Education and Employment Patterns of Bioscientists: A Statistical Report (1971)

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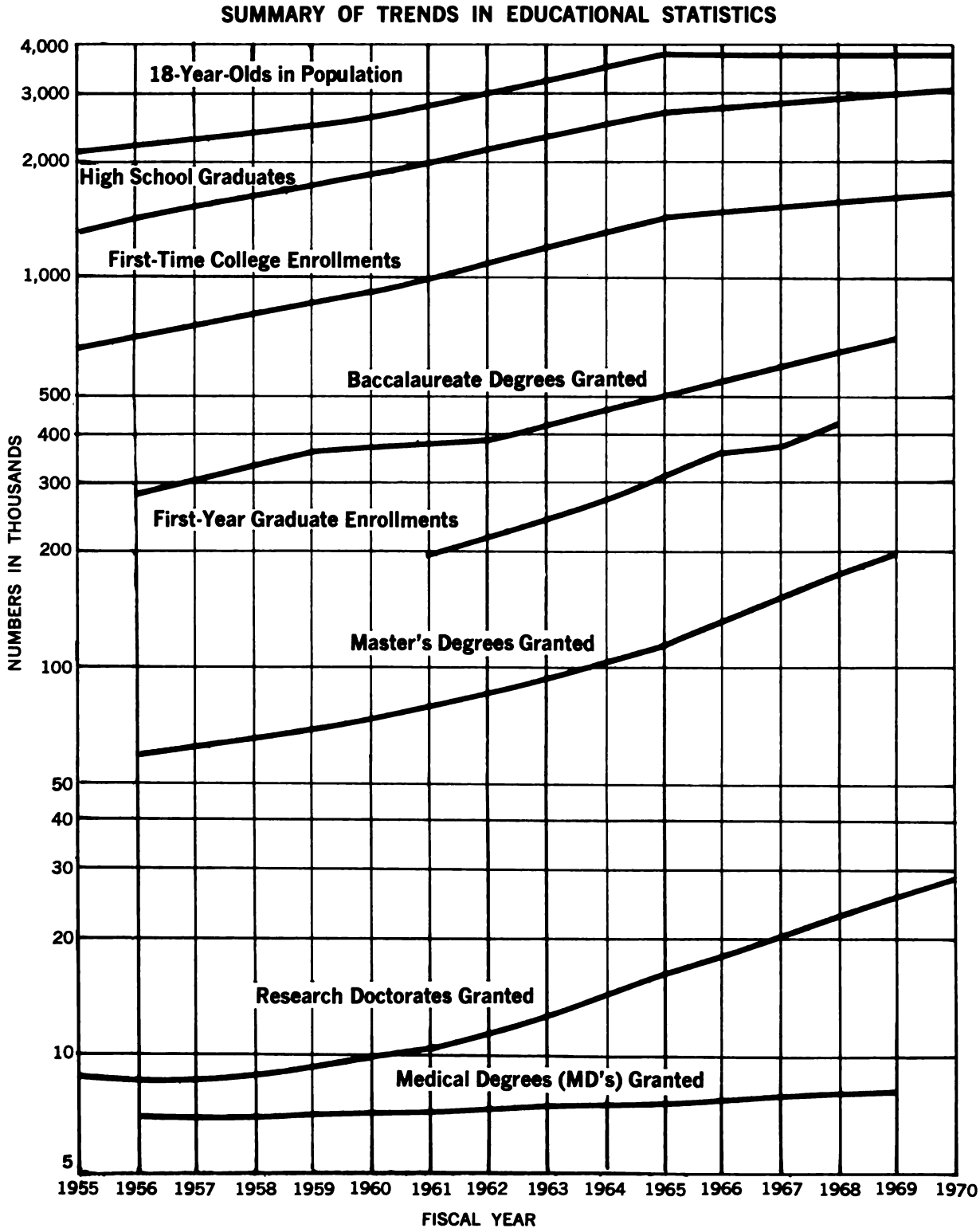
EDUCATION AND EMPLOYMENT PATTERNS OF BIOSCIENTISTS

A STATISTICAL REPORT

Prepared in the Office of Scientific Personnel of National Research Council

Under the sponsorship of the National Institute of General Medical Sciences National Institutes of Health



FOREWORD

This report contains a compilation of manpower statistics describing the education and employment of bioscientists. In order to allow for comparisons with other scientists or with nonscientists, the tables also include data from the other major disciplines.

The purpose of the study is to present objective data, collected from a variety of sources, which provide useful information for policy-makers and a broad frame of reference for further, more detailed manpower studies. Such a background is necessary to those who must evaluate trends in the education and employment of bioscientists including trends in those fields receiving training support from the National Institute of General Medical Sciences. In addition to compiling data that are readily available, the report identifies several major data gaps where information is not available or not readily and regularly available.

Guidance for the study was provided by an Advisory Committee composed of bioscientists and mathematical sociologists who suggested areas of data collection and reviewed the resulting report. Members of the Committee are:

JOHN A. D. COOPER, *Chairman*, Association of American Medical Colleges
HAROLD J. BLUMENTHAL, Stritch School of Medicine, Loyola University
WARREN O. HAGSTROM, University of Wisconsin
ROBERT W. HODGE, University of Chicago
ALLEN LEIN, University of California (San Diego)
J. F. A. MCMANUS, Federation of American Societies for Experimental Biology
GERHARD W. E. PLAUT, Rutgers, the State University

Staff members of the Office of Scientific Personnel compiled the data and planned and wrote the report. Those most closely associated with the project were:

FRED D. BOERCKER, Director of Educational and Employment Studies, who served as staff officer for the project
CLAREBETH MAGUIRE, Manpower Publications Coordinator
EDNA H. NIVEN, Administrative Secretary
HERBERT SOLDZ, Manager, Data Processing Section
GEORGE BOYCE, Manager of Systems Analysis
INGRID MEIER, Senior Programmer
CATHY ROBERTS, Programmer

Shortly after the manuscript for this report was completed, Dr. Boercker left the staff of the Office of Scientific Personnel to return to college teaching. Supervision of the final writing of the report was provided by Lindsey R. Harmon, Director of Research.

Dr. Solomon Schneyer, Chief, Program Analysis Branch, National Institute of General Medical Sciences, served as the NIGMS Project Officer, and he also provided helpful suggestions during the course of the study.

The National Institute of General Medical Sciences provided funds in support of the study and for publication of this report. This assistance is gratefully acknowledged.

It is hoped that the report will serve as a useful and timely source of basic data for those concerned with the planning and support of advanced education and with the employment of bioscientists.

William C. Kelly, *Director*
Office of Scientific Personnel

FEBRUARY 1, 1971.

CONTENTS

TABLES AND FIGURES

CHAPTER I

INTRODUCTION

Background of the study

This study is a follow-up of an earlier evaluative study of the training programs of the National Institute of General Medical Sciences (NIGMS) which was conducted by the National Research Council for NIGMS.[1] One result of the evaluative study was an impressive collection of data describing both the academic departments and the trainees and fellows receiving NIGMS support during the period FY 1958–1967. Such data continue to be collected and are now available through 1969. However, interpretation of these NIGMS data was often difficult because time-trend statistics describing the education and employment of all bioscientists and other scientists were not readily available for comparison. The primary purpose of this study was to collect such reference statistics from various sources and to present them in a convenient set of tables for ready reference and for future evaluative studies. Chapter 2 of this report contains tables of statistical information describing the education and employment of bioscientists. Policy decisions affecting higher education are made not only by universities but also by government agencies, professional societies, and industry, and such decisions should be based on reliable, objective information. Recently, policies concerning the education and employment of PhD's have received much national attention in connection with the draft, Federal financial support for research and for fellowships, and the alleged overproduction of PhD's. A second purpose of this study is to assemble manpower data which would provide background for those who make policy decisions in such matters.

Although bioscientists are the group that is treated in greatest detail in this study, the data collection was not limited to these fields. The tables list information for the other natural sciences and, in most instances, for all doctoral fields, thus providing a broad reference background for the bioscience data. Because the data do include all fields, the statistics in this report should be useful not only to the NIGMS and to bioscientists but also to specialists in many other disciplines.

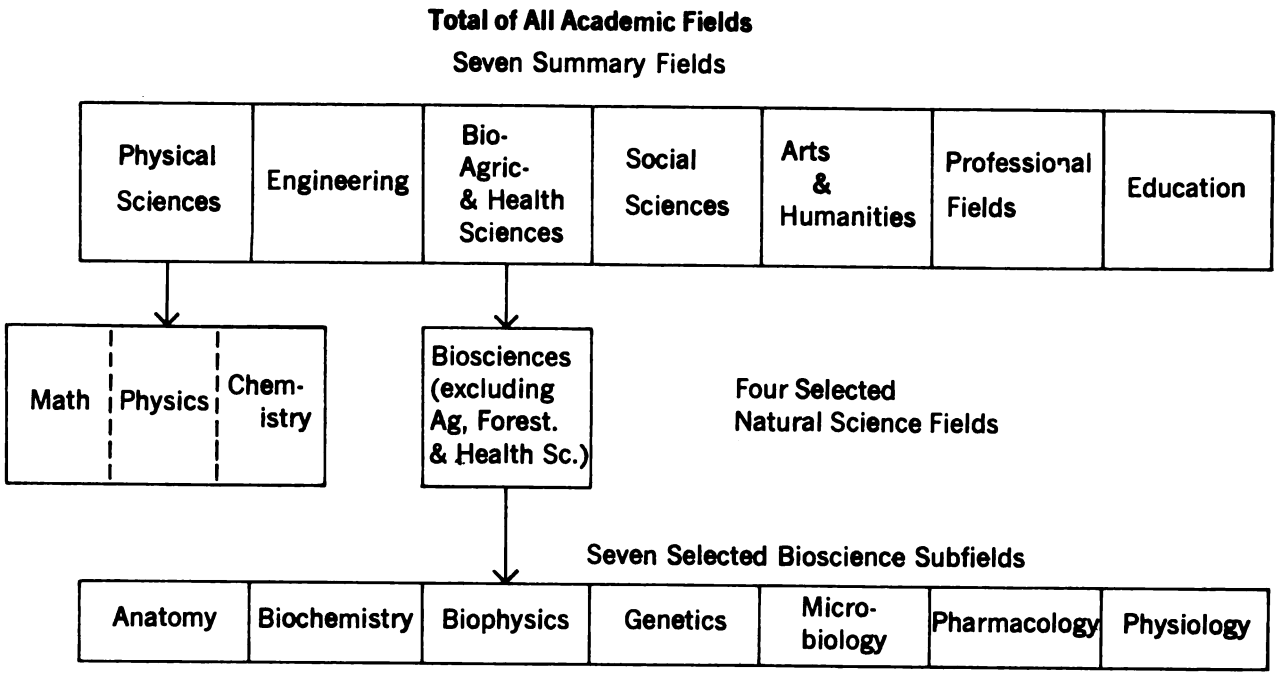
If education and employment statistics are to be useful, they must be kept reasonably current. The trend lines should not lag the present by more than one or two years, if the data are to be of maximum value. Therefore, a statistical report such as this should provide for regular updating to forestall rapid obsolescence. For this reason, the data in this report come primarily from sources that *regularly* report statistical information in published form. For example, the Office of Education annually publishes *Earned Degrees Conferred* and the National Science Foundation biennially reports on *American Science Manpower*. A number of government and private agencies have data files containing important information, but these were not included in this report because the data are not made readily available to others for updating of information. It is hoped that this publication will call attention to important data gaps and that agencies which collect such data, but do not publish regularly, will be encouraged to do so in the future. Those who wish to update statistics in this book may do so by subscribing to the publication series described in Chapter 3.

Selection of Academic Fields for Inclusion in The Study

The tables and figures in the following chapter present data which describe education and employment patterns in the various academic disciplines or fields. Most of the tables are so arranged as to present data by field, with the

[1]National Research Council, 1969 *Effects of NIGMS Training Programs on Graduate Education in the Biomedical Sciences* Washington: U.S. Department of Health, Education, and Welfare

fields organized according to the following plan:



Statistics for the seven summary fields provide a very broad perspective and allow for comparisons between trends observed in the sciences and nonscience fields. The fields of mathematics, chemistry, and physics are the largest of the physical sciences and provide appropriate comparisons with the biosciences. As used here, "biosciences" exclude agriculture, forestry, and the health sciences, which are, however, a part of the parent summary field. The seven selected bioscience subfields were chosen to be representative of the much larger number of fields supported by NIGMS, and they are long-established categories both within NIGMS and in the Doctorate Records File of the Office of Scientific Personnel, from which much of the material in this report was extracted.

Because of the close relationship between the development of the biomedical sciences and the practice of medicine, Table 6e has been included to display data for medical schools and numbers of MD's graduated.

In order to help the reader comprehend quickly the large amount of detailed information, titles have been kept succinct, and a uniform style of data presentation has been adopted throughout the chapter. Each topic is introduced by a numbered figure which generally displays graphically a time trend for a given characteristic based on the total population of interest. The figure is followed by one or more tables which provide detailed information for various subgroups of the population. Each table is numbered to correspond with the appropriate figure. If more than one table is required for the topic, alphabetic subscripts are added to the table number—for instance, Table 4a, Table 4b, etc. All tables contain references to the primary source, and notes at the bottom of the tables state definitions of any unusual terms used in the tables.

The written text accompanying the data has been kept minimal. It consists of brief statements pointing out the principal trends or patterns of the data. In this way it is hoped that the reader will be able to review general trends by use of the figures and summary statements and to study detail, when needed, in the tables. Detailed interpretation of the significance of the data lies outside the scope of this report and is left for the reader. To illustrate, the

frontispiece brings together on one page eight basic data series for some or all of the years 1955–1970. These eight trend lines, representing 18-year-olds in the population, high school graduates, first-time college enrollments, baccalaureate degrees granted, first-year graduate enrollments, masters degrees, research doctorates, and medical doctorates are graphed on semi-logarithmic paper to facilitate comparison of time trends. Each of these data series is further developed in the text, tables, and graphs of the following chapter.

CHAPTER II:

EDUCATIONAL AND EMPLOYMENT STATISTICS

Educational patterns of bioscientists

- Enrollments and degrees
- Institutions and staff
- Students
- Expenditures for training support

Employment patterns of bioscientists

- Type of employer and type of primary work activity
- Salary
- Expenditures for research

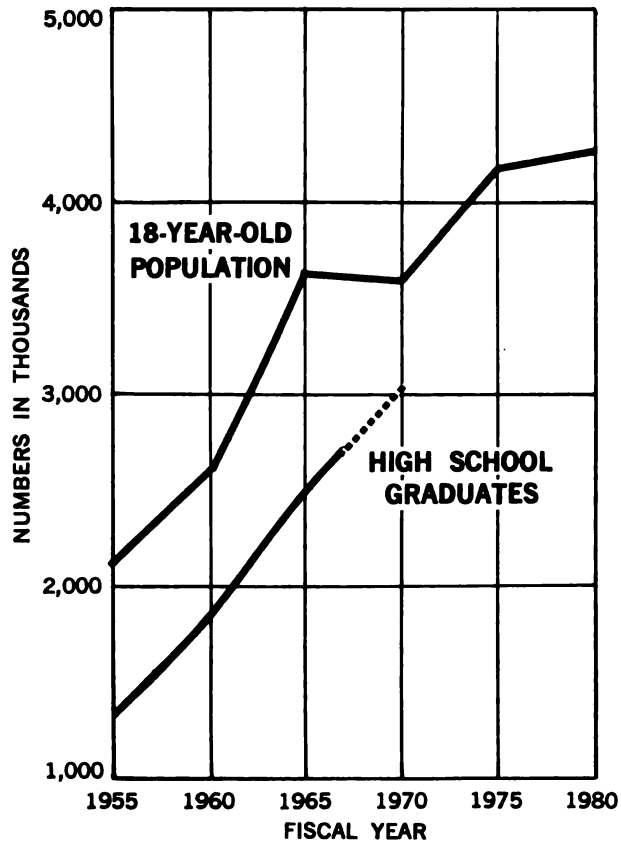
Data in the first section of this chapter describe educational patterns of bioscientists, from high school through postdoctoral training, comparing them with other scientists and with nonscientists. The statistics also point out the changing pattern of financial support for higher education. Information describing the postdoctoral careers and employment patterns is presented in the second section of the chapter. In general, the employment data have been restricted to information about research doctorate recipients because this is the only group for whom reasonably complete and reliable data are regularly published. Although the emphasis throughout is on bioscientists, comparative data are included for other major science groups and for selected nonscience groups.

The data were collected primarily from seven institutional sources: the U.S. Office of Education, the Federal Interagency Committee on Education, the Bureau of the Census, the National Science Foundation, the Educational Testing Service, the American Medical Association, and the National Research Council. The data collection techniques and publication schedules for each of the primary data sources cited in this chapter are described in detail in Chapter III.

Enrollments and Degrees

Section 1:
High school enrollments

Figure 1.
Number of high school graduates and number of 18-year-olds in population, 1955, 1960, 1965 and projected to 1980.



- The rates of growth of the 18-year old population and of the high school graduation population have decreased since 1965.
- High school graduation is rapidly approaching universal attainment in the United United States. Also, the percentage of boys graduating from high school, which had lagged behind that for girls, had become almost caught up by 1970. (Table 1a)
- Enrollments in most high school mathematics and science courses increased as rapidly between 1957 and 1965 as did the general enrollments. In 1965, however, although almost 75% of all 18-year olds have had at least one biology course in high school, only about 25% have had a course in chemistry and about 14% a course in physics. Likewise, only a small percentage of high school graduates have taken mathematics beyond elementary algebra and geometry. (Compare numbers of 18-year olds in Table 1a with enrollment numbers in Table 1b.)

TABLE 1a
Number of High School Graduates, by Sex, with Percentages of Relevant Age Groups, 1956–67, and Projected to 1975

Academic Year	High School Graduates (in Thousands)			Relevant Age Group* (in Thousands)			Percentage of Relevant Age Group		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
1955–56	682	739	1421	1118	1102	2220	61.0	67.1	64.0
1956–57	696	750	1446	1148	1127	2275	60.6	66.5	63.6
1957–58	729	784	1513	1180	1157	2337	61.8	67.8	64.7
1958–59	790	849	1639	1236	1212	2448	63.9	70.0	67.0
1959–60	898	966	1864	1343	1315	2658	66.9	73.5	70.1
1960–61	958	1013	1971	1402	1371	2773	68.3	73.9	71.1
1961–62	941	984	1925	1433	1400	2833	65.7	70.3	67.9
1962–63	959	991	1950	1406	1371	2777	68.2	72.3	70.2
1963–64	1123	1167	2290	1571	1530	3101	71.5	76.3	73.8
1964–65	1305	1337	2642	1697	1652	3349	77.0	80.9	78.9
1965–66	1326	1346	2672	1826	1776	3602	72.6	75.8	74.2
1966–67	1331	1348	2679	1798	1748	3546	74.0	77.1	75.5
1967–68	1373	1386	2759	1812	1761	3573	75.8	78.7	77.2
1968–69	1435	1446	2881	1842	1789	3631	78.0	80.8	79.3
1969–70	1503	1512	3015	1888	1835	3723	79.6	82.4	81.0
1970–71	1563	1571	3134	1942	1886	3828	80.4	83.3	81.8
1971–72	1618	1620	3238	1997	1939	3936	81.0	83.5	82.3
1972–73	1667	1664	3331	2033	1973	4006	82.0	84.3	83.2
1973–74	1716	1712	3428	2074	2013	4087	82.7	85.0	83.9
1974–75	1761	1754	3515	2101	2039	4140	83.8	86.0	84.9

*The "relevant age group" is calculated as the 3-year moving average of 18-year olds. The moving average allows for the fact that some high school graduates are age 17 and some age 19, and smooths the data somewhat as compared with the unrealistic assumption that all high school graduates are just age 18. The age group data were calculated from U.S. Census data: "*Estimates of Population of the United States by Single Years of Age, Color, and Sex 1900 to 1959*", and " . . . *1960–64*" and unpublished tabulations (series C) projected to 1975.

Sources:
The 1955–56 to 1965 high school graduation data were taken from OE 10036–66, *Projections of Educational Statistics to 1975–76*, 1966 Edition, U.S. Office of Education.
The 1965–66 to 1975 high school graduation data were taken from OE 10036–68, *Projections of Educational Statistics to 1977–78*, 1968 Edition, U.S. Office of Education and *Digest of Educational Statistics 1968*, (OE 10024–68).

TABLE 1b
Number of enrollments in science and mathematics in public high schools, by fiscal years, 1957–1965

Type of Course	Number of High School Students Enrolled (in thousands)				
	1957	1959	1961	1963	1965
Total All Science	4,044	4,670	4,905	6,020	7,244
General Science	1,518	1,581	1,549	1,827	2,176
Biology	1,430	1,677	1,686	2,487	2,694
Chemistry	520	657	708	859	1,085
Physics	310	379	385	397	526
Other Science	266	376	577	450	763
Total All Mathematics	4,401	5,108	5,174	6,731	7,496
General Mathematics	976	1,024	1,377	1,213	1,387
Elementary Algebra	1,518	1,775	1,607	2,131	2,260
Intermediate & Advanced Algebra	484	643	742	1,017	1,055
Geometry (Plane & Solid)	948	1,085	1,133	1,527	1,621
Trigonometry	200	220	246	204	231
Analytic Geometry & Analysis	na	na	na	na	217
Other Mathematics	275	361	69	639	725

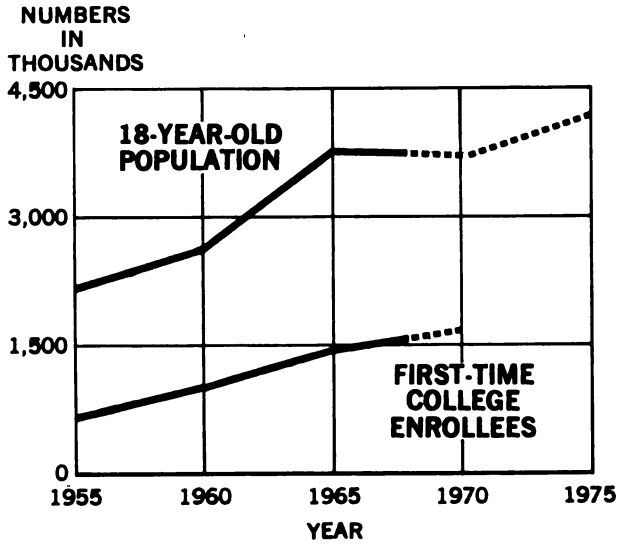
Note: The biennial survey, "Offerings and Enrollments in Science and Mathematics in Public High Schools," conducted by the U.S. Office of Education, was discontinued after 1965.

