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ABSTRACT

Based upon the findings of the National Science Foundation's (NSF) Survey of Scientific and Engineering Personnel Employed at Universities and Colleges, January 1980, this report presents highlights and summaries of statistical data regarding trends in academic employment of scientists and engineers between 1978 and 1980. Data are reported concerning: (1) the employment status (whether employed part-time or full-time): (2) type of institution: (3) research and development activity: (4) field of employment: (5) institutional control: and (6) employment of women in the field. (CS)

SCIENCE RESOURCES STUDIES HIGHLIGHTS

NATIONAL SCIENCE FOUNDATION WASHINGTON, D C 20550 AUGUST 3, 1981 NSF 81-315

Academic Employment of Scientists and Engineers Increased 6% Between 1978 and 1980

This report is based upon the findings of the National Science Foundation's (NSF) Survey of Scientific and Engineering Personnel Employed at Universities and Colleges January 1980 which was mailed to approximately 2,200 universities and colleges offering a program in the sciences or engineering. Estimates made for nonrespondents represent 21 percent of the total number of scientists and engineers employed in universities and colleges

Highlights

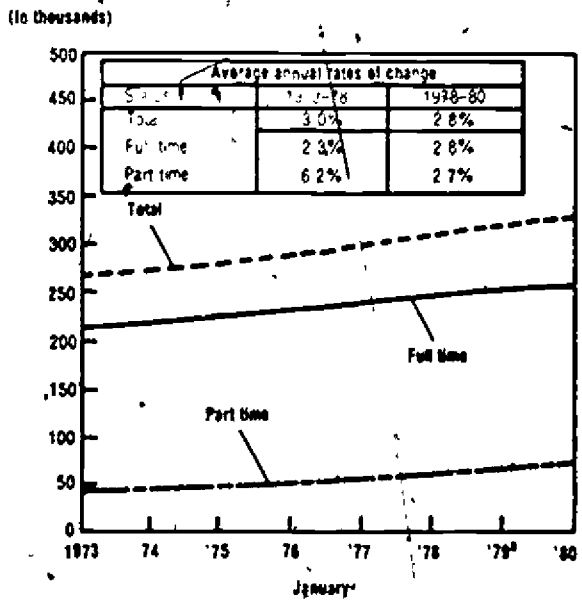
- An estimated 325,000 scientists and engineers were employed at institutions of higher education in January 1980. This represents an average annual increase of 3 percent over 1978 levels, the last year NSF conducted a full-scale version of this survey. The 1978-80 expansion in academic science and engineering (S/E) personnel matched the 1973-78 average rate of growth of the S/E labor force in universities and colleges.

- Continued growth in academic S/E employment occurred between 1978 and 1980 in parallel with strong industrial demand for doctorate-holders. Employment of S/E doctorates by business and industry increased more than twice as rapidly as by educational institutions between 1977 and 1979 (16 percent compared to 7 percent).[a]

- After a 5-year period 1973-78 during which the annual growth rate of part-time S/E personnel exceeded that for full-timers 6 percent to 2 percent, universities and colleges reported that between 1978 and 1980, both full- and part-timers increased 3 percent per year (chart 1).

The slowdown in part-time hiring rates was traceable to 2-year institutions where the number declined by 1 percent per year, down sharply from the 12-percent annual growth reported between 1973 and 1978.

Chart 1. Scientists and engineers employed at universities and colleges by status



[a]Estimated based on responses from doctorate granting institutions
SOURCE: National Science Foundation

[a]Data from an abbreviated survey of S/E personnel at doctorate-granting institutions in 1979 that were combined with the full-scale 1980 survey data indicate that the S/E employment growth occurred at about the same rates in both the 1978-79 and 1979-80 periods.

National Science Foundation, *Characteristics of Doctoral Scientists and Engineers in the United States: 1979* (Detailed Statistical Tables) (NSF 80-323) (Washington, D.C.: 1981), table 2.

