0	25.0
Manufacturing	100.0	76.1	23.9
Durable goods	100.0	87.0	13.0
Nondurable goods	100.0	32.0	68.0
Nonmanufacturing	100.0	67.0	33.0

Detail may not add to totals due to rounding.

Chart 5

Percent of Scientists and Engineers in R&D in Manufacturing and Nonmanufacturing Industries, 1967



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Detailed figures for R&D scientists and engineers (singly and collectively) are shown in appendix table A-10 along with the percent that the R&D estimates are of the related total employment estimate (together with comparable figures for 1966 and percent change). Total technicians in R&D for the same industries, and years, are also shown. The technician figures may not include those drawn temporarily from an open roster as additional help on R&D projects.

Another aspect of the R&D picture is found in the appropriate detail by industry in appendix table A-8, which shows employment of scientists and engineers by function and by industry for 1967. As an overall average for all industries, management and administration in R&D was 17 percent of total R&D in 1967. (This percent was the same for total scientists and engineers, total engineers, and total scientists).

The 1966-67 growth rate for total engineers and engineers in R&D was identical: 6 percent. A better impression of the magnitude of this growth is apparent from the figures themselves:

	1967	1966	Change
Total engineers, all industry	824,000	776,200	47,800
Total engineers in R&D, all industry	285,300	268,700	16,600
Engineers as a percent of total scientists and engineers	81.3	81.3	
R&D engineers as a percent of total scientists and engineers in R&D	74.6	74.2	

Although scientists and engineers greatly outnumber scientists in R&D, certain scientist occupations are much more concentrated in R&D. Compared with the average ratio for engineers nearly 35 percent in R&D in 1967, the corresponding norm for scientists was 51 percent, and in certain occupations much higher. Virtually all of the increase in physicists reported in 1967 employment (1,100) was in R&D (1,000). This percent is normal considering that over four-fifths of physicists are concentrated in this area.

Mathematicians showed a conspicuous growth in total employment (15 percent) and in R&D (13 percent) for the 12 months ending January 1967. As the second largest scientist occupation, these percentage growth rates have a numerical base not found in many of the other smaller scientist groups. Thus, mathematicians' total employment in 1967 of 31,300 reflected a 4,600 increase of which 1,700 went into R&D activities bringing the R&D total up to 15,100. This is equivalent to 48 percent of the total, one of the higher R&D occupational ratios.

Large establishments employing 1,000 persons or more employed over half of all scientists and engineers in industry. In the durable goods segment of manufacturing industries, this dominance of the large establishment in scientific and engineering employment becomes even more pronounced with 70 percent of the total claimed. However, in the nonmanufacturing sector, smaller establishments dominated scientist and engineer employment. Medium-sized establishments, employing between 100 and 999 persons, and small establishments, employing fewer than 100 persons, where most of the commercial laboratories and engineering and architectrual services are located, each had 37 percent of all scientists and engineers in the nonmanufacturing sector. Relevant details for the overall percent distribution of scientists and engineers by size of establishment at the all-industry level are shown below.

	Total scientists and engineers	Percent distribution of scientists and engineers by size of establishment (number of employees)			
		All sizes	1,000 and over	100 to 999	Under 100
All industry	1,013,000	100.0	53.5	30.0	16.5
Manufacturing	713,300	100.0	65.4	26.9	7.7
Durable goods	550,700	100.0	70.1	22.6	7.3
Nondurable goods	162,600	100.0	49.4	41.5	9.1
Nonmanufacturing	299,800	100.0	25.1	37.6	37.4

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Appendix A. Statistical Tables

Table A-1. Scientists and engineers employed in industry, by occupation, with percent distribution 1966 and 1967

Occupation	1967	1966	Change 1966-67		Percent distribution	
			Number	Percent	1967	1966
Total scientists and engineers	1,013,100	954,600	58,500	6.1	100.0	100.0
Engineers	824,000	776,200	47,800	6.2	81.3	81.5
Scientists	189,100	178,400	10,700	6.0	18.7	18.5
Physical scientists	135,300	128,800	6,500	5.0	13.4	13.4
Chemists	85,200	84,300	900	1.1	8.4	8.9
Physicists	16,200	15,100	1,100	7.3	1.6	1.5
Metallurgists	12,000	11,000	1,000	9.1	1.2	1.1
Geologist and geophysicists	16,400	13,800	2,600	18.8	1.6	1.4
Other physical scientists	5,500	4,700	800	17.0	.5	.5
Life scientists	22,400	22,400	-	-	2.2	2.3
Medical scientists	3,400	(1/)	(1/)	(1/)	(1/)	(1/)
Agricultural scientists	6,100	(1/)	(1/)	(1/)	(1/)	(1/)
Biological scientists	9,100	(1/)	(1/)	(1/)	(1/)	(1/)
Other life scientists	3,800	(1/)	(1/)	(1/)	(1/)	(1/)
Mathematicians	31,300	27,200	4,100	15.1	3.1	2.8

1/ Due to the relatively small size of these occupations 1966 data has been omitted.

NOTE: Due to rounding, and particularly the exclusion of less than 50 in any count, detail may not add to totals.

Table A-2. Technicians employed in industry, by occupation, with percent distribution 1966 and 1967

Occupation	1967	1966	Change 1966-67		Percent distribution	
			Number	Percent	1967	1966
Total technicians	734,700	673,200	61,500	9.1	100.0	100.0
Draftsmen	270,700	244,600	26,100	10.7	36.8	36.3
Surveyors	22,800	26,600	-3,800	-14.3	3.1	4.0
Engineering and physical science technicians	328,300	299,800	28,500	9.5	44.7	44.5
Electrical and electronic technicians	161,000	150,300	10,700	7.1	21.9	22.3
Other engineering and physical science technicians	167,400	149,500	17,900	12.0	22.8	22.2
Life science technicians	29,300	28,400	900	3.2	4.0	4.2
Medical and dental technicians	21,900	22,100	-200	-.9	3.0	3.3
Biological and agricultural technicians	7,400	6,300	1,100	17.5	1.0	.9
All other technicians	83,600	73,700	9,900	13.4	11.4	10.9

NOTE: Due to rounding, and particularly the exclusion of less than 50 in any count, detail may not add to totals.

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Table A-3. Scientists, engineers, and technicians employed in manufacturing and nonmanufacturing industries with percent distribution, 1967

Industry	Adjusted total employment in survey-covered industries 1/		Scientists and engineers		Engineers		Scientists		Technicians	
Total employed ---	33,925,000	100.0	1,013,100	100.0	824,000	100.0	189,100	100.0	734,700	100.0
Manufacturing -------	17,644,000	52.0	713,300	70.4	577,500	70.1	135,800	71.8	416,000	56.6
Durable goods -----	10,579,700	31.2	550,700	54.4	493,000	59.8	57,700	30.5	346,000	47.1
Nondurable goods --	7,063,300	20.8	162,600	16.0	84,500	10.3	78,100	41.3	70,000	9.5
Nonmanufacturing ----	16,281,000	48.0	299,800	29.6	246,500	29.9	53,300	28.2	318,700	43.4

1/ Employment data have been adjusted to reflect exclusions of out-of-scope industries and establishments as defined in the methodology of the survey (appendix B). These figures are the benchmark controls used in the survey and are not to be confused with totals under corresponding headings in BLS Employment and Earnings.

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Table A-4. Industry SIC codes and minimum employment levels covered by the survey[1]

Industry	Industry SIC codes	Minimum employment in establishment
Manufacturing		
Durable goods manufacturing:		
Aircraft, ordnance, and missiles		
Aircraft and parts	372	4
Ordnance and missiles	19	4
Stone, clay, and glass products	32	4
Primary metal industries	33	4
Fabricated metal products	34	4
Machinery, except electrical	35	1
Engines and turbines	351	1
Specialized machinery and equipment	352-6 & 358	1
Office and computing machines	357	1
Electrical machinery	36	1
Electrical distribution equipment and industrial apparatus	361-2	1
Communication equipment	366	1
Electronic components	367	4
Motor vehicles and equipment	371	4
Instruments and related products	38	4
Nondurable goods manufacturing:		
Food and kindred products	20	10
Textile and apparel	22-23	50
Paper and allied products	26	10
Chemicals and allied products	28	4
Industrial chemicals	281	4
Plastics and synthetics, except glass	282	4
Drugs	283	4
Petroleum refining and related industries	29	10
Rubber and miscellaneous plastics products	30-31	10
Nonmanufacturing industries		
Metal, coal, and nonmetallic mining	10-12 & 14	10
Crude petroleum and natural gas extraction	13	4
Contract construction	15-17	4
Transportation and related services	41-47	50
Communications	48	4
Electric, gas, and sanitary services	49	4
Wholesale and retail trade	50, 52-54 & 58-59	10
Finance, insurance, and real estate	60-67	50
Business, medical, and engineering services	70-79 (ex. 739) & 81	100
Commercial laboratories, research, and other business services	739	1
Medical and dental laboratories	807	1
Engineering and architectural services	891	1

1/ Codes refer to those used in the Standard Industrial Classification Manual 1967, prepared by the Office of Statistical Standards, Bureau of the Budget.

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Table A-5. Employment of scientists, engineers, and technicians, by industry, 1966 and 1967, and percent change, 1966—67

Industry	1967	1966	Change 1966-67	
			Number	Percent
Total scientists and engineers	1,013,100	954,600	58,500	6.1
Engineers	824,000	776,200	47,800	6.2
Scientists	189,100	178,400	10,700	6.0
Total technicians	734,700	673,200	61,500	9.1
Manufacturing:				
Total scientists and engineers	713,300	665,900	47,400	7.1
Engineers	577,500	536,200	41,300	7.7
Scientists	135,800	129,700	6,100	4.7
Total technicians	416,000	380,400	35,600	9.4
Durable goods manufacturing: 1/				
Total scientists and engineers	550,700	508,600	42,100	8.3
Engineers	493,000	457,500	35,500	7.8
Scientists	57,700	51,100	6,600	12.9
Total technicians	346,000	317,000	29,000	9.1
Aircraft, ordnance, and missiles: 2/				
Total scientists and engineers	154,300	143,200	11,100	7.8
Engineers	136,400	127,800	8,600	6.7
Scientists	17,900	15,400	2,500	16.2
Total technicians	59,100	53,700	5,400	10.1
Aircraft and parts:				
Total scientists and engineers	93,400	83,300	10,100	12.1
Engineers	84,500	76,300	8,200	10.7
Scientists	8,900	7,000	1,900	27.1
Total technicians	38,200	34,400	3,800	11.0
Ordnance and missiles:				
Total scientists and engineers	60,900	59,900	1,000	1.7
Engineers	51,900	51,500	400	.8
Scientists	9,000	8,400	600	7.1
Total technicians	20,900	19,300	1,600	8.3
Stone, clay, and glass products:				
Total scientists and engineers	12,000	10,600	1,400	13.2
Engineers	9,500	8,900	600	6.7
Scientists	2,500	1,700	800	47.1
Total technicians	7,400	5,600	1,800	32.1
Primary metal industries:				
Total scientists and engineers	29,200	27,700	1,500	5.4
Engineers	21,400	20,500	900	4.4
Scientists	7,800	7,200	600	8.3
Total technicians	18,200	17,600	600	3.4
Fabricated metal products:				
Total scientists and engineers	31,800	30,200	1,600	5.3
Engineers	29,200	27,900	1,300	4.7
Scientists	2,600	2,300	300	13.0
Total technicians	25,800	24,700	1,100	4.5
Machinery, except electrical:				
Total scientists and engineers	88,600	81,600	7,000	8.6
Engineers	81,500	75,100	6,400	8.5
Scientists	7,100	6,500	600	9.2
Total technicians	77,800	67,400	10,400	15.4
Specialized machines and equipment:				
Total scientists and engineers	51,800	48,300	3,500	7.2
Engineers	49,700	46,500	3,200	6.9
Scientists	2,100	1,800	300	16.7
Total technicians	43,600	39,800	3,800	9.5
Office and computing machinery:				
Total scientists and engineers	22,800	20,000	2,800	14.0
Engineers	18,900	16,000	2,800	17.5
Scientists	4,100	4,000	100	2.5
Total technicians	22,700	18,500	4,200	22.7

See footnotes at end of table.

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Table A-5. Employment of scientists, engineers, and technicians, by industry, 1966 and 1967, and percent change, 1966—67—Continued

Industry	1967	1966	Change 1966-67	
			Number	Percent
Electrical machinery: 2/				
Total scientists and engineers	152,500	144,500	8,000	5.5
Engineers	142,000	135,500	6,500	4.8
Scientists	10,500	9,000	1,500	16.7
Total technicians	104,400	100,900	3,500	3.5
Electrical distribution equipment and industrial apparatus:				
Total scientists and engineers	28,700	28,300	400	1.4
Engineers	27,300	26,800	500	1.9
Scientists	1,400	1,500	-100	-6.7
Total technicians	24,000	22,000	2,000	9.1
Communication equipment:				
Total scientists and engineers	72,700	74,300	-1,600	-2.2
Engineers	68,100	69,500	-1,400	-2.0
Scientists	4,600	4,800	-200	-4.2
Total technicians	42,900	44,700	-1,800	-4.0
Electronic components and equipment:				
Total scientists and engineers	28,800	21,400	(2/)	
Engineers	25,400	19,900	(2/)	
Scientists	3,400	1,500	(2/)	
Total technicians	22,500	19,600	(2/)	
Motor vehicles and equipment: 2/				
Total scientists and engineers	31,500	23,600	(2/)	
Engineers	29,300	22,100	(2/)	
Scientists	2,200	1,500	(2/)	
Total technicians	18,800	15,700	(2/)	
Instruments and related products:				
Total scientists and engineers	38,100	35,600	2,500	7.0
Engineers	32,600	29,600	3,000	10.1
Scientists	5,500	6,000	-500	-8.3
Total technicians	22,500	20,200	2,300	11.4
Nondurable goods manufacturing: 3/				
Total scientists and engineers	162,600	157,300	5,300	3.4
Engineers	84,500	78,700	5,800	7.4
Scientists	78,100	78,600	-500	-.6
Total technicians	70,000	63,400	6,600	10.4
Food and kindred products:				
Total scientists and engineers	13,600	11,800	1,800	15.3
Engineers	6,200	4,900	1,300	26.5
Scientists	7,400	6,900	500	7.2
Total technicians	5,100	4,200	900	21.4
Textile mill products and apparel:				
Total scientists and engineers	5,500	6,200	-700	-11.3
Engineers	3,700	3,700		
Scientists	1,800	2,500	-700	-28.0
Total technicians	2,400	2,600	-200	-7.7
Paper and allied products:				
Total scientists and engineers	13,900	13,800	100	.7
Engineers	9,400	9,700	-300	-3.1
Scientists	4,500	4,100	400	9.8
Total technicians	8,100	6,000	2,100	35.0
Chemicals and allied products:				
Total scientists and engineers	99,400	97,700	1,700	1.7
Engineers	42,500	40,600	1,900	4.7
Scientists	56,900	57,100	-200	-.4
Total technicians	40,800	38,300	2,500	6.5
Industrial chemicals:				
Total scientists and engineers	43,100	41,900	1,200	2.9
Engineers	22,000	21,400	600	2.8
Scientists	21,100	20,500	600	2.9
Total technicians	18,000	17,400	600	3.4

See footnotes at end of table.