SOURCE: U.S. Office of Education, *Digest of Educational Statistics, 1968*, p. 34 U.S. Department of Commerce, *Statistical Abstract of the United States, 1966*, p. 551.

Section 2:
First-time college enrollments

Figure 2.

Number of first-time college enrollments and number of 18-year-olds in population, 1955, 1960, 1965, 1970, and projected 1975.



- The number of first-time college enrollments continues to increase, but the rate of increase has slowed since 1965.
- Almost half of the appropriate age group (18-year olds) in the United States continue with some type of formal education beyond high school.
- As of 1970, it is estimated that 61% of the male high school graduates and 49% of the female graduates continue to college.
- Women accounted for 38% of the first-time college enrollments of 1955, but they were 44% of the 1970 enrollees.

TABLE 2
Number of First-Time College Enrollments with Percentage of Relevant Age Group, by Sex, 1955–1970

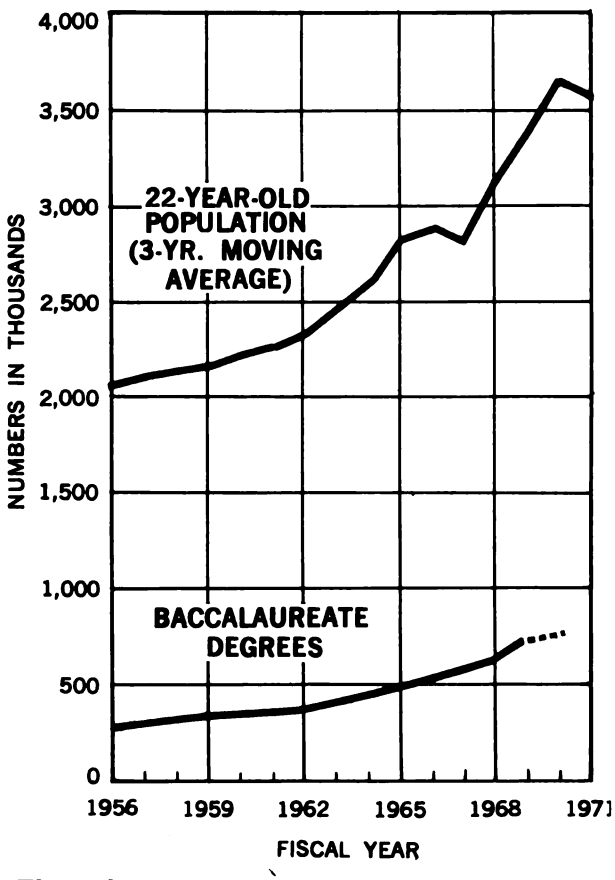
Year of Enrollment	First-Time College Enrollments (in Thousands)			Relevant Age Group* (in Thousands)			Percentage of Relevant Age Group		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
1955	416	254	670	1103	1090	2193	37.7	23.3	30.6
1956	442	273	715	1118	1102	2220	39.5	24.8	32.2
1957	441	281	722	1148	1127	2275	38.4	24.9	31.7
1958	464	308	772	1180	1157	2337	39.3	26.6	33.0
1959	486	332	818	1236	1212	2448	39.3	27.4	33.4
1960	539	384	923	1343	1315	2658	40.1	29.2	34.7
1961	592	426	1018	1402	1371	2773	42.2	31.1	36.7
1962	598	432	1030	1433	1400	2833	41.7	30.9	36.4
1963	604	442	1046	1406	1371	2777	43.0	32.2	37.7
1964	702	523	1225	1571	1530	3101	44.7	34.2	39.5
1965	829	613	1442	1697	1652	3349	48.9	37.1	43.1
1966	787	591	1378	1826	1776	3602	43.1	33.3	38.3
1967	814	625	1439	1798	1748	3546	45.3	35.8	40.6
1968	925	705	1630	1812	1761	3573	51.0	40.0	45.6
1969	(976)	(753)	(1729)	1842	1789	3631	53.0	42.1	47.6
1970	(923)	(738)	(1661)	1888	1835	3723	48.9	40.2	44.6

( ) = estimated
*See footnote (*) Table 1a

Sources:
Number of College Enrollment from USOE *Digest of Educational Statistics 1969*, (OE 10024–69).
Relevant Age Group data from U.S. Census; data smoothed by 3-year averaging.

Section 3:
Number of Baccalaureate Degrees

Figure 3.
Number of baccalaureate degrees granted fiscal years 1956, 1959, 1962, 1965, 1968, 1969, and 22-year-olds in population, 1956–1971 (3-year moving average).



- The relevant age group (22-year-olds) increased from 2.1 million in 1956 to 3.1 million in 1968. It will reach 4.2 million by 1980, level off for about 5 years, and then begin to decrease. Because some people earn baccalaureates at either younger or older ages, a 3-year moving average of ages 21, 22, and 23 has been used instead of the single-age figure, to smooth the statistics.
- During the period 1956–1968, in which the 22-year-old population increased 50%, the number of baccalaureated recipients increased 122%. The proportion of this age group with baccalaureates increased from 13.9% to 20.3%. The proportion of women with degrees jumped from 10.2% to 17.8%, while the proportion of men with baccalaureates increased from 17.4% to 22.8%.
- The social sciences and arts and humanities areas grew most rapidly in number of BA degrees earned—nearly 10% per year. In 1956 they accounted for 13% and 16% of the baccalaureate degrees, respectively, and in 1968 for 18% and 21%. Engineering, professional fields, and education dropped in percentage of total baccalaureates; the physical and biological sciences remained roughly constant in percentage of total baccalaureates between 1956 and 1968.
- Over the entire 1956-1968 period, in all the summary fields except the professions, the growth rate was greater for women than for men. In the 1956–59 period, the growth rate was higher for men in all fields; since 1959 the reverse has been true in all fields.
- Among the four natural science fields, the rate of increase of baccalaureate degrees between 1956 and 1968 was much greater in mathematics than in the other fields or in the total of all fields. The rate of increase in the biosciences and physics was about the same as that for all fields; the rate of growth for chemistry was appreciably slower than the others. The fastest-growing field in this group was mathematics; it is also the field with the largest proportion of women.

TABLE 3a
Number of Baccalaureate Degrees Granted in Seven Summary Fields, By Sex, with Percentage of Relevant Age Group, Fiscal Years 1956–1968

Year	Sex	Baccalaureate Field: Physical Sciences	Engineering	Bio-Ag-Health Sciences	Social Sciences	Arts and Humanities	Professional Fields	Education	Total Baccalaureates	Relevant Age Group (in thousands)	Percentage Bacc Relevant Age Group
1956	Male	13,293	26,251	23,439	24,128	23,789	49,864	19,883	180,647	1,041	17.4
	Female	3,024	76	7,105	11,961	21,506	12,419	50,733	106,824	1,046	10.2
	Total	16,317	26,327	30,544	36,089	45,295	62,283	70,616	287,471	2,087	13.8
1959	Male	20,167	38,044	26,328	31,145	28,562	63,102	26,448	233,796	1,077	21.7
	Female	4,281	121	8,461	13,139	25,376	11,958	61,429	124,765	1,091	11.4
	Total	24,448	38,165	34,789	44,284	53,938	75,060	87,877	358,561	2,168	16.5
1962	Male	24,051	32,989	26,119	34,447	32,719	57,791	26,077	234,193	1,168	20.0
	Female	6,401	113	9,875	15,887	35,352	11,022	71,159	149,809	1,167	12.8
	Total	30,452	33,102	35,994	50,334	68,071	68,813	97,236	384,002	2,335	16.4
1965	Male	28,445	34,760	32,566	48,818	45,416	70,212	27,900	299,117	1,413	21.2
	Female	8,964	125	13,952	25,910	54,079	14,244	90,634	207,908	1,395	14.9
	Total	37,409	34,885	46,518	74,728	99,495	84,456	118,534	496,025	2,808	17.7
1968	Male	31,546	37,464	35,046	70,303	60,044	92,635	32,709	359,747	1,581	22.8
	Female	11,455	216	22,908	42,622	75,911	20,854	103,150	277,116	1,554	17.8
	Total	43,001	37,680	57,954	112,925	135,955	113,489	135,859	636,863	3,135	20.3
	Average Annual Growth Increments Over 1956-68 Period										
	Male	7.5	3.0	3.4	9.3	8.0	5.3	4.2	6.5		
	Female	11.7	9.1	10.2	11.2	11.1	4.3	6.1	8.3		
	Total	8.4	3.0	5.5	10.0	9.6	6.5	5.6	6.9		

Note: (1) Totals in the biological-agricultural-health sciences and professional fields have been adjusted to reflect differences in categorizing "First Professional Degrees" by the U.S. Office of Education. Data for the earlier years were adjusted to conform with definitions in use since 1966.
(2) The relevant age group is defined as the 3-year moving average of 22-year olds. See text for details.

SOURCE: U.S. Office of Education, *Earned Degrees Conferred by Higher Educational Institutions.*
U.S. Department of Commerce, "Estimates of the Population of the United States, by Single Years of Age, Color, and Sex 1900 to 1959," Series P-25, No. 311, July 2, 1965, p. 10, p. 4; "Estimates of the Population of the United States, by Single Years of Age, Color, and Sex 1960 to 1964," Series P-25, No. 314, August 19, 1965, p. 7; "Estimates of the Population of the United States, by Age, Race, and Sex: July 1, 1964 to 1967," Series P-25, No. 385, February 14, 1968, p. 15.

TABLE 3b
Number of Baccalaureate Degrees Granted in Four Selected Natural Science Fields, by Sex, Fiscal Years 1956–1968.

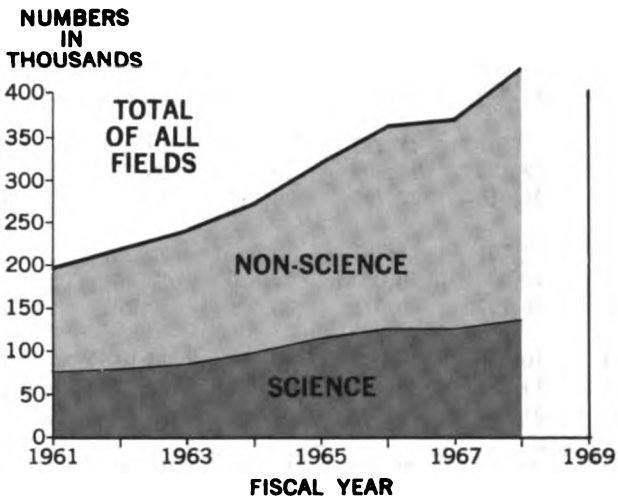
Fiscal Year	Sex	Mathematics*	Physics	Chemistry	Bio-sciences**
1956	Male	3,137	2,233	4,996	9,607
	Female	1,523	102	1,182	2,959
	Total	4,660	2,335	6,178	12,566
	% Female	32.7	4.4	19.1	23.5
1959	Male	6,504 (28)	3,668 (18)	5,897 (6)	11,503 (6)
	Female	2,515 (18)	141 (11)	1,411 (6)	3,646 (7)
	Total	9,019 (25)	3,809 (18)	7,308 (6)	15,149 (6)
	% Female	27.9	3.7	19.3	24.1
1962	Male	10,354 (17)	4,624 (8)	6,369 (2.5)	12,155 (2)
	Female	4,255 (19)	188 (10)	1,715 (7)	4,822 (10)
	Total	14,609 (18)	4,812 (8)	8,084 (3)	16,977 (4)
	% Female	29.1	3.9	21.2	28.4
1965	Male	13,177 (8)	4,679 (<1)	8,106 (8)	17,844 (14)
	Female	6,440 (15)	245 (9)	1,931 (4)	7,380 (15)
	Total	19,617 (10)	4,924 (1)	10,037 (7)	25,224 (14)
	% Female	32.8	5.0	19.2	29.3
1968	Male	14,839 (4)	4,749 (<1)	8,876 (3)	23,107 (9)
	Female	8,786 (11)	296 (6)	1,962 (<1)	8,948 (7)
	Total	23,625 (6)	5,045 (1)	10,838 (2)	32,055 (8)
	% Female	37.2	5.9	18.1	27.9

*Includes statistics.
**Excludes agriculture, forestry, and health sciences which are included in "Bio-Agricultural Health Sciences" in Table 3a.
Note: Figures in parentheses indicate average *annual* percentage increment over the 3-year period shown.
SOURCE: U.S. Office of Education, *Earned Degrees Conferred by Higher Educational Institutions.*

Section 4:
First-year graduate enrollments

Figure 4.

Number of first-year graduate enrollments, science versus all fields, FY 1961–1968.



- The total number of first-year graduate enrollments in FY 1968 was more than double that of FY 1961. (Students who had completed less than one full year of required work for an advanced degree or its equivalent in part-time work are designated as "first-year students".) Full-time enrollments increased most rapidly, representing 33.9% of the 1961–63 total enrollment, and 38.5% of the 1966–68 enrollments. (A full-time student is one whose academic load in terms of course work or other activity (such as thesis) is at least 75% of that normally expected of such students; all others are part-time students.)
- The percentage increases in enrollments, FY 1961 to FY 1968, in the sciences and engineering were less than in the nonscience fields, corresponding with a smaller rate of increase in baccalaureate degrees (see Section 3).
- Full-time first-year graduate enrollments varied from a low of 14% in education (1961–63) to 68.4% in biosciences (1966–68). From the 1961–63 period to 1966–68, the percentage of full-time first year enrollments increased in all fields, social sciences showing the greatest increase, from 51.1% to 58.6%.
- The distribution of first-year graduate enrollments among the seven summary fields is roughly proportional to the distribution of baccalaureates in these fields. The sciences and engineering account for about 40% of the baccalaureates, and they account for 45% of the full-time graduate enrollments and 32% of the total first-year enrollments.
- Among the four natural science fields, the rate of increase in total first-year graduate enrollments (1961 to 1968) for the biosciences was slightly higher than that for all fields; the rate of increase for mathematics was somewhat lower than that for all fields; and the increments for physics and chemistry markedly lower.
- In math and physics, the growth rate in baccalaureates for women lags behind that for men by at least 3 years, while in biosciences and chemistry the growth rate changes are mixed.
- In the four natural science fields, the ratio of first-year graduate enrollments to baccalaureates granted the preceding June varied widely. In math it varied between 50% and 60%; in chemistry it went up to nearly 70%; in biosciences it was slightly below 50%, while in physics it was over 100%. In evaluating these statistics, it is important to keep in mind the fact that "first-year" does *not* mean "first time in graduate school". A student attending on a part-time basis may be enrolled for several years before completing the equivalent of a full year of graduate work.

TABLE 4a.
Number of First-Year Graduate Enrollments in 7 Summary Fields, By Attendance Status FY 1961–1968

Fiscal Year	Status	Physical Sciences	Engineering	Biological Sciences	Social Sciences	Arts and Humanities	Professional Fields	Education	Total All Fields
1961	Full-time	9,408	7,996	8,549	11,592	12,038	8,560	10,782	68,925
	Part-time	10,238	11,898	4,152	11,261	11,914	18,564	60,228	128,255
	Total	19,646	19,894	12,701	22,853	23,952	27,124	71,010	197,180
1962	Full-time	9,762	8,245	8,744	12,741	13,293	8,964	10,896	72,645
	Part-time	10,334	13,306	4,567	12,175	13,809	20,585	70,071	144,847
	Total	20,096	21,551	13,311	24,916	27,102	29,549	80,967	217,492
1963	Full-time	10,782	9,092	9,537	13,751	14,461	10,263	12,331	80,217
	Part-time	11,260	14,957	4,729	12,976	16,050	22,815	77,464	160,251
	Total	22,042	24,049	14,266	26,727	30,511	33,078	89,795	240,468
1964	Full-time	11,817	10,021	10,624	16,096	17,360	10,755	13,945	90,618
	Part-time	12,961	17,390	5,469	14,987	19,173	26,447	83,794	180,221
	Total	24,778	27,411	16,093	31,083	36,533	37,202	97,739	270,839
1965	Full-time	14,141	11,433	12,819	20,564	20,742	17,076	17,009	113,784
	Part-time	14,236	18,812	6,466	16,817	22,718	35,747	89,228	204,024
	Total	28,377	30,245	19,285	37,381	43,460	52,823	106,237	317,808
1966	Full-time	15,183	12,391	14,762	23,488	25,224	20,902	19,864	131,814
	Part-time	15,099	20,121	7,415	18,507	25,519	29,548	100,827	227,036
	Total	30,282	32,512	22,177	41,995	50,743	60,450	120,691	358,850
1967	Full-time	16,768	12,890	16,153	25,099	28,137	25,734	23,982	148,763
	Part-time	13,852	19,388	6,961	16,469	24,906	38,816	101,617	222,009
	Total	30,620	32,278	23,114	41,568	53,043	64,550	125,599	370,772
1968	Full-time	17,121	13,570	16,366	28,427	32,156	29,926	28,213	165,782
	Part-time	15,237	20,164	7,437	19,321	28,074	48,386	123,625	262,244
	Total	32,358	33,734	23,803	47,748	60,230	78,312	151,841	428,026
	Percent Full-Time Enrollments								
1961-1963		48.4	38.8	66.6	51.1	48.9	31.0	14.1	33.9
1964,1965		48.7	37.2	66.3	53.4	47.6	30.6	15.2	34.7
1966-1968		52.6	39.4	68.4	58.6	52.0	37.6	18.0	38.5

Note: Students who had completed less than one full year of required work for an advanced degree or its equivalent in part-time work are designated as "first-year students".
A full-time student is one whose academic load in terms of course work or other activity (such as thesis) is at least 75% of that normally expected of such students; a part-time student is one whose academic load is less than 75%.

SOURCE: U.S. Office of Education, *Students Enrolled for Advanced Degrees*, 54019 series.

TABLE 4b.
Number of first-year graduate enrollments in 4 natural science fields, by attendance status, fiscal years 1961–1968

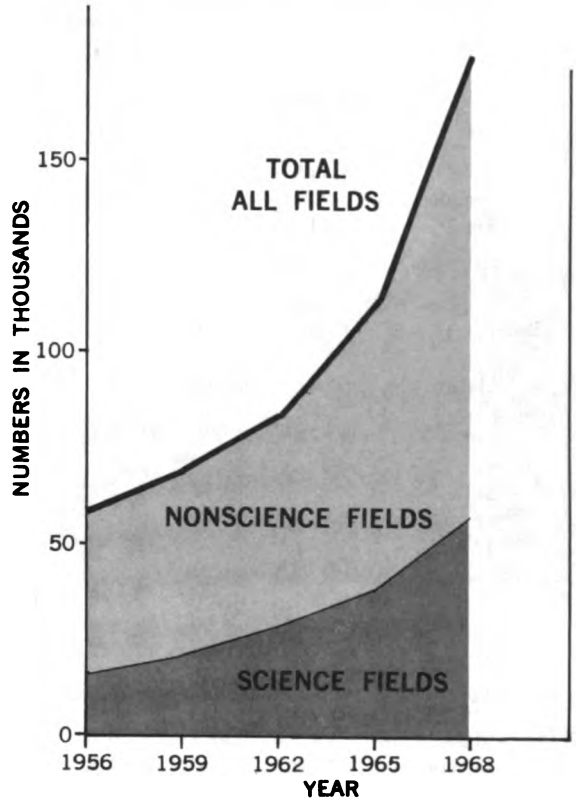
Fiscal Year	Status	Mathematics	Physics	Chemistry	Bio-sciences
1961	Full-time	2,989	2,209	2,656	4,340
	Part-time	4,466	2,233	2,526	2,697
	Total	7,455	4,442	5,182	7,037
1962	Full-time	3,234	2,400	2,697	4,634
	Part-time	4,617	2,176	2,628	3,065
	Total	7,851	4,576	5,325	7,699
1963	Full-time	3,494	2,528	3,172	5,084
	Part-time	5,319	2,329	2,717	3,112
	Total	8,813	4,857	5,889	8,196
1964	Full-time	3,952	2,694	3,418	5,973
	Part-time	6,151	2,609	3,233	3,772
	Total	10,103	5,303	6,651	9,745
1965	Full-time	4,870	3,154	3,791	7,361
	Part-time	6,960	2,773	3,162	4,460
	Total	11,830	5,927	6,953	11,821
1966	Full-time	5,343	3,263	4,038	8,486
	Part-time	7,616	2,581	3,369	5,122
	Total	12,959	5,844	7,407	13,608
1967	Full-time	5,698	3,231	4,665	9,310
	Part-time	6,926	2,037	2,679	4,890
	Total	12,624	5,268	7,344	14,200
1968	Full-time	5,577	3,373	4,608	9,528
	Part-time	7,576	2,187	2,732	5,346
	Total	13,153	5,560	7,340	14,874

Note: For definitions of "first-year enrollments," "full-time," and "part-time" see Table 4a.
SOURCE: U.S. Office of Education, *Students Enrolled for Advanced Degrees*, 54019 series.

Section 5:
Number of Master's degrees

- The number of master's degrees granted/year tripled between FY 1956 and FY 1968.
- Master's degree production is increasing much faster than the rate of growth of the 24-year old age group. The percentage of the age group attaining the master's degree increased from 3% to 6% between FY 1956 and FY 1968.

Figure 5.
Number of master's degrees granted, science versus all fields, FY 1956–1968.



- Men received two-thirds of the master's degrees awarded during the period 1956–1968. Only in education and arts and humanities did women receive as many master's degrees as men.
- The sciences and engineering, which account for 32% of the total first-year graduate enrollments, also account for 32% of the master's degrees.
- Within the four natural science fields, the rate of increase of master's degree production (1956-1968) for the biosciences and physics was about the same as that for all fields combined; the rate of increase for mathematics was almost double that for all fields; and the rate of increase for chemistry was much less than that for all fields.