(Prepared in the Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies)

- Between 1978 and 1980 the 6-percent per year growth rate of women S/E professionals employed full time in the academic sector exceeded the growth rate for men which was 2 percent per year. This pattern matched the average yearly rates of increase for men and women between 1974 when NSF first collected data by sex—and 1978. Despite their rapid rate of increase during the entire 1974-80 period women accounted for only 18 percent of full-timers employed in all S/E disciplines in 1980 ranging from a high of 26 percent in psychology to 3 percent in engineering. Also, data collected for the first time in 1980 indicate that 26 percent of all part timers employed in S/E areas were women.

- Much of the 1978-80 S/E personnel growth in academe occurred in large research-oriented universities. As a group the 100 largest academic S/E employers reported that S/E personnel engaged in R&D activities—in full-time-equivalent (FTE) terms—increased 4 percent per year between 1978 and 1980. These institutions also reported a 5-percent per year rise in constant dollar R&D spending during this period.[1]

- The growth rate of FTE's engaged in R&D activities for academe as a whole was only 1 percent per year between 1978 and 1980. In contrast to the 4-percent annual increase reported by the 100 largest academic S/E employers, all other institutions reported a net decline averaging 7.1 percent in the number of FTE's involved in research during this period. Growth in R&D activities for the entire sector was reported in four S/E areas, with the largest rise shown in engineering, up 10 percent per year during the 2-year span. In the social sciences, R&D involvement dropped markedly, down 12 percent per year.

- The 1-percent annual growth rate of FTE's engaged in academic research contrasts with that of the industrial sector, where R&D employment rose at 6 percent per year in the 1978-80 period, twice the growth rate reported between 1973 and 1978.[2]

Employment Status

For the first time since the early seventies, both full- and part-time S/E employment increased at the same rate between 1978 and 1980—3 percent per year. During the previous five years, 1973-78, the average annual growth rate for part-timers exceeded that for full-timers, 6 percent to 2 percent.

Full-timers who entered the academic S/E ranks have recently achieved tenure at significant rates. For example, in a recent survey partially funded by NSF, universities and 4-year colleges (where most of the 5-year growth in full-timers has occurred) reported that during the 1978-79 academic year three of every five full-time faculty considered for advancement received tenure. One in five remained eligible for future reconsideration. Prior to being considered for tenure, these faculty members had spent an average of five years in their positions.[3]

Type of Institution

As a group, doctorate-granting universities accounted for all of the increase in total S/E employment between 1978 and 1980. The 1978-80 growth rates for both full- and part-time S/E personnel in doctorate institutions were higher than the rates reported in the 1973-78 period (table 1). Large research-oriented doctorate institutions fueled most of the overall S/E personnel growth. For example the 100 largest doctorate universities having the highest S/E professional staff totals accounted for almost two-thirds of the 1978-80 increase in total S/E employment in academe. In contrast, academic institutions that do not grant the doctorate reported a yearly 1-percent decline in S/E employment between 1978 and 1980, following five years of 4-percent increases per year.

Table 1. Scientists and engineers employed at universities and colleges by level of institution and employment status

Level and status	Average annual rate of change	
	1978-80	1973-78
Total all institutions	2.8%	3.0%
Full time	2.8	2.3
Part time	2.7	6.2
Doctorate granting	4.5	2.8
Full time	4.7	2.8
Part time	3.6	2.7
All other institutions	-.7	3.6
Full time	-1.6	1.2
Part time	1.7	11.8

SOURCE: National Science Foundation

R&D Activity

When measured in FTE terms, the number of academic scientists and engineers engaged in R&D activities rose 2 percent overall between 1978 and 1980, or at an

[1] National Science Foundation, *Academic Science R&D Funds, Fiscal Year 1979* (Detailed Statistical Tables) (NSF 81-301) (Washington, D.C., 1981) table B-3.

[2] National Science Foundation, *National Patterns of Science and Technology Resources 1980* (NSF 80-308) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1980) table 14.