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Table A-5. Employment of scientists, engineers, and technicians, by industry, 1966 and 1967, and percent change, 1966—67—Continued

Industry	1967	1966	Change 1966-67	
			Number	Percent
Chemicals and allied products--Continued				
Plastics and synthetics, except glass:				
Total scientists and engineers	18,200	18,600	-400	-2.2
Engineers	10,700	10,600	100	.9
Scientists	7,500	8,000	-500	-6.3
Total technicians	8,200	8,000	200	2.5
Drugs:				
Total scientists and engineers	16,900	17,700	-800	-4.5
Engineers	1,600	1,800	-200	-11.1
Scientists	15,300	15,900	-600	-3.8
Total technicians	5,300	4,800	500	10.4
Petroleum refining and related industries:				
Total scientists and engineers	14,700	13,900	800	5.8
Engineers	10,700	9,900	800	8.1
Scientists	4,000	4,000	-	-
Total technicians	6,200	5,800	400	6.9
Rubber and miscellaneous plastics products:				
Total scientists and engineers	12,400	11,000	1,400	12.7
Engineers	9,700	7,800	1,900	24.4
Scientists	2,700	3,200	-500	-15.6
Total technicians	5,500	4,900	600	12.2
Nonmanufacturing industries: 4/				
Total scientists and engineers	299,800	288,600	11,200	3.9
Engineers	246,500	240,000	6,500	2.7
Scientists	53,300	48,600	4,700	9.7
Total technicians	318,700	292,800	25,900	8.8
Metal, coal and nonmetallic mining:				
Total scientists and engineers	7,100	7,100	-	-
Engineers	5,300	5,500	-200	-3.6
Scientists	1,800	1,600	200	12.5
Total technicians	3,500	3,400	100	2.9
Crude petroleum and natural gas extraction, including gas field services:				
Total scientists and engineers	24,600	22,100	2,500	11.3
Engineers	12,000	11,700	300	2.6
Scientists	12,600	10,400	2,200	21.2
Total technicians	8,800	6,700	2,100	31.3
Contract construction:				
Total scientists and engineers	43,600	47,200	-3,600	-7.6
Engineers	43,300	46,700	-3,400	-7.3
Scientists	300	500	-200	-40.0
Total technicians	25,700	30,200	-4,500	-7.3
Transportation and related services:				
Total scientists and engineers	9,800	8,800	1,000	11.4
Engineers	9,400	8,400	1,000	11.9
Scientists	400	400	-	-
Total technicians	6,700	6,800	-100	-1.5
Communications:				
Total scientists and engineers	18,300	27,300	1,000	5.8
Engineers	17,900	17,100	800	4.7
Scientists	400	200	200	100.0
Total technicians	34,500	31,700	2,800	8.8
Electric, gas, and sanitary services:				
Total scientists and engineers	27,100	27,300	-200	-.7
Engineers	25,900	26,100	-200	-.8
Scientists	1,200	1,200	-	-
Total technicians	21,200	19,800	1,400	7.1
Wholesale and retail trade:				
Total scientists and engineers	34,900	31,600	3,300	10.4
Engineers	24,800	23,000	1,800	7.8
Scientists	10,100	8,600	1,500	17.4
Total technicians	38,000	31,200	6,800	21.8

See footnotes at end of table.

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Table A-5. Employment of scientists, engineers, and technicians, by industry, 1966 and 1967 and percent change, 1966—67—Continued

Industry	1967	1966	Change 1966-67	
			Number	Percent
Finance, insurance, and real estate:				
Total scientists and engineers	9,200	9,000	200	2.2
Engineers	4,400	4,200	200	4.7
Scientists	4,800	4,800	-	-
Total technicians	7,200	5,800	1,400	24.1
Business, medical, and engineering services:				
Total scientists and engineers	124,600	117,800	6,800	5.8
Engineers	103,400	97,300	6,100	6.3
Scientists	21,200	20,500	700	3.4
Total technicians	172,500	156,200	16,300	10,4
Commercial laboratories, research, and other business services:				
Total scientists and engineers	55,200	51,500	3,700	7.2
Engineers	38,900	35,100	3,500	9.9
Scientists	16,300	16,100	200	1.2
Total technicians	48,200	38,900	9,300	23.9
Medical and dental laboratories:				
Total scientists and engineers	1,600	1,400	200	14.3
Engineers	-	-	-	-
Scientists	1,600	1,400	200	14.3
Total technicians	20,700	18,500	2,200	11.9
Engineering and architectural services:				
Total scientists and engineers	67,000	64,100	2,800	4.5
Engineers	64,000	61,200	2,800	4.6
Scientists	3,000	2,900	100	3.4
Total technicians	103,300	97,800	5,500	5.6

1/ Also included are lumber, wood products, and furniture; other transportation equipment; and other manufacturing industries.

2/ Due to a change in estimating procedure and the allocation of consolidated reports in the motor vehicle industry, 1967 data are not comparable with 1966. This adjustment also affects to a lesser degree certain other industries, namely, aircraft and parts, ordnance and missiles, and industries in the electrical machinery group. However, the effect of this adjustment is largely restricted to 2 occupations, engineers and engineering and physical science technicians.

3/ Also included are tobacco manufactures; printing, publishing, and allied industries; and leather and finished leather products.

4/ Also included are agricultural services, forestry, and fisheries.

NOTE: Detail may not add to totals because of rounding or inclusion in totals of items not shown separately.

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Table A-6. Employment of scientists and engineers, by occupation and industry, 1967

Industry	Total scientists and engineers	Engineers	Total scientists	Total physical scientists	Chemists
Total	1,013,100	824,000	189,100	135,300	85,200
Manufacturing	713,300	577,500	135,800	100,600	72,600
Durable goods manufacturing, total 1/	550,700	493,000	57,700	39,900	17,600
Aircraft, ordnance, and missiles	154,300	136,400	17,900	10,000	3,700
Aircraft and parts	93,400	84,500	8,900	5,100	2,100
Ordnance and missiles	60,900	51,900	9,000	4,900	1,600
Stone, clay, and glass products	12,000	9,600	2,400	2,300	1,400
Primary metal industries	29,200	21,400	7,800	7,400	2,300
Fabricated metal products	31,800	29,200	2,600	2,000	900
Machinery, except electrical	88,600	81,500	7,100	3,700	1,800
Specialized machinery and equipment	51,800	49,700	2,100	1,600	900
Office and computing machines	22,800	18,800	4,000	1,500	800
Electrical machinery	152,500	142,000	10,500	7,000	2,500
Electrical distribution equipment and industrial apparatus	28,700	27,300	1,400	1,200	500
Communication equipment	72,700	68,100	4,600	2,600	600
Electronic components	28,800	25,400	3,400	2,200	800
Motor vehicles and equipment	31,500	29,300	2,200	1,600	800
Instruments and related products	38,100	32,400	5,700	5,000	3,500
Nondurable goods manufacturing, total 2/	162,600	84,500	78,100	60,800	55,000
Food and kindred products	13,600	6,200	7,400	4,500	4,100
Textile and apparel	5,500	3,700	1,800	1,600	1,500
Paper and allied products	13,900	9,400	4,500	3,300	2,700
Chemicals and allied products	99,400	42,500	56,900	44,300	40,500
Industrial chemicals	43,100	22,000	21,100	19,100	16,400
Plastics and synthetics, except glass	18,200	10,700	7,500	6,900	6,500
Drugs	16,900	1,600	15,300	6,200	5,900
Petroleum refining and related industries	14,700	10,700	4,000	3,800	3,300
Rubber and miscellaneous plastics products	12,400	9,700	2,700	2,600	2,200
Nonmanufacturing industries, total 3/	299,800	246,500	53,300	34,700	12,600
Metal, coal, and nonmetallic mining	7,100	5,300	1,800	1,700	500
Crude petroleum and natural gas extraction	24,600	12,000	12,600	12,300	400
Contract construction	43,600	43,300	300	-	-
Transportation and related services	9,800	9,400	400	200	100
Communications	18,300	17,900	400	-	-
Electric, gas, and sanitary services	27,100	25,900	1,200	700	300
Wholesale and retail trade	34,900	24,800	10,100	5,000	4,300
Finance, insurance, and real estate	9,200	4,400	4,800	-	-
Business, medical, and engineering services	124,600	103,400	21,200	14,500	6,800
Commercial laboratories, research, and other business services	55,200	38,900	16,300	12,100	6,000
Medical and dental laboratories	1,600	-	1,600	400	300
Engineering and architectural services	67,000	64,000	3,000	2,000	500

See footnotes at end of table.

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Table A-6. Employment of scientists and engineers, by occupation and industry, 1967—Continued

Industry	Physicists	Metallurgists	Geologists and geophysicists	Other physical scientists	Total life scientists	Mathematicians
Total	16,200	12,000	16,400	5,500	22,400	31,300
Manufacturing	11,700	11,000	1,200	4,200	16,300	18,800
Durable goods manufacturing, total 1/	9,300	10,100	800	2,100	1,500	16,200
Aircraft, ordnance, and missiles	3,900	2,000	200	300	500	7,300
Aircraft and parts	1,400	1,500	-	200	200	3,500
Ordnance and missiles	2,500	500	200	100	300	3,800
Stone, clay, and glass products	200	200	200	200	-	200
Primary metal industries	100	4,800	100	100	100	300
Fabricated metal products	300	700	-	100	-	600
Machinery, except electrical	600	1,200	-	100	200	3,200
Specialized machinery and equipment	100	600	-	-	100	400
Office and computing machines	400	100	-	100	100	2,500
Electrical machinery	2,900	500	100	900	200	3,400
Electrical distribution equipment and industrial apparatus	400	100	-	100	-	200
Communication equipment	1,300	200	-	600	100	1,900
Electronic components	900	100	100	200	-	1,100
Motor vehicles and equipment	200	500	-	100	-	500
Instruments and related products	1,000	100	-	400	200	500
Nondurable goods manufacturing, total 2/	2,400	900	400	2,100	14,800	2,600
Food and kindred products	100	-	-	400	2,600	300
Textile and apparel	-	-	-	100	-	100
Paper and allied products	100	-	-	500	800	300
Chemicals and allied products	2,100	700	100	800	11,200	1,400
Industrial chemicals	1,700	700	100	200	1,100	900
Plastics and synthetics, except glass	200	-	-	200	200	200
Drugs	100	-	-	200	9,000	200
Petroleum refining and related industries	100	-	300	100	-	200
Rubber and miscellaneous plastics products	100	-	-	300	100	100
Nonmanufacturing industries, total 3/	4,400	1,000	15,200	1,300	6,100	12,500
Metal, coal, and nonmetallic mining	-	400	700	-	-	-
Crude petroleum and natural gas extraction	100	-	11,600	100	-	300
Contract construction	-	-	-	-	-	200
Transportation and related services	-	-	-	-	-	-
Communications	-	-	-	-	-	400
Electric, gas, and sanitary services	-	-	-	-	100	200
Wholesale and retail trade	200	100	200	200	2,700	2,300
Finance, insurance, and real estate	-	-	-	-	200	4,500
Business, medical, and engineering services	4,000	500	2,400	900	2,100	4,400
Commercial laboratories, research, and other business services	3,300	400	1,800	700	700	3,500
Medical and dental laboratories	-	-	-	-	1,200	-
Engineering and architectural services	700	100	600	200	200	900

1/ Also included are lumber, wood products, and furniture; other transportation equipment; and other manufacturing industries.

2/ Also included are tobacco manufactures; printing, publishing, and allied industries; and leather and finished leather products.

3/ Also included are agricultural services, forestry, and fisheries.

NOTE: Detail may not add to totals because of rounding or inclusion in totals of items not shown separately.

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Table A-7. Employment of technicians, by occupation and industry, 1967

Industry	Total technicians	Draftsmen	Surveyors	Total engineering and physical science technicians
Total	734,700	270,700	22,800	328,300
Manufacturing	416,000	140,200	1,400	222,600
Durable goods manufacturing, total 1/	346,000	138,800	1,200	181,000
Aircraft, ordnance, and missiles	59,100	15,900	-	37,700
Aircraft and parts	38,200	11,100	-	22,900
Ordnance and missiles	20,900	4,800	-	14,800
Stone, clay, and glass products	7,400	2,100	100	3,800
Primary metal industries	18,200	5,100	200	10,000
Fabricated metal products	25,800	17,500	200	6,400
Machinery, except electrical	77,800	39,100	100	30,500
Specialized machinery and equipment	43,600	30,100	100	9,200
Office and computing machines	22,700	3,000	-	18,100
Electrical machinery	104,400	29,900	400	66,600
Electrical distribution equipment and industrial apparatus	24,000	9,600	200	12,800
Communication equipment	42,900	10,500	100	29,100
Electronic components	22,500	4,100	100	16,500
Motor vehicles and equipment	18,800	6,700	-	11,100
Instruments and related products	22,500	6,600	-	11,900
Nondurable goods manufacturing, total 2/	70,000	9,400	300	41,600
Food and kindred products	5,100	800	-	1,700
Textile and apparel	2,400	400	-	800
Paper and allied products	8,100	1,500	100	5,600
Chemicals and allied products	40,800	4,200	100	25,600
Industrial chemicals	18,000	2,600	-	12,000
Plastics and synthetics, except glass	8,200	700	-	6,000
Drugs	5,300	200	-	1,500
Petroleum refining and related industries	6,200	800	100	4,100
Rubber and miscellaneous plastics products	5,500	1,400	-	2,900
Nonmanufacturing industries, total 3/	318,700	130,500	21,300	105,700
Metal, coal, and nonmetallic mining	3,500	600	700	1,400
Crude petroleum and natural gas extraction	8,800	3,800	600	2,800
Contract construction	25,700	17,400	3,100	2,800
Transportation and related services	6,700	2,000	1,200	2,300
Communications	34,500	800	-	31,600
Electric, gas and sanitary services	21,200	6,300	1,500	10,800
Wholesale and retail trade	38,000	4,800	-	19,700
Finance, insurance, and real estate	7,200	700	100	500
Business, medical, and engineering services	172,500	94,000	14,000	33,600
Commercial laboratories, research, and other business services	48,200	16,600	400	25,900
Medical and dental laboratories	20,700	-	-	-
Engineering and architectural services	103,300	77,300	13,800	7,700

See footnotes at end of table.

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Table A-7. Employment of technicians, by occupation and industry, 1967—Continued

Industry	Electrical and electronic technicians	Other engineering and physical science technicians	Total life science technicians	All other technicians
Total	161,000	167,400	29,300	83,600
Manufacturing	94,100	128,600	6,900	44,800
Durable goods manufacturing, total 1/	90,500	90,500	1,600	31,400
Aircraft, ordnance, and missiles	18,100	19,600	300	5,200
Aircraft and parts	9,000	13,900	100	4,100
Ordnance and missiles	9,100	5,700	200	1,100
Stone, clay, and glass products	1,500	2,300	100	1,200
Primary metal industries	1,500	8,500	100	2,900
Fabricated metal products	1,300	5,100	-	1,600
Machinery, except electrical	12,800	17,600	200	7,900
Specialized machinery and equipment	2,400	6,800	200	4,000
Office and computing machines	9,900	8,300	-	1,600
Electrical machinery	47,400	19,200	200	7,300
Electrical distribution equipment and industrial apparatus	9,300	3,500	100	1,300
Communication equipment	19,800	9,200	-	3,200
Electronic components	13,700	2,800	100	1,700
Motor vehicles and equipment	200	10,900	-	1,000
Instruments and related products	6,500	5,400	500	3,500
Nondurable goods manufacturing, total 2/	3,500	38,100	5,400	13,400
Food and kindred products	300	1,400	1,100	1,600
Textile and apparel	200	600	-	1,200
Paper and allied products	700	4,900	200	800
Chemicals and allied products	1,500	24,100	3,900	7,000
Industrial chemicals	700	11,300	800	2,600
Plastics and synthetics, except glass	400	5,600	-	1,400
Drugs	100	1,400	2,800	800
Petroleum refining and related industries	300	3,800	-	1,200
Rubber and miscellaneous plastics products	200	2,700	100	1,100
Nonmanufacturing industries, total 3/	66,900	38,800	22,300	38,800
Metal, coal, and nonmetallic mining	100	1,300	100	600
Crude petroleum and natural gas extraction	1,100	1,800	-	1,500
Contract construction	2,300	500	-	2,400
Transportation and related services	1,700	600	100	1,200
Communications	21,000	10,600	-	2,000
Electric, gas and sanitary services	6,200	4,500	100	2,500
Wholesale and retail trade	17,100	2,600	1,800	11,600
Finance, insurance, and real estate	100	400	100	5,800
Business, medical, and engineering services	17,200	16,400	19,600	11,100
Commercial laboratories, research, and other business services	13,500	12,400	700	4,600
Medical and dental laboratories	-	-	18,800	1,800
Engineering and architectural services	3,700	4,000	100	4,500

1/ Also included are lumber, wood products, and furniture; other transportation equipment, and other manufacturing industries.

2/ Also included are tobacco manufactures; printing, publishing, and allied industries; and leather and finished leather products.

3/ Also included are agricultural services, forestry, and fisheries.

NOTE: Detail may not add to totals because of rounding or inclusion in total of items not shown separately.