TABLE 5a.
Number of Master's Degrees Granted in 7 Summary Fields, By Sex, with Percentage of 24-Year Olds, Fiscal Years 1956–1968

Fiscal Year	Sex	Master's Field: Physical Sciences	Engineering	Biological Sciences	Social Sciences	Arts and Humanities	Professional Fields	Education	Total Master's	Total 24-year olds (in thousands)	Percentage Master's /24-year olds
1956	Male	3,143	4,716	3,249	3,454	4,045	4,801	16,005	39,413	1,091	3.6
	Female	399	19	819	974	2,608	1,075	14,133	20,027	1,096	1.8
	Total	3,542	4,735	4,068	4,428	6,653	5,876	30,138	59,440	2,187	2.7
1959	Male	4,059	6,767	3,727	4,138	5,034	6,642	16,954	47,321	1,092	4.3
	Female	581	24	1,240	1,144	3,299	1,273	14,615	22,176	1,091	2.0
	Total	4,640	6,791	4,967	5,282	8,333	7,915	31,569	69,497	2,182	3.2
1962	Male	5,681	8,911	4,285	5,596	6,277	8,110	19,845	58,705	1,125	5.2
	Female	886	40	1,365	1,634	4,594	1,537	16,128	26,184	1,134	2.3
	Total	6,567	8,951	5,650	7,230	10,871	9,647	35,973	84,889	2,259	3.8
1965	Male	7,699	12,060	5,377	7,803	10,020	10,244	23,008	76,211	1,226	6.2
	Female	1,318	45	2,123	2,293	7,430	1,958	20,817	35,984	1,221	3.0
	Total	9,017	12,105	7,500	10,096	17,450	12,202	43,825	112,195	2,447	5.0
1968	Male	9,031	15,133	7,576	13,738	13,393	23,911	30,967	113,749	1,421	8.0
	Female	1,966	99	3,466	6,375	11,751	6,889	32,855	63,401	1,408	4.5
	Total	10,997	15,232	11,042	20,113	25,144	30,800	63,822	177,150	2,829	6.3
	Average Annual Percentage Growth Increments, 1956-1968										
	Male	9.3	10.1	7.3	12.2	10.6	x	5.7	9.2		
	Female	14.2	14.7	12.8	16.9	13.3	x	7.3	10.1		
	Total	9.9	10.1	8.7	13.4	11.7	x	6.4	9.5		

Note: Re-definition in 1966 of master's degrees to include those previously termed "first professional" in some subfields renders this series non-comparable between 1965 and 1968.

SOURCE: U.S. Office of Education, *Earned Degrees Conferred by Higher Educational Institutions.*
U.S. Department of Commerce, "Estimates of the Population of the United States by Single Years of Age, Color, and Sex 1900 to 1959," Series P-25, No. 311, July 2, 1965, p. 10, p. 4; "Estimates of the Population of the United States, by Single Years of age, Color, and Sex 1960 to 1964," Series P-25, No.314, August 19, 1965, p. 7; "Estimates of the Population of the United States, by Age, Race, and Sex: July 1, 1964 to 1967," Series P-25, No. 385, February 14, 1968, p. 15.

TABLE 5b.
Number of Master's Degrees Granted in 4 Natural Science Fields, By Sex, Fiscal Years 1956–1968

Fiscal Year	Sex	Mathematics*	Physics	Chemistry	Biosciences
1956	Male	719	719	1,035	1,379
	Female	179	23	129	380
	Total	898	742	1,164	1,759
1959	Male	1,188	885	981	1,543
	Female	311	30	164	459
	Total	1,499	915	1,145	2,002
1962	Male	2,179	1,363	1,163	1,982
	Female	501	62	241	660
	Total	2,680	1,425	1,404	2,642
1965	Male	3,531	1,826	1,362	2,629
	Female	812	80	322	975
	Total	4,343	1,906	1,684	3,604
1968	Male	4,202	1,993	1,579	3,963
	Female	1,331	95	407	1,554
	Total	5,533	2,088	1,986	5,517
	Average Annual Percentage Growth Increments 1956-1968				
	Male	15.9	8.9	3.6	9.2
	Female	18.2	12.5	10.1	12.5
	Total	16.3	9.0	4.5	10.0

*Includes statistics.
SOURCE: U.S. Office of Education, *Earned Degrees Conferred by Higher Educational Institutions.*

Section 6:
Numbers of research doctorates

- The number of research doctorates granted in FY 1970 was three times as great as the number granted in FY 1960.
- Despite the rapid increase in PhD production, only a very small percentage of the age group attains the doctorate. The ratio of FY 1969 doctorate recipients who were U.S. citizens to U.S. 30-year-old population was 0.009, less than 1%.
- Approximately one-eighth of all research doctorate recipients are women.
- Almost two-thirds of the doctorates are awarded in the science and engineering fields. These fields account for only one-third of the first-year graduate enrollments and one-third of the master's degrees.
- The distribution of doctorates by summary field has remained relatively stable throughout the period, except for engineering, which accounted for only 8.1% of the FY 1960 doctorates but 11.7% of the FY 1970 total.

Figure 6.
Number of research doctorates granted, science versus all fields, FY 1960–1970.

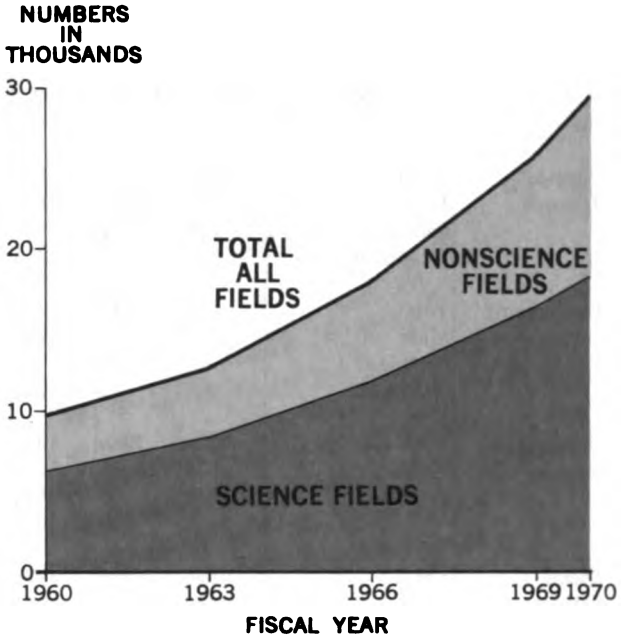


TABLE 6a
Number of Research Doctorate Degrees Granted in 7 Summary Fields, By Sex, Fiscal Years 1960–1970

Field	Sex	Fiscal Year of Doctorate										
		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Physical Sciences	Total	2125	2325	2484	2911	3116	3550	3828	4331	4637	4964	5607
	Male	2077	2243	2383	2787	2980	3373	3648	4123	4405	4705	5289
	Female	75	82	101	124	136	177	180	208	232	259	318
	% Female	3.5	3.5	3.1	4.3	4.4	5.0	4.7	4.8	5.0	5.2	5.7
Engineering	Total	794	940	1215	1356	1663	2073	2299	2602	2850	3234	3432
	Male	791	936	1211	1346	1653	2066	2291	2593	2838	3224	3417
	Female	3	4	4	10	10	7	8	9	12	10	15
	% Female	0.4	0.4	0.3	0.7	0.6	0.3	0.3	0.3	0.4	0.3	0.4
Bio-Ag-Hlth Sciences	Total	1728	1783	1976	2081	2362	2685	2885	3143	3693	4116	4564
	Male	1575	1618	1784	1875	2118	2407	2540	2725	3184	3547	3977
	Female	153	165	192	206	244	278	345	418	509	569	587
	% Female	8.9	9.3	9.7	9.9	10.3	10.4	12.0	13.3	13.8	13.8	12.9
Social Sciences	Total	1696	1821	1928	2078	2304	2376	2691	3178	3583	4024	4647
	Male	1471	1562	1674	1795	1973	2062	2283	2705	3008	3339	3862
	Female	225	259	254	283	331	314	408	473	575	685	785
	% Female	13.3	14.2	13.2	13.6	14.4	13.2	15.2	14.9	16.0	17.0	16.9
Arts and Humanities	Total	1448	1495	1561	1662	1982	2327	2508	2863	3196	3544	4043
	Male	1197	1262	1280	1375	1644	1925	2011	2306	2482	2710	3094
	Female	251	233	281	287	338	402	497	557	714	834	949
	% Female	17.3	15.6	18.0	17.3	17.1	17.3	19.8	19.5	22.3	23.5	23.5
Professional Fields	Total	362	365	438	492	527	590	676	759	857	901	1111
	Male	326	325	393	428	477	536	604	679	774	809	993
	Female	36	40	45	64	50	54	72	80	83	92	118
	% Female	9.9	11.0	10.3	13.0	9.5	9.2	10.7	10.5	9.7	10.2	10.6
Education	Total	1548	1680	1898	2131	2350	2736	3043	3477	4022	4618	5836
	Male	1250	1335	1539	1715	1900	2209	2462	2789	3223	3720	4654
	Female	298	345	359	416	450	527	581	688	799	898	1182
	% Female	19.3	20.5	18.9	19.5	19.1	19.3	19.1	19.8	19.9	19.4	20.2
Other and Unspecified	Total	6	4	6	12	19	5	24	33	85	333	196
	Male	5	4	6	11	17	5	24	26	80	286	189
	Female	1	0	0	1	2	0	0	7	5	47	7
	% Female	16.7	0	0	8.3	10.5	0	0	21.2	5.9	14.1	3.6
Total PhD's	Total	9,734	10,413	11,506	12,723	14,323	16,342	17,954	20,386	22,923	25,734	29,436
	Male	8,692	9,285	10,270	11,332	12,762	14,583	15,863	17,946	19,994	22,340	25,475
	Female	1042	1128	1236	1391	1561	1759	2091	2440	2929	3394	3,961
	% Female	10.7	10.8	10.7	10.9	10.9	10.8	11.6	12.0	12.8	13.2	13.4

SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File

TABLE 6b
Number of Research Doctorates Granted in All Fields Combined, 1960–1970, With 30-year-old Population and Percentage of Age Group Attaining Doctorates

Fiscal Year	Doctorates Granted			Population, Age 30* (in thousands)			Percent of Age Group Earning Doctorates		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1960	8,692	1,042	9,734	1,135	1,164	2,299	.76	.09	.42
1961	9,285	1,128	10,413	1,122	1,150	2,272	.83	.10	.46
1962	10,270	1,236	11,506	1,102	1,127	2,229	.93	.11	.52
1963	11,332	1,391	12,723	1,080	1,101	2,181	1.05	.13	.58
1964	12,762	1,561	14,323	1,075	1,094	2,169	1.19	.14	.66
1965	14,583	1,759	16,342	1,080	1,096	2,176	1.35	.16	.75
1966	15,863	2,091	17,954	1,098	1,110	2,208	1.44	.19	.81
1967	17,946	2,240	20,386	1,114	1,131	2,245	1.61	.20	.91
1968	19,994	2,929	22,923	1,137	1,155	2,292	1.76	.25	1.00
1969	22,340	3,394	25,734	1,158	1,177	2,335	1.93	.29	1.10
1970	25,475	3,961	29,436	1,188	1,207	2,395	2.14	.33	1.23

*3-year moving average, to smooth data and in recognition of the fact that some are younger, some older, at attainment of doctorate. Computed from estimates from U.S. Census Estimates—Series P-25, No. 385.

SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File

TABLE 6c
Number of Research Doctorates Granted in 4 Selected Natural Science Fields FY 1960–1970

Field	Sex	Fiscal Year of Doctorate										
		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Mathematics	Total	291	332	388	484	589	685	769	830	972	1063	1218
	Male	276	315	366	456	556	635	721	782	923	1007	1142
	Female	15	17	22	28	33	50	48	48	49	56	76
	% Female	5.2	5.1	5.7	5.8	5.6	7.3	6.2	5.8	5.0	5.3	6.2
Physics	Total	530	597	710	817	866	1046	1061	1310	1430	1452	1657
	Male	521	590	696	807	852	1019	1039	1274	1397	1414	1611
	Female	9	7	14	10	14	27	22	36	33	38	46
	% Female	1.7	1.2	2.0	1.2	1.6	2.6	2.1	2.7	2.3	2.6	2.7
Chemistry	Total	1078	1150	1137	1288	1350	1444	1594	1773	1793	1947	2223
	Male	1030	1094	1077	1206	1266	1345	1496	1655	1654	1801	2043
	Female	48	56	60	82	84	99	98	118	139	146	180
	% Female	4.5	4.9	5.3	6.4	6.2	6.9	6.1	6.7	7.8	7.5	8.1
Biosciences	Total	1158	1172	1299	1414	1582	1829	1991	2197	2616	2865	3162
	Male	1023	1018	1125	1231	1371	1586	1685	1822	2169	2367	2665
	Female	135	154	174	183	211	243	306	375	447	498	497
	% Female	11.7	13.1	13.4	12.9	13.3	13.3	15.4	17.1	17.1	17.4	15.7

SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File

TABLE 6d.
Number of research doctorate degrees granted in 7 selected bioscience fields, NIGMS-Supported* vs. non-NIGMS-Supported, FY 1958–1969

Fiscal Year of PhD	Support Status in Grad. School	Anatomy	Biochemistry	Biophysics	Genetics	Microbiology	Pharmacology	Physiology	Total
1958	NIGMS	0	0	0	0	0	0	0	0
	Non-NIGMS	30	237	21	71	203	48	0	610
1959	NIGMS	0	8	0	1	1	1	4	15
	Non-NIGMS	36	209	23	74	167	39	0	548
1960	NIGMS	2	13	0	5	4	4	3	31
	Non-NIGMS	29	245	23	68	180	49	2	596
1961	NIGMS	5	53	1	9	15	18	18	119
	Non-NIGMS	40	221	24	64	161	31	2	543
1962	NIGMS	17	81	10	17	45	20	27	217
	Non-NIGMS	32	205	23	64	154	54	61	593
1963	NIGMS	17	128	9	27	52	25	45	303
	Non-NIGMS	34	175	27	70	158	46	97	607
1964	NIGMS	31	164	21	26	52	44	64	402
	Non-NIGMS	25	206	19	72	142	46	125	635
1965	NIGMS	49	185	34	33	95	55	107	558
	Non-NIGMS	39	208	20	69	179	44	97	656
1966	NIGMS	29	243	39	36	112	62	93	614
	Non-NIGMS	37	215	42	77	176	44	103	694
1967	NIGMS	45	247	54	49	111	72	115	693
	Non-NIGMS	40	254	38	95	222	43	132	824
1968	NIGMS	53	306	65	51	139	80	146	840
	Non-NIGMS	34	271	40	101	220	67	156	889
1969	NIGMS	61	260	75	54	152	86	163	851
	Non-NIGMS	60	287	35	72	228	61	156	899
Total, All Years	NIGMS	309	1,688	308	308	778	467	785	4,643
	Non-NIGMS	436	2,733	335	897	2,190	572	931	8,094

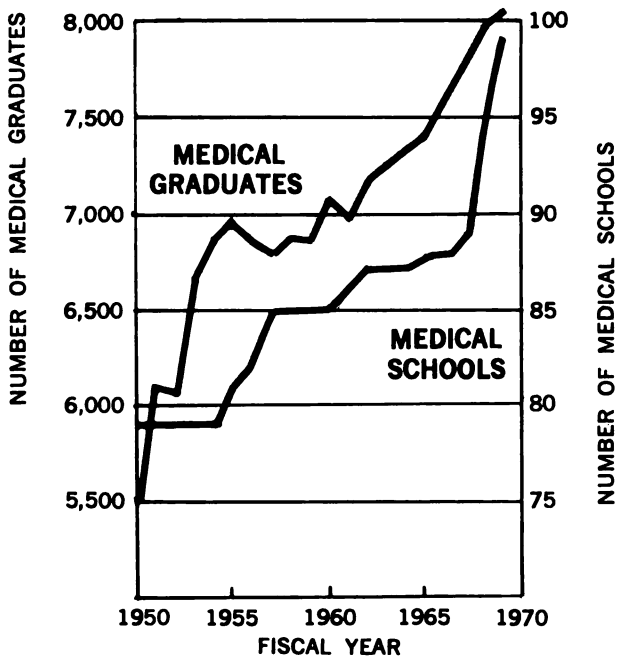
*Persons receiving any support by fellowship or traineeship are included here as NIGMS-supported.

Notes: All NIGMS-supported doctorate recipients in physiology were assumed to be in the area of animal physiology.
Two of the seven bioscience fields show a decrease in total PhD production between FY 1968 and FY 1969. However, a new field (molecular biology) was introduced into the Survey of Earned Doctorates Specialties List in FY 1969, and 89 persons selected it. Because most of these 89 would have selected one of the seven listed fields of molecular biology had not been available, the apparent decreases in PhD production should be interpreted with caution.

SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.
NIGMS, Statement of Appointment of Trainee and Fellowship Award Statement.

Medical Enrollments

Figure 6a.
Number of U.S. medical schools and M.D. graduates, FY 1950–1969.



- Following the post-WWII spurt, there was a slight drop in output of physicians to 1957, then very slow growth until 1965. Since that time, growth in output has averaged slightly over 2% per annum—approximately the growth rate of the U.S. population.
- Number of medical schools in operation was practically constant through the 1950's. Schools in development in the late 1950's came into operation in the 1960's; a dozen new schools were in development between 1962 and 1969.

TABLE 6e
Number of U.S. Medical Schools and M.D. Graduates
Fiscal Years 1950–1969

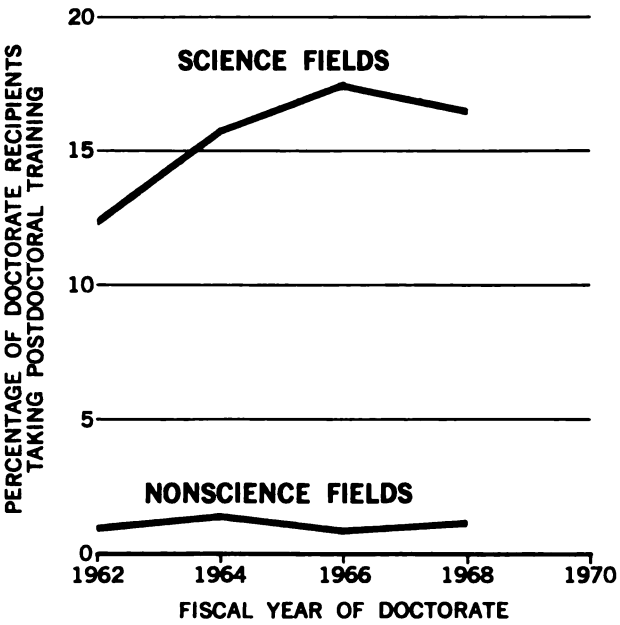
Fiscal Year	Number of Schools	Number of M.D. Graduates	Annual Percentage Increment
1950	79	5,553	
1951	79	6,135	+10.5
1952	79	6,080	− .9
1953	79	6,668	+ 9.7
1954	80	6,861	+ 2.9
1955	81	6,977	+ 1.7
1956	82	6,845	− 1.9
1957	85*	6,796	− .7
1958	85*	6,861	+ 1.0
1959	85*	6,860	0.0
1960	85	7,081	+ 3.2
1961	86	6,994	— 1.2
1962	87*	7,168	+ 2.5
1963	87*	7,264	+ 1.0
1964	87*	7,336	+ 1.0
1965	88*	7,409	+ 1.9
1966	88*	7,574	+ 2.2
1967	89*	7,743	+ 2.2
1968	94*	7,973	+ 3.0
1969	99*	8,059	+ 1.1

*Includes schools in development.
SOURCE: *Journal of the American Medical Association*, November 24, 1969. Vol. 210, No. 8, p. 1484.

Section 7:
Numbers of immediate postdoctoral fellowships and traineeships

Figure 7.

Percentage of doctorate recipients accepting immediate postdoctoral fellowships, traineeships, or other study appointments, FY 1962–1968.



- Immediate postdoctoral study is almost entirely confined to the physical sciences and biosciences. Over four-fifths of all immediate postdoctorals are in these two summary fields.
- Between FY 1962 and FY 1966, the percentage of doctorate recipients continuing with immediate postdoctoral study increased from 8.5% to 11.5%. It dropped slightly to 11.0% in FY 1968. (See Figure 14, describing Federal funding of fellowships and traineeships.)
- The percentage of women doctorate recipients receiving postdoctoral fellowships and traineeships was the same as or higher than the percentage of men, field by field.
- Doctorate recipients in the seven selected bioscience subfields who had received NIGMS predoctoral training support were much more likely to accept immediate postdoctoral fellowships or traineeships than were non-NIGMS-supported PhD's in these fields.
- The doctorate recipients of FY 1967–1969, who completed their undergraduate training in the United States, received baccalaureate degrees from 1240 U.S. institutions. Those with doctorates in education received baccalaureates from 1025 different institutions, but the doctorate recipients in classics received baccalaureate degrees from only 136 institutions. Most PhD fields draw from less than 500 baccalaureate institutions—not necessarily the same 500 for each field.
- Although the Office of Education data in the American Council on Education's publication, *A Fact Book on Higher Education*, lists 278 U.S. institutions offering doctoral programs in FY 1968, only 234 of these had granted one or more research doctorates during the period FY 1967–1969. Research doctorates in most fields are granted in less than 100 institutions.
- Doctoral programs in fields such as mathematics, chemistry, and physics are available from most PhD-granting institutions in each geographic region, but programs in other fields such as classics, philosophy, fine arts, and theology may be available from only a very few institutions in a given geographic region.
- NIGMS training programs have reached most of the PhD-granting institutions in the seven selected bioscience fields.