[3] Frank J. Atelsek and Irene L. Gomberg, *Tenure Practices at Four-Year Colleges and Universities*, Higher Education Panel Report Number 48 (Washington, D.C.: American Council on Education, 1980).

average rate of 1 percent per year. This is significantly lower than the 4-percent average annual increase between 1973 and 1978.

The slowdown in R&D employment growth was not consistent across all types of institutions. As noted, the 100 largest institutions ranked in terms of S/E employment continued to report a 4-percent average annual growth in FTE's involved in R&D projects in the 1978-80 period. These leading institutions accounted for three-fourths of the total number of R&D engaged FTE's and four-fifths of all funds for sponsored research and development performed in the academic sector in 1979.

Between 1978 and 1980 scientists and engineers engaged in R&D activity increased in four of the seven major S/E fields, led by engineering with an average annual addition of 10 percent. The physical, environmental, and life sciences increased at about 2 percent per year. The largest rate of decline in FTE's involved in research occurred in the social sciences, down 12 percent per year, psychology, down 10 percent, and mathematical and computer sciences, 7 percent.

Field of Employment

Since 1973, academic S/E employment has increased in all S/E fields with average annual growth rates ranging from 6 percent in the mathematical and computer sciences to 2 percent in the physical sciences.

In 1978-80, academic employment of scientists and engineers expanded in five of the seven major S/E fields. For the first time, however, declines were reported in the social sciences and psychology (chart 2).

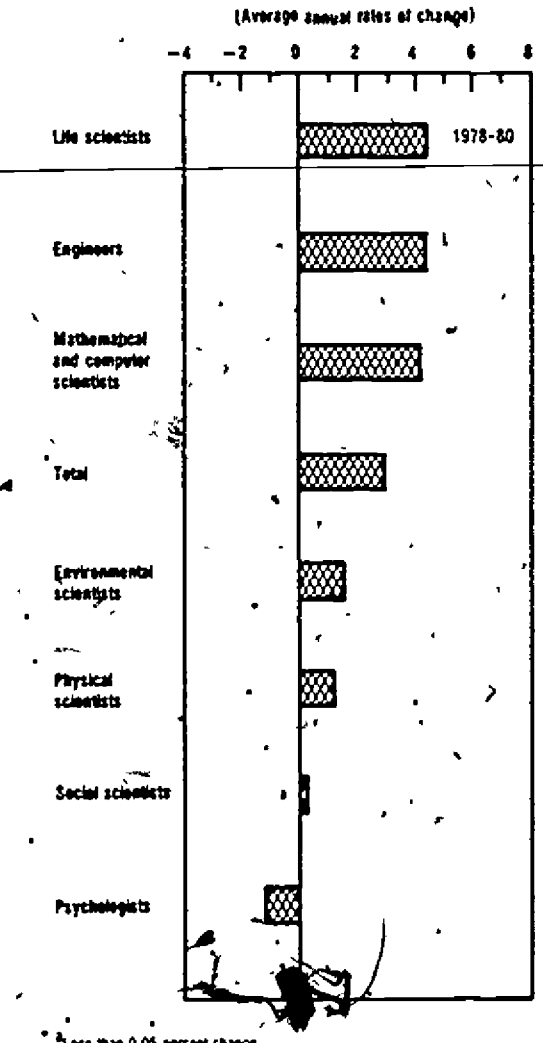
Despite the academic personnel increases in engineering, nearly 9 in 10 engineering colleges reported in a recent study that their ability to recruit and retain full-time faculty worsened during the last few years because of competition from industry, and that as of fall 1980, a substantial number of academic engineering positions were unfilled.

Institutional Control

Total S/E employment at publicly controlled universities and colleges increased at a slightly faster pace, 3 percent per year, than at private institutions, up 2 percent per year between 1978 and 1980. During this period, both full- and part-time S/E employment increased at public schools, averaging 3 percent per year and 5 percent per year, respectively. Private institutions, on the other hand, reported that full timers increased 3 percent per year in the 1978-80 period but employment of part-time personnel declined 1 percent annually.