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Table A-8. Employment of scientists and engineers, by function and industry, 1967

Industry and occupation	Total scientists and engineers, all functions	R&D		Management other than R&D	Production and operation	Sales and services	All other functions
		Total	Management and administration				
Total scientists and engineers	1,013,100	382,300	65,800	122,300	330,800	102,100	75,600
Engineers	824,000	285,300	49,300	104,200	287,900	84,900	61,700
Scientists	189,100	97,000	16,500	18,100	42,900	17,200	13,900
Manufacturing:							
Total scientists and engineers	713,300	322,600	54,400	71,600	217,900	60,600	40,600
Engineers	577,500	245,500	41,600	60,400	187,900	50,000	33,700
Scientists	135,800	77,100	12,800	11,200	30,000	10,600	6,900
Durable goods manufacturing: 1/							
Total scientists and engineers	550,700	259,000	42,600	52,000	162,500	46,800	30,400
Engineers	493,000	225,000	37,600	47,500	149,600	44,400	26,500
Scientists	57,700	34,000	5,000	4,500	12,900	2,400	3,900
Aircraft, ordnance, and missiles:							
Total scientists and engineers	154,300	95,800	11,400	7,700	40,100	4,600	6,100
Engineers	136,400	82,600	9,800	7,100	37,500	4,500	4,700
Scientists	17,900	13,200	1,600	600	2,600	100	1,400
Aircraft and parts:							
Total scientists and engineers	93,400	58,900	6,800	4,800	25,100	3,000	1,600
Engineers	84,500	52,000	5,900	4,500	23,600	3,000	1,400
Scientists	8,900	6,900	900	300	1,500	-	200
Ordnance and missiles:							
Total scientists and engineers	60,900	36,900	4,600	2,900	15,000	1,600	4,500
Engineers	51,900	30,600	3,900	2,600	13,900	1,500	3,300
Scientists	9,000	6,300	700	300	1,100	100	1,200
Stone, clay, and glass products:							
Total scientists and engineers	12,000	2,900	500	2,000	5,100	1,300	700
Engineers	9,500	1,600	300	1,900	4,300	1,200	500
Scientists	2,500	1,300	200	100	800	100	200
Primary metal industries:							
Total scientists and engineers	29,200	4,000	1,200	6,300	14,800	2,300	1,800
Engineers	21,400	2,500	800	5,000	10,700	1,800	1,400
Scientists	7,800	1,500	400	1,300	4,100	500	400
Fabricated metal products:							
Total scientists and engineers	31,800	8,700	2,300	5,200	11,900	4,000	2,000
Engineers	29,200	7,400	2,100	5,000	11,100	3,800	1,900
Scientists	2,600	1,300	200	200	800	200	100
Machinery, except electrical:							
Total scientists and engineers	88,600	33,400	8,000	11,200	24,600	13.100	6,300
Engineers	81,500	29.300	7,100	10,400	23,300	12,500	6,000
Scientists	7,100	4,100	900	800	1,300	600	300
Specialized machines and equipment:							
Total scientists and engineers	51,800	13,400	3,500	7,700	16,400	10,000	4,300
Engineers	49,700	12,500	3,200	7,500	15,800	9,900	4,000
Scientists	2,100	900	300	200	600	100	300
Office and computing machinery:							
Total scientists and engineers	22,900	14,800	3,400	2,100	3,100	1,600	1,300
Engineers	18,800	12,100	2,900	1,600	2,800	1,100	1,200
Scientists	4,100	2,700	500	500	300	500	100
Electrical machinery:							
Total scientists and engineers	152,500	81,300	13,800	12,100	33,800	15,900	9,400
Engineers	142,000	74,300	13,000	11,400	32,400	15,700	9,200
Scientists	10,500	7,000	800	700	1,400	200	1,200
Electrical distribution equipment and industrial apparatus:							
Total scientists and engineers	28,700	10,500	1,900	2,800	7,700	5,400	2,300
Engineers	27,300	9,500	1,800	2,800	7,500	5,300	2,200
Scientists	1,400	1,000	100		200	100	100

See footnote at end of table.

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Table A-8. Employment of scientists and engineers, by function and industry, 1967—Continued

Industry and occupation	Total scientists and engineers, all functions	R&D		Management other than R&D	Production and operation	Sales and services	All other functions
		Total	Management and administration				
Electrical machinery--Continued							
Communication equipment:							
Total scientists and engineers	72,700	50,300	7,900	4,200	10,000	4,400	3,800
Engineers	68,100	46,800	7,500	3,900	9,600	4,400	3,400
Scientists	4,600	3,500	400	300	400	-	400
Electronic components and accessories:							
Total scientists and engineers	28,800	11,200	1,700	2,600	9,000	4,100	1,900
Engineers	25,400	9,400	1,500	2,500	8,400	4,100	1,000
Scientists	3,400	1,800	200	100	600	-	900
Motor vehicles and equipment:							
Total scientists and engineers	31,500	12,600	1,500	3,000	14,000	700	1,200
Engineers	29,300	11,100	1,400	2,900	13,500	700	1,100
Scientists	2,200	1,500	100	100	500	-	100
Instruments and related products:							
Total scientists and engineers	38,100	16,200	2,900	2,800	12,600	4,200	2,300
Engineers	32,600	12,800	2,400	2,300	11,800	3,600	2,100
Scientists	5,500	3,400	500	500	800	600	200
Nondurable goods manufacturing: 2/							
Total scientists and engineers	162,600	63,600	11,700	19,600	55,400	13,800	10,200
Engineers	84,500	20,500	4,000	12,900	38,300	5,600	7,200
Scientists	78,100	43,100	7,700	6,700	17,100	8,200	3,000
Food and kindred products:							
Total scientists and engineers	13,600	3,900	900	1,900	6,700	500	600
Engineers	6,200	700	200	900	4,100	100	400
Scientists	7,400	3,200	700	1,000	2,600	400	200
Textile mill products and apparel:							
Total scientists and engineers	5,500	1,500	600	800	2,900	100	200
Engineers	3,700	800	300	600	2,100	100	100
Scientists	1,800	700	300	200	800	-	100
Paper and allied products:							
Total scientists and engineers	13,900	4,800	1,200	2,000	5,100	900	1,100
Engineers	9,400	2,500	600	1,500	4,000	600	800
Scientists	4,500	2,300	600	500	1,100	300	300
Chemicals and allied products:							
Total scientists and engineers	99,400	43,900	7,000	10,100	28,500	10,500	6,400
Engineers	42,500	11,500	1,800	5,600	17,700	3,500	4,200
Scientists	56,900	32,400	5,200	4,500	10,800	7,000	2,200
Industrial chemicals:							
Total scientists and engineers	43,100	18,900	2,700	5,000	12,400	2,900	3,900
Engineers	22,000	6,900	1,000	3,100	7,900	1,200	2,900
Scientists	21,100	12,000	1,700	1,900	4,500	1,700	1,000
Plastics and synthetics, except glass:							
Total scientists and engineers	18,200	6,600	800	1,300	7,400	2,100	800
Engineers	10,700	2,700	300	1,000	5,500	1,100	400
Scientists	7,500	3,900	500	300	1,900	1,000	400
Drugs:							
Total scientists and engineers	16,900	8,800	1,500	1,500	2,800	3,100	700
Engineers	1,600	300	100	400	700	-	200
Scientists	15,300	8,500	1,400	1,100	2,100	3,100	500
Petroleum refining and related products:							
Total scientists and engineers	14,700	3,500	600	2,800	6,700	700	1,000
Engineers	10,700	1,300	200	2,500	5,600	400	900
Scientists	4,000	2,200	400	300	1,100	300	100
Rubber and miscellaneous plastics products:							
Total scientists and engineers	12,400	4,900	11,200	1,600	4,000	1,000	900
Engineers	9,700	3,200	880	1,400	3,400	900	800
Scientists	2,700	1,700	400	200	600	100	100

See footnote at end of table.

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Table A-8. Employment of scientists and engineers, by function and industry, 1967—Continued

Industry and occupation	Total scientists and engineers, all functions	R&D		Management other than R&D	Production and operation	Sales and services	All other functions
		Total	Management and administration				
Nonmanufacturing industries 3/							
Total scientists and engineers	299,800	59,700	11,400	50,700	112,900	41,500	35,000
Engineers	246,500	39,800	7,700	43,800	100,000	34,900	28,000
Scientists	53,300	19,900	3,700	6,900	12,900	6,600	7,000
Metal, coal, and nonmetallic mining:							
Total scientists and engineers	7,100	1,100	300	1,400	4,000	300	300
Engineers	5,300	500	100	1,200	3,200	300	100
Scientists	1,800	600	200	200	800	-	200
Crude petroleum and natural gas extraction including gas field service:							
Total scientists and engineers	24,600	2,700	500	4,000	13,200	700	4,000
Engineers	12,000	1,300	200	2,200	7,200	600	700
Scientists	12,600	1,400	300	1,800	6,000	100	3,300
Contract construction:							
Total scientists and engineers	43,600	1,200	800	10,500	21,700	5,600	4,600
Engineers	43,300	1,200	800	10,500	21,500	5,500	4,600
Scientists	300	-	-	-	200	100	-
Transportation and related services:							
Total scientists and engineers	9,800	900	300	2,100	5,500	200	1,100
Engineers	9,400	800	200	2,000	5,300	200	1,100
Scientists	400	100	100	100	200	-	-
Communications:							
Total scientists and engineers	18,300	300	100	4,100	12,200	200	1,500
Engineers	17,900	300	100	4,000	12,200	200	1,200
Scientists	400	-	-	100	-	-	300
Electric, gas, and sanitary services:							
Total scientists and engineers	27,100	1,000	300	7,000	13,700	3,000	2,400
Engineers	25,900	800	200	6,900	13,200	2,900	2,100
Scientists	1,200	200	100	100	500	100	300
Wholesale and retail trade:							
Total scientists and engineers	34,900	3,200	800	7,000	4,500	18,800	1,400
Engineers	24,800	1,900	400	4,700	3,000	14,400	800
Scientists	10,100	1,300	400	2,300	1,500	4,400	600
Finance, insurance, and real estate:							
Total scientists and engineers	9,200	1,000	500	1,900	2,300	2,600	1,400
Engineers	4,400	100	100	700	400	2,200	1,000
Scientists	4,800	900	400	1,200	1,900	400	400
Business, medical, and engineering services:							
Total scientists and engineers	124,600	48,300	8,000	12,700	35,600	9,600	18,400
Engineers	103,400	33,100	6,000	11,600	34,000	8,600	16,100
Scientists	21,200	15,200	2,000	1,100	1,600	1,000	2,300
Commercial laboratories, research, and other business services:							
Total scientists and engineers	55,200	37,200	6,000	2,900	6,100	4,000	5,000
Engineers	38,900	24,200	4,200	2,200	5,600	3,300	3,600
Scientists	16,300	13,000	1,800	700	500	700	1,400
Medical and dental laboratories:							
Total scientists and engineers	1,600	400		300	600	-	300
Engineers			-		-	-	
Scientists	1,600	400	-	300	600	-	300
Engineering and architectural services:							
Total scientists and engineers	67,000	10,700	2,000	9,300	28,600	5,500	12,900
Engineers	64,000	8,800	2,000	9,200	28,200	5,300	12,500
Scientists	3,000	1,900	-	100	400	200	400

1/ Also included are lumber, wood products, and furniture; other transportation equipment; and other manufacturing industries.

2/ Also included are tobacco manufactures; printing, publishing, and allied industries; and leather and finished leather products.

3/ Also included are agricultural services, forestry, and fisheries.

NOTE: Detail may not add to totals because of rounding or inclusion in totals of items not shown separately.

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Table A-9. Employment of scientists and engineers in industry in R&D by occupation, 1966 and 1967

Occupation	Total	1967 In R&D		Total	1966 In R&D	
		Number	Percent		Number	Percent
Total scientists and engineers	1,013,100	382,300	37.7	954,600	362,000	37.9
Engineers	824,000	285,300	34.6	776,200	268,700	34.6
Scientists	189,100	97,000	51.3	178,400	93,300	52.3
Physical scientists	135,300	72,500	53.6	128,800	70,700	54.9
Chemists	85,200	48,000	56.3	84,300	47,900	56.8
Physicists	16,200	13,800	85.2	15,100	12,800	84.8
Metallurgists	12,000	5,200	43.3	11,000	4,700	42.7
Geologists and geophysicists	16,400	2,800	17.1	13,800	3,000	21.7
Other physical scientists	5,500	2,700	49.1	4,700	2,200	46.8
Life scientists	22,400	9,300	41.5	22,400	9,100	40.6
Medical scientists	3,400	1,600	47.1	4,300	2,200	51.2
Agricultural scientists	6,100	1,300	21.3	4,900	1,300	26.5
Biological scientists	9,100	5,700	62.6	9,100	4,800	52.7
Other life scientists	3,800	800	21.1	4,100	800	19.5
Mathematicians	31,300	15,100	48.2	27,200	13,400	49.3

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Table A-10. Scientists, engineers, and technicians employed by industry, and related numbers employed in R&D, 1966 and 1967

Industry	1967			1966			1966-67	
	Total	In R&D		Total	In R&D		Change in R&D	
		Number	Percent of total		Number	Percent of total	Number	Percent
Total scientists and engineers	1,013,100	382,300	37.7	954,600	362,000	37.9	20,300	5.6
Engineers	824,000	285,300	34.6	776,200	268,700	34.6	16,600	6.2
Scientists	189,100	97,000	51.3	178,400	93,300	52.3	3,700	4.0
Total technicians	734,700	173,100	23.6	673,200	156,100	23.2	17,000	10.9
Manufacturing:								
Total scientists and engineers	713,300	322,600	45.2	665,900	303,900	45.6	18,700	6.2
Engineers	577,500	245,500	42.5	536,200	229,900	42.9	15,600	6.8
Scientists	135,800	77,100	56.8	129,700	74,000	57.1	3,100	4.2
Total technicians	416,000	135,800	32.6	380,400	120,100	31.6	5,700	13.1
Durable goods manufacturing: 1/								
Total scientists and engineers	550,700	259,000	47.0	508,600	240,400	47.3	18,600	7.7
Engineers	493,000	225,000	45.6	457,500	209,900	45.9	15,100	7.2
Scientists	57,700	34,000	58.9	51,100	30,500	59.7	3,500	11.5
Total technicians	346,000	110,000	31.8	317,000	96,800	30.5	12,200	13.6
Aircraft, ordnance, and missiles: 2/								
Total scientists and engineers	154,300	95,800	62.1	143,200	90,400	63.1	5,400	6.0
Engineers	136,400	82,600	60.6	127,800	78,600	61.5	4,000	5.1
Scientists	17,900	13,200	73.7	15,400	11,800	76.6	1,400	11.9
Total technicians	59,100	27,000	45.7	53,700	23,200	43.2	3,800	16.4
Aircraft and parts:								
Total scientists and engineers	93,400	58,900	63.1	83,300	53,000	63.6	5,900	11.1
Engineers	84,500	52,000	61.5	76,300	47,400	62.1	4,600	9.7
Scientists	8,900	52,000	77.8	7,000	5,600	80.0	1,300	23.2
Total technicians	38,200	16,800	44.0	34,400	15,100	43.9	1,700	11.3
Ordnance and missiles:								
Total scientists and engineers	60,900	36,900	60.6	59,900	37,400	62.4	-500	-1.3
Engineers	51,900	30,600	59.0	51,500	31,200	60.6	-600	-1.9
Scientists	9,000	6,300	70.0	8,400	6,200	73.8	100	1.6
Total technicians	20,900	10,200	48.8	19,300	8,100	42.0	2,100	25.9
Stone, clay, and glass products:								
Total scientists and engineers	12,000	2,900	24.2	10,600	2,300	21.7	600	26.1
Engineers	9,500	1,600	16.8	8,900	1,500	16.9	100	6.7
Scientists	2,500	1,300	52.0	1,700	800	47.1	500	62.5
Total technicians	7,400	1,400	18.9	5,600	700	12.5	700	100.0
Primary metal industries:								
Total scientists and engineers	29,200	4,000	13.7	27,700	3,800	13.7	200	5.3
Engineers	21,400	2,500	11.7	20,500	2,400	11.7	100	4.2
Scientists	7,800	1,500	19.2	7,200	1,400	19.4	100	7.1
Total technicians	18,200	1,900	10.4	17,600	1,700	9.7	200	11.8
Fabricated metal products:								
Total scientists and engineers	31,800	8,700	27.4	30,200	7,400	24.5	1,300	17.6
Engineers	29,200	7,400	25.3	27,900	6,400	22.9	1,000	15.6
Scientists	2,600	1,300	50.0	2,300	1,000	43.5	300	30.0
Total technicians	25,800	5,000	19.4	24,700	4,700	19.0	300	6.4
Machinery, except electrical:								
Total scientists and engineers	88,600	33,400	37.7	81,600	32,300	39.6	1,100	3.4
Engineers	81,500	29,300	36.0	75,100	28,200	37.5	1,100	3.9
Scientists	7,100	4,100	57.7	6,500	4,100	63.1	-	-
Total technicians	77,800	17,000	21.9	67,400	16,100	23.9	900	5.6
Specialized machines and equipment:								
Total scientists and engineers	51,800	13,400	25.9	48,300	13,000	26.9	400	3.1
Engineers	49,700	12,500	25.2	46,500	12,100	26.0	400	3.3
Scientists	2,100	900	42.9	1,800	900	50.0	-	-
Total technicians	43,600	7,300	16.7	39,800	7,500	18.8	-200	-2.7
Office and computing machinery:								
Total scientists and engineers	22,900	14,800	64.6	20,000	13,900	69.5	900	6.5
Engineers	18,800	12,100	64.4	16,000	11,200	70.0	900	8.0
Scientists	4,100	2,700	65.9	4,000	2,700	67.5	-	-
Total technicians	22,700	7,300	32.2	18,500	6,100	33.0	1,200	19.7

See footnotes at end of table.

