THE STATUS OF WOMEN IN SCIENCE AND ENGINEERING  
A LOOK AT SOME STATISTICS

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The representation of women in science and engineering has increased dramatically during the past several years and is currently at an all time high. In 1990, for example, women earned 28 percent of all science and engineering doctorates: 33 percent in the sciences and 8 percent in engineering. The distribution of these degrees earned by women, however, is skewed towards the social and life sciences and psychology. By comparison, the distribution of doctorates earned by men is broader across disciplines (Figure 1). Women earned 33 percent of the doctorates awarded in the social sciences in 1990, 34 percent of the doctorates awarded in the life sciences, and 56 percent of those awarded in psychology.

A source of the distribution of doctoral degrees earned by women can be found in the baccalaureate degrees awarded to women. Bachelor of Science (BS) degrees awarded to both men and women are increasing only in the fields of psychology and the social sciences and are decreasing in all other fields including engineering, the physical sciences, the geosciences, mathematics and computer sciences, and the biological and agricultural sciences.

Figure 1

Women in Engineering Conference: Increasing Enrollment and Retention
1992 WEPAN National Conference
In the science and engineering work force, women represent about 17 percent of employed scientists and engineers at all levels of degree attainment. Women scientists and engineers are more likely to be in the labor force -- either working or seeking employment -- than other women. According to recent statistics, about 95 percent of women scientists and engineers are in the labor force compared to 75 percent of all college-educated women and 57 percent of all women.

In 1989, women comprised 17 percent of the science and engineering doctorates employed in universities and four-year colleges in tenured, tenure-track, and research positions (Figure 2). Women are nearly evenly distributed: 7 percent in tenured, 4 percent in tenure-track, and 6 percent in non-tenure track positions. By comparison, tenured men comprise 49 percent of the cohort with 12 percent in tenure-track positions and 22 percent in research positions.

![Figure 2](image)

If we look at doctoral employees in the sciences and engineering separately, women comprise 20 percent of those employed by universities and four-year colleges in the sciences and 3 percent of those in the engineering fields.

The distribution of rank provides further evidence of inequity between men and women employed in academic institutions. If we consider females to comprise 100 percent of all women with doctorates in the sciences or engineering employed by universities and four-year colleges and 100 percent of all comparable males, we find that 47 percent of the males were full professors in 1989 compared with 18 percent of the women (Figure 3). The smaller proportion of males are at the assistant professor level and in research positions, and for females the larger proportion are found in those positions. Looking at the difference in distribution of men and women at each rank, men comprise 92 percent of all full professors in all of the science and engineering fields compared with 8 percent who are women. In the natural sciences and engineering the situation is worse. In these fields women represent
only 5 percent of all full professors. Given these deficits, it is no wonder that young women are discouraged from going into the sciences and engineering.

Figure 3

Women who earned doctorates a year or less prior to 1989 in science or engineering fields earned, in 1989, 88 percent of the salaries of their male counterparts. More specifically, women scientists earned 96 percent of what men earned ($35,200 vs. $36,700) and women engineers earned 98 percent ($47,700 vs. $48,500) (Figure 4). However, when looking at all women who have earned doctorates in the sciences or engineering and who are currently employed, the differences increase. In general, women scientists and engineers earn 80 percent of the salaries

Figure 4
of their male counterparts, with scientists at 82 percent and engineers at 85 percent. Much of this difference is due to age, but age does not explain all of it. Clearly, there is a culture problem.

Next, let us take a look at the overall participation in science and engineering education by gender. Overall, the critical transition points are from high school seniors with science interest to college freshmen who enter with a science or engineering preference; from graduation with undergraduate majors in science or engineering to entry into graduate school; and from graduate school entry to completion of the doctorate degrees in the sciences or engineering (Figure 5).