TABLE 7a
Number of Doctorate Recipients Accepting Immediate Postdoctoral Fellowships, Traineeships, or Other Study Appointments, by Field and Sex, FY 1962–1968

Field of PhD		1962			1964			1966			1968		
		Male	Fem.	Total	Male	Fem.	Total	Male	Fem.	Total	Male	Fem.	Total
Physical Sciences	PhD's*	1907	80	1987	2643	109	2752	3235	149	3384	4041	189	4230
	Postdoc.	315	16	331	557	24	581	748	48	796	823	43	866
	% P-Doc.	16.5	20.0	16.7	21.1	22.0	21.1	23.1	32.2	23.5	20.4	22.8	20.5
Engineering	PhD's	965	2	967	1500	9	1509	2062	7	2069	2666	11	2677
	Postdoc.	36	1	37	91	1	92	119	0	119	124	1	125
	% P-Doc.	3.7	–	3.8	6.1	–	6.1	5.8	0	5.8	4.7	–	4.7
Bio-Ag-Health Sciences	PhD's	1401	140	1541	1863	201	2064	2237	290	2527	2951	438	3389
	Postdoc.	249	36	285	477	58	535	603	124	727	865	184	1049
	% P-Doc.	17.8	25.7	18.5	25.6	28.9	25.9	27.0	42.8	28.8	29.3	42.0	31.0
Social Sciences	PhD's	1313	170	1483	1814	280	2094	2096	356	2452	2760	496	3256
	Postdoc.	77	8	85	106	18	124	141	36	177	172	34	206
	% P-Doc.	5.9	4.7	5.7	5.8	6.4	5.9	6.7	10.1	7.2	6.2	6.9	6.3
Arts & Human.	PhD's	1050	208	1258	1536	284	1820	1893	431	2324	2347	631	2978
	Postdoc.	17	1	18	28	5	33	20	11	31	22	12	34
	% P-Doc.	1.6	–	1.4	1.8	–	1.8	1.1	2.6	1.3	.9	1.9	1.1
Prof. Fields	PhD's	336	36	372	437	35	472	547	55	602	685	77	762
	Postdoc.	3	2	5	6	1	7	1	0	1	7	4	11
	% P-Doc.	–	–	–	1.4	–	1.5	–	–	–	1.0	–	1.4
Education	PhD's	1208	268	1476	1759	407	2166	2318	511	2829	3061	731	3792
	Postdoc.	6	2	8	13	7	20	10	5	15	26	9	35
	% P-Doc.	.5	–	.5	.7	1.7	.9	.4	1.0	.5	.8	1.2	.9
Other Fields	PhD's	4	0	4	18	2	20	21	0	21	43	2	45
	Postdoc.	1	0	1	1	0	1	2	0	2	3	0	3
	% P-Doc.	–	–	–	–	–	–	–	–	–	–	–	–
Total, All Fields	PhD's	8184	904	9088	11570	1327	12897	14409	1799	16208	18554	2575	21129
	Postdoc.	704	66	770	1279	114	1393	1644	224	1868	2042	287	2329
	%P-Doc.	8.6	7.3	8.5	11.0	8.6	10.8	11.4	12.5	11.5	11.0	11.1	11.0
Mathematics	PhD's	299	17	316	511	32	543	664	40	704	852	37	889
	Postdoc.	29	0	29	35	3	38	46	1	47	43	1	44
	% P-Doc.	9.7	0	9.2	6.8	–	7.0	6.9	–	6.7	5.0	–	4.9
Physics	PhD's	540	12	552	752	7	759	939	19	958	1248	24	1272
	Postdoc.	83	4	87	151	0	151	241	8	249	272	3	275
	% P-Doc.	15.4	–	15.8	20.1	0	19.9	25.7	42.1	26.0	21.8	–	21.6
Chemistry	PhD's	867	48	915	1104	65	1169	1277	80	1357	1551	120	1671
	Postdoc.	189	11	200	351	21	372	411	36	447	467	39	506
	% P-Doc.	21.8	22.9	21.9	31.8	32.3	31.8	32.2	45.0	32.9	30.1	32.5	30.3
Bio-Sciences	PhD's	1046	138	1184	1403	181	1584	1697	270	1967	2252	408	2660
	Postdoc.	229	36	265	446	58	504	562	123	685	803	182	985
	% P-Doc.	21.9	26.1	22.4	31.8	32.0	31.8	33.1	45.6	34.8	35.7	44.6	37.0

*PhD's whose first postdoctoral status was known. This figure excludes PhD's whose plans were uncertain. Percentages not computed where the number of postdoctorals was less than 5.

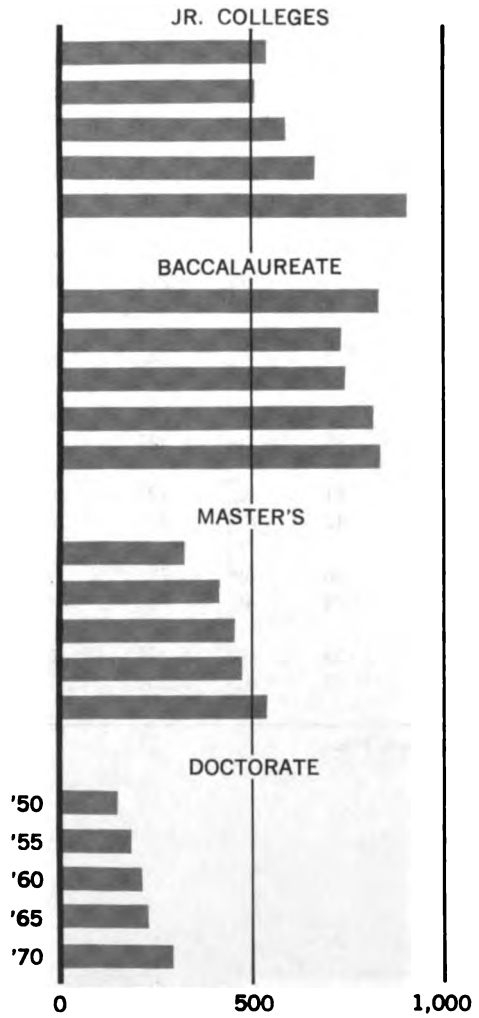
Table 7b.
Percentage of doctorate recipients continuing with immediate postdoctoral study, 7 bioscience subfields, NIGMS-supported vs. non-NIGMS-supported, FY 1963–1969

Field of PhD	Support Status in Grad. School	Percentage of doctorate recipients accepting immediate postdoctoral fellowships, traineeships, or other study appointments, by fiscal year of doctorate							Total, all years		
		1963	1964	1965	1966	1967	1968	1969	No. of PhD's	No. of Postdocs	% Postdocs
Anatomy	NIGMS	24	42	35	24	40	30	41	285	100	35
	Non-NIGMS	6	20	18	16	15	26	27	269	51	19
Biochemistry	NIGMS	62	60	63	63	62	66	74	1,533	992	65
	Non-NIGMS	34	38	37	37	46	44	53	1,616	683	42
Biophysics	NIGMS	67	57	56	62	65	65	59	297	182	61
	Non-NIGMS	33	26	35	45	37	45	40	221	86	39
Genetics	NIGMS	56	38	48	44	45	45	50	276	129	47
	Non-NIGMS	23	26	22	18	23	19	40	556	134	24
Microbiology	NIGMS	50	35	41	51	49	47	59	713	348	49
	Non-NIGMS	23	20	25	30	25	35	36	1,325	374	28
Pharmacology	NIGMS	36	41	51	58	44	41	62	424	209	49
	Non-NIGMS	20	24	23	18	37	42	33	351	102	29
Physiology	NIGMS	40	45	45	38	44	46	59	733	344	47
	Non-NIGMS	20	24	26	22	31	28	40	866	245	28
Total, 7 fields	NIGMS	52	49	51	53	53	53	62	4,261	2,304	54
	Non-NIGMS	25	28	28	29	33	35	42	5,204	1,675	32

SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.

Section 8:
Institutions

Figure 8.
Number of U.S. colleges and universities, by highest level of degree offered, 1950–1970.



ACADEMIC INSTITUTIONS BY HIGHEST LEVEL OF DEGREE OFFERED

- The total number of institutions of higher education in the U.S. increased 37% in the period 1950–1968.
- The number of institutions offering doctoral level programs almost doubled between 1950 and 1968. During the same interval, the number of institutions offering the master's degrees—but not doctorate degrees—increased 57%, and the number of U.S. medical schools increased 19%, from 79 to 94.
- The apparent stability in the number of institutions offering baccalaureates, but not graduate degrees, represents an equilibrium between losses to the group by those that became master's granting and gains to the group from former junior colleges that now offer baccalaureates.
- The net gain in number of junior colleges during the period was 60%.

TABLE 8a
Number of U.S. Colleges and Universities, by Highest Level of Degree Offered, FY 1950–1970

Type of Institution	Year				
	1950	1955	1960	1965	1970
Junior Colleges	541	510	593	664	903
Baccalaureate Institutions	828	732	741	823	835
Master's Institutions	324	415	455	472	517
Doctoral Institutions	148	180	210	227	296
Other Institutions	17	18	31	21	—
Total, All Institutions	1,858	1,855	2,028	2,207	2,551

SOURCE: American Council on Education, *A Fact Book on Higher Education* and *Education Directory, Higher Education, 1969–70*, U.S. Office of Education

TABLE 8b.
Number of U.S. baccalaureate source institutions* for doctorate recipients, by field of PhD, by fiscal year of PhD

Field of PhD	Fiscal Years of Doctorates			
	1958–60	1961–63	1964–66	1967–69
Mathematics	251	317	418	506
Physics	291	354	392	461
Chemistry	524	559	647	679
Earth Sciences	164	192	212	281
Engineering	197	234	270	342
Agriculture	127	128	145	166
Health Sciences	98	110	148	217
Biochem, Biophys, Physiol, Biostat.	351	391	512	575
Anat, Cytol, Entom, Genet, Microbiol, Embry.	305	357	437	565
Ecology, Hydrobiology	70	91	93	166
Botany, Zoology, Gen. Biol.	295	337	402	473
Psychology	419	453	526	627
Anthropology, Archeology	80	95	112	156
Sociology	207	214	281	346
Economics	242	293	341	407
Political Science	217	272	323	392
History	367	384	505	563
Eng. & Am. Lit.	350	409	503	625
Modern Languages	190	199	278	369
Classics	67	88	115	136
Philosophy	181	190	224	287
Speech	209	237	290	330
Fine Arts & Music	170	178	208	261
Business Administration	177	208	272	321
Religion & Theology	217	230	269	320
Education	761	833	925	1025
All fields	1024	1082	1163	1240

*"Baccalaureate source" includes all institutions within the United States, granting baccalaureate or higher degrees, that were sources of baccalaureate degrees for the doctorate recipients of the specified time period and field.
SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.

TABLE 8c.
Number of PhD-granting institutions*, by field of PhD, by fiscal year of PhD

Field of PhD	Fiscal Years of Doctorates			
	1958–60	1961–63	1964–66	1967–69
Mathematics	75	86	102	124
Physics	80	97	121	147
Chemistry	114	134	151	167
Earth Sciences	56	62	80	96
Engineering	76	85	106	126
Agriculture	47	47	56	58
Health Sciences	43	49	57	74
Biochem, Biophys, Physiol, Biostat.	98	117	140	157
Anat, Cytol, Entom, Genet, Microbiol, Embry.	101	117	127	146
Ecology, Hydrobiology	42	54	58	76
Botany, Zoology, Gen. Biol.	79	88	104	128
Psychology	87	103	115	138
Anthropology, Archeology	27	28	38	52
Sociology	60	62	68	80
Economics	72	83	91	103
Political Science	58	70	72	88
History	75	84	99	107
Eng. & Am. Lit.	75	78	97	115
Modern Languages	53	60	68	79
Classics	26	32	38	40
Philosophy	47	52	63	79
Speech	30	35	37	43
Fine Arts & Music	37	41	47	53
Business Administration	37	39	47	63
Religion & Theology	28	33	32	41
Education	100	107	120	134
All fields	173	193	220	234

*"PhD-granting" indicates an institution within the United States which has granted at least one research doctorate in the field during the specified time period.
SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.

TABLE 8d.
Number of PhD-granting institutions for PhD's of FY 1967–1969, by region of U.S., by field of PhD

Field of PhD	Geographic Location of PhD-granting Institutions									
	New England	Mid-Atlantic	East No. Central	West No. Central	South Atlantic	East So. Central	West So. Central	Mountain	Pacific	Total
Mathematics	13	23	15	9	20	7	12	11	14	124
Physics	17	28	18	10	22	6	12	15	19	147
Chemistry	20	32	21	14	23	9	14	16	18	167
Earth Sci.	9	15	12	10	10	1	10	14	15	96
Engineering	13	24	17	10	15	8	11	13	15	126
Agriculture	6	4	7	7	10	5	4	6	9	58
Health Sci.	8	14	15	7	9	2	6	3	10	74
Biochem, Biophys, Physiol, Biostat.	15	33	23	13	23	9	10	12	19	157
Anat, Cytol, Entom, Genet, Microbiology, Embryology	15	29	18	13	24	8	11	12	16	146
Ecology, Hydrobiology	5	13	10	6	11	4	6	9	12	76
Botany, Zool, Gen. Biol.	15	19	16	12	20	9	9	12	16	128
Psychology	13	24	24	11	18	8	12	12	16	138
Anthropology, Archeology	4	15	11	6	3		2	3	8	52
Sociology	9	15	14	9	10	4	4	5	10	80
Economics	10	19	14	11	16	6	10	5	12	103
Political Science	9	20	12	7	15	4	6	5	10	88
History	11	18	18	9	16	7	7	7	14	107
Eng. & Am. Lit.	8	21	20	8	16	10	10	7	15	115
Modern Lang.	7	15	11	7	13	3	6	6	11	79
Classics	5	11	9	3	3	1	2	1	5	40
Philosophy	8	21	16	7	9	1	4	2	11	79
Speech	1	8	13	4	3	1	4	4	5	43
Fine Arts & Music	4	10	11	5	6	1	7	3	6	53
Business Adminis.	3	11	12	7	10	3	7	4	6	63
Religion & Theology	5	15	7	1	6	1	1	1	4	41
Education	8	19	25	12	17	10	14	15	14	134
Unduplicated Total of Inst.	25	53	33	16	31	11	18	18	29	234

SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.

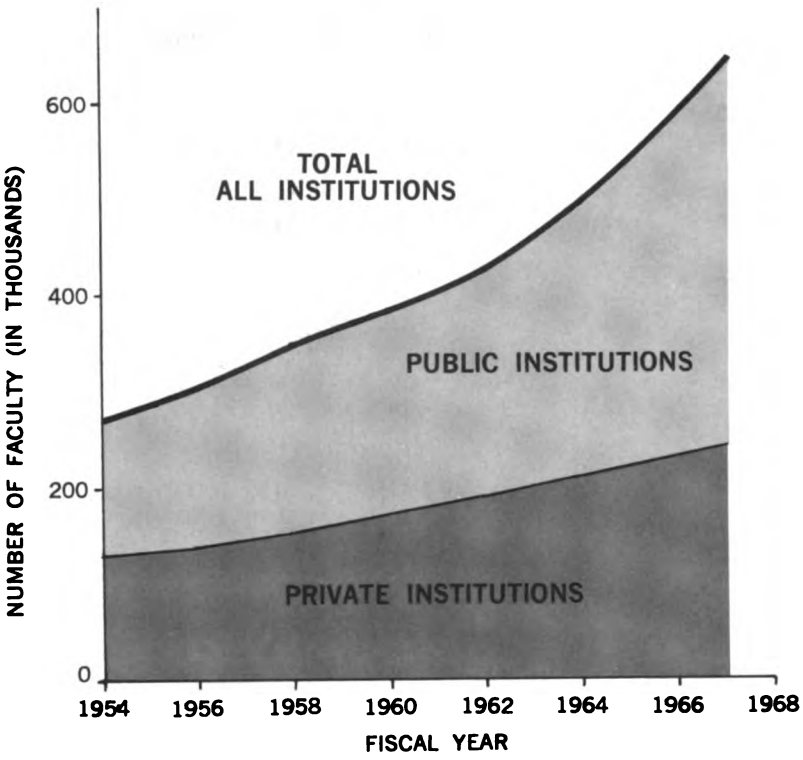
TABLE 8e
Number of PhD-granting Institutions, by Region of the U.S., for PhD's of FY 1967–1969, NIGMS-supported vs. all PhD's in 7 Selected Bioscience Fields

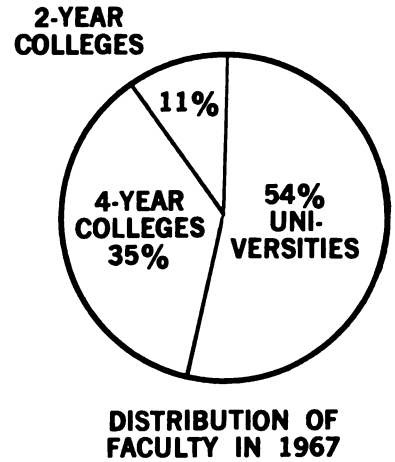
Region		Number of Institutions Granting PhD's in:						
		Anatomy	Biochem	Biophysics	Genetics	Microbiol	Pharmacol	Physiol
New England	NIGMS	5	12	5	4	9	7	8
	Total	6	15	9	7	13	10	14
Middle Atlantic	NIGMS	9	19	9	6	14	15	14
	Total	14	30	12	11	22	16	25
East North Central	NIGMS	8	14	7	7	14	11	14
	Total	12	19	9	12	17	13	19
West North Central	NIGMS	4	10	2	1	10	5	7
	Total	8	13	3	8	10	8	10
South Atlantic	NIGMS	4	16	5	5	12	5	13
	Total	9	19	5	12	20	11	23
East South Central	NIGMS	5	7	2	0	5	5	5
	Total	6	9	3	1	8	5	8
West South Central	NIGMS	3	7	2	2	8	5	8
	Total	4	10	3	6	11	5	8
Mountain	NIGMS	3	3	0	3	5	3	4
	Total	4	10	3	7	9	3	4
Pacific	NIGMS	6	13	8	10	13	5	12
	Total	8	16	12	13	14	8	14
U.S. Total	NIGMS	47	101	40	38	90	61	85
	Total	71	141	59	77	124	79	125
	% NIGMS	66	72	68	49	73	77	68

SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.
NIGMS Statement of Appointment of Trainee and Fellowship Awards.

Section 9:
Faculty

Figure 9.—Number of higher education faculty, or type of institution, 1954–1967.





Up-to-date data describing professional characteristics of higher education staff are not available. Based on three-to-six-year-old data, one may estimate that:

- The number of higher education faculty doubled between FY 1954 and FY 1967.
- The percentage of all faculty employed in public institutions has been increasing. In FY 1954, 52% of the faculty were in public institutions, but by FY 1967, this had increased to 62%.
- Approximately 5/9 of the faculty are in universities, 3/9 in four-year colleges, and 1/9 in two-year colleges.
- More than 4/5 of the faculty are men.
- Approximately 3/4 of the faculty teach, and the remainder perform various administrative duties.
- Over half of the faculty in the colleges and universities hold doctorates; less than 1/10 of the two-year college faculty have doctorates.

TABLE 9a.
Number of higher education faculty, by type of control, by type of institution, FY 1954–1967

Fiscal Year	Faculty and Other Professional Staff* Number of Different Persons		
	Total	Public	Private
1954	268,028	140,273	127,755
1956	301,582	161,345	140,237
1958	348,509	189,834	158,675
1960	382,664	209,643	173,021
1962	427,833	235,851	191,982
1964	498,359	288,165	210,194
1967	650,198	402,898	247,300
University	352,640	241,647	110,993
4-yr college	223,306	100,463	122,843
2-yr college	74,252	60,788	13,464

*Includes full- and part-time faculty for resident instruction in degree-credit and other courses; professional staff for general administration, student personnel services, library, organized research; professional staff in elementary and secondary schools conducted by institutions of higher education.

SOURCE: American Council on Education, *A Fact Book on Higher Education*, Third issue, 1969, p. 9125.
U.S. Office of Education, *Numbers and Characteristics of Employees in Institutions of Higher Education*, 1966, p. 9.

TABLE 9b.
Selected characteristics of teaching faculty in universities and 4-year colleges, FY 1963

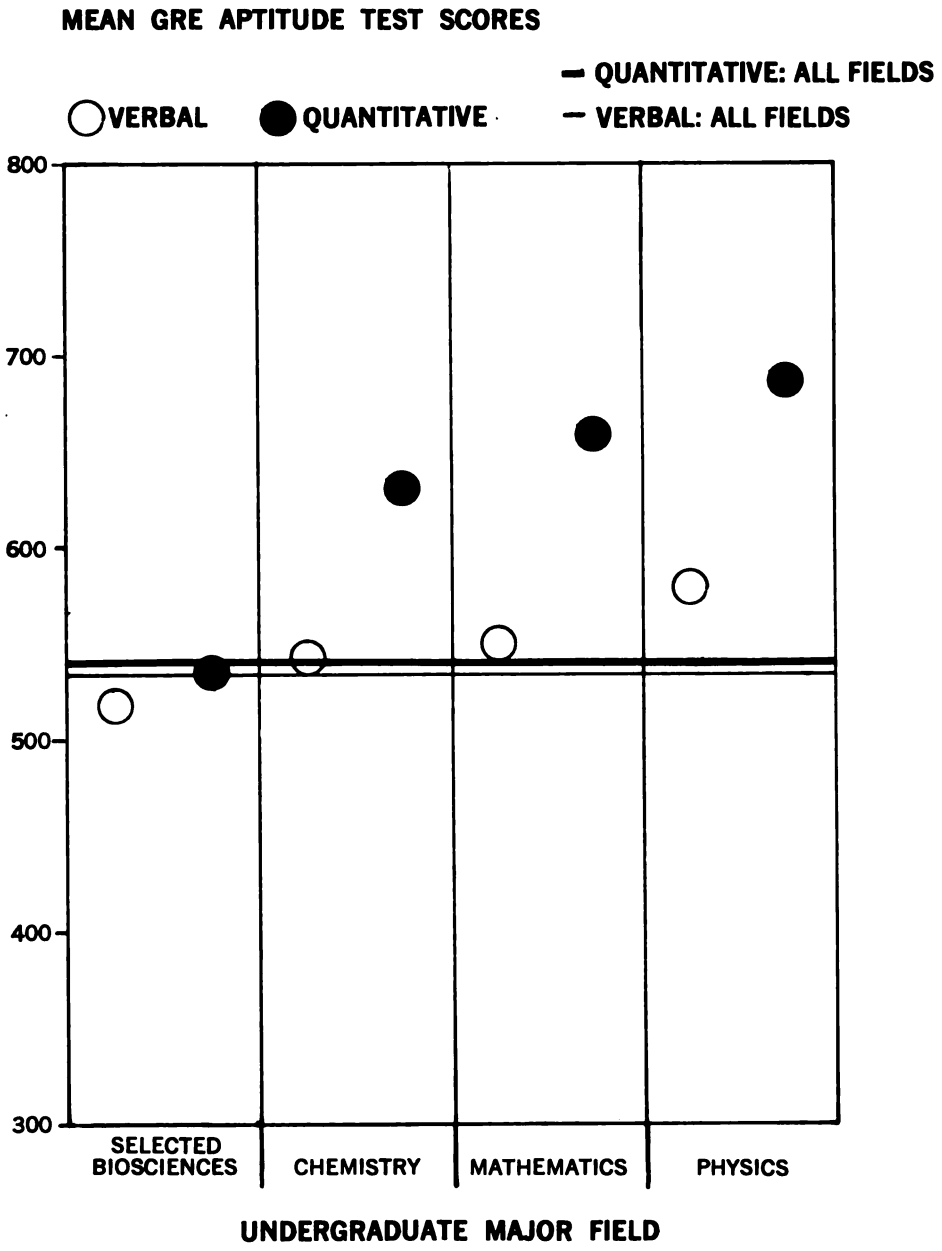
Faculty Characteristics	Universities				Other 4-year Institutions				Total All Institutions	
	≥750 Faculty		<750 Faculty		≥200 Faculty		<200 Faculty			
	N	%	N	%	N	%	N	%	N	%
Total Teaching Faculty	28,983	100.0	39,942	100.0	16,882	100.0	52,396	100.0	138,203	100.0
Sex										
Male	25,718	88.7	34,416	86.1	13,980	82.8	39,446	75.3	113,560	82.2
Female	3,265	11.3	5,526	13.8	2,902	17.2	12,950	24.7	24,643	17.8
Rank										
Professor	9,832	33.9	11,697	29.3	3,706	22.0	12,277	23.4	37,512	27.1
Associate Professor	7,373	25.4	9,931	24.9	4,149	24.6	11,387	21.7	32,840	23.8
Assistant Professor	7,396	25.5	11,290	28.2	5,815	34.4	15,860	30.3	40,361	29.2
Instructor	4,189	14.5	6,351	15.9	2,643	15.6	9,248	17.6	22,431	16.2
Other	194	0.7	672	1.7	569	3.4	3,624	6.9	5,059	3.7
Teaching Area										
Agriculture	1,093	3.8	1,463	3.6	146	0.9	284	0.5	2,986	2.2
Biological Sciences	3,260	11.2	3,499	8.8	873	5.2	3,261	6.2	10,893	7.9
Business and Commerce	1,389	4.8	2,164	5.4	998	5.9	2,424	4.6	6,975	5.0
Education	1,610	5.6	2,330	5.8	1,629	9.6	5,148	9.8	10,717	7.8
Engineering	2,974	10.3	3,399	8.5	1,890	11.2	1,235	2.4	9,498	6.9
English and Journalism	1,556	5.4	3,055	7.6	1,375	8.1	5,812	11.1	11,798	8.5
Fine Arts	1,939	6.7	2,944	7.4	1,598	9.5	6,881	13.1	13,362	9.7
Foreign Lang & Lit.	1,393	4.8	2,085	5.2	705	4.2	3,332	6.4	7,515	5.4
Health Fields	2,965	10.2	3,661	9.2	338	2.0	538	1.0	7,502	5.4
Home Economics	393	1.4	542	1.4	262	1.5	749	1.4	1,946	1.4
Law	503	1.7	765	1.9	53	0.3	137	0.3	1,458	1.0
Mathematics	1,304	4.5	1,940	4.9	1,225	7.2	3,171	6.1	7,640	5.5
Philosophy	331	1.1	604	1.5	200	1.2	1,079	2.1	2,214	1.6
Physical Education	808	2.8	1,271	3.2	923	5.5	3,278	6.2	6,280	4.5
Physical Sciences	2,491	8.6	3,126	7.8	1,532	9.1	4,680	8.9	11,829	8.6
Psychology	908	3.1	1,031	2.6	558	3.3	1,352	2.6	3,849	2.8
Religion & Theology	98	0.3	599	1.5	95	0.6	1,356	2.6	2,148	1.6
Social Sciences	3,414	11.8	4,609	11.5	1,942	11.5	7,018	13.4	16,983	12.3
All Other	556	1.9	856	2.1	541	3.2	661	1.3	2,614	1.9
Highest Educational Level										
Doctorates	18,896	65.1	21,629	54.1	8,596	50.9	20,827	39.7	69,948	50.6
Non-doctorates	10,087	34.8	18,312	45.8	8,286	49.0	31,569	60.2	68,254	49.3