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Table A-10. Scientists, engineers, and technicians employed by industry, and related numbers employed in R&D, 1966 and 1967—Continued

Industry	1967			1966			1966-67	
	Total	In R&D		Total	In R&D		Change in R&D	
		Number	Percent of total		Number	Percent of total	Number	Percent
Electrical machinery:2/								
Total scientists and engineers	152,500	81,300	53.3	144,500	75,800	52.5	5,500	7.3
Engineers	142,000	74,300	52.3	135,500	69,400	51.2	4,900	7.1
Scientists	10,500	7,000	66.7	9,000	6,400	71.1	600	9.4
Total technicians	104,400	39,800	38.1	100,900	33,400	33.1	6,400	19.2
Electrical distribution equipment and industrial apparatus:								
Total scientists and engineers	28,700	10,500	36.6	28,300	10,100	35.7	400	4.0
Engineers	27,300	9,500	34.8	26,800	9,100	34.0	400	4.4
Scientists	1,400	1,000	71.4	1,500	1,000	66.7	-	-
Total technicians	24,000	5,600	23.3	22,000	5,200	23.6	400	7.7
Communication equipment:								
Total scientists and engineers	72,700	50,300	69.2	74,300	47,700	64.2	2,600	5.5
Engineers	68,100	46,800	68.7	69,500	44,200	63.6	2,600	5.9
Scientists	4,600	3,500	76.1	4,800	3,500	72.9	-	-
Total technicians	42,900	22,800	53.1	44,700	19,400	43.4	3,400	17.5
Electronic components and equipment:								
Total scientists and engineers	28,800	11,200	38.9	21,400	8,700	40.7	(2/)	(2/)
Engineers	25,400	9,400	37.0	19,900	7,600	38.2	(2/)	(2/)
Scientists	3,400	1,800	52.9	1,500	1,100	73.3	(2/)	(2/)
Total technicians	22,500	6,800	30.2	19,600	4,100	20.9	(2/)	(2/)
Motor vehicles and equipment: 2/								
Total scientists and engineers	31,500	12,600	40.0	23,600	9,300	39.4	(2/)	(2/)
Engineers	29,300	11,100	37.9	22,100	8,200	37.1	(2/)	(2/)
Scientists	2,200	1,500	68.2	1,500	1,100	73.3	(2/)	(2/)
Total technicians	18,800	7,900	42.0	15,700	7,700	49.0	(2/)	(2/)
Instruments and related products:								
Total scientists and engineers	38,100	16,200	42.5	35,600	14,800	41.6	1,400	9.5
Engineers	32,600	12,800	39.3	29,600	11,600	39.2	1,200	10.3
Scientists	5,500	3,400	61.8	6,000	3,200	53.3	200	6.3
Total technicians	22,500	7,200	32.0	20,200	6,400	31.7	800	12.5
Nondurable goods manufacturing:3/								
Total scientists and engineers	162,600	63,600	39.1	157,300	63,500	40.4	100	.2
Engineers	84,500	20,500	34.3	78,700	20,000	25.4	500	2.5
Technicians	78,100	43,100	55.2	78,600	43,500	55.3	-400	-.9
Total technicians	70,000	25,800	36.9	63,400	23,300	36.8	2,500	10.7
Food and kindred products:								
Total scientists and engineers	13,600	3,900	28.7	11,800	4,000	33.9	-100	-2.5
Engineers	6,200	700	11.2	4,900	800	16.3	-100	-12.5
Scientists	7,400	3,200	43.2	6,900	3,200	46.4	-	-
Total technicians	5,100	1,200	23.5	4,200	1,100	26.2	100	9.1
Textile mill products and apparel:								
Total scientists and engineers	5,500	1,500	27.3	6,200	1,900	30.6	-400	-21.1
Engineers	3,700	800	21.6	3,700	600	16.2	200	33.3
Scientists	1,800	700	38.9	2,400	1,300	52.0	-600	-46.2
Total technicians	2,400	300	12.5	2,600	200	7.7	100	50.0
Paper and allied products:								
Total scientists and engineers	13,900	4,800	34.5	13,800	5,000	36.2	-200	-4.0
Engineers	9,400	2,500	26.6	9,700	2,700	27.8	-200	-7.4
Scientists	4,500	2,300	51.1	4,100	2,300	56.1		-
Total technicians	8,100	2,100	25.9	6,000	1,100	18.3	1,000	90.9
Chemicals and allied products:								
Total scientists and engineers	99,400	43,900	44.2	97,700	43,000	44.0	900	2.1
Engineers	42,500	11,500	27.1	40,600	11,400	28.1	100	.9
Scientists	56,900	32,400	56.9	57,100	31,600	55.3	800	2.5
Total technicians	40,800	18,600	45.6	38,300	16,900	44.1	1,700	10.1
Industrial chemicals:								
Total scientists and engineers	43,100	18,900	43.9	41,900	18,700	44.6	200	1.1
Engineers	22,000	6,900	31.4	21,400	6,900	32.2	-	-
Scientists	21,100	12,000	56.9	20,500	11,800	57.6	200	1.7
Total technicians	18,000	7,800	43.3	17,400	7,400	42.5	400	5.4

See footnotes at end of table.

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Table A-10. Scientists, engineers, and technicians employed by industry, and related numbers employed in R&D 1966 and 1967—Continued

Industry	1967			1966			1966-67	
	Total	In R&D		Total	In R&D		Change in R&D	
		Number	Percent of total		Number	Percent of total	Number	Percent
Chemicals and allied products--Continued								
Plastics and synthetics, except glass:								
Total scientists and engineers	18,200	6,600	36.3	18,600	7,000	37.6	-400	-5.7
Engineers	10,700	2,700	25.2	10,600	2,600	24.5	100	3.8
Scientists	7,500	3,900	52.0	8,000	4,400	55.0	-500	-11.4
Total technicians	8,200	3,800	46.3	8,000	4,000	50.0	-200	-5.0
Drugs:								
Total scientists and engineers	16,900	8,800	52.1	17,700	7,500	42.4	1,300	17.3
Engineers	1,600	300	18.8	1,800	400	22.2	-100	-25.0
Scientists	15,300	8,500	55.6	15,900	7,100	44.7	1,400	19.7
Total technicians	5,300	2,600	49.1	4,800	2,100	43.8	500	23.8
Petroleum refining and related industries:								
Total scientists and engineers	14,700	3,500	23.8	13,900	3,600	25.9	-100	-2.8
Engineers	10,700	1,300	12.1	9,900	1,400	14.1	-100	-7.2
Scientists	4,000	2,200	55.0	4,000	2,200	55.0	-	-
Total technicians	6,200	1,800	29.0	5,800	1,900	32.8	-100	-5.3
Rubber and miscellaneous plastics products:								
Total scientists and engineers	12,400	4,900	39.5	11,000	4,900	44.5	-	-
Engineers	9,700	3,200	33.0	7,800	2,700	34.6	500	18.5
Scientists	2,700	1,700	63.0	3,200	2,200	68.8	-500	-22.7
Total technicians	5,500	1,200	21.8	4,900	1,400	28.6	-200	-14.3
Nonmanufacturing industries:								
Total scientists and engineers	299,800	59,700	19.9	288,600	58,100	20.1	1,600	2.8
Engineers	246,500	39,800	16.1	240,000	38,900	16.2	900	2.3
Scientists	53,300	19,900	37.3	48,600	19,200	39.5	700	3.6
Total technicians	318,700	37,200	11.7	292,800	36,800	12.6	400	1.1
Metal, coal, and nonmetallic mining:								
Total scientists and engineers	7,100	1,100	15.5	7,100	900	12.7	200	22.2
Engineers	5,300	500	9.4	5,500	400	7.3	100	25.0
Scientists	1,800	600	33.3	1,600	500	31.3	100	20.0
Total technicians	3,500	400	11.4	3,400	300	8.8	100	33.3
Crude petroleum and natural gas extraction including gas field services:								
Total scientists and engineers	24,600	2,700	11.0	22,100	1,700	7.7	1,000	58.8
Engineers	12.000	1,300	10.8	11,700	500	4.3	800	160.0
Scientists	12,600	1,400	11.1	10,400	1,200	11.5	200	16.7
Total technicians	8,800	1,100	12.5	6,700	400	6.0	700	175.0
Contract construction:								
Total scientists and engineers	43,600	1,200	2.8	46,200	800	1.7	400	50.0
Engineers	43,300	1,200	2.8	46,700	800	1.7	400	50.0
Scientists	300	-	-	500	-	-	-	
Total technicians	25,700	1,000	3.9	30,200	1,700	5.6	-700	-41.2
Transportation and related services:								
Total scientists and engineers	9,800	900	9.2	8,800	800	9.1	100	12.5
Engineers	9,400	800	8.5	8,400	600	7.1	200	33.3
Scientists	400	100	25.0	400	200	50.0	-100	-50.0
Total technicians	6,700	200	3.0	6,800	100	1.5	100	100.0
Communications:								
Total scientists and engineers	18,300	300	1.6	17,300	700	4.0	-400	-57.1
Engineers	17,900	300	1.7	17,100	600	3.5	-300	-50.0
Scientists	400	-	-	200	100	50.0	-100	-100.0
Total technicians	34,500	200	.6	31,700	1,000	3.2	-800	-80.0
Electric, gas, and sanitary services:								
Total scientists and engineers	27,100	1,000	3.7	27,300	800	2.9	200	25.0
Engineers	25,900	800	3.1	26,100	700	2.7	100	14.3
Scientists	1,200	200	16.7	1,200	100	8.3	100	100.0
Total technicians	21,200	200	.9	19,800	300	1,5	-100	-33.3

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Table A-10. Scientists, engineers, and technicians employed by industry, and related numbers employed in R&D, 1966 and 1967—Continued

Industry	1967			1966			1966-67	
	Total	In R&D		Total	In R&D		Change in R&D	
		Number	Percent of total		Number	Percent of total	Number	Percent
Wholesale and retail trade:								
Total scientists and engineers -----	34,900	3,200	9.2	31,600	3,200	10.1	-	-
Engineers -----	24,800	1,900	7.7	23,000	2,000	8.7	-100	-5.0
Scientists -----	10,100	1,300	12.9	8,600	1,200	14.0	100	8.3
Total technicians -----	38,000	2,700	7.1	31,200	1,500	4.8	1,200	80.0
Finance, insurance, and real estate:								
Total scientists and engineers -----	9,200	1,000	10.9	9,000	1,200	13.3	-200	-16.7
Engineers -----	4,400	100	2.3	4,200	100	2.4		-
Scientists -----	4,800	900	18.8	4,800	1,100	22.9	-200	-18.2
Total technicians -----	7,200	100	1.4	5,800	100	1.7	-	-
Business, medical, and engineering services:								
Total scientists and engineers -----	124,600	48,300	38.8	117,800	48,000	40.7	300	.6
Engineers -----	103,400	33,100	32.0	97,300	33,200	34.1	-100	-.3
Scientists -----	21,200	15,200	71.7	20,500	14,800	72.2	400	2.7
Total technicians -----	172,500	31,200	18.1	156,200	30,400	19.5	800	2.6
Commercial laboratories, research, and other business services:								
Total scientists and engineers ---	55,200	37,200	67.4	51,500	38,200	74.2	-1,000	-2.6
Engineers -----	38,900	24,200	62.2	35,400	25,100	70.9	-900	-3.6
Scientists -----	16,300	13,000	79.8	16,100	13,100	81.4	-100	-.8
Total technicians -----	48,200	20,800	43.2	38,900	19,500	50.1	1,300	6.7
Medical and dental laboratories:								
Total scientists and engineers ---	1,600	400	25.0	1,400	200	14.3	200	100.0
Engineers -----	-	-	-	-	-	-	-	-
Scientists -----	1,600	400	25.0	1,400	200	14.3	200	100.0
Total technicians -----	20,700	700	3.4	18,500	1,200	6.5	-500	-41.7
Engineering and architectural services:								
Total scientists and engineers ---	67,000	10,700	16.0	64,100	9,600	15.0	1,100	11.5
Engineers -----	64,000	8,800	13.8	61,200	8,100	13.2	700	8.6
Scientists -----	3,000	1,900	63.3	2,900	1,500	51.7	400	26.7
Total technicians -----	103,300	9,800	9.5	97,800	9,700	9.9	100	1.0

1/ Also included are lumber, wood products, and furniture; other transportation equipment; and other manufacturing industries.

2/ Due to a change in estimating procedure and the allocation of consolidated reports in the motor vehicle industry, 1967 data are not comparable with 1966. This adjustment also affects to a lesser degree certain other industries, namely, aircraft and parts, ordnance, and parts missiles, and industries in the electrical machinery group. However, the effect of this adjustment is largely restricted to two occupations, engineers, and engineering and physical science technicians.

3/ Also included are tobacco manufactures; printing, publishing, and allied industries; and leather and finished leather products.

4/ Also included are agricultural services, forestry, and fisheries.

NOTE: Detail may not add to totals because of rounding or inclusion in totals of items not shown separately.