For the entire period studied, 1973-80 total S/E employment at public institutions increased at an average rate of 4 percent per year compared to 1 percent in private institutions. No single factor explains why S/E growth has occurred most rapidly in public schools. There was, however, significant S/E personnel expansion during the 1973-80 period at several large State universities, e.g., the Louisiana State University system, and the campuses of the University of Texas, as medical facilities were expanded in response to State health care programs. Growth also occurred in many State institutions where research programs related to local industries have been established.

Chart 2. Scientists and engineers employed at universities and colleges by field



* Less than 0.05 percent change
SOURCE: National Science Foundation

The term, "FTE-measured R&D activities," refers to time spent on separately budgeted research and development in January of each year and does not include time spent on departmental research or any research activities occurring in the summer.

From unpublished data collected from a Higher Education Panel survey conducted by the American Council on Education (ACE) for NSF. ACE will issue a report on this topic at a later time.

Sex of S/E Personnel

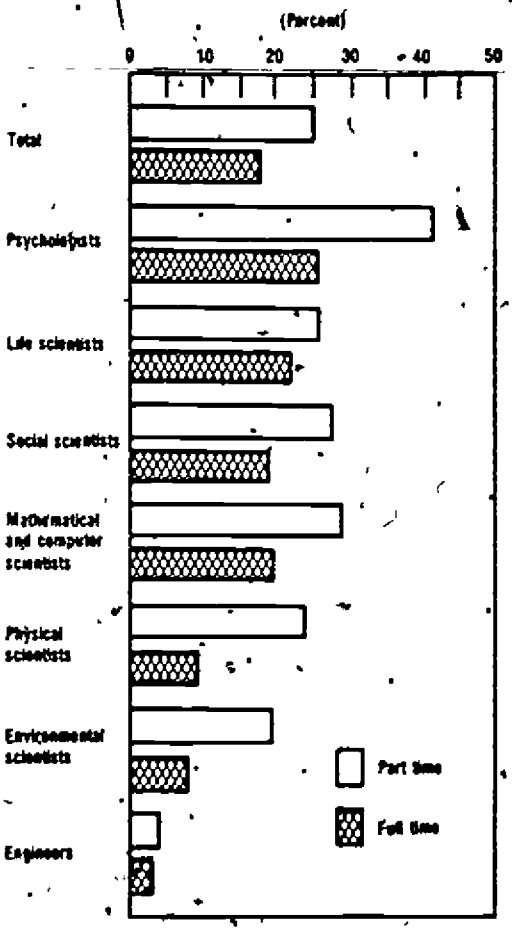
Universities and colleges continued to hire women scientists and engineers at about three times the rate of men. Beginning in 1974, when NSF first collected data on full-timers by sex, the average yearly growth rate for women has exceeded that for men—6 percent compared to 2 percent. Although women are being added to the ranks of S/E personnel at a faster rate, their impact on particular disciplines has changed slowly. For example, women S/E professionals accounted for only 18 percent of the full-time S/E total in academe in 1980, compared to 15 percent in 1974. Women accounted for less than 3 percent of all full-timers in engineering compared to 26 percent of all psychologists in 1980 (chart 3). Nevertheless, among full-timers employment of women has increased most dramatically since 1974 in the environmental sciences and engineering where they have averaged annual increases of 16 percent and 14 percent, respectively.

In all seven major S/E fields the proportion of women part-timers exceeded that of women full-timers in 1980. In psychology, women comprised over 40 percent of the part-time S/E staff and in five other fields they represent one-fourth or more of the part-time S/E staff. Only in environmental sciences and engineering are their proportions lower.

* * * * * * * * * * * *

The report, *Academic Science Scientists and Engineers, January 1980* (Detailed Statistical Tables) (NSF 81-307), can be obtained from the Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550. For information on the availability of data tapes, please call Moshman Associates, Inc., at 301-229-3000.

Chart 3. Women as a percent of scientists and engineers employed at universities and colleges by status: January 1980



SOURCE: National Science Foundation

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