SOURCE: U.S. Office of Education, *Teaching Faculty in Universities and 4-year Colleges*, Spring 1963, p. 64-65.

Section 10:
Students

Figure 10.

Graduate record examination (GRE) aptitude test scores—verbal and quantitative parts—in four undergraduate major fields, FY 1964.



Ability measures

- Data describing numbers of student enrollments and degree recipients are readily available. However, data describing *ability* measures as related to educational progress

TABLE 10.

Mean scores on GRE Verbal and Quantitative Tests, by major field of undergraduate study, FY 1964

Undergraduate Major Field	Number of Candidates Taking Test	Mean Score: Verbal Test	Mean Score: Quantitative Test
Biological Sciences			
Bacteriology	278	504	539
Biochemistry	295	572	635
Biology	3,096	518	525
Botany	278	527	558
Physiology	168	535	551
Zoology	1,110	546	560
Total of above	5,225	527	542
Agriculture	785	421	505
Forestry	208	498	576
Nursing	370	475	411
Pharmacy	126	470	535
Physical Sciences			
Astronomy	55	611	695
Chemistry	3,557	551	640
Geology	717	549	599
Mathematics	4,778	559	668
Natural Science	625	523	576
Physics	3,472	589	695
Engineering			
Aeronautical	445	526	669
Chemical	955	524	695
Civil	880	478	656
Electrical	2,821	526	683
Industrial	340	494	638
Mechanical	1,511	504	669
Other	802	536	675
Metallurgy	133	545	676
Mining	14	480	589
Social Sciences			
Anthropology	353	619	529
Archeology	30	673	563
Economics	2,241	546	581
Geography	300	509	522
International Studies	270	593	549
Political Science	2,476	582	528
Psychology	5,696	565	529
Social Science	1,252	522	476
Social Work	398	452	409
Sociology	1,606	532	477
Arts and Humanities			
Drama-Theater	312	542	457
English	6,953	600	492
Fine Arts	645	524	450
French	970	580	486
German	345	592	527
History	5,367	569	495
Humanities	703	609	530
Music	1,086	492	457
Philosophy	1,017	621	565
Russian	153	623	545
Scholastic Philosophy	82	606	532
Spanish	595	533	446
Speech	551	501	433
Professional Fields			
Architecture	199	534	592
Business	2,898	461	515
Home Economics	551	432	410
Journalism	279	543	482
Library Science	496	516	425
Religion	573	537	487
Education			
Education	8,807	448	427
Physical Education	1,223	399	411

Note: **Field differences based on these data must be interpreted with care. Only a small percentage of baccalaureate recipients elect to take GRE tests, and these are not random samples of each baccalaureate group.**

SOURCE: **Educational Testing Service, *Graduate Record Examinations Special Report*, August, 1965, p. 9.**

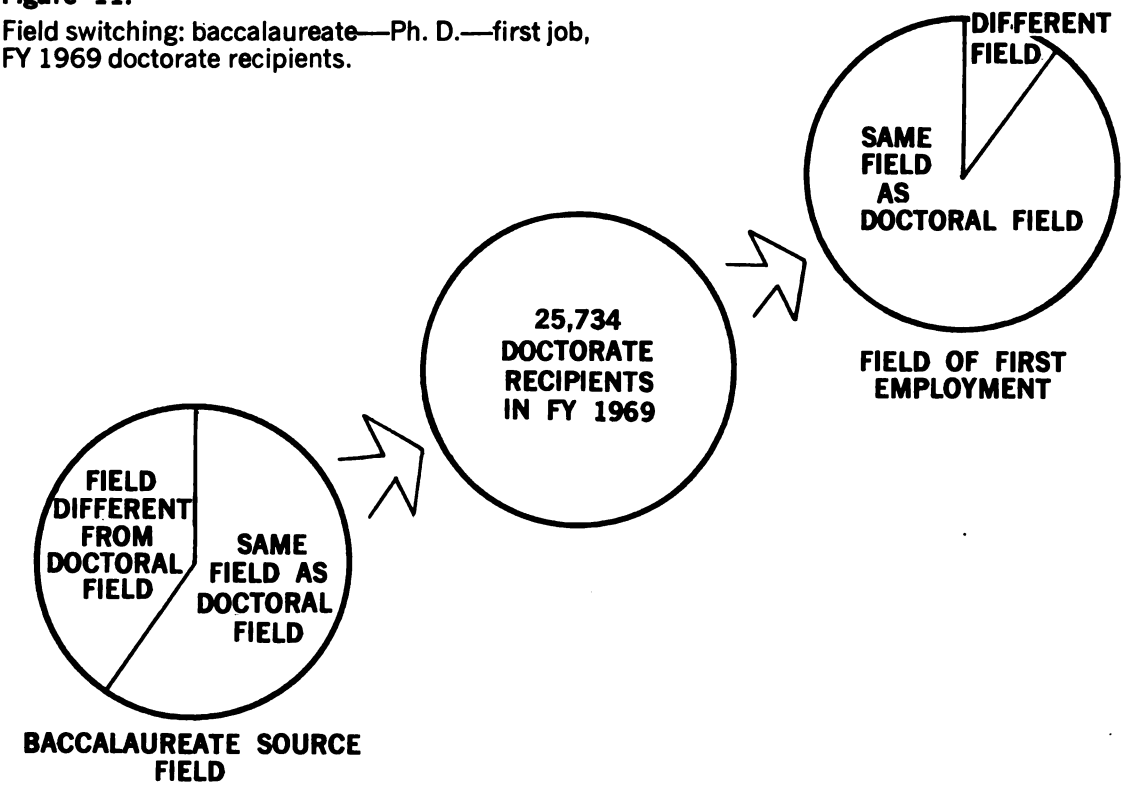
are scarce. A summary of follow-up data collected from a sample of high school graduates of 1960 by Project TALENT appears in *Human Resources and Higher Education*, p. 147–196 (published by the Russell Sage Foundation, 1970).

- Limited data from the Graduate Record Examinations of FY 1964 indicate that students with undergraduate majors in biosciences, who elected to take these examinations, do not do as well on the GRE verbal and quantitative examinations as do those with majors in mathematics, physics, and chemistry. The differences are especially marked on the quantitative examinations.

Section 11:
Field switching

Figure 11.

Field switching: baccalaureate—Ph. D.—first job, FY 1969 doctorate recipients.



- Field switching between baccalaureate and doctorate is common, but the shifts are among related areas. The highly quantitative fields within the physical sciences and engineering draw from one another but only minimally from non-quantitative baccalaureate fields. These quantitative fields tend to have the least BS-PhD field shifting.
- Very little field shifting occurs between doctorate and first postdoctoral job. Doctorate recipients of FY 1969 were able to utilize their graduate training in their employment.

TABLE 11.

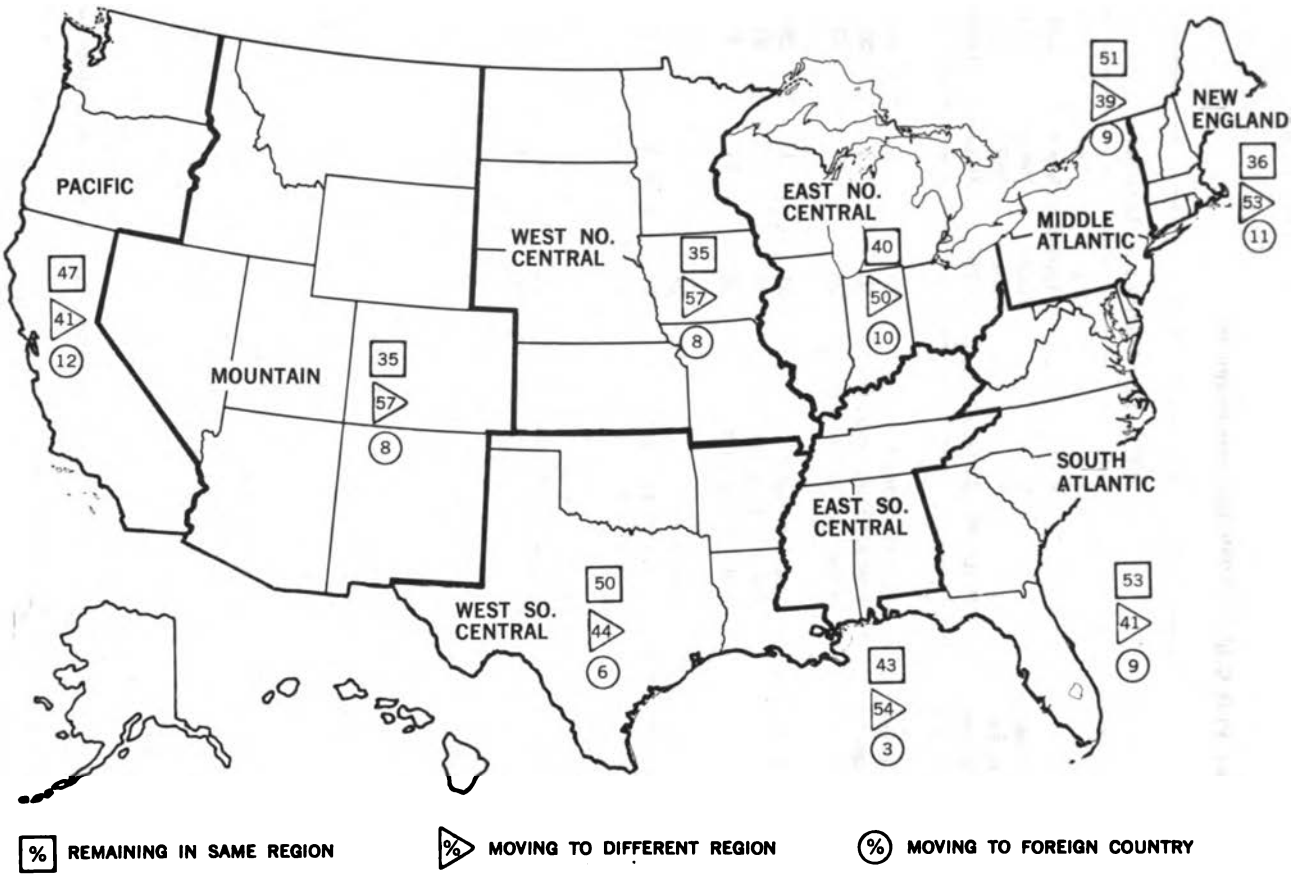
Field switching: Baccalaureate—PhD—first job, FY 1969 doctorate recipients

BACCALAUREATE SOURCE FIELD (% same field as PhD; % major source other than PhD field; % other field)		PhD FIELD (100%)		FIELD OF FIRST POSTDOCTORAL EMPLOYMENT (% includes those PhD's accepting employment; excludes postdoctoral study and no response)
Mathematics	75	Mathematics	70	Same subfield of Mathematics
Engineering	9	1,063	25	Mathematics—different subfield
All other	16		5	Other than Mathematics
Physics and Astronomy	76	Physics and Astronomy	55	Same subfield of Physics and Astronomy
Engineering	12	1,452	35	Physics and Astronomy—different subfield
All other	12		10	Other than Physics and Astronomy
Chemistry	86	Chemistry	73	Same subfield of Chemistry
Engineering	4	1,947	20	Chemistry—different subfield
All other	9		7	Other than Chemistry
Earth Sciences	60	Earth Sciences	69	Same subfield of Earth Sciences
Physics and Astronomy	9	502	24	Earth Sciences—different subfield
All other	31		7	Other than Earth Sciences
Engineering	87	Engineering	73	Same subfield of Engineering
Physics and Astronomy	5	3,234	16	Engineering—different subfield
All other	8		11	Other than Engineering
Agricultural Sciences	78	Agricultural Sciences	69	Same subfield of Agricultural Sciences
Biosciences	5	707	7	Agricultural Sciences—different subfield
All other	16		24	Other than Agricultural Sciences
Health Sciences	33	Health Sciences	76	Same subfield of Health Sciences
Biosciences	23	253	6	Health Sciences—different subfield
All other	44		18	Other than Health Sciences
Biosciences	54	Biosciences	63	Same subfield of Biosciences
Chemistry	16	3,156	26	Biosciences—different subfield
All other	29		11	Other than Biosciences
Psychology	67	Psychology	70	Same subfield of Psychology
Education	4	1,728	23	Psychology—different subfield
All other	29		7	Other than Psychology
Anthropology	44	Anthropology	96	Anthropology
Sociology	7	180	0	Other Social Sciences
All other	48		4	All Other
Sociology	46	Sociology	87	Sociology
Psychology	5	402	5	Other Social Sciences
All other	48		8	All other
Economics, Econometrics, Stat.	51	Economics, Econometrics,	86	Economics, Econometrics, Stat.
Mathematics	11	and Statistics	5	Other Social Sciences
All other	38	799	9	All other
Geography	65	Geography	93	Geography
Earth Sciences	5	113	2	Other Social Sciences
All other	30		4	All other
Polit. Sci., Int. Rel., Area Studies	51	Political Sci., International	76	Polit. Sci., Int. Rel., Area Studies
History	10	Relations, and Area Studies	13	Other Social Sciences
All other	39	603	11	All other
Fine Arts, Music, Speech	62	Fine Arts, Music, and	90	Fine Arts, Music, Speech
Languages and Linguistics	9	Speech as a Dramatic Art	3	Other Arts and Humanities
All other	29	477	6	All other
History	63	History	87	History
Polit. Sci., Int. Rel., Area Studies	5	881	9	Other Arts and Humanities
All other	32		4	All other
Lang., Literature, Linguistics	71	Languages, Literature,	93	Lang., Literature, Linguistics
Education	3	and Linguistics	2	Other Arts and Humanities
All other	26	1,796	5	All other
Philosophy	62	Philosophy	92	Philosophy
Lang., Literature, Linguistics	6	295	1	Other Arts and Humanities
All other	31		7	All other
Education	46	Education	61	Same subfield of Education
Lang., Literature, Linguistics	6	4,618	23	Education—different subfield
All other	48		16	Other than Education
Business Administration	46	Business Administration	87	Business Administration
Engineering	15	514	1	Other Professional Fields
All other	39		12	All other
Religion and Theology	17	Religion and Theology	86	Religion and Theology
Philosophy	22	206	2	Other Professional Fields
All other	61		12	All other
Same field	60	Total All Fields	89	Same field
All other	40	25,734	11	All other

SOURCE: National Research Council, Office of Scientific Personnel, *Summary Report 1969*.

Section 12:
Geographic mobility: Baccalaureate-PhD-first postdoctoral position

Figure 12.—Geographic mobility: Ph. D. to first postdoctoral employment.



- Education and engineering are strongly state-centered professions. These two fields have the highest percentages remaining in-state throughout the various career stages. Both professions also require state certification and licensing.
- Engineering and biological sciences draw heavily from foreign baccalaureate sources. In engineering, the percentage taking first postdoctoral positions in a foreign country is much lower than the percentage of foreign baccalaureates feeding into the field. In the biological sciences, the foreign return rate is much closer to the percentage of foreign baccalaureates coming into the field.
- Few doctorate recipients from the New England and Mountain states had taken baccalaureates in these regions, and few remained in the regions for initial jobs. In contrast, over half of the doctorate recipients in the Middle Atlantic and the West South Central states had taken baccalaureates in these regions and remained in the regions for their first jobs.
- Geographic mobility (doctorate to first postdoctoral employment) of the NIGMS-supported doctorate recipients was little different from that of the non-NIGMS group except for "foreign." Since very few foreign citizens receive NIGMS predoctoral support, the percentage of NIGMS people accepting foreign postdoctoral appointments is relatively small.

TABLE 12a.

Geographic mobility: baccalaureate-PhD-first postdoctoral location, by PhD field, FY 1969 doctorate recipients

Baccalaureate to PhD				PhD to First Postdoctoral Location					
% Bacc. from Same State as PhD	% from Same Region, Diff. State	% from Other U. S. Region	% from Foreign	Summary Field of Doctorate	Postdoctoral Status	% P. D. Location Same State as PhD	% to Same Region Diff. State	% to Other U. S. Region	% to Foreign
28	13	44	14	Physical Sciences	Postdoc Study[a]	25	8	52	16
					Postdoc Employment[b]	26	15	52	6
					Total Study+Employ.	26	13	52	9
33	9	34	24	Engineering	Postdoc Study	51	1	26	22
					Postdoc Employment	34	12	47	7
					Total Study+Employ.	36	11	46	8
27	12	41	19	Biological Sciences	Postdoc Study	28	8	52	11
					Postdoc Employment	26	13	45	16
					Total Study+Employ.	27	11	48	14
29	12	47	12	Social Sciences	Postdoc Study	32	11	47	10
					Postdoc Employment	29	13	49	9
					Total Study+Employ.	29	13	49	9
30	13	48	9	Arts & Humanities	Total Study+Employ.[c]	28	14	52	6
44	14	37	5	Education	Total Study+Employ.[c]	45	14	35	5
23	16	48	13	Professional Fields	Total Study+Employ.[c]	28	13	50	8
31	12	42	13	Total, All Fields	Postdoc Study	29	8	49	14
					Postdoc Employment	32	14	46	8
					Total Study+Employ.	32	13	47	9

[a]Postdoctoral study=postdoctoral fellowship, traineeship, research associateship, or other study.

[b]Postdoctoral employment includes only those who have definite postdoctoral employment and stated location of employment; exclues those on postdoctoral study and those not stating location of postdoctoral employment.

[c]Study and employment status combined because numbers in postdoctoral study are small (less than 4%) in these fields.

SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.

TABLE 12b.
Geographic mobility: baccalaureate-PhD-first postdoctoral location, by *region of PhD institution*, FY 1969 doctorate recipients*

Baccalaureate to PhD				PhD to First Postdoctoral Location				
% Bacc. from Same State as PhD	% from Same Region Diff. State	% from Other U. S. Region	% from Foreign	Region of PhD Institution	% P.D. Location Same State as PhD	% to Same Region, Diff. State	% to Other U. S. Region	% to Foreign
24	11	50	15	New England	28	8	53	11
41	11	33	14	Mid. Atlantic	38	13	39	9
29	15	41	14	E. No. Central	26	14	50	10
30	15	42	13	W. No. Central	23	12	57	8
23	15	51	11	So. Atlantic	30	23	41	6
37	12	43	7	E. So. Central	34	9	54	3
45	11	34	10	W. So. Central	39	11	44	6
26	8	55	10	Mountain	27	8	57	8
30	8	44	18	Pacific	38	9	41	12

*Data based on those who have indicated definite plans for postdoctoral study or postdoctoral employment and have stated the location of their study or employment.
SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.