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Table A-11. Technicians employed for each 100 scientists and engineers, and R&D technicians for each 100 scientists and engineers in R&D by industry, 1967

Industry	Total scientists and engineers	Technicians		In R&D		
		Total	Average number for each 100 scientists and engineers	Total scientists and engineers	Technicians	
					Total	Average number for each 100 scientists and engineers
Total	1,013,100	734,700	73	382,300	173,100	45
Manufacturing	713,300	416,000	58	322,600	135,800	42
Durable goods manufacturing, total 1/	550,700	346,000	63	259,000	110,000	42
Aircraft, ordnance, and missiles	154,300	59,100	38	95,800	27,000	28
Aircraft and parts	93,400	38,200	41	58,900	16,800	29
Ordnance and missiles	60,900	20,900	34	36,900	10,200	28
Stone, clay, and glass products	12,000	7,400	62	2,900	1,400	48
Primary metal industries	29,200	18,200	62	4,000	1,900	48
Fabricated metal products	31,800	25,800	81	8,700	5,000	57
Machinery, except electrical	88,600	77,800	88	33,400	17,000	51
Specialized machinery and equipment	51,800	43,600	84	13,400	7,300	54
Office and computing machines	22,800	22,700	100	14,800	7,300	49
Electrical machinery	152,500	104,400	68	81,300	39,800	49
Electrical distribution equipment and industrial apparatus	28,700	24,000	84	10,500	5,600	53
Communication equipment	72,700	42,900	59	50,300	22,800	45
Electronic components	28,800	22,500	78	11,200	6,800	61
Motor vehicles and equipment	31,500	18,800	60	12,600	7,900	63
Instruments and related products	38,100	22,500	59	12,200	7,200	59
Nondurable goods manufacturing, total 2/	162,600	70,000	43	63,600	25,800	41
Food and kindred products	13,600	5,100	38	3,900	1,200	31
Textile and apparel	5,500	2,400	44	1,500	300	20
Paper and allied products	13,900	8,100	58	4,800	2,100	44
Chemicals and allied products	99,400	40,800	41	43,900	18,600	42
Industrial chemicals	43,100	18,000	42	18,900	7,800	41
Plastics and synthetics, except glass	18,200	8,200	45	6,600	3,800	58
Drugs	16,900	5,300	31	8,800	2,600	30
Petroleum refining and related industries	14,700	6,200	42	3,500	1,800	51
Rubber and miscellaneous plastics products	12,400	5,500	44	4,900	1,200	24
Nonmanufacturing industries, total 3/	299,800	318,700	106	59,700	37,200	62
Metal, coal, and nonmetallic mining	7,100	3,500	49	1,100	1,100	100
Crude petroleum and natural gas extraction	24,600	8,800	36	2,700	400	15
Contract construction	43,600	25,700	59	1,200	1,000	83
Transportation and related services	9,800	6,700	68	,900	200	22
Communications	18,300	34,500	189	300	200	67
Electric, gas, and sanitary services	27,100	21,200	78	1,000	200	20
Wholesale and retail trade	34,900	38,000	108	3,200	2,700	84
Finance, insurance, and real estate	9,200	7,200	78	1,000	100	10
Business, medical, and engineering services	124,600	172,500	138	48,300	31,200	65
Commercial laboratories, research, and other business services	55,200	48,200	87	37,200	20,800	56
Medical and dental laboratories	1,600	20,700	1,294	400	700	175
Engineering and architectural services	67,000	103,300	154	10,700	9,800	92

1/ Also included are lumber, wood products, and furniture; other transportation equipment; and other manufacturing industries.

2/ Also included are tobacco manufactures; printing, publishing, and allied industries; and leather and finished leather products.

3/ Also included are agricultural services, forestry, and fisheries.

NOTE: Detail may not add to totals because of rounding or inclusion in totals of items not shown separately.

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Table A-12. Scientists and engineers as percent of total employment in selected industries, 1966—67

Industry	1967	1966
Total, all industries	3.0	2.9
Manufacturing	4.0	4.0
Durable goods manufacturing	5.2	5.2
Aircraft, ordnance, and missiles 1/	13.8	15.4
Aircraft and parts	11.4	-
Ordnance and missiles	20.2	-
Stone, clay, and glass products	2.0	2.0
Primary metal industries	2.2	2.1
Fabricated metal products	2.3	2.4
Machinery, except electrical	4.5	4.5
Specialized machinery and equipment	4.1	4.1
Office and computing machines	9.8	9.8
Electrical machinery	7.7	8.1
Electrical distribution equipment and industrial apparatus	6.8	7.4
Communication equipment	14.5	16.6
Electronic components	7.0	
Motor vehicles and equipment 1/	3.5	
Instruments and related products	8.7	8.8
Nondurable goods manufacturing	2.3	2.2
Food and kindred products	.8	.7
Textile and apparel	.3	.4
Paper and allied products	2.1	2.2
Chemicals and allied products	10.2	10.7
Industrial chemicals	13.8	14.2
Plastics and synthetics, except glass	8.9	9.4
Drugs	14.2	14.7
Petroleum refining and related industries	8.4	7.8
Rubber and miscellaneous plastics products	3.5	2.3
Nonmanufacturing	1.8	1.8
Metal, coal, and nonmetallic mining	2.3	2.3
Crude petroleum and natural gas extraction	11.3	8.2
Contract construction	1.8	1.9
Transportation and related services	.5	.4
Communications	1.9	1.9
Electric, gas, and sanitary services	4.3	4.4
Wholesale and retail trade	.6	.6
Finance, insurance, and real estate	.5	.5
Business, medical, and engineering services	6.7	6.8
Commercial laboratories, research, and other business services	7.3	7.6
Medical and dental laboratories	4.2	4.0
Engineering and architectural services	25.0	25.7

1/ Due to a change in estimating procedure and the allocation of consolidated reports in the motor vehicle industry, 1967 data are not comparable with 1966. This adjustment also affects to a lesser degree certain other industries, namely, aircraft and parts, ordnance and missiles, and industries in the electrical machinery group. However, the effect of this adjustment is largely restricted to 2 occupations, engineers and engineering and physical science technicians.

NOTE: Ratios were computed on the basis of employment only within scope of the survey.

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Table A-13. Employment and percent distribution of scientists and engineers by industry and size of establishment, 1967

Industry	Total	Size of establishment			Total	Percent distribution		
		1000 and over	100-999	Under 100		1000 and over	100-999	Under 100
Total	1,013,100	541,600	304,300	167,100	100.0	53.5	30.0	16.5
Manufacturing	713,300	466,600	191,700	55,100	100.0	65.4	26.9	7.7
Durable goods manufacturing, total 1/	550,700	386,300	124,200	40,200	100.0	70.1	22.6	7.3
Aircraft, ordnance, and missiles	154,300	141,100	12,200	1,000	100.0	91.4	7.9	.6
Aircraft and parts	93,400	84,700	7,800	900	100.0	90.7	8.4	.9
Ordnance and missiles	60,900	56,400	4,400	100	100.0	92.6	7.2	.2
Stone, clay, and glass products	12,000	4,500	5,600	1,900	100.0	37.5	46.7	15.8
Primary metal products	29,200	19,000	8,000	2,200	100.0	65.1	27.4	7.5
Fabricated metal products	31,800	11,700	13,500	6,700	100.0	36.8	42.5	21.1
Machinery except electrical	88,600	44,400	28,700	15,400	100.0	50.1	32.4	17.4
Specialized machinery and equipment	51,800	18,600	25,000	8,500	100.0	35.5	48.3	16.4
Office and computing machines	22,800	18,600		4,300	100.0	81.6	-	18.9
Electrical machinery	152,500	107,600	36,000	8,900	100.0	70.6	23.6	5.8
Electrical distribution and industrial apparatus	28,700	14,700	10,600	3,500	100.0	51.2	36.9	12.2
Communication equipment	72,700	61,600	10,100	1,000	100.0	84.7	13.9	1.4
Electronic components	28,800	16,800	8,700	3,200	100.0	58.3	30.2	11.1
Motor vehicles and equipment	31,500	27,500	3,700	300	100.0	87.3	11.7	1.0
Instruments and related products	38,100	24,700	10,500	2,800	100.0	64.8	27.6	7.3
Nondurable goods manufacturing, total	162,600	80,300	67,500	14,800	100.0	49.4	41.5	9.1
Food and kindred products	13,600	3,900	6,100	3,600	100.0	28.7	44.9	26.5
Textile and apparel	5,500	1,400	3,900	100	100.0	25.5	70.9	1.8
Paper and allied products	13,900	6,300	6,900	700	100.0	45.3	49.6	5.0
Chemicals and allied products	99,400	54,100	38,000	7,300	100.0	54.4	38.2	7.3
Industrial chemicals	43,100	27,300	14,000	1,800,	100.0	63.3	32.5	4.2
Plastics and synthetics, except glass	18,200	11,900	5,700	600	100.0	65.4	31.3	3.3
Drugs	16,900	10,200	5,800	900	100.0	60.4	34.3	5.3
Petroleum refining and related industries	14,700	7,600	6,200	1,000	100.0	51.7	42.2	6.8
Rubber and miscellaneous plastics products	12,400	5,300	4,900	2,200	100.0	42.7	39.5	17.7

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Table A-13. Employment and percent distribution of scientists and engineers by industry and size of establishment, 1967—Continued

Industry	Total	Size of establishment			Total	Percent distribution		
		1000 and over	100-999	Under 100		1000 and over	100-999	Under 100
Nonmanufacturing industries, total	299,800	75,100	112,700	112,000	100.0	25.1	37.6	37.4
Metal, coal, and nonmetallic mining	7,100	2,300	3,500	1,300	100.0	32.4	49.3	18.3
Crude petroleum and natural gas extraction	24,600	6,000	12,200	6,400	100.0	24.4	49.6	26.0
Contract construction	43,600	-	20,000	23,700	100.0	-	45.9	54.4
Transportation and related services	9,800	7,000	1,800	1,100	100.0	71.4	18.4	11.2
Communications	18,300	10,500	600	7,200	100.0	57.4	3.4	39.3
Electric, gas, and sanitary services	27,100	15,000	9,700	2,400	100.0	55.4	35.8	8.9
Wholesale and retail trade	34,900	2,800	15,800	16,300	100.0	8.0	45.3	46.7
Finance, insurance, and real estate	9,200	1,400	6,600	1,200	100.0	15.2	71.7	13.0
Business, medical, and engineering services	124,600	30,100	42,400	52,100	100.0	24.2	34.0	41.8
Commercial laboratories, research, and other business services	55,200	22,500	18,400	14,300	100.0	40.8	33.3	25.9
Medical and dental laboratories	1,600	-	200	1,400	100.0	-	12.5	87.5
Engineering and architectural services	67,000	7,400	23,200	36,400	100.0	11.0	34.6	54.3

1/ Also included are lumber, wood products, and furniture; other transportation equipment; and other manufacturing industries.

2/ Also included are tobacco manufactures; printing, publishing,and allied industries; and leather and finished leather products.

3/ Also included are agricultural services, forestry, and fisheries.

NOTE: Detail may not add to totals because of rounding or inclusion in totals of items not shown separately.

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Appendix B. Survey Methods

This appendix contains a brief discussion of coverage and conduct of the survey, nature of the estimates, problems of definition and classification of data, and comparability of the 1967 survey with earlier surveys.

Scope of the survey

The basic sample of establishments included in the survey was drawn from lists of establishments reporting to State employment security agencies for unemployment compensation purposes (first quarter of 1963). This list was supplemented by a list of railroads and related companies. (Except in Hawaii and Alaska, most railroads are interstate and are not included in the State UI statistics.) These combined lists included approximately 2,300,000 organizations with around 45 million employees and comprise the most comprehensive and readily accessible roster of establishments available in the United States. The sample was further supplemented by a list of establishments which had reported an exceptionally high proportion of scientists and engineers in the 1963 and 1964 surveys. This group of reporting units included a large number of establishments selected in earlier samples as supplemental members.[1] Most of these establishments were independent research and development laboratories which work under contract. The ratio of scientists and engineers employed to total employment in these units was, on the average, 50 percent higher than the overall average for industry. Although no special recognition was made for technicians in the supplemental listing, they were considered in the general design of the sample. For example, medical and dental laboratories which have a high representation of technicians were covered extensively in the survey—all size groups were represented and there was no cutoff.

Certain categories of establishments were eliminated from the master list before the sample was selected, either because a separate survey of the given category was being sponsored by the National Science Foundation or because the number of scientific and technical personnel employed was believed to be negligible. The categories or organizations omitted were those classified according to the standard industrial classification system[2] in the following major industry groups: 01 and 02—farms; 071—agricultural services, except animal husbandry and horticultural services; 55—automotive dealers and gasoline service stations; 56—apparel and accessory stores; 57—furniture and home equipment; 80—medical and other health services (except 807, medical and dental laboratories, which was included); 82—educational services; 84—museums, art galleries, and botanical and zoological gardens; 86—nonprofit membership organizations; 88—private households; 89—miscellaneous services (except 891, engineering and architectural services, which was included); 91 through 94—government; and 99—nonclassifiable establishments.

Establishments below a specified minimum size, determined separately for each major industry group, also were excluded from the sample. (See appendix table A-4.) Very few scientists, engineers, or technicans are employed in these small-sized establishments. These minimum-size cutoffs were essential to the efficiency of the survey. Altogether, 1.8 million establishments employing nearly 11 million workers were excluded from the original lists of establishments. Since the unemployment insurance (UI) listing of establishments from which the sample was drawn was compiled as of March 1963, the survey also did not reach establishments created after that date. However, this exclusion does not necessarily mean an understatement, since current employment

[1] The 1961-64 sample contained a supplemental group of about 800 research and development laboratories drawn originally from the 11th edition of Industrial Research Laboratories of the United States, 1960 No. 844 (National Research Council), and A List of Small Business Concerns Interested in Performing Research and Development, June 1960 (U.S. Department of Commerce, Small Business Administration).

[2] All industrial classification for this survey was in terms of the 1957 Standard Industrial Classificational Manual. See Standard Industrial Classification Manual, 1957 and the 1963 Supplement. Executive Office of the President, Bureau of the Budget.

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figures are used as the basis of the estimate to which are applied the proportionate ratios of scientists and engineers.

As a result of the exclusions described above, a sampling universe of about 530,000 establishments employing around 33 million workers remained. Before the sample was drawn, the universe listing was stratified by State, region, industry, and size of establishment.

Sample design

The survey sample consists of three major segments: The probability segment, supplementals, and multiestablishment reporters. The probability segment comprised nearly 25,000 establishments in the 1967 survey, selected at random from the March 1963 State UI lists. Supplementals, including railroads and selected establishments known to employ large numbers of scientists and engineers, raised this total to slightly over 27,000 establishments. About 1,200 of these establishments were known to be incorporated into about 300 companies that report on a multiestablishment basis, either company- or industrywide or on a divisional or regional basis. In addition to the 1,200 establishments drawn in the probability sample, the reports from these 300 companies covered about 10,000 units not in the sample.

The sampling ratio in the probability segment was varied in relation to size of establishment and other factors to obtain maximum reliability with resources available. In every covered industry, all establishments having 1,000 employees or more were included in the sample. In other industry-size cells, the sampling ratios ranged from 1 in 1 to 1 in 100. In general, the larger the establishment and the greater the number of technical personnel used by the industry, the higher was the sampling ratio. This procedure varied for the supplementals. Although the railroads were reported on a company rather than establishment basis, they were handled the same as the probability segment with certainty cases of 1,000 or more and a cutoff (50) for the smaller size groups. In contrast, all establishments on the supplemental list of high scientist- and engineer-users were included with a weight of unity and added to their appropriate industry-size class, regardless of the sampling ratio used in the UI sample for that particular industry- size class; and if the supplemental establishment duplicated a UI sample unit, it was treated as a supplemental unit with a weight of unity. The sample was designed to obtain satisfactory estimates of total scientists and engineers and of technicians in as much industry detail as possible from a sample of this size and, in addition, to obtain State estimates for as many States as practical. This necessitated different sampling ratios in the same industry-size group for different States.

Definitions used

The definitions used in the 1967 survey were the same as those used in 1966 and previous surveys. These definitions were developed originally in consultation with industry representatives and others having knowledge of the field. The objective was to describe clearly the desired information and also to conform, insofar as possible, to customary personnel accounting practices. It was recognized that wide differences in organization and personnel records among industries, as well as among establishments in the same industry, would make inevitable some variation interpretation and application of the definitions.

The definition of the term "technician" was especially subject to variations in interpretation. There is, as yet, no general agreement as to the meaning of this term, which covers positions with a variety of job titles that differ among establishments. Consequently, the categories of personnel included in the figures reported for this item probably contain a higher order of response variation than do any of the other occupational categories contained in this bulletin.

A definition of the desired reporting unit also was provided. This definition was based, by necessity, on that used by the UI agencies in the listing of establishments from which the

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sample was drawn.[3] Separate information was requested for each establishment. Since it was known that some multiestablishment companies might find it difficult to supply the requested information for each separate establishment, it was stated on the questionnaire that if necessary, data might, be submitted on a multi-establishment basis. In 1967, this alternative procedure was followed by about 300 companies with over 10,000 establishments. It also was noted on the questionnaire that multi-industry companies might submit separate reports among corporate industrial division lines or on another comparable basis, since this method, from an industry survey viewpoint, is generally preferable to a single multiestablishment company report.

Conduct of the survey

The questionnaire for the 1967 survey, reproduced in appendix C was substantially the same as that used in 1966. It requested information on the employment of scientists and engineers by occupational function and their employment on Federal Government work; data on the employment of economists, statisticians, and psychologists; and technicians. The findings concerning the employment of scientists and engineers on Federal Government work and data on the employment of economists, statisticians, and psychologists have been excluded from this report pending further study.

The questionnaires were mailed in February 1967, in most instances directly to the establishments. There were two full scale mail followups; the first was a simple remainder letter to the entire mailing list, and the second was a complete followup of all outstanding respondents. A third followup by mail, telephone, or field visit was made of selected critical nonrespondents that were essential to obtain meaningful data on a State level.

[3] UI reporting procedures permit establishment reports for units that may be statewide or countrywide in scope or less than plantwide (e.g., all of a corporation's insurance agents in a given State cited as a separate establishment).

Each questionnaire was screened before it was accepted. Screening was designed to insure that each report was arithmetically consistent with respect to the various items, subtotals, and totals reported; that it was properly classified by industry and size class; and that it represented the specific establishment drawn for the sample rather than multiestablishment report of either a single or multi-industry type. Each questionable item was researched to the fullest extent possible, including contact with the respondent, in order to determine what sort of correction to the originally submitted data was needed. Approximately 25 percent of all questionnaires received required some form of correction adjustment.

The industrial classifications of the establishment in the survey were, in general, those assigned by the State employment security agencies, which developed the lists from which the sample was drawn. The industry classification for each establishment in the probability segment of the sample was determined by each State agency on the basis of the establishment's principal product. The industry code originally assigned to an establishment was changed in relatively few cases. When a multiestablishment return was received, the employment data for the return were distributed by occupation, industry, and size in accordance with product or service information furnished by each respondent.

Comparability with previous surveys

The 1967 survey is basically comparable to the 1966 survey. The same sample of establishments was used, and identical questionnaires and definitions were employed. However, certain factors can affect comparability to some degree. Even though response rates may be similar, for example, the data received from the same establishment responding in two different years may indicate a difference in the interpretation of the definitions. Despite these variations, the total effect on year-to-year comparability is small, except for items where very small numbers were involved.

The estimating and processing procedures between 1967 and 1966 survey were unchanged.

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Estimating methods

Estimating procedures used in this survey apply individually to each of the covered occupations. The group totals, such as life scientists, physical scientists, and total scientists and engineers, are summed from the estimates of the individual occupations comprising them. Estimates are obtained for each industry-size cell as a result of applying, to the total employment of the corresponding universe cell, the ratio of the sum of weighted employment in each occupation to the sum of weighted total employment derived from sample respondents.

The procedures used for the probability cells and the supplemental cells are necessarily treated in somewhat different ways. The methods are described below. The symbols used in the estimating equations were as follows:

M = total universe employment (derived from BLS employment estimates and a special tabulation of employment reported in the UI program), as of January of each related year.

e_{1i} = total employment reported by the i-th establishment in the probability sample.

e_{2i} = total employment reported by the i-th establishment in the supplemental sample.

e_{3i} = total employment distributed by estimating cell, as reported by the i-th consolidated reporter (both multi- and single-industry types).

B_o = total employment of the supplemental units at the time the selection was made (January 1963).

B_1 = corresponding total employment of all responding supplement units (January 1963).

w_i = the sampling ratio reciprocal of units selected in the probability sample.

p_{1i} = item of estimate reported by the i-th establishment of the probability sample.

p_{2i} = item of estimate reported by the i-th establishment in the supplemental sample.

p_{3i} = distributed item of estimate imputed from the i-th unit of a consolidated reported (both multi- and single-industry types).

Since all estimates are calculated separately for each stratum, no notation representing industry or size is used.

The estimate (P'_1), such as the number of engineers performing research and development, was calculated for establishments tabulated in the probability sample as:

$$P'_1 = M' \left(\frac{\Sigma p_{1i} w_i}{\Sigma e_{1i} w_i}\right), \text{ where}$$

$$M' = M-(E'_2 + \Sigma e_{3i}) \text{ and}$$

$$E'_2 = \Sigma e_{2i} \left(\frac{B_o}{B_1}\right)$$

Estimates of all functions in each occupation were obtained by summation. The estimate for establishments drawn in the supplemental sample was calculated as :

$$P'_2 = \Sigma p_{2i} \left(\frac{B_o}{B_1}\right)$$

The estimate for each industry-size stratum was calculated as:

$$P' = P'_1 + P'_2 + \Sigma P_{3i}$$

Returns from multiestablishment reporters are only for the units covered and are not used as a basis for estimating total of other units, such as nonrespondents. Thus, the total from these multiestablishment reports are not subject to sampling errors as such. However, since reports of this type frequently cover units

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in two industries or more, it is necessary to distribute occupational employment among these industries. The method of distribution is the same for each occupation and can be illustrated by the following example:

Company X reports a total of 1,500 employees, 1,000 in cell Pa and 500 in cell Pb. In addition it reports a total of T engineers but does not indicate how many are in each of the two cells. In brief, the procedure used to estimate the distribution by cell was: A preliminary estimate was first made for each cell by applying the cell ratio of engineers to total employment (in the probability segment of the cell) to the reported employment by Company X in then cell. These preliminary estimates were than proportionately adjusted to the reported total number of engineers for the company. This is expressed in symbolic terms as follows:

	Cell P_a	Cell P_b
Given Engineers in probability segment	$\Sigma(p_{ai}\, w_{ai})$	$\Sigma(p_{bi}\, w_{bi})$
Reported employment in probability segment	$\Sigma(e_{ai}\, w_{ai})$	$\Sigma(e_{bi}\, w_{bi})$
Reported company X employment	1000	500

Then

$$P'_a = \frac{1000\ \Sigma(p_{ai}\, w_{ai})}{\Sigma(e_{ai}\, w_{ai})} \qquad P'_b = \frac{500\ \Sigma(p_{bi}\, w_{bi})}{\Sigma(e_{bi}\, w_{bi})}$$

$$P_{3a} = \frac{P'_a}{P'_a + P'_b} \cdot T \qquad P_{3b} = \frac{P'_b}{P'_a + P'_b} \cdot T$$

where P_{3a} = estimated engineers for company X in cell P_a and P_{3b} = estimated engineers for company X in cell P_b.

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BLS No. 2716-A

Budget Bureau No. 44-R1157.6
Approval Expires December 31, 1967

FOR BLS USE ONLY						
Date			Batch number			
Date	Action					

(PLEASE CHANGE ADDRESS OR ZIP CODE IF INCORRECT)

A SURVEY OF SCIENTIFIC AND TECHNICAL PERSONNEL IN INDUSTRY: 1967

U.S. DEPARTMENT OF LABOR
Bureau of Labor Statistics

PLEASE REPLY FOR UNIT IDENTIFIED ON LABEL

Since this survey is based on a sample of units, multiunit companies may receive more than one questionnaire. Your reply to this questionnaire should be restricted, if possible, to the unit identified on the label. If it is not feasible to supply separate figures for each unit, please follow the alternate reporting method described in Paragraph 1 of the REPORTING INSTRUCTIONS.

YOUR REPLY WILL BE HELD IN STRICT CONFIDENCE

GENERAL INSTRUCTIONS: Data should apply, if possible, to the pay period which included January 12, and should cover total employment of the reporting unit and all personnel who were working as engineers, scientists, technicians, or other designated occupational groups. (See Paragraph 2 of the REPORTING INSTRUCTIONS.)

Information supplied on this form will be seen only by sworn employees of the Bureau of Labor Statistics. Only statistical summaries that preserve the confidentiality of the data supplied will be released.

Mail one copy of completed questionnaire to:

COMMISSIONER OF LABOR STATISTICS
U.S. DEPARTMENT OF LABOR
WASHINGTON, D.C. 20212

1. GENERAL INFORMATION—to be completed by ALL respondents:

PLEASE COMPLETE ITEMS 1.10(a) AND (b) WHETHER OR NOT YOU EMPLOY ANY OF THE SPECIALIZED PERSONNEL SHOWN IN ITEM 1.20.
(Please reply for both years)

1.10 Enter total employment (whether full- or part-time, salaried or hourly, employees):

1.20 Did you have ANY employees in the following categories as of January 1967 or 1966? Please check YES or NO for items 1.21 through 1.28 (definitions are contained in Paragraph 2 of the REPORTING INSTRUCTIONS).

	AS OF JANUARY 1967 (a)		AS OF JANUARY 1966 (b)	
	YES	NO	YES	NO
1.21 Engineers	☐	☐	☐	☐
1.22 Mathematicians	☐	☐	☐	☐
1.23 Physical scientists	☐	☐	☐	☐
1.24 Life scientists	☐	☐	☐	☐
1.25 Economists	☐	☐	☐	☐
1.26 Statisticians	☐	☐	☐	☐
1.27 Psychologists	☐	☐	☐	☐
1.28 Draftsmen, surveyors, and technicians	☐	☐	☐	☐

If ANY item 1.21–1.28 is checked YES, please complete applicable items 2 through 5 on the reverse side of this form.
If ALL items 1.21–1.28 are checked NO, please complete this page only.

1.30 Method of reporting (see Paragraph 1 of the REPORTING INSTRUCTIONS):

1.31–1.33 This is a report for—(please check only one):

1.31 Reporting unit shown on the address label ☐ 1.32 Entire company (if NOT requested on the address label) ☐ 1.33 Other than 1.31 or 1.32 ☐

If 1.31 has been checked, do not complete item 6 unless specifically requested on the address label.

If 1.32 or 1.33 has been checked, does this report cover more than one industry as described in Paragraph 5 of the REPORTING INSTRUCTIONS?

1.34–1.35 1.34 ☐ Yes 1.35 ☐ No

If 1.34 has been checked, item 6 should be completed in accordance with Paragraph 4 of the REPORTING INSTRUCTIONS. If 1.35 has been checked, the industry classification of the reporting unit represented by this report should be entered below. (See Paragraph 5 of the REPORTING INSTRUCTIONS.)

1.36 _____ (Principal product or service) _____ (Industry Group Code)

Person to be addressed if questions arise concerning this report:

_____ (Name (Please print or type)) _____ (Title) _____ (Street, City and State) _____ (ZIP) _____ (Phone)

- 1 -

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TERMS ARE DEFINED IN PARAGRAPH 2 OF THE REPORTING INSTRUCTIONS
(Please reply for both years—Reasonable estimates will be satisfactory)

2. ENGINEERS, MATHEMATICIANS, AND SCIENTISTS—BY OCCUPATION AND FUNCTION

OCCUPATION Count each person only once. Classification should be related to the occupation and function which occupies the greatest part or each individual's time.	AS OF JANUARY 1967 (Column a=the sum of b through g)							As of January 1966
		FUNCTION						
	Total employed (all functions) (a)	Performance of research—development (b)	Mgmt. & Admin. of research—development (c)	Mgmt. & Admin. of activities other than research—development (d)	Sales and Service (e)	Production and operations (f)	All other functions (g)	Total employed (all functions) (h)
2.00 TOTAL ENGINEERS, MATHEMATICIANS, PHYSICAL SCIENTISTS AND LIFE SCIENTISTS								
2.10 TOTAL ENGINEERS								
2.20 TOTAL MATHEMATICIANS								
2.30 TOTAL PHYSICAL SCIENTISTS								
2.31 Chemists								
2.32 Physicists								
2.33 Metallurgists								
2.34 Geologists and geophysicists								
2.39 Other physical scientists								
2.40 TOTAL LIFE SCIENTISTS								
2.41 Medical scientists (exclude practitioners)								
2.42 Agricultural scientists								
2.43 Biological scientists								
2.49 Other life scientists								

3. ENGINEERS, MATHEMATICIANS, AND SCIENTISTS EMPLOYED ON FEDERAL GOVERNMENT WORK

Were any of the ENGINEERS, MATHEMATICIANS, or SCIENTISTS reported in item 2.00 employed on Federal Government Work in 1967 or 1966? (If 3.01 is checked indicating yes for either year please complete items 3.00 through 3.21 below)		(a) as of 1967	(b) as of 1966
	3.01 Yes	☐	☐
	3.02 No	☐	☐

SUMMATION INSTRUCTIONS

Item 2: Vertically, item 2.00 equals the sum of items 2.10 plus 2.20 plus 2.30 plus 2.40; item 2.30 equals the sum of 2.31 through 2.39; and item 2.40 equals the sum of 2.41 through 2.49.

Item 3: Vertically, item 3.00 equals the sum of items 3.10 plus 3.20.

OCCUPATION AND FUNCTION	AS OF JANUARY 1967 (Column a=b+c+d)				AS OF JANUARY 1966
	All Federal agencies (a)	Department of Defense (b)	National Aeronautics and Space Administration (c)	Other agencies (d)	All Federal agencies (e)
3.00 TOTAL ENGINEERS, MATHEMATICIANS, PHYSICAL SCIENTISTS AND LIFE SCIENTISTS					
3.10 Total engineers					
3.11 Engineers primarily engaged in performing or administering research-development					
3.20 Total mathematicians, physical or life scientists					
3.21 Mathematicians, physical or life scientists primarily engaged in performing or administering research-development					

NOTE: For this survey the production of standard items (e.g., shelf or vendor items) for the Federal Government is NOT considered work performed for the Federal Government. See Paragraph 3 of the REPORTING INSTRUCTIONS for further explanation. Occupations and functions reported in item 3 **cannot** exceed the number reported for comparable occupations and functions in item 2. Item 3.11 **cannot** exceed 3.10 and item 3.21 **cannot** exceed 3.20.

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TERMS ARE DEFINED IN PARAGRAPH 2 OF THE REPORTING INSTRUCTIONS
(Please reply for both years—Reasonable estimates will be satisfactory)

4. ECONOMISTS, STATISTICIANS, AND PSYCHOLOGISTS

OCCUPATION	As of January 1967 (a)	As of January 1966 (b)
4.00 TOTAL—ECONOMISTS, STATISTICIANS, AND PSYCHOLOGISTS		
4.10 ECONOMISTS		
4.20 STATISTICIANS		
4.30 PSYCHOLOGISTS		

5. DRAFTSMEN, SURVEYORS, AND TECHNICIANS

OCCUPATION	As of January 1967 (a)	As of January 1966 (b)
5.00 TOTAL—ALL OCCUPATIONS LISTED BELOW		
5.10 DRAFTSMEN		
5.20 SURVEYORS		
5.30 ELECTRICAL AND ELECTRONIC TECHNICIANS		
5.40 OTHER ENGINEERING AND PHYSICAL SCIENCE TECHNICIANS		
5.50 BIOLOGICAL AND AGRICULTURAL TECHNICIANS		
5.60 MEDICAL AND DENTAL TECHNICIANS		
5.90 OTHER TECHNICIANS		

5.99 DRAFTSMEN, SURVEYORS, AND TECHNICIANS ENGAGED IN RESEARCH AND DEVELOPMENT as of January 1967.

Enter the number of draftsmen, surveyors, and technicians reported in item 5.00(a) who spent the greatest proportion of their time performing, managing, or administering research and development activities. NOTE: Item 5.99 CANNOT exceed the entry in 5.00(a).

SUMMATION INSTRUCTIONS

Item 4: Vertically, item 4.00 equals the sum of items 4.10 through 4.30.
Item 5: Vertically, item 5.00 equals the sum of items 5.10 through 5.90.

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6. ADDITIONAL INFORMATION REQUESTED FROM COMPANIES WHICH HAVE SELECTED THE ALTERNATE METHOD OF REPORTING (CONSOLIDATED REPORTS)

(See paragraph 1B and paragraph 4 of the Reporting Instructions before completing this item.)

UNITS COVERED BY ITEMS 1 THROUGH 5			DISTRIBUTION OF UNITS AND EMPLOYMENT					
			UNITS WITH 1–99 EMPLOYEES		UNITS WITH 100–999 EMPLOYEES		UNITS WITH 1,000 OR MORE EMPLOYEES	
INDUSTRY GROUP CODE (A)	TOTAL NUMBER OF UNITS, AS OF JANUARY 1967 (B)	TOTAL EMPLOYMENT, AS OF JANUARY 1967 (C)	NUMBER OF UNITS (D)	NUMBER EMPLOYED (E)	NUMBER OF UNITS (F)	NUMBER EMPLOYED (G)	NUMBER OF UNITS (H)	NUMBER EMPLOYED (I)
TOTAL— ALL INDUSTRIES								

Units covered by "Partial Consolidations." (If more space is required, please attach extra pages.)