TABLE 12c.
Geographic mobility: PhD to first postdoctoral employment, by region of PhD institution, NIGMS-supported vs. non-NIGMS-supported, FY 1969 doctorate recipients

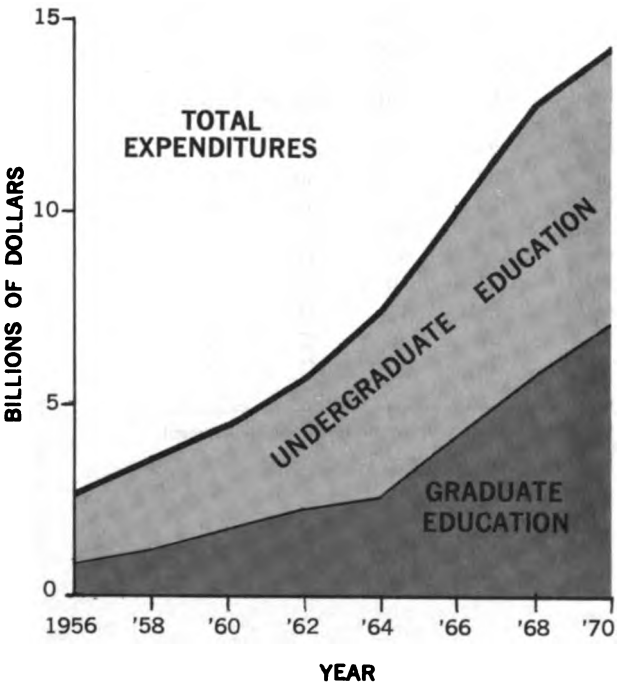
Region of PhD Institution	% Job Same State as PhD		% To Same Region, Diff. State		% To Other U.S. Region		% To Foreign	
	NIGMS	Non-NIGMS	NIGMS	Non-NIGMS	NIGMS	Non-NIGMS	NIGMS	Non-NIGMS
New England	24	27	4	0	70	53	2	20
Middle Atlantic	33	33	10	16	53	29	3	22
East North Central	23	23	16	16	59	38	1	24
West North Central	15	40	11	6	68	40	5	14
South Atlantic	32	42	18	17	47	25	3	15
East South Central	36	48	21	5	43	43	0	5
West South Central	31	57	12	7	55	20	2	17
Mountain	22	18	13	9	65	72	0	0
Pacific	29	39	6	11	59	34	7	16
Total, All Regions	27	35	12	12	58	36	3	17

Note: Data excludes those on postdoctoral study and those not stating definite location of postdoctoral employment.
SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.

Section 13:
Expenditures for Higher Education

Figure 13.

Expenditures for educational and general purposes by institutions of higher education, biennially 1956 to projected 1970.



Total expenditures

- Meaningful divisions between expenditures for graduate vs. undergraduate education are difficult to make. Careful studies in this area are only now getting underway. The data presented in Table 13 are labeled "estimates," and they should be so interpreted.
- Total expenditures for higher education increased fivefold between 1956 and 1970; expenditures for graduate education increased about sevenfold during the same period.
- Graduate education accounted for about one third of the higher education expenditures of 1956, but it accounted for half of the 1970 expenditures.

TABLE 13.
Expenditures of U.S. institutions of higher education for educational and general purposes and estimated cost of graduate education, FY 1956–1970

FY Year	Total[a] Expenditures (Millions of Dollars)	Estimated Cost[b] of Graduate Education (Millions of Dollars)	Grad. Educ. as % of Total
1956	$2,789	$1,000	28%
1958	3,634	1,330	37
1960	4,536	1,810	40
1962	5,798	2,390	41
1964	7,466	3,110	42
1966	10,004	4,240	42
1968	12,700 (est)	5,740	45
1970	14,300 (proj)	7,070	49

[a] p. 92 *Digest of Educational Statistics, 1969* (includes states and outlying areas); p. 9106 *A Fact Book on Higher Education*, ACE 1968, 1970 data added).

[b] p. 159 *Graduate Education: Parameters for Public Policy*, National Science Board (1969).

TABLE 14a.
Number of predoctoral graduate students supported and amount of Federal fellowship and traineeship support, by year, by field, FY 1961–1970

Field	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
	Number of persons supported in fiscal year									
Mathematics	700	961	1,024	1,199	1,413	2,069	2,834	3,268	2,963	2,244
Physical Sciences	1,287	1,705	1,979	2,496	3,014	4,400	5,470	6,006	5,815	4,499
Engineering	652	881	1,074	1,436	3,131	4,236	4,852	5,530	5,075	4,342
Biological Sciences	1,336	2,482	2,882	3,615	3,985	4,884	6,186	7,412	7,876	8,046
Social Sciences	1,189	2,038	2,495	2,695	3,264	4,248	7,169	9,695	10,232	9,287
Arts & Humanities	1,146	1,836	2,131	1,934	1,866	2,740	4,559	6,319	6,396	5,054
Education	2,099	2,331	2,747	3,193	4,713	5,298	10,002	12,534	13,179	10,619
Health Sciences	935	1,366	1,448	2,143	2,570	2,827	3,241	3,740	3,558	3,884
Other	51	116	194	326	457	483	952	2,441	2,492	1,011
Total	9,395	13,716	15,974	19,037	24,413	31,185	45,265	56,945	57,586	48,986
	Amount of Federal support* in fiscal year (thousands of dollars)									
Mathematics	2,717	3,681	4,240	6,222	8,022	11,975	16,068	17,025	14,120	11,071
Physical Sciences	5,117	6,753	9,084	16,043	19,412	26,525	31,500	29,928	27,172	22,252
Engineering	2,684	3,702	5,147	11,172	19,150	25,433	28,457	28,581	24,282	22,820
Biological Sciences	5,238	9,362	11,144	17,254	18,168	23,611	30,463	34,077	36,295	38,171
Social Sciences	4,860	8,348	10,196	12,550	14,846	20,441	36,488	48,691	53,510	46,399
Arts & Humanities	5,179	8,344	9,760	8,882	8,804	13,633	24,023	31,127	32,579	28,124
Education	6,631	7,958	9,185	10,636	18,650	21,870	45,454	57,604	62,620	55,267
Health Sciences	3,925	4,856	5,525	9,423	9,824	11,316	13,919	15,169	17,964	18,321
Other	185	886	1,503	2,638	3,389	3,505	6,537	17,096	17,914	6,054
Total	36,537	53,890	65,785	94,820	120,265	158,310	232,910	279,299	286,556	248,479

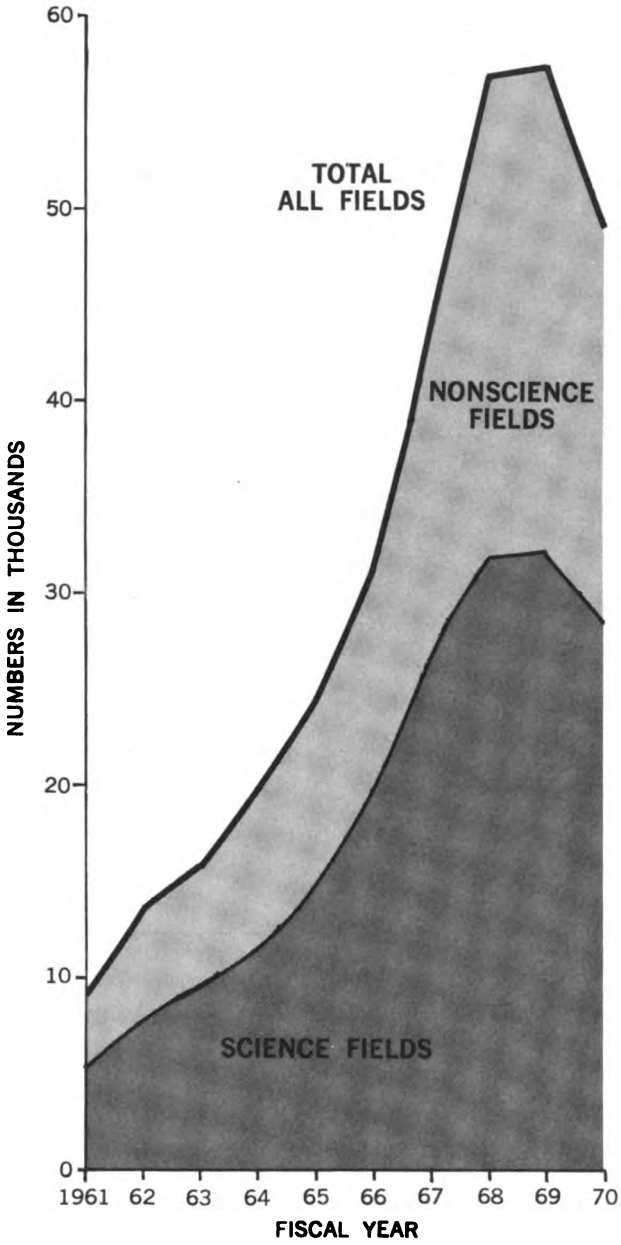
SOURCE: The Federal Interagency Committee on Education, *Report on Federal Predoctoral Student Support*, April 1970. Supplemental data from Mrs. Barbara Montgomery, Federal Interagency Committee on Education.

*Amounts of Federal support include institutional allowances as well as stipend and dependency support to the student.

Note: The sharp increase in number of dollars "Other" in 1968 and 1969 is caused by the increase in National Teaching Fellowship Program, Developing Institutions Program, Office of Education Title III. These fellowships are not distributed by academic field, and there were large numbers of them in FY 1968 and FY 1969.

Section 14:
Predoctoral fellowships and traineeships

Figure 14.
Number of predoctoral graduate students supported by federal fellowship and traineeship programs, FY 1961–1970.



- Federal support for predoctoral fellowships and traineeships grew rapidly from FY 1961 until FY 1968, but since FY 1968 this support has begun to decrease in all fields except the biosciences, and even here the rate of increase has declined markedly.
- Total dollar support increased almost sevenfold during the period FY 1961 to FY 1970, and number of persons supported increased fivefold. Mathematics and physical sciences experienced the smallest percentage increases in support during the 1960's; engineering and biosciences received the largest percentage increases.
- The number of persons supported by NIGMS traineeships and fellowships increased rapidly between FY 1958 and FY 1964, remained essentially constant through FY 1967, and decreased in FY 1968 and FY 1969.

TABLE 14b.
Number of persons supported by NIGMS traineeship and fellowship programs, by FY on duty, 1958–1969

FY on duty	Number of Persons Supported, by Type of Support*		
	Trainees	Fellows	Unduplicated Total**
1958	152	0	152
1959	756	31	787
1960	1,350	384	1,728
1961	2,034	798	2,803
1962	4,379	977	5,299
1963	6,094	1,303	7,309
1964	7,472	1,397	8,792
1965	7,429	1,472	8,784
1966	7,675	1,814	9,347
1967	6,817	2,130	8,835
1968	6,339	2,246	8,513
1969	6,527	1,980	8,449

*Includes all academic fields and all academic levels—prePhD, preMD, post MD, postPhD, and all other.
**A very small number (about 1%) receive both traineeship and fellowship support during the same fiscal year.
SOURCE: NIGMS: Statement of Appointment of Trainees, and Fellowship Award Statement

Employment Patterns of Bioscientists

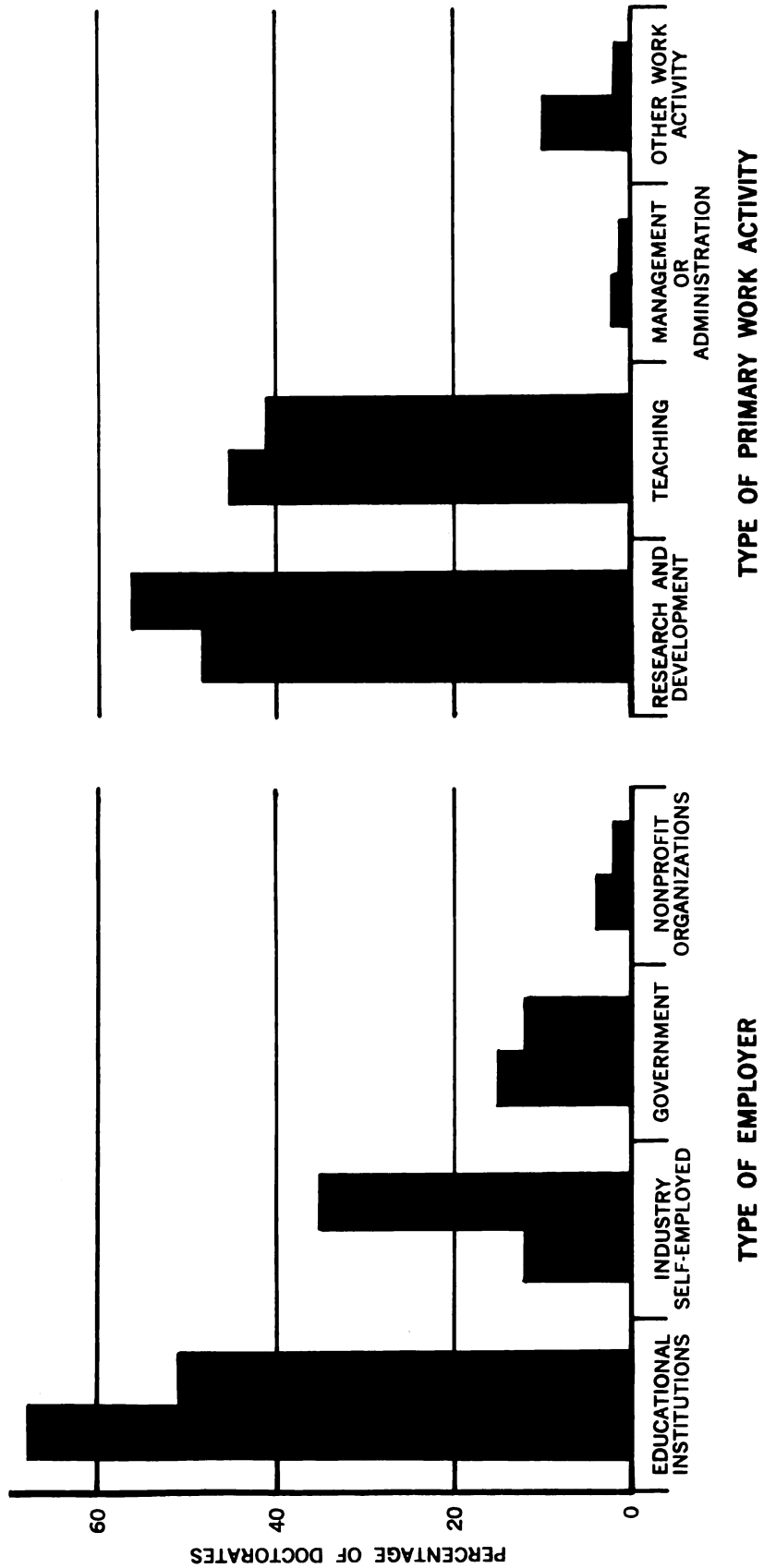
Type of employer and type of primary work activity

Salary

Expenditures for research

Section 15: Type of Employer and Principal Work Activity

Figure 15.—Type of employer and type or primary work activity for employed doctorate bioscientists and physical scientists in 1968 National Register of Scientific and Technical Personnel.



- Educational institutions are virtually the only employers of nonscience PhD's. Science doctorate recipients distribute more broadly —about half to educational institutions, one-fourth to industry, and the remainder to governmental and nonprofit institutions.
- The primary work activities of nonscientists are teaching and administration. Despite their research doctorates, very few consider research as a primary work activity. The first postdoctoral work activities of science doctorates are divided about evenly between research and teaching.
- Comparison of PhD biological scientists with PhD physical scientists in the National Register of Scientific and Technical Personnel reveals little difference in their primary work activities (about half of each work in research), but there are marked differences in type of employer. Bioscientists are more likely to work in educational institutions or for government agencies; physical scientists are more likely to work for industry.
- Although foreign citizens among the new PhD's have the same general pattern of initial postdoctoral employment as do U.S. citizens, there are some significant differences. In the physical sciences and engineering, a larger proportion of foreign citizens go to work in academic institutions, and smaller proportions in private industry and U.S. government jobs.
- Comparison Table 15a (*immediate* postdoctoral employment: data from NRC Doctorate Records File) with 15d (all years of professional experience: data from the N.S.F. National Register) shows that doctorate recipients tend to move out of both research and teaching as careers mature. (The change is real, but slightly exaggerated in comparing T15a and T15d because of self-selection of Register respondents.) Government employees are slightly more inclined to complete Register questionnaires than are employees of colleges and universities.

TABLE 15a.

Immediate postdoctoral employment for FY 1969 doctorate recipients* in 7 summary fields by citizenship

Field of PhD	Citizenship	Type of Employer											Type of Primary Work Activity								
		Educ. Inst.		Indus. Self		Gov't		Nonprofit		Other		Unknown N	Total N	Research		Teaching		Adminis.		Other		Unknown N
		N	%	N	%	N	%	N	%	N	%			N	%	N	%	N	%	N	%	
Physical Sciences	U. S.	1408	50	1015	36	316	11	69	2	17	1	74	2899	1564	56	1143	41	36	1	54	2	100
	Non-U.S.	253	60	121	28	34	8	8	2	9	2	12	437	228	55	179	43	6	1	4	1	20
	Total	1661	51	1136	35	350	11	77	2	26	1	86	3336	1792	56	1322	41	42	1	58	2	120
Engineering	U. S.	665	31	1127	52	262	12	91	4	18	1	67	2230	1508	70	526	24	48	2	77	4	70
	Non-U. S.	252	39	310	48	47	7	15	2	16	2	35	675	424	65	199	30	4	1	26	4	22
	Total	917	33	1437	51	309	11	106	4	34	1	102	2905	1932	69	725	26	52	2	103	4	92
Biological Sciences	U.S.	1351	70	247	13	285	14	42	2	17	1	69	2011	896	46	884	45	48	2	117	6	64
	Non-U. S.	279	67	35	8	75	18	12	3	15	4	30	446	231	55	172	41	3	1	9	2	30
	Total	1630	69	282	12	360	15	54	2	32	1	99	2457	1127	48	1056	45	51	2	126	5	94
Social Sciences	U. S.	2204	75	137	5	384	13	188	6	35	1	98	3046	636	22	1752	59	107	4	448	15	102
	Non-U. S.	300	76	16	4	33	8	17	4	29	7	17	412	96	24	258	66	15	4	23	6	19
	Total	2504	75	153	5	417	12	205	6	64	2	115	3458	732	22	2010	60	122	4	471	14	121
Arts & Humanities	U. S.	2796	96	21	1	44	2	31	1	16	–	48	2956	75	3	2673	93	81	3	43	1	84
	Non-U. S.	228	95	2	1	2	1	–	–	9	3	13	254	10	4	227	95	1	–	2	1	14
	Total	3024	96	23	1	46	1	31	1	25	1	61	3210	85	3	2900	93	82	3	45	1	98
Professional Fields	U. S.	548	82	40	6	28	4	39	6	11	2	14	680	42	6	515	77	45	7	62	9	14
	Non-U. S.	83	81	4	4	4	4	5	5	6	6	5	107	12	12	76	74	4	4	11	11	4
	Total	631	82	44	6	32	4	44	6	17	2	19	787	54	7	591	77	49	6	73	9	18
Education	U. S.	3520	89	45	1	248	6	108	3	15	–	152	4088	357	9	2035	51	1200	30	354	9	134
	Non-U. S.	171	80	2	1	23	11	7	3	12	5	17	232	33	15	145	66	32	14	11	5	11
	Total	3691	89	47	1	271	7	115	3	27	–	169	4320	390	9	2180	52	1232	30	365	9	145
Other & Unspecified													133									
Total, All Fields	U. S.	12579	72	2647	15	1574	9	573	3	130	1	525	18028	5111	29	9587	55	1576	9	1164	6	573
	Non-U. S.	1576	64	493	20	220	9	64	3	96	4	129	2578	1043	42	1257	51	69	3	86	3	120
	Total	14155	71	3140	16	1794	9	637	3	226	1	654	20606	6154	31	10844	54	1645	8	1250	6	693

*Excludes those who accepted postdoctoral fellowships, traineeships, or other postdoctoral study.
Percentages based on total known type of employer or type of primary work activity.
SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.

TABLE 15b

Immediate postdoctoral employment for FY 1969 doctorate recipients* in 4 natural science fields, by citizenship.

Field of PhD	Citizenship	Type of Employer											Type of Primary Work Activity								
		Educ. Inst.		Indus/Self		Gov't		Nonprofit		Other		Unknown N	Total N	Research		Teaching		Adminis.		Other		Unknown N
		N	%	N	%	N	%	N	%	N	%			N	%	N	%	N	%	N	%	
Bioscience	U. S.	948	77	132	11	105	8	32	3	8	1	154	1379	471	38	696	57	21	2	43	3	148
	Non-U. S.	131	72	13	7	31	17	5	3	2	1	106	288	98	52	86	46	–	–	4	2	100
	Total	1079	77	145	10	136	10	37	3	10	1	260	1667	569	40	782	55	21	1	47	3	248
Chemistry	U. S.	297	30	617	63	51	5	16	2	1	–	76	1058	700	71	263	27	11	1	12	1	72
	Non-U. S.	49	36	79	59	7	5	–	–	–	–	64	199	94	70	37	27	3	2	1	1	64
	Total	346	31	696	62	58	5	16	1	1	–	140	1257	794	71	300	27	14	1	13	1	136
Mathematics	U. S.	654	85	75	10	21	3	15	2	–	–	42	807	206	27	543	71	6	1	9	1	43
	Non-U. S.	113	88	11	9	3	2	1	1	–	–	24	152	44	35	81	64	–	–	1	1	26
	Total	767	86	86	10	24	3	16	2	–	–	66	959	250	28	624	70	6	1	10	1	69
Physics	U. S.	293	43	257	38	92	14	32	5	2	–	114	790	458	67	209	30	7	1	13	2	103
	Non-U. S.	53	67	14	18	8	10	4	5	–	–	73	152	42	53	37	46	1	1	–	–	72
	Total	346	46	271	36	100	13	36	5	2	–	187	942	500	65	246	32	8	1	13	2	175

*Excludes those who accepted postdoctoral fellowships, traineeships, or other postdoctoral study.
Percentages based on total known type of employer or type of primary work activity.

SOURCE: National Research Council, Office of Scientific Personnel, Doctorate Records File.

TABLE 15c.
Immediate postdoctoral employment for FY 1967–1969 doctorate recipients (excluding those in postdoctoral training*) in 7 bioscience fields, NIGMS-supported vs. non-NIGMS-supported.