(UNIT NAME)	(ADDRESS)

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BUDGET BUREAU NO. 1157.6
Approval Expires December 31, 1967

REPORTING INSTRUCTIONS

A SURVEY OF SCIENTIFIC AND TECHNICAL PERSONNEL IN INDUSTRY 1967 BLS FORM 2716-A

CONTENTS

Paragraph	Subject	Page
1.	**METHODS OF REPORTING**	2
	A. Reporting Unit	2
	B. Alternate Method of Reporting	2
2.	**DEFINITION OF TERMS**	3
	A. General	3
	B. Occupations	4
	C. Functions	11
3.	**FEDERAL GOVERNMENT WORK**	14
4.	**INSTRUCTIONS FOR COMPLETION OF ITEM 6**	15
	A. General	15
	B. Specific Instructions	15
	C. Partial Consolidations	17
5.	**INDUSTRY DEFINITIONS AND GROUP CODES**	18

U.S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS

A SURVEY OF SCIENTIFIC AND TECHNICAL PERSONNEL IN INDUSTRY 1967

DETAILED REPORTING INSTRUCTIONS

1. METHOD OF REPORTING

A. **Reporting Unit.—Replies should be restricted, insofar as possible, to the reporting unit identified on the label.** This survey is based primarily on a sample of individual establishments — or "Reporting Units"—which correspond to units reported to the State Employment Security Agency for unemployment compensation purposes. It is, therefore, possible for multiunit companies to receive more than one questionnaire. As a general rule, each reporting unit is engaged in only one, or predominantly one, industry or other type of economic activity at one location. Some reporting units, however, may be designated, for purposes of this survey, as "All employees in a given State," or "All employees in a particular city" or "All employees in a specified county of a State." Please reply, if possible, for the unit identified on the mailing label of the questionnaire.

B. **Alternate Method of Reporting.—** Experience has shown that a few multiunit companies cannot prepare reports on an establishment or reporting unit basis as described above. Therefore, an alternate method of reporting is prescribed

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for all such respondents as follows:

If you cannot supply separate figures for the unit(s) identified on the label, please complete items 1–5 on BLS Form 2716–A on a companywide, or other consolidated basis, and check questionnaire items 1.32 or 1.33, as appropriate. Similarly, if it is possible to prepare separate reports for some requested units, but not for others, please complete those establishment reports for which separate data are available, and prepare a consolidated report(s) for the other segments of your company. **Whenever a consolidated report is filed, please complete item 6 of BLS Form No. 2716–A.** Directions for preparing item 6 are included in paragraph 4 of these instructions. Special arrangements may be made for filing consolidated reports on an industry or division basis by contacting the Bureau of Labor Statistics, Washington, D.C. 20212 by mail, or by phone (Area code 202, 961–2477).

2. DEFINITION OF TERMS

A. General

Employees in the specialized occupations covered by this survey should be counted on a **"Working As"** basis, as of the date of the report (mid-January 1967), regardless of field of degree or whether they hold a college degree. For example, an employee trained as an engineer but working as a mathematician as of the date of the report should be reported as a mathematician. Similarly, an em-

ployee trained as a biological technician but working as a medical technician as of the date of the report should be reported as a medical technician. If actual data are not available, estimates made by the respondent are acceptable. When data are **not** available and reasonable estimates are deemed by the respondent to be impossible, please write "Not Available" in the appropriate items of the questionnaire.

B. Occupations

Engineers (items 1.21 and 2.10).—Count as engineers all persons actually engaged in chemical, civil, electrical, mechanical, metallurgical, or any other type of engineering work at a level which requires knowledge of engineering equivalent at least to that acquired through completion of a 4-year college course with a major in one of these fields, **regardless of whether they hold a college degree.** Include all engineers in research and development, production, management, technical service, sales, and other positions which require them to use the indicated level of knowledge in their work. **Exclude** persons trained in engineering, but currently employed in positions not requiring the use of such training. Include architectural engineers; **exclude** architects.

Mathematicians (items 1.22 and 2.20).—Count as mathematicians only those persons whose positions require a knowledge of mathematics equivalent at least to that acquired through a 4-year college

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course with a major in mathematics and who spend the greatest proportion of their time in development or application of mathematical techniques, **regardless of whether they hold a college degree.** Include all mathematicians in research and development, production, management, technical service, sales, and other positions which require them to use the indicated level of knowledge in their work. Include actuaries, statisticians, and computer programmers **only** if they specialize in mathematical techniques. **Exclude** accountants.

Physical Scientists (items 1.23 and 2.30).—Count as physical scientists all chemists, physicists, metallurgists, geologists, geophysicists, and other physical and earth scientists who are actually engaged in scientific work at a level which requires a knowledge of the physical sciences equivalent to that acquired through completion of a 4-year college course with a major in one of the physical science fields, **regardless of whether they hold a college degree.** Include all physical scientists engaged in research and development, production, management, technical service, sales, and other positions which require them to use the indicated level of knowledge in their work. **Exclude** persons trained in the physical sciences but currently employed in positions not requiring the use of such training.

Life Scientists (items 1.24 and 2.40).—Count as life scientists all medical scientists, agricultural scientists, biological scientists, and other life scientists who are actually engaged in scientific work at a level which requires a knowledge of the life sciences equivalent to that acquired through completion of a 4-year college course with a major in one of the life science fields, **regardless of whether they hold a college degree.** Include all life scientists engaged in research and development, production, management, technical service, sales, and other positions which require them to use the indicated level of knowledge in their work. **Exclude** persons trained in the life sciences but currently employed in positions not requiring the use of such training. **Exclude** psychologists from this category, and report them in item 4.30 of BLS Form 2716–A. Definitions for medical, agricultural, and biological scientists follow.

Medical Scientists.—*Count as medical scientists only those physicians, dentists, public health specialists, pharmacists, and members of other scientific professions who meet the general requirements for "Life Scientists" and who are concerned with the understanding of human diseases and improvement of human health, and spend the greatest proportion of their time in clinical investigation or other research, production, technical writing, and related activities. Exclude from this category all practitioners—that is, those medical scientists who spend the greatest proportion of their time providing care to patients, dispensing drugs or services, or in diagnosis, etc. Persons working as pathologists, microbiologists, pharmacologists, etc. should be* **excluded** *from the figures for medical scientists and included in the figures for biological scientists.*

Agricultural Scientists.—*Count as agricultural scientists all persons who meet*

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the general requirements for "Life Scientists" and who are primarily concerned with the understanding and improvement of agricultural productivity, such as those working in agronomy, animal husbandry, forestry, horticulture, range management, soil culture, and veterinary science. **Exclude** *veterinarians who spend the greatest proportion of their time providing care to animals, since they are primarily practitioners and are not within the scope of this survey.*

Biological Scientists.—*Count as biological scientists all persons who meet the general requirements for "Life Scientists" and who spend the greatest proportion of their time in scientific work dealing with life processes other than those classified in the agricultural and medical sciences. Include pathologists, microbiologists, pharmacologists, bacteriologists, toxicologists, botanists, zoologists, etc.*

Economists, Statisticians, and Psychologists (items 1.25–1.27 and 4).—Include all employees who are actually working as economists, statisticians, or psychologists, at a level which requires knowledge of these subjects equivalent at least to that acquired through completion of a 4-year college course with a major in one of these fields, **regardless of whether they hold a college degree.** **Exclude** persons trained in one of these fields who are currently employed in positions which do not specifically require the use of such training. Definitions for the individual occupations follow.

Economists.—*Count as economists those persons who meet the general requirements for this item and who perform studies, or are engaged in research, of a fundamentally economic nature, e.g., the analysis, interpretation, or forecasting of economic trends and conditions; the study of relationships within the economy—either of wide scope or in specialized areas such as finance, price*

movements, manpower, international trade, or domestic market conditions. Include market research analysts who are trained in economics and who utilize this knowledge in the performance of their duties. Also include persons whose primary function is to consult with or advise management on economic conditions and trends in the formulation of company plans or policy. **Exclude** *accountants or fiscal analysts whose primary duties are to evaluate company costs or prepare corporate ratios.*

Statisticians.—*Count as statisticians all persons,* **other than those reported as mathematicians,** *who meet the general requirements for this item and who are primarily engaged in the recurrent application of statistical techniques which involve the use of mathematical-statistical theory equivalent to that taught at the college level,* **regardless of college degrees held.** *For purposes of this survey, statistical techniques shall include the design of surveys or experiments as well as the collection, organization, interpretation, or analysis of numerical data. Such data may represent either complete enumeration or statistical samples. Persons counted within the framework of this definition may be employed in business fields such as finance, marketing, management analysis, or advertising; in social science fields such as economics, political science, demography, or psychology; in engineering fields; or in physical or life science fields such as biology, agriculture, pharmacology, or medicine.* **Exclude** *statisticians who are engaged solely in the development of mathematical theory associated with the general application of statistical techniques—these persons should be reported as mathematicians. Also,* **exclude** *persons engaged in quality control, time or motion study applications, inventory control, computer programming, testing, etc., who utilize statistical techniques merely as an occasional adjunct to the performance of other primary duties; these persons should be reported as engineers, economists, psychologists, technicians, or excluded entirely from the specialized personnel included in this survey—whichever is most appropriate.*

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Psychologists.—*Count as psychologists all persons who meet the general requirements for this item and who are concerned with the application or establishment of principles related to human behavior in order to help management make decisions regarding personnel policies, procedures, products, or services. Psychologists frequently will be engaged in specialized fields such as industrial, experimental, consumer, consulting, clinical, social, educational, or engineering psychology. Examples of psychologists' range of job duties might include such provinces as: consultation with management to furnish expert professional advice, opinion, assistance, or knowledge in the application and use of psychological methods, theories, and techniques; behavior modification through personal counseling, interviewing, management development, and industrial, communication programs; training and education for employees and managers; or measurement and evaluation of individual and group behavior through the application, development, administration, validation, and interpretation of psychological tests. Other job duties might be related to techniques of product design and development, including the application of knowledge derived from studies of consumer behavior and of human characteristics; research on personnel policies and practices; employee attitudes and motivation; job and organizational effectiveness; marketing and advertising, and the design, development, and operation of complex systems with regard to the human factors involved.*

Draftsmen, Surveyors, and Technicians (items 1.28 and 5).—Count in this occupational grouping all persons actually engaged in technical work at a level which requires knowledge of engineering, mathematical, and physical or life sciences, comparable to that acquired **either** through study at technical institutes, junior colleges, or other formal post-high school training less extensive than a 4-

year college course, **or** through equivalent on-the-job training or experience. Some typical job titles are draftsman, surveyor, laboratory assistant, physical science aid, and electronic technician. All persons in positions which require the indicated level of knowledge should be counted, **regardless of job title or department in which employed.** Computer programmers who meet the above definition of technicians should be reported on line 5.90 of the questionnaire, "Other technicians." **Exclude** those persons whose positions require knowledge or training consistent with the foregoing definitions of engineers, mathematicians, or scientists, and report them in the appropriate occupational category on the questionnaire. Also, **exclude** all craftsmen such as machinists and electricians, and specialized personnel such as airline pilots, navigators, flight engineers, and ships' officers. Separate definitions of electrical and electronic technicians; other engineering and physical science technicians; biological and agricultural technicians; and medical and dental technicians follow.

Electrical and Electronic Technicians.—*Count in this group technicians with a background in electrical or electronic theory, physical science, and mathematics which enables them to perform jobs above the* **routine** *operating or maintenance levels. Normally, such employees are engaged in constructing, repairing, testing, installing, modifying, operating, or even designing a variety of production or experimental types of complex electrical or electronic equipment.*

Other Engineering and Physical Science Technicians.—*Count in this group tech-*

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nicians who assist engineers and physical scientists in both laboratory and production types of activities. Normally, these technicians work under the direct supervision of an engineer or scientist and assist him in those functions usually described as "routine" at the professional level.

Biological and Agricultural Technicians.—*Count in this group all life science technicians except medical and dental technicians, as defined below.*

Medical and Dental Technicians.—*Count in this group employees working as laboratory assistants whose duties include such operations as making laboratory tests; taking or developing X-ray pictures; constructing metal clamps, inlays, and bridge work according to specifications; and who in other ways assist in medical or dental research or laboratory operations.* **Exclude** *technicians whose primary function is care or treatment of patients, such as nurses.*

C. Functions

Research and Development.—Include in this function in item 2 (cols. b and c), items 3.11 and 3.21, and item 5.99 respectively, those engineers; mathematicians; physical and life scientists; and draftsmen, surveyors, and technicians **who spend the greatest proportion of their time** performing, managing, or administering basic and applied research in engineering, mathematics, and physical and life sciences (including medicine) and in the design and development of prototypes and processes. If the primary objective of an activity is to make further improvements on the products or processes, then the work is research-development. If, on the other hand, the product or process is substantially "set," and the primary objective is to develop

markets, do preproduction planning, or get the production process going smoothly, then the work is no longer research-development. For purposes of this survey, research and development **includes** the activities described below whether assigned to separate research and development organizational units of the establishment, or carried on by laboratories and technical groups not part of a separate research and development unit per se.

(a) Pursuit of planned research for new knowledge, whether or not the search has reference to a specific application.

(b) Application of existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.

(c) Application of existing knowledge to problems involved in the improvement of a present product or process.

Research and Development Excludes the Following Functions:

Market research (including statistical surveys of product acceptance, estimates of market size, and studies of channels of distribution); market development (including the sale of either old or new products to obtain acceptance of them in new outlets); quality and quantity control tests and analyses; trouble-shooting in connection with breakdowns in full-scale production, including related analytical work; technical plant sanitation control; work required for minor adaptations of a specific product to meet the requirements of a specific customer, including installation and servicing in a customer's plant; engineering and other technical service furnished in accordance with agreements to licensees outside the company; aid furnished by the research and development organization to manufacturing divisions to enable them to operate in accordance with previously determined formulas, standard practice instructions, or finished product specifications; aid furnished to develop advertising programs to promote

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or demonstrate new products or processes, including the development of material furnished for trial or demonstration; assistance in preparation of speeches and publications for persons not engaged in research and development; experimental work performed at the request of the patent division to provide information needed during the prosecution of a patent litigation, and technical writing.

Management and Administration.—Column (c) and column (d) of item 2 should include all persons who spend the greatest proportion of their time in managerial or administrative work for which scientific and engineering background consistent with the above definitions of engineers, mathematicians, physical and life scientists is normally required. Enter the number of such employees engaged in administering research-development in column (c) of item 2. Enter in column (d) of item 2 the number of engineers, mathematicians, physical and life scientists engaged in administering sales and service, production operations, and all other phases of engineering and scientific work. Do not include supervisors in columns (c) or (d) who spend more than half of their time on functions other than Management and Administration.

Sales and Service.—Enter in column (e) of item 2 the number of engineers, mathematicians, physical and life scientists included in column (a) who are primarily engaged in sales work and/or in providing technical services directly to customers. Include only those persons who qualify as engineers, mathematicians, physical and life scientists according to the above

definitions and whose work involves contact with customers. Persons engaged in providing technical service to another part of the parent company should be counted in column (f) of item 2, "Production and Operations."

Production and Operations.—Enter in column (f) of item 2 the number of engineers, mathematicians, physical and life scientists who spend the greatest proportion of their time on work related to the production processes or operations of the reporting unit such as inspection, quality control, etc. Include such employees who are working on design, analysis, and testing activities that are not part of research-development. These employees, if engaged in administration of these activities, should be counted in column (d) of item 2.

All Other Activities.—Enter in column (g) of item 2 the number of engineers, mathematicians, physical and life scientists who spend the greatest proportion of their time in functions not falling within one of the other categories in columns (b) through (f) of item 2; some examples are exploration (locating fuels and other natural resources), technical purchasing, market research, and operations research. Engineers, mathematicians, physical and life scientists, engaged in administering these activities should be counted in column (d) of item 2.

3. FEDERAL GOVERNMENT WORK

Item 3 on the questionnaire is designed to obtain estimates of the total number

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of engineers, mathematicians, and scientists employed by industry whose work is involved directly with national defense, space, and other programs of the Federal Government. Work performed for the Federal Government includes production, research, development, testing, evaluation, or other activities under prime contracts with the Department of Defense, including the Army, Navy, Air Force, Marine Corps, Defense Atomic Support Agency, and all other Department of Defense organizations; the National Aeronautics and Space Administration; or other agencies of the Federal Government. Also, include work performed under subcontracts with prime contractors or other subcontractors. The production of standard items for sale (e.g., shelf or vendor items) to the Federal Government is **not** considered work performed for the Federal Government for purposes of this survey.

4. INSTRUCTIONS FOR COMPLETION OF ITEM 6

A. **General.**—Item 6 is needed to provide basic information used to make distributions of all data reported in items 1 through 5 which represent consolidations (companywide or partial). **Each** reporter who submits a companywide (consolidated), or partially consolidated report, should complete this item. A "total line" is provided as the first line of item 6, and should be filled in whenever data are included for **more than one** major product or industry group code.

B. **Specific Instructions.—Column A:** Enter the industry group codes which represent the principal products or services of each of the

units included in the consolidated report shown on BLS Form No. 2716–A, **using a separate line for each group code.** A list of products and services, their industry group codes, and their respective "SIC" codes are shown at the end of these instructions (paragraph 5). **Column (B):** Enter the total number of separate plants, establishments, or other designated reporting units applicable to **each** industry group code listed in column (A).

Column (C): Enter the January 1967 total employment applicable to each industry group code. The sum of all entries in column (C) should represent the total employment figure reported in item 1.10 (a) of the related BLS Form 2716–A. Employment on company overhead located in **separate** establishments covered by the consolidated report should be listed as an aggregate figure in column (C), and designated (OV) in column (A) in lieu of an industry group code. **Columns (D) through (I):** Enter a distribution of the January 1967 total employment shown in column (C) and the total number of plants or establishments (or other designated reporting units) from column (B), subdivided by small, medium, and large establishments: i.e., establishments with fewer than 100 employees, 100–999 employees, and 1,000 or more employees. **The sum of the entries in columns (D) through (I) must equal the entries in columns (B) and (C), respectively.** For example, a company with five plants, having an aggre-

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gate of 3,200 employees engaged in the manufacture and distribution of glass products; with a distribution of 50, 250, 500, 1,100, and 1,300 employees in five plants, might report as follows: Column (A)—group code 20; column (B)—5; column (C)—3,200; column (D)—1; column (E)—50; column (F)—2; column (G)—750 (250 + 500); column (H)—2; and column (I)—2,400 (1,100 + 1,300). The same technique also would apply to each other product or service applicable to this company, as indicated by the entries in column (A). Thus, if the same company also employed an additional 2,400 employees in another industry area (i.e., another group code) the entry in column (C) of the next line of this form would be 2,400 and the total line, column (C) would be 5,600 (3,200 + 2,400), as would the entry in item 1.10(a) of the related BLS Form No. 2716–A. Also, items 2 through 5 on the consolidated BLS Form No. 2716–A would relate to all the units included in the consolidated total of 5,600 employees.

C. **Partial Consolidations.**—At the bottom of Item 6 are blank lines to be used by companies that have elected to file reports which, for any reason, represent partial companywide reports (Partial Consolidations). It is requested that such reporters use this part of the form to list the names and addresses of the units covered by their report. The total **number** of such units will, of course, have been reported in Item 6, column (B), and a breakdown of this figure,

by size of unit, in columns (D), (F), and (H), respectively.

5. INDUSTRY DEFINITIONS AND GROUP CODES

For purposes of this survey, American industry has been classified into approximately eighty separate categories. Each category, or industry grouping, represents a single Standard Industrial Classification (SIC) code (see manual published by the Bureau of the Budget, 1957—as amended) or a grouping of these codes. The subdivisions used for this survey are identified in three ways: (1) an industry group code, (2) a descriptive name of the industries or types of business activity included in the group code, and (3) the related SIC code or codes. These three identifying elements are specified in the list of industry classifications which follows.

Item 1.36 on BLS Form 2716–A asks each respondent who reports for a unit other than that identified on the address label to indicate his **principal** product or service, and the related industry group code. The listing noted below should be used for this purpose. Directions for the use of this list in connection with the preparation of Item 6 are contained in paragraph 4 of these instructions.

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INDUSTRY GROUP CODE	PRINCIPAL PRODUCT OR SERVICE	RELATED SIC CODES
01	*Ordnance and Accessories*	19
02	*Food and Kindred Products* (Includes related products such as ice, chewing gum, fats and oils, and prepared feeds for animals and fowls.)	20
03	*Tobacco Manufactures* (Excludes the manufacture of insecticides made from tobacco by-products.)	21
04	*Textile Mill Products*	22
05	*Apparel and Other Finished Fabric Products*	23
06	*Lumber and Wood Products* (Except Furniture.)	24
07	*Furniture and Fixtures* (Made from wood, metal, or other products.)	25
08	*Paper and Allied Products* (Includes the manufacturing of pulps from wood or other cellulose products.)	26
09	*Printing and Publishing* (Excludes news syndicates and textile product printing or finishing.)	27
	CHEMICALS AND ALLIED PRODUCTS	
10	*Industrial Chemicals* (Excludes products made from these chemicals.)	281
11	*Plastics Materials and Synthetic Resins and Man-Made Fibers* (Excludes the manufacture of finished products made from these materials and glass or glass products.)	282
12	*Drugs*	283
13	*Soaps, Detergents, and Cleaning Preparations; Perfumes, Cosmetics, and other Toiletries; Paints, Varnishes, Lacquers, and Enamels; and other Miscellaneous Chemical Products*	284–6 & 289
14	*Agricultural Chemicals* (Fertilizers, Pesticides, etc.)	287
	PETROLEUM REFINING AND RELATED INDUSTRIES	
15	*Petroleum Refining* (Excludes the production of natural gas and the manufacture of lubricants by blending and compounding purchased material.)	291
16	*Paving and Roofing Materials, and Miscellaneous Petroleum and Coal Products*	295 & 299
	RUBBER, PLASTIC AND LEATHER PRODUCTS	
17	*Rubber and Miscellaneous Finished Plastics Products* (Excludes manufacture of rubberized clothing, fabrics, webbing, and the production of basic plastics materials.)	30
18	*Leather and Finished Leather Products* (Includes artificial leather products.)	31
	STONE, CLAY, AND GLASS PRODUCTS	
19	*Hydraulic Cement* (Excludes the production of ready-mixed concrete.)	324
20	*Stone, Clay, and Glass Products* (Excludes the manufacture of ophthalmic lenses.)	321–3 & 325–9
	PRIMARY METAL INDUSTRIES	
21	*Blast Furnaces, Steel Works, and Rolling and Finishing Mills* (Excludes foundries, as well as primary and secondary smelting and refining of nonferrous metals.)	331
22	*Iron and Steel Foundries and Forgings* (Do not use this code unless it is the *principal* activity of the reporting unit.)	332 & 3391
23	*Smelting, Refining, and Finishing of Nonferrous Metals* (Do not use this code unless it is the *principal* activity of the reporting unit.)	333–6 & 3392 & 3399

INDUSTRY GROUP CODE	PRINCIPAL PRODUCT OR SERVICE	RELATED SIC CODES
	FABRICATED METAL PRODUCTS	
24	*Metal Cans; Cutlery, Hand Tools, and Hardware; Heating Apparatus (except electrical) and Plumbing Fixtures; Screw Machine Products and Fasteners; Metal Stampings; Coating and Allied Services; and Miscellaneous Fabricated Wire Products*	341–3 & 345–8
25	*Fabricated Structural Metal Products, and Other Miscellaneous Metal Products* (Except plumbing fixtures.)	344 & 349
	MACHINERY (EXCEPT ELECTRICAL)	
26	*Engines and Turbines* (Excludes aircraft and rocket engines; automotive engines, except diesel; engine generator sets; and locomotives.)	351
27	*Farm Machinery and Equipment* (Excludes machinery and equipment used primarily for construction purposes.)	352
28	*Construction, Mining, Materials Handling Machinery and Equipment; Metalworking Machinery and Equipment; Special and General Industrial Machinery and Equipment, except Electrical; and Service Industry Machinery* (Includes elevators and moving stairways; conveying equipment; hoists; exhaust and ventilating fans; refrigeration machinery (except household) and complete air conditioning units; and measuring and dispensing pumps. Excludes transportation equipment, hand tools (except power driven), and electrical household appliances. Machines powered by "built in," or detachable motors ordinarily are included in this group.)	353–6 & 358
81	*Office, Computing, and Accounting Machines* (Includes scales and balances, except laboratory. Classify photo-copy equipment in industry group code 42.)	357
29	*Miscellaneous Machinery, Except Electrical* (Includes machine shops engaged in jobbing, repair, or manufacturing of special machinery or parts—not elsewhere classified.)	359
	ELECTRICAL MACHINERY, EQUIPMENT, AND SUPPLIES	
30	*Electric Transmission and Distribution Equipment, and Electrical Industrial Apparatus* (Excludes manufacturing of frequency transformers, current-carrying devices, turbo generators, and automatic temperature controls.)	361–2
31	*Household Appliances* (Excludes commercial cooking equipment, industrial refrigeration, commercial laundry equipment, and industrial vacuum cleaners.)	363
32	*Electric Lighting and Wiring Equipment* (Excludes glass blanks for bulbs, lamp components such as filaments, etc.; production of glassware for lighting fixtures; porcelain and glass insulators.	364
33	*Radio and Television Receiving Sets, Except Communication Types; and Phonograph Records*	365
34	*Communications Equipment* (Excludes manufacturing of transmitting tubes.)	366
35	*Electronic Components and Accessories* (Includes the manufacturing of electron tubes, except X-ray tubes.)	367

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INDUSTRY GROUP CODE	PRINCIPAL PRODUCT OR SERVICE	RELATED SIC CODES
36	*Miscellaneous Electrical Machinery, Equipment, and Supplies* (Includes the manufacturing of storage and primary batteries; X-ray tubes; electrical equipment for internal combustion engines, and electrical items, not classified elsewhere.)	369
TRANSPORTATION EQUIPMENT		
37	*Motor Vehicles and Motor Vehicle Equipment* (Excludes the manufacturing of motorcycles, track laying tractors, combat tanks, tires and tubes, automobile glass, vehicular lighting equipment, ignition systems, and storage batteries.)	371
38	*Aircraft and Parts* (Excludes the manufacturing of aeronautical instruments and electrical equipment.)	372
39	*Ship and Boat Building and Repairing; Railroad Equipment; Motorcycles, Bicycles, and Parts; and Miscellaneous Transportation Equipment* (Excludes the fabricating of structural assemblies or components for ships; and shops owned or operated by railroads or transit companies, which build or repair cars for their own use.)	373–5 & 379
INSTRUMENTS AND RELATED PRODUCTS		
40	*Engineering, Laboratory, and Scientific and Research Instruments and Equipment* (Excludes optical, surgical, dental, and mechanical measuring instruments and tools; and electrical measuring and recording instruments.)	381
41	*Instruments for Measuring, Controlling, and Indicating Physical Characteristics* (Excludes the manufacturing of industrial electric controls.)	382
42	*Optical Instruments and Lenses; Surgical, Medical, and Dental Instruments and Supplies; Ophthalmic Goods; Photographic Equipment and Supplies; Watches, Clocks and Related Parts* (Excludes manufacturing of sighting and fire control instruments; molded glass blanks; unsensitized paper stock, mounts, easels, and folders for photographic use; photographic chemicals; flash, flood, and projection lamps; glass and unbreakable crystals.)	383–7
MISCELLANEOUS MANUFACTURING INDUSTRIES		
43	*Jewelry, Silverware, and Plated Ware; Musical Instruments and Parts; Toys, Amusement, and Athletic Goods; Pens, Pencils, and Artists' Supplies; Novelties and Notions* (Excludes athletic apparel; small arms ammunition and firearms; drafting instruments; and children's bicycles.)	391, 393–396
44	*Miscellaneous Manufacturing Industries, Not Elsewhere Classified*	398 & 399
AGRICULTURAL SERVICES, FORESTRY, AND FISHERIES		
45	*Animal Husbandry Services* (Excludes establishments engaged in poultry raising; and commercial kennels primarily engaged in raising dogs.)	072
46	*Horticultural Services, Hunting and Trapping, Game Propagation, Forestry, and Fisheries* (Excludes logging camps and logging contractors.)	073–4, 08 & 09

INDUSTRY GROUP CODE	PRINCIPAL PRODUCT OR SERVICE	RELATED SIC CODES
MINING (SOLIDS AND LIQUIDS)		
47	*Metal Mining*	10
48	*Anthracite and Bituminous Coal, and Lignite Mining*	11 & 12
49	*Crude Petroleum and Natural Gas* (Excludes field services for operators on a contract or fee basis.)	131
50	*Natural Gas Liquids, and Oil and Gas Field Services* (Includes field services for operators on a contract or fee basis.)	132 & 138
51	*Mining and Quarrying of Nonmetallic Minerals, Except Fuels* (Excludes establishments primarily engaged in the manufacture of stone, clay, or glass products).	14
CONTRACT CONSTRUCTION		
52	*Building Construction, General Contractors*	15
53	*Highway and Street Construction, Except Elevated Highways*	161
54	*Heavy Construction, Except Highway and Street*	162
55	*Construction, Special Trade Contractors*	17
TRANSPORTATION AND RELATED SERVICES		
56	*Railroads, Sleeping and Dining Car Service, and Railway Express Service* (Includes Repair shops.)	4011, 402 & 404
82	*Switching and Terminal Companies* (Excludes such activities when operated by railroad companies.)	4013
57	*Local and Suburban Passenger Transportation*	411
58	*Trucking, Local and Long Distance*	421
59	*Water Transportation*	44
60	*Air Transportation* (Includes terminal services.)	45
61	*Pipe Line Transportation* (Pipe line transportation of natural gas is classified in industry group code 68.)	46
62	*Transportation Services*	47
COMMUNICATION AND RELATED SERVICES		
63	*Telephone Communication* (Wire or Radio)	481
64	*Telegraph Communication* (Wire and Radio)	482
65	*Radio and Television Broadcasting*	483
66	*Other Communication Services*	489
ELECTRIC, GAS, AND SANITARY SERVICES		
67	*Electric Companies and Systems*	491
68	*Gas Companies and Systems*	492
69	*Combination Companies and Systems* (Includes companies that provide gas or electric services, in combination with other utility services.)	493
70	*Water Systems, Sanitary Services, and Steam Systems*	494–7
WHOLESALE AND RETAIL TRADE		
71	*Wholesale Trade — Dry Goods and Apparel, Groceries, and Raw Farm Products*	503–5
72	*Wholesale Trade–Motor Vehicles and Automotive Equipment; Drugs and Chemicals; Electrical Goods; Hardware, Plumbing, and Heating Equipment and Supplies; and other Miscellaneous Wholesale Trade* (Except Machinery, Equipment, and Supplies.)	501–2, 506–7 & 509
73	*Wholesale Trade — Machinery, Equipment, and Supplies*	508

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INDUSTRY GROUP CODE	PRINCIPAL PRODUCT OR SERVICE	RELATED SIC CODES
74	*Retail Trade–Building Materials, Hardware, and Farm Equipment; General Merchandise; Food; Eating and Drinking Places; and other Miscellaneous Retail Stores* (Note: Exclude automotive dealers, gasoline service stations, and the retail sale of apparel, accessories, home furnishings and equipment. These types of retail stores are *not* within the scope of this survey. Retail Department Stores, however, which sell a wide variety of products are classified within SIC 53 and, therefore, are covered by this survey.)	52–54 & 58–59
FINANCE, INSURANCE, AND REAL ESTATE		
75	*Finance and Real Estate*	60–62 & 64–67
76	*Insurance*	63

INDUSTRY GROUP CODE	PRINCIPAL PRODUCT OR SERVICE	RELATED SIC CODES
SERVICES		
77	*Hotels and Lodging Places; Personal Services; Automobile and Miscellaneous Repair; Amusement and Recreation; Advertising; and Legal Services* (Excludes commercial laboratories, and miscellaneous business and consulting services.)	70, 72; 731–6 & 75, 76, 78, 79 & 81
78	*Commercial Research, Development, and Testing Laboratories; Business and Management Consulting Services; and other Miscellaneous Business Services* (Laboratories operated primarily to service their company's own manufacturing activities should be assigned the industry group code of these activities.)	739
79	*Medical and Dental Laboratories*	807
80	*Engineering and Architectural Services*	891

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