Field of PhD	Support Status in Grad. School	Type of Employer (%)					Un-known N	Total Eligible for Empl. N	Type of Primary Work Activity (%)				Un-known N
		Educ. Inst.	Indus/ Self	Govt	Non Prof.	Other			Res.	Tchng	Admin.	Other	
Anatomy	NIGMS	96	1	1	0	1	22	100	32	63	2	3	18
	Non-NIGMS	89	2	4	2	2	13	103	36	57	4	3	5
Biochemistry	NIGMS	54	24	12	10	0	70	268	67	25	1	7	51
	Non-NIGMS	52	22	13	9	3	114	423	71	24	1	4	61
Biophysics	NIGMS	70	17	9	2	2	20	73	64	34	0	2	15
	Non-NIGMS	56	6	29	8	2	15	67	59	26	9	7	9
Genetics	NIGMS	92	2	5	1	0	16	82	36	62	0	2	10
	Non-NIGMS	72	12	12	2	2	79	198	63	35	0	2	29
Microbiology	NIGMS	67	15	10	8	0	41	194	53	37	2	8	30
	Non-NIGMS	53	15	22	5	5	100	456	58	33	2	7	59
Pharmacology	NIGMS	53	27	18	2	0	27	120	67	25	1	7	18
	Non-NIGMS	51	33	10	3	3	31	107	58	33	3	6	19
Physiology	NIGMS	72	12	12	3	1	36	210	50	44	1	4	26
	Non-NIGMS	73	7	11	5	4	55	296	50	43	3	3	28
Total, All Flds	NIGMS	68	16	10	5	1	232	1,047	55	38	1	7	168
	Non-NIGMS	61	15	15	5	4	407	1,650	59	35	2	4	210

*Excludes those who accepted postdoctoral fellowships, traineeships, or other postdoctoral study. Please note from Table 7b that 54% of the NIGMS doctorate recipients and 32% of the non-NIGMS doctorate recipients continue with immediate postdoctoral study. Exclusion of these large percentages of persons, who are *not* randomly selected, makes interpretation of these data difficult. The type of employer and work activity for the excluded group may differ markedly from this group.

SOURCE: NIGMS: Statement of Appointment of Trainees, and Fellowship Award Statement

TABLE 15d.
Type of employer and type of primary work activity for employed doctoral scientists* in the National Register of Scientific and Technical Personnel, 1960–1968

	Type of Employer										Type of Work Activity							
	Educ. Inst.		Indus. & Self		Gov't		NonProf.		Unknown & Other		Total		Research		Teaching		Admin.		Unknown & Other	
Field/Year	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Biosciences																				
1960	9,337	64	1,770	12	2,250	15	747	5	530	4	14,634	100	7,188	49	4,334	30	2,308	16	804	5
1962	9,263	63	1,676	11	2,563	17	693	5	515	4	14,710	100	7,249	49	4,462	30	2,278	15	721	5
1964	10,288	65	1,706	11	2,362	15	718	5	648	4	15,722	100	7,250	46	4,573	29	2,638	17	1,261	8
1966	11,535	66	1,896	11	2,528	14	848	5	721	4	17,528	100	8,099	46	4,851	28	3,049	17	1,529	9
1968	16,559	67	2,440	10	3,409	14	1,270	5	998	4	24,676	100	12,037	49	6,756	27	4,059	16	1,824	7
Physical Sciences																				
1960	13,663	39	14,990	43	2,940	8	2,341	7	723	2	34,657	100	17,193	50	7,984	23	7,702	22	1,778	5
1962	15,007	41	15,004	41	3,327	9	2,393	7	947	3	36,678	100	17,520	48	9,045	24	7,971	22	2,142	6
1964	18,615	45	16,190	39	3,473	8	1,872	5	1,389	3	41,539	100	19,869	48	9,909	24	8,167	19	3,594	9
1966	22,424	48	16,826	36	3,807	8	2,037	4	2,073	4	47,167	100	22,043	47	11,387	24	8,802	19	4,935	10
1968	27,629	48	20,890	37	4,246	7	1,689	3	2,627	5	57,081	100	24,469	43	14,845	26	11,427	20	6,340	1
Social Sciences																				
1960	(Data on the social sciences not available on a comparable basis for 1960 and 1962)																			
1962																				
1964	11,671	62	2,206	12	2,633	14	1,326	7	1,006	5	18,842	100	3,888	21	7,107	38	3,421	18	4,426	23
1966	14,436	64	2,302	10	3,016	13	1,476	7	1,245	6	22,475	100	4,781	21	8,341	37	4,296	19	5,057	23
1968	20,436	69	2,714	9	3,106	11	1,978	7	1,215	4	29,449	100	5,884	20	12,301	42	5,583	19	5,681	19

*Table 15a describes *immediate* postdoctoral employment as reported in the Survey of Earned Doctorates. This table describes employment of *all* employed doctoral scientists for various years of work experience as reported to the National Register of Scientific and Technical Personnel.

SOURCE: National Science Foundation, *American Science Manpower*

TABLE 15e.
Primary work activity, in 1967, of all M.D. graduates of U.S. medical schools as reported to the American Medical Association's Physician Records Service file.

	Number	Percent
Total graduates from U.S. Medical Schools, all years	256,536	100.0
Primary Work Activity in 1967		
Patient Care	228,337	89.0
(Solo, partnership, group)	(168,469)	(65.7)
(Interns, residents, fellows)	(31,226)	(12.2)
(Hospital staff)	(28,642)	(11.2)
Other Professional Activities	16,452	6.4
(Medical school faculty)	(9,401)	(3.7)
(Administration)	(3,806)	(1.5)
(Research)	(3,245)	(1.3)
Inactive	11,747	4.6

SOURCE: *Medical School Alumni, 1967*, p. 24.

Section 16:

Salary

- Salary data reported from the National Register of Scientific and Technical Personnel do not provide sufficient detail to make adequate comparisons between fields. Median salary for PhD's in a field equated for type of employer, type of work activity, and years of professional experience is not available from the published tabulations.
- The median annual salaries of bioscientists are about the same as those of social science PhD's, but they are somewhat less than the median annual salaries of physical scientists. However, these differences are decreasing because the rate of increase for the physical sciences is less somewhat than for the other two.
- In educational institutions the median salary of bioscientists compares favorably with those of chemists, physicists, and mathematicians. In industry, government, and nonprofit institutions the biosciences lag the others.

Figure 16.
Median annual salaries in 1968 of research doctorates in 4 natural science fields by type of employer.

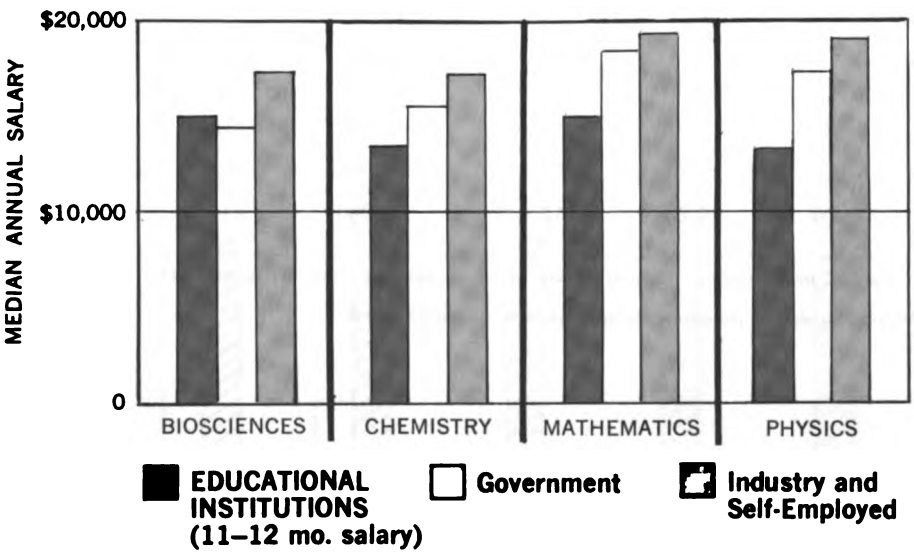


TABLE 16a.
Median Annual Salaries of Research Doctorates in the Life, Physical and Social Sciences as Reported to the National Register of Scientific and Technical Personnel, Biennially 1960–1968.

Field		1960	1962	1964	1966	1968
Life	Median Annual Salary	$ 9,000	$10,000	$11,200	$12,500	$14,200
Sciences	% Increment Above Previous Period		11.1	12.0	11.6	13.6
Physcial	Median Annual Salary	11,000	12,000	12,600	13,800	15,400
Sciences	% Increment Above Previous Period		9.1	5.0	9.5	15.9
Social	Median Annual Salary	9,000	10,000	11,200	12,400	14,300
Sciences	% Increment Above Previous Period		11.1	12.0	10.7	15.3

Notes: Salaries were reported to the nearest thousand dollars in 1960 and 1962. No specifications after 1962.
The fields included in the three summary fields are approximately the same from year to year for the life and physical sciences. The social science fields increase from one in 1960 (psychology) to six in 1968.

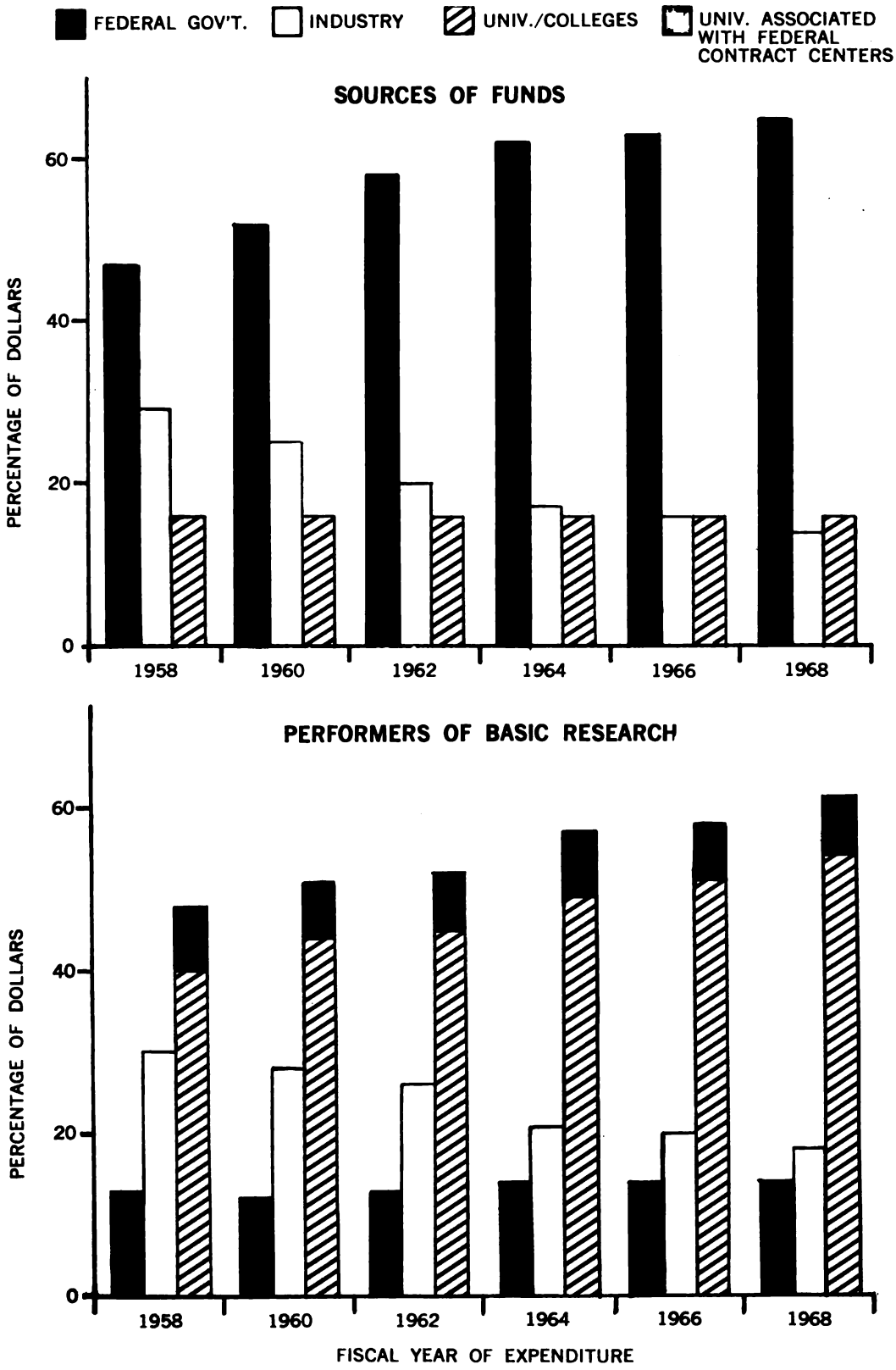
TABLE 16b.
Median Annual Salaries of Research Doctorates, by Type of Employer, by Field of Science, 1968 National Register of Scientific and Technical Personnel.

Scientific Field	Educatonal Institutions[a]	Industry and Self-employed	Government	Non-profit Organization	Other & Unknown
Biosciences	$15,000	$17,200	$14,400	$15,000	$16,000
Chemistry	13,500	17,100	15,600	16,000	15,200
Mathematics	15,000	19,600	18.400	20,000	18,000
Physics	13,400	19,000	17,400	18,000	- - -

[a]Salaries of scientists employed by educational institutions are based on calendar year (11-12 months) salaries.
SOURCE: National Science Foundation, *American Science Manpower* (biennial series)

Section 17: *Expenditures*

Figure 17.—Sources of funds and performers of basic research biennially 1958–1968.



- In absolute amounts, all types of agencies increased their contributions to, and use of, funds for basic research during the past decade. Industry and nonprofit organizations performed roughly the same amount of basic research as they financed; the Federal government was a source of five times as much funding as it used, and the universities performed about three times as much basic research as they funded.
- As a percentage of the total, the Federal government has been an increasing source of funds for basic research, and industry has provided a decreasing percentage of the total. As performers of basic research, the educational institutions accounted for an increasing percentage and industry a decreasing percentage of the total.

TABLE 17.
Transfers of funds expended annually for performance of basic research by sector, distributed by source, 1958–1968.

		Sources of Funds for Basic Research* (Dollars in millions)									
		Total		Fed. Govt.		Industry		Univ. & Colleges		Non-Profit	
FY of	Expenditure	$	%	$	%	$	%	$	%	$	%
	1958	973	100	460	47	282	29	159	16	72	8
	1960	1326	100	693	52	331	25	215	16	87	7
	1962	1886	100	1094	58	382	20	293	16	120	6
	1964	2560	100	1593	62	425	17	402	16	140	5
	1966	3135	100	1988	63	496	16	494	16	157	5
(prel)	1968	3730	100	2405	65	525	14	615	16	185	5

		Performers of Basic Research (Dollars in millions)											
		Total		Fed. Govt.		In-dustry		Univ. & Colleges		Univ. Assoc. Contr. Cntr.		Non-Profit	
		$	%	$	%	$	%	$	%	$	%	$	%
	1958	973	100	126	13	295	30	390	40	78	8	84	9
	1960	1326	100	160	12	376	28	576	44	97	7	117	9
	1962	1886	100	251	13	488	26	850	45	136	7	161	9
	1964	2560	100	364	14	549	21	1261	49	191	8	195	8
	1966	3135	100	449	14	624	20	1601	51	227	7	234	7
(prel)	1968	3730	100	515	14	680	18	1990	54	275	7	270	7

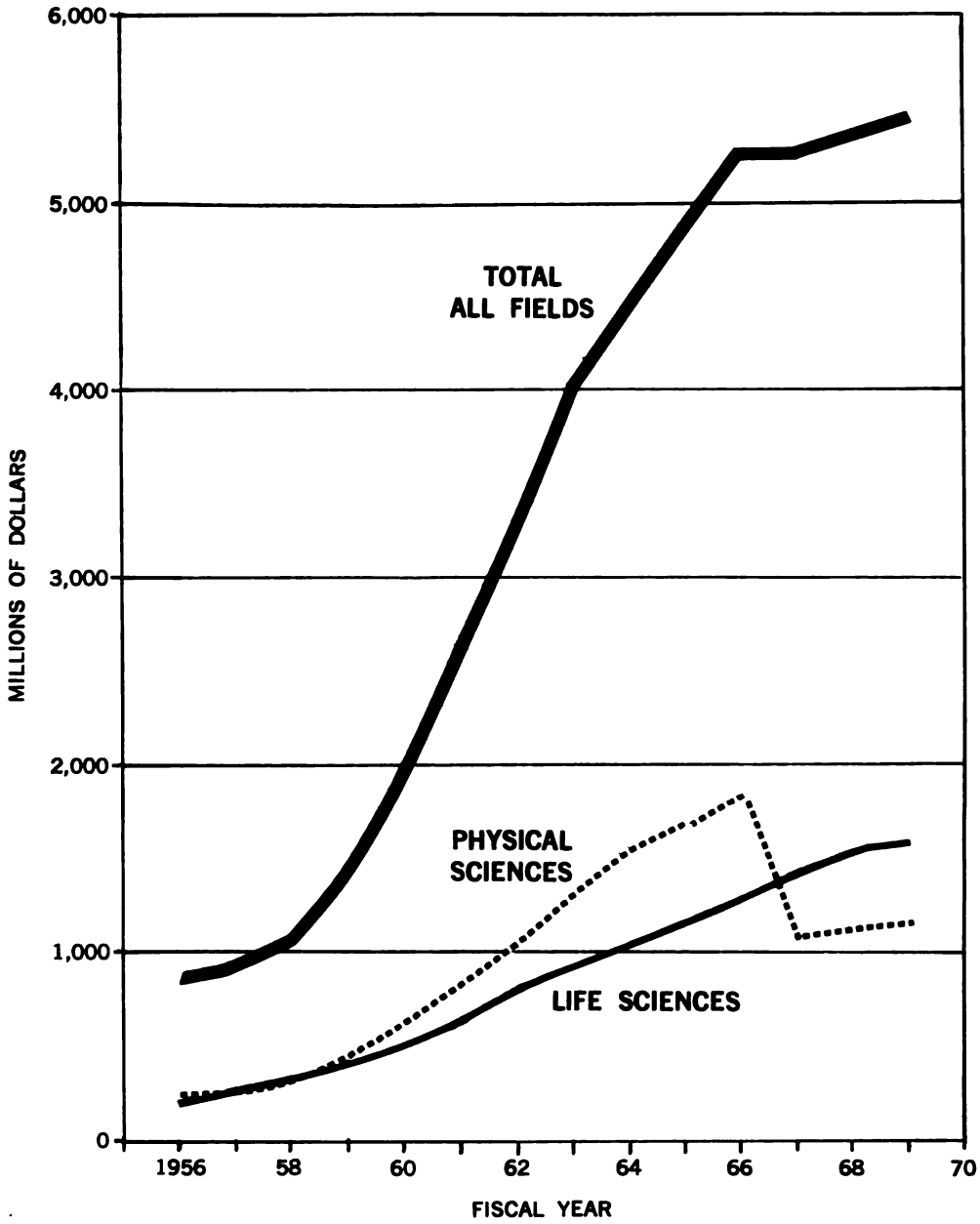
SOURCE: National Science Foundation, *National Patterns of R&D Resources, Funds & Manpower in the United States, 1953-1970*, NSF 69-30, 1969.

*Basic research is defined as that directed toward increases of knowledge in science with "the primary aim of the investigator . . . a fuller knowledge of understanding of the subject under study, rather than a practical application thereof."

Section 18:
Federal funds for research

Figure 18.

Federal funds for research in the life sciences, physical sciences, and total all fields, FY 1956–1969.



- Federal funding of basic and applied research increased rapidly from FY 1958 through FY 1966, but since then it has leveled off in absolute amount.
- Physical sciences were cut back drastically; life sciences continued to receive increasing support.

- Reductions in research support in the physical sciences were caused by sharp cutbacks in research funding by NASA and DoD. These two agencies accounted for 70% of the Federal research funding for physical sciences in FY 1966. The life sciences receive almost two-thirds of their Federal research support from HEW, and this support has continued to increase—but at a decreasing rate—through FY 1969.

TABLE 18.
Federal Obligations for Basic and Applied Research, by Source Agency, By Field of Science, FY 1961–1969

Millions of Dollars by Fiscal Year

Source Agency	1961	1962	1963	1964	1965	1966	1967	1968*	1969**
	Total All Fields								
Total, All Agencies	2,620	3,273	4,041	4,464	4,854	5,271	5,273	5,365	5,447
Dept. Agriculture	138	150	160	182	218	228	237	239	247
Dept. Commerce	27	29	36	39	44	41	51	56	63
Dept. Defense	885	1,008	1,632	1,771	1,751	1,849	1,591	1,577	1,633
Dept. HEW	427	574	653	772	862	966	1,082	1,147	1,208
Dept. Interior	70	82	76	90	98	121	143	152	162
Atomic Energy Comm.	220	247	281	308	334	371	392	402	420
NASA	453	714	1,005	1,147	1,290	1,358	1,379	1,356	1,245
Natl Science Fndn	77	105	144	164	172	224	241	257	247
	Biological Sciences (excl. Med. & Agric.)								
Total, All Agencies	129	145	185	220	258	370	434	454*	
Dept. Agriculture	15	11	12	18	20	22	27	28	
Dept. Commerce									
Dept. Defense	29	31	46	54	49	42	51	41	
Dept. HEW	13	15	17	20	26	119	138	151	
Dept. Interior	20	19	23	22	26	35	37	44	
Atomic Energy Comm.	28	31	35	39	41	45	49	50	
NASA	2	17	17	30	50	62	71	74	
Natl Science Fndn.	24	26	34	39	43	41	55	58	
	Chemistry								
Total, All Agencies	134	165	196	233	233	258	242	239	256
Dept. Agriculture						30	28	27	28
Dept. Commerce						5	5	5	6
Dept. Defense	(Detail by agency not available					89	68	66	78
Dept. HEW	prior to 1966 in Chemistry)					32	33	36	37
Dept. Interior						16	17	14	16
Atomic Energy Comm						56	60	60	63
NASA						10	8	6	6
Natl Science Fndn.						19	23	22	20

*Change in field breakout in 1968 made figures for 1968 incompatible with those for previous year. Therefore 1968 data in this field are estimated.
**Estimated
SOURCE: National Science Foundation, *Federal Funds for Research, Development, and Other Scientific Activities.*

TABLE 18. Continued
Millions of Dollars by Fiscal Year

Source Agency	1961	1962	1963	1964	1965	1966	1967	1968*	1969**
	(Mathematical Sciences)								
Total, All Agencies	40	64	87	93	105	123	130	119	127
Dept. Agriculture									
Dept. Commerce									
Dept. Defense	32	39	54	69	72	87	90	79	88
Dept. HEW			2	3	4	5	5	5	5
Dept. Interior				2	2	2	2	2	2
Atomic Energy Comm.	4	4	5	5	6	5	6	6	6
NASA	2	17	13	6	7	8	6	4	4
Natl. Science Fndn.	5	7	11	11	12	14	19	19	18
	(Agricultural Science								
Total, All Agencies	63	71	76	80	106	109	114	117*	
Dept. Agriculture	60	67	70	75	97	101	104	105	
Dept. Commerce									
Dept. Defense									
Dept. HEW									
Dept. Interior		1				2	1	2	
Atomic Energy Comm.	1	1	2	2	2	2	2	2	
NASA							1	2	
Natl Science Fndn.									
	Physics								
Total, All Agencies	321	372	511	482	536	578	579	619	604
Dept. Agriculture						2	3	4	4
Dept. Commerce						10	11	11	12
Dept. Defense						228	207	237	207
Dept. HEW									
Dept. Interior						2	3	3	4
Atomic Energy Comm.						193	209	217	229
NASA						120	114	108	111
Natl Science Fndn.						23	32	38	36

*Change in field breakout in 1968 made figures for 1968 incompatible with those for previous years. Therefore the 1968 data in this field are estimated.
**Estimated
SOURCE: National Science Foundation, *Federal Funds for Research, Development, and Other Scientific Activities*

TABLE 18. Continued
Millions of Dollars by Fiscal Year

Source Agency	1961	1962	1963	1964	1965	1966	1967	1968*	1969**
	Physical Sciences								
Total, All Agencies	855	1,022	1,330	1,590	1,694	1,842	1,074	1,131	1,150
Dept. Agriculture	24	27	30	39	42	42	38	38	38
Dept. Commerce	15	18	23	24	25	27	15	16	18
Dept. Defense	378	380	511	587	547	542	327	338	325
Dept. HEW	5	2	13	15	20	39	41	45	46
Dept. Interior	29	34	29	37	41	47	21	18	21
Atomic Energy Comm.	144	165	188	208	226	263	268	277	292
NASA	25	316	494	611	709	752	289	317	331
Natl Science Fndn.	32	44	64	74	81	123	70	77	75
	Life Sciences, Total								
Total, All Agencies	635	820	933	1,060	1,183	1,290	1,451	1,537	1,597
Dept. Agriculture	85	91	95	108	136	142	150	150	154
Dept. Commerce									
Dept. Defense	52	58	93	98	99	107	106	105	107
Dept. HEW	380	523	568	662	714	777	878	951	997
Dept. Interior	20	20	23	22	28	37	41	43	48
Atomic Energy Comm.	45	50	56	62	67	72	78	79	81
NASA	4	17	21	32	51	67	88	98	88
Natl Science Fndn	26	32	42	44	44	42	58	57	56
	Medical Sciences								
Total, All Agencies	443	604	672	761	819	811	903	1,016*	
Dept. Agriculture	10	13	13	15	19	19	20	20	
Dept. Commerce									
Dept. Defense	23	27	46	43	50	64	55	52	
Dept. HEW	367	509	551	642	688	658	740	819	
Dept. Interior							2	2	
Atomic Energy Comm.	15	17	19	21	23	25	27	28	
NASA	2		4	2		5	16	47	
National Science Fndn	2	6	8	5	1	1	2	2	

*Change in field breakout in 1968 made figures for 1968 incompatible with those for previous years. Therefore 1968 data in this field are estimated.
**Estimated
SOURCE: National Science Foundation, *Federal Funds for Research, Development, and Other Scientific Activities.*

Chapter III

ANNOTATED BIBLIOGRAPHY OF SOURCE DOCUMENTS

The data presented in the preceding chapter are generally in time-series form, terminating at about FY 1969. However, most of the data appearing in the tables were obtained from sources which periodically repeat their surveys and report the results regularly in data booklets. The reader may up-date the information in this report by subscribing to these booklets, most of which are publications from government agencies. This chapter provides an annotated listing of the source publications cited in Chapter Two.

The source documents are listed by subject grouping—"Population", "High School Enrollments and Graduates", "Higher Education Enrollments", etc. Within each category, a source agency is identified followed by the publication(s) from that agency dealing with the subject. A short statement describing the method of data collection is also provided.

Population

Source Agency: U.S. Department of Commerce
Bureau of the Census
Population Division

Source Publication(s):

Population Estimates, "Estimates of the Population of the United States, by Single Years of Age, Color, and Sex, 1900 to 1959". (Series P–25, No. 311, July 2, 1965)

—data by single years of age were not published prior to this report.

Population Estimates, "Estimates of the Population of the United States, by Single Years of Age, Color, and Sex, 1960 to 1964." (Series P–25, No. 314, April 19, 1965)

Population Estimates, "Estimates of the Population of the United States, by Age, Race, and Sex: July 1, 1964 to 1967." (Series P–25, No. 385, February 14, 1968)

Population Estimates, "Projections of the Population of the United States, by Age, Sex, and Color to 1990, with Extensions of Population by Age and Sex to 2015." (Series P–25, No. 381, December 18, 1967)

Method of Data Collection:

The estimates for single years of age, by color and sex are published annually. Each publication includes population data as of the preceding July 1st and several years prior (the number of years for which data are presented varies in the annual reports). The estimates for the fifties and sixties are based of the census counts taken in April and adjusted to July 1 of the census year. "The population count is brought from the census year to the estimate date by aging the population according to the length of the estimate period and by assigning births, deaths, and net immigrants during the estimate period to the proper age group." A note to the estimates in single years of age indicates that they "are subject to considerable error". "They represent very approximately the size of the population in a given age and reflect very roughly variations from age to age and year to year."

The projections of the population by age, sex, and color are published periodically—no specific time interval. The most recent projections are those in the above cited publication.

The projections are based on the 1960 Census data and carried forward to July 1, 1965 by employing birth, death, and net immigration statistics for the intervening years. The population in midyear 1966 was continued forward by use of life-table survival rates and allowances for net immigration. The projections for cohorts born after midyear 1966 depend on births for each year. The Census bureau uses four fertility rates, i.e., average number of children born by the end of childbearing period per 1000 women. Series A uses a 3.4 rate, B uses a 3.1, C a 2.8, and D a 2.4 rate.

Series A and B are not used extensively. The Population Division makes short-range projec-

tions based on the Series D (2.4) rate and long-range projections using the Series C (2.8) rate.

High School: Enrollments and Graduates

Source Agency: U.S. Department of Health, Education, and Welfare
Office of Education
National Center for Educational Statistics

Source Publications:
"Offerings and Enrollments in Science and Mathematics in Public High Schools."

"Digest of Educational Statistics, 1969"

"Projections of Educational Statistics to 1977–78"

Method of Data Collection:

Enrollments in public high school science and mathematics programs were obtained from biennial surveys conducted from 1954 to 1964. A twenty percent stratified sample of public high schools in the U.S. were surveyed. The sample data were inflated to provide national *estimates.*

The number of high school graduates includes graduates of all regular public and non-public schools. The data on public school graduates are obtained each fall from the State departments of education. Graduates of non-public schools are reported in surveys of non-public schools by the Office of Education.

HEGIS

The Higher Education General Information Survey (HEGIS) of the U.S. Office of Education annually collects data from all accredited institutions of higher education. It combines into one package surveys which, prior to 1966, were sent to colleges and universities at differing times in the year.

The basic HEGIS package covers the following areas of information:

1. Institutions—characteristics of colleges and universities
2. Students—enrollments and degrees
3. Employees—professional and nonprofessional
4. Financial statistics
5. Physical facilities

HEGIS is mailed in April to the presidents of academic institutions for distribution to the person or office who maintains the institutional records for each portion of the survey questionnaire. The survey obtains information for the fiscal year (July 1 through June 30) following the April mail-out. The various sections of the survey are scheduled to be returned to OE from July to December.

All data collected by HEGIS are published and reports are available for purchase from the Government Printing Office. The period of time from data collection to publication varies considerably. In the following sections the frequency of collection for specific information items and the most recent publication of the data will be given.

Higher Education: Enrollments

Source Agencies: U.S. Department of Health, Education, and Welfare
Office of Education
National Center for Educational Statistics

American Council on Education
Washington, D.C.

Source Publications:
"Opening Fall Enrollment in Higher Education" Office of Education series OE 54003

"Students Enrolled for Advanced Degrees" Office of Education series OE 54019

"Projections of Educational Statistics to 1977–78" Office of Education series OE 10030

"A Fact Book on Higher Education" American Council on Education

Method of Data Collection:

The "Fact Book" is a compilation of data collected from various sources and published annually by the American Council on Education. The booklet is prepared in four sections

which present selected statistics on (1) enrollment data (2) population, business activity, and employment (3) institutions, faculty and staff, student characteristics and finances and (4) earned degrees. The data in these sections are updated annually.

Undergraduate and graduate enrollments are collected annually by the Office of Education in their HEGIS package. The institutional response to this portion of the survey is nearly 100%. The most recent available data are included for any institutions that do not respond. The 1968 "Opening Fall Enrollment" and "Students Enrolled for Advanced Degrees" were published in the first half of 1970.

The projections of enrollments by the Office of Education are based on 1957–58 to 1967–68 data. The projections assume that the trends in enrollment rates for the past ten-year period will continue for the next ten years.

Higher Education: Degrees

Source Agencies: U.S. Department of Health, Education and Welfare
Office of Education
National Center for Educational Statistics

National Research Council
Office of Scientific Personnel

Source Publications:
"Earned Degrees Conferred"
Office of Education series OE 54013

"Doctorate Recipients from United States Universities, 1958–1966"

"Summary Report 1967: Doctorate Recipients from United States Universities"; "Summary Report 1968..."; "Summary Report 1969 ..."

Method of Data Collection:

The Office of Education annually obtains information on degrees (associate degrees and other formal degrees below the baccalaureate, bachelor's, master's, doctor's and first professional degrees) from the college or university registrars. The information is collected as part of the HEGIS package. The institutions' responses to the degree portion of the survey is, as is the case for the enrollment section, nearly 100%. Nonrespondents to the degree portion of the survey are listed in each publication, and data from the last report made by the institution are used.

The Office of Scientific Personnel collects information on research doctorates only by its Survey of Earned Doctorates. Questionnaires are annually sent to the graduate deans of doctorate-granting institutions. The questionnaire form is filled out by each doctorate recipient after he has completed all requirements for his degree. The response rate is better than 98%. Information about nonrespondents is obtained from the universities' commencement programs.

Higher Education: Institutions

Source Agencies: U.S. Department of Health, Education, and Welfare
Office of Education
National Center for Education Statistics

National Research Council
Office of Scientific Personnel

Source Publications:
"Education Directory Part 3: Higher Education" Office of Education series OE 50000

"Doctorate Recipients from United States Universities, 1958–1966" and "Summary Report" for 1967, 1968, and 1969

Method of Data Collection:

The Office of Education obtains information about higher education institutions from the "Institutional Characteristics . . ." portion of HEGIS. The annual *Education Directory* contains detailed information about the institutions, i.e., type, control, enrollment, names of administrators, accreditation, etc. It also presents several tables summarizing some data

about the institutions. All institutions are included which offer at least a 2-year program of college-level studies in residence and have met specific criteria of accreditation. Several other OE publications present information by named institution, e.g., enrollments, degrees, and professional and nonprofessional employees. The 1969–70 *Education Directory* of higher educational institutions was published in June 1970.

The Office of Scientific Personnel publishes data about doctorate-granting institutions. These data are obtained from the annual Survey of Earned Doctorates referred to in the notes on higher education degrees. Institutions are included which have granted at least one doctorate; those with doctoral programs, but which have not yet granted doctorate degrees, are excluded.

Higher Education: Academic Aptitude of Graduate Students

Source Agency: Educational Testing Service
Princeton, New Jersey

Source Publication:

Although the Educational Testing Service administers the Graduate Record Examinations at regular intervals each year, it does not regularly publish the Aptitude Test scores (verbal and quantitative) distributed by undergraduate major or by field of the Advanced Test. The following are reports of *ad hoc* studies:

- *Graduate Record Examinations Special Report.* Report No. 65–3, August, 1965 (Reports FY 1964 data)
- *Graduate Record Examinations Special Report.* Report No. 68–2, July, 1968. (Reports FY 1968 data)

Method of Data Collection:

The Graduate Record Examinations are administered by the ETS and consist of an Aptitude Test and an Advanced Test. "The Aptitude Test measures two general abilities: verbal and quantitative aptitudes which have been found to be valuable indicators of capacity to handle graduate-level work . . . The verbal section of the Aptitude Test consists of verbal reasoning items and reading comprehension questions. The quantitative section is comprised of questions on mathematical reasoning and interpretive questions on graphic material and other descriptive data.

The Advanced Tests are achievement tests designed to measure knowledge and skills in fields commonly chosen as major fields by undergraduates."*

These examinations are not taken by all baccalaureate recipients but generally by a self-selected group who wish to use the scores as part of an application for graduate school admission or for a fellowship competition. For instance, the data reported in *Graduate Records Examinations Special Report* are based on approximately 80,000 cases, but there were approximately 460,000 baccalaureate degrees awarded in that same fiscal year (1964). Comparisons between groups using GRE results should always be made in terms of the nonrandom sample *who elected to take the examination.*

Higher Education: Faculty

Source Agency: U.S. Department of Health, Education, and Welfare
Office of Education
National Center for Educational Statistics

Source Publications:

"Teaching Faculty in Universities and Four-Year Colleges, Spring 1963" Office of Education series OE 53022

"Faculty and Other Professional Staff in Institutions of Higher Education, First Term 1963–64"
Office of Education series OE 53000

"Numbers and Characteristics of Employees in Institutions of Higher Education, Fall 1966"
Office of Education

Method of Data Collection:

Faculty data are currently collected as part of the HEGIS package sent by the Office of

*p. 3 *Graduate Record Examinations Special Report.*

Education to college and university presidents. The 1966–67 and 1967–68 surveys obtained information about professional and nonprofessional employees, number of full- and part-time faculty by academic field and rank, salaries and fringe benefits. The faculty portion of the 1968 survey was a sample survey and requested only the number of full- and part-time faculty by fine field. In 1969–70, the faculty survey collected data on faculty salaries by academic rank. Information will be obtained in 1970–71 for all employees in the institutions of higher education—professional and nonprofessional, full- and part-time. The survey of employees has six parts:

1. number of employees by primary function
2. total full-time equivalents in teaching and research by academic field
3. full-time resident faculty by highest degree and academic field
4. salaries of academic deans and full-time resident faculty
5. fringe benefits for academic deans and full-time resident faculty
6. salaries of selected administrators

Responses to the faculty portion of HEGIS have been received from about 80% of the institutions. Information about factulty at nonresponding institutions is obtained from the most recent and available sources, e.g. college catalogs, AAUP, etc.

The above cited publication, "Numbers and Characteristics of Employees . . . Fall, 1966" and "Higher Education Salaries, 1966–67" are the most recent publications of faculty data collected by the Office of Education.

Higher Education: Expenditures

Source Agency: U.S. Department of Health, Education, and Welfare
Office of Education
National Center for Educational Statistics

National Science Foundation
National Science Board

Source Publications:

"Digest of Educational Statistics, 1969"
Office of Education series OE 10024

"Financial Statistics of Institutions of Higher Education: Current Funds Revenues and Expenditures, 1965–1966"
Office of Education series OE 52010

"Graduate Education: Parameters for Public Policy" National Science Board (NSF, 1969)

Method of Data Collection:

Prior to the first HEGIS survey in 1965–66, financial data for higher educational institutions were collected and published biennially. The trend data were obtained from the "Digest" listed above.

Financial information on higher educational institutions is collected from college and university business offices as part of the HEGIS questionnaire package.

The HEGIS questionnaire is sent to all institutions of higher education. The 1965–66 survey received an 85% response rate to the financial questionnaire. In order to present national totals, ratios were applied to all data for the responding institutions. These ratios were obtained by grouping nonresponse institutions within each state by control (public or private) and by level (university, other 4-year institutions, and 2-year institutions). In 1966–67, data for nonresponding institutions (14%) were obtained from (1) each institution's response to a prior or succeeding survey and adjusted in accordance with trend information, or (2) from a peer institution's response to the 1966–67 survey. Peer institutions were selected on the basis of location, level of institution, and enrollment.

The following reports on finances result from the HEGIS survey: "Current Funds Revenues and Expenses: Property"; "Student Financial Aid"; the "Financial Statistics . . ." cited above, and "Financial Statistics of Institutions of Higher Education: Federal Funds 1965–66 and 1966–67."

The cost of graduate education was estimated by the National Science Foundation. It is derived from estimates of the cost of instruction per graduate student (based on graduate student enrollment and estimates of the portion of total Expenditures for Educational and General Purposes reported by the Office of

Education) and the expenditures for Organized Research per graduate student. Refer to "Graduate Education: Parameters . . .", pages 150–159, for a detailed description of the methodology of these costs and the projections to 1981–82.

Higher Education: Student Support

Source Agency: Federal Interagency Committee on Education (FICE)
Student Support Study Group

Source Publication:
"Report on Federal Predoctoral Student Support–Part I: Fellowships and Traineeships"

Method of Data Collection:

The Federal Interagency Committee on Education was established by President Johnson in 1964 as a center of coordination for the more than 30 government agencies which administer educational programs.

FICE has collected data on the number of students supported and the amount expended by Federal agencies from 1960–61 to 1969–70. The data were obtained by questionnaire from the agencies' program administrators. The report cited above contains information collected in 1969 from all agencies supporting full-time predoctoral students on fellowships and traineeships. Part II of the report (to be published by September 1970) will present data on students supported under the institutional training grants of the National Institutes of Health and the National Institute of Mental Health.

The data in Part I, which was published in June 1970, are presented by year and academic field.

FICE previously collected data and published a report on student support. This earlier (1968) report did not include information from the Department of Housing and Urban Development, the Department of the Interior, the Social and Rehabilitation Service of the Department of Health, Education, and Welfare, and some missing components of the Public Health Service. Data from these agencies are included in the current report.

There are no definite plans as to whether there will be a continuing series of surveys on student support by FICE.

Employment of Doctorate Recipients

Source Agencies: National Science Foundation
Office of Economic and Manpower Studies

National Research Council
Office of Scientific Personnel

Source Publications:
"American Science Manpower"
National Science Foundation Series

"Doctorate Recipients from United States Universities, 1958–1966"; and "Summary Report" for 1967, 1968, and 1969

Method of Data Collection:

"American Science Manpower" is a series of publications which presents data from the National Register of Scientific and Technical Personnel. The National Register has biennially collected employment information from scientists since 1954. The most recent report, published early in 1970, provides data from the 1968 Register.

The registration questionnaires are distributed with the cooperation of scientific professional societies. Information is collected from physical and biological scientists, mathematicians, and social scientists. In 1968, the Register obtained information from 298,000 scientists. According to the 1968 report, data on individual scientists constitute "partial coverage of the scientific community."

Questionnaires were received from 66% of the individuals on the mailing lists compiled by the cooperating societies; 16% of these questionnaires were eliminated from the final analyses because they were incomplete or the respondents did not have full professional qualifications.

No estimates are given on the coverage of the Register although the results of the study of a sample of nonrespondents are included in the appendix of the 1968 report.

"As compared with the respondents, the qualified nonrespondents:

(1) show higher proportions in chemistry and agricultural sciences and lower proportions in biological sciences and psychology;

(2) have fewer Ph.D.'s and M.D.'s and more bachelor's degrees;

(3) are more often employed in industry and business or self-employed and less often employed in educational institutions;

(4) are more likely to be in management or administration or production and inspection and less likely to be in research and development; and

(5) are somewhat older."

Employment data published by the Office of Scientific Personnel are obtained from the annual Survey of Earned Doctorates questionnaire. (See description under "Degrees.") These data describe the *immediate* postdoctoral employment of the doctorate recipients of a given year in contrast to the National Register of Scientific and Technical Personnel statistics which describe the employment characteristics of scientists with varied years of professional experience.

Research Support

Source Agency: National Science Foundation
Office of Economic and Manpower Studies

Source Publications:

"National Patterns of R & D Resources, 1953–1970" NSF 69–30

"Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1968, 1969, and 1970"

Method of Data Collection:

The National Patterns of R & D Resources surveys have been conducted by NSF since 1953. The reports are in the form of "Transfer Tables" or matrices which relate four pertinent sectors as sources of funds and performers of research. The four sectors are:

- Federal sector—Executive agencies surveyed annually by NSF providing data for both the National Patterns and Federal Funds reports. Return rate is 100%.
- Industry sector—all major industries surveyed annually by NSF. Forms sent to all companies with 1000 or more employees. Return rate is better than 95%.
- Universities and Colleges—surveyed biennially by NSF. All U.S. colleges and universities are sent a questionnaire. The overall return rate is approximately 80% but special efforts are made to ensure almost complete returns from the largest 100 institutions. Estimates are provided for nonrespondents.
- Other nonprofit—surveyed biennially. Forms sent to all organizations having intramural research programs of $100,000 or more. Return rate is somewhat over 80%, and estimates are made for nonrespondents.

The Federal Funds for R & D surveys are conducted by means of annual surveys of Executive Agencies by NSF. These surveys have been conducted since 1952. Although NSF staff confers with the respondent agencies, the ultimate decisions on classification of activities and the amounts reported are made by the agencies. Published reports of the data appear annually.

Education and Employment Data for Graduates of U.S. Medical Schools

Source Agency: Division of Medical Education
American Medical Association
535 N. Dearborn St.
Chicago, Illinois 60610

Source Publications:

Annual supplement "Medical Education in the United States" included in one of the November issues of *The Journal of the American Medical Association* (JAMA)

Medical School Alumni, 1967
C. N. Theodore, G. E. Sutter, J. N. Haug
American Medical Association, Chicago, Illinois, 1968

One of the "Special Statistical Series" published by the AMA

Method of Data Collection:

- Physician Records Service. This is a complete registry begun in 1904 of all MD's in the United States, including those graduating from U.S. medical schools and those from foreign countries. The registry includes data about each person's educational background, post-MD training, and professional employment. Each person's file is regularly updated. The data are on magnetic tape and may be considered to be virtually complete and up-to-date for each of the 1/3 million persons listed.
- Liaison Committee on Medical Education Annual Questionnaire. This questionnaire, sponsored jointly by the American Medical Association and by the Association of American Medical Colleges, is mailed out annually to each of the accredited medical colleges in the United States. The response rate is 100%. The questionnaire collects information about student enrollments, number of faculty, medical college expenditures, etc. from each accredited medical school.

Information from these sources is summarized annually in the JAMA. The reports have been published since 1908 and are quite detailed, including as much as 120 pages of tables and explanatory comment.

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