![Participation in Natural Sciences & Engineering by Gender](image)

**Figure 5**

At the sophomore level in high school, 14 percent of the girls express interest in science and engineering compared to 25 percent of the boys. At graduation from high school 9.2 percent of the girls indicate an interest in pursuing further study in the sciences or engineering compared to 17 percent of the boys, and 5.4 percent of young women entering college express an interest compared to 12 percent of the young men. Colleges seem to retain the interest of young women, since 3.1 percent graduate with undergraduate degrees in the sciences or engineering compared to 7.5 percent of the young men. Seven-tenths of one percent of women enter graduate school with the intention of earning a degree in the sciences or engineering and 0.6 percent earn a master's degree, compared with 2.5 percent of the men who enter graduate school and 1.9 percent who earn this degree. The percentage of the original 100 percent of high school sophomore women who earn a doctorate degree in these fields is 0.15 percent compared to 0.4 percent of the original 100 percent of high school sophomore men. Fewer than one-third as many women as men obtained the doctorate degree.
Other transitions of concern to women include that from completion of graduate school into an academic career; from a non-faculty position to the tenure-track; from the level of associate professor to that of full professor; and, re-entry as a result of career interruption. So that the underrepresentation of women in the science and engineering work force is a result of their under-utilization and the fact that too few women opt for careers in these fields.

Since 1982, the National Science Foundation has been primarily involved in supporting doctoral women. The strategy for career advancement is that programs for women scientists and engineers will result in their increased participation as principal investigators (PI) on Federal research grants and that this, in turn, will lead to favorable impact on tenure decisions. Tenured positions will lead to increased participation as PI's and, hence, to senior faculty status.

Currently four programs are supported for women that are Foundation-wide: the Visiting Professorships for Women, Faculty Awards for Women Scientists and Engineers, Research Planning Grants and Career Advancement Awards. The oldest of these programs is the Visiting Professorships for Women which was initiated in 1982, and the most recent, established in 1991, is the Faculty Awards for Women.

The two major objectives of the Visiting Professorships for Women program are (1) to provide opportunities for women to advance their careers in the sciences and engineering, and (2) to encourage women to pursue careers in science and engineering by providing greater visibility for women scientists and engineers. The program is multidisciplinary, has an annual deadline for submitting proposals, and individuals apply but awards are made to a host institution. To be eligible, an applicant must have a doctorate and independent research beyond a postdoctorate; be currently or recently affiliated with an institution of higher education, research, government or industry; not have a salary, or the promise of one, with the host institution; and be a U.S. citizen, national or permanent resident. Proposals include a research proposal and a plan for developing visibility as a faculty member on the host campus. Funds may be requested for salary, wages for research assistants or support personnel, travel, materials and supplies, computer time, and indirect costs to the host institution. The award period can be from six months up to three years.

Research Planning Grants are made (1) to help increase the number of new women investigators participating in the Foundation's research programs, and (2) to facilitate preliminary studies and other activities related to the development of competitive research projects. These are one-time awards that may be used for preliminary work to determine the feasibility of a proposed line of inquiry and other activities that will facilitate proposal development. Eligibility is limited to women who have never served as principal or co-principal investigators on a Federal research grant; who hold a faculty or research-related position in a U.S. academic institution; and who are U.S. citizens, nationals, or permanent residents. Proposals include a project description, and award
maximum is $18,000 for 18 months. The target date for application is January 15.

The Career Advancement Award's objective is to support activities that can expand a promising applicant's research career potential. These awards are designed to expand research opportunities for women by helping researchers acquire expertise in new areas to enhance their research capability, assist those who have had a significant career interruption to acquire "updating" for re-entry into their respective fields, etc. To be eligible, a woman must hold a faculty or research-related position in a U.S. academic institution; be a U.S. citizen, national, or permanent resident; and have some prior independent research experience. Included in the proposal is a description of the applicant's research interests and goals, the activities to be undertaken, and a discussion of how the activities will help to advance the applicant's research career. The target date is January 15; and, awards are limited to $50,000, with a possible addition of up to $10,000 for equipment, if required, and are usually for 12 months.

The Faculty Awards for Women program is currently under revision. In 1991-92, 100 awards were made to women scientists and engineers who held the academic rank of associate professor with tenure. Nominations were made by U.S. degree-granting institutions, with the limit of one nominee per department but no limit on the number from a given institution. The program's objectives were (1) to recognize the Nation's most outstanding and promising women scientists and engineers in academic careers of research and teaching, and (2) to retain these women in academia. Awards were made at $50,000 per year for five years and represented all fields supported by the National Science Foundation.

These four programs -- the Visiting Professorships for Women, Research Planning Grants, Career Advancement Awards, and the Faculty Awards for Women -- comprise special efforts to increase the representation of women in the sciences and engineering. Of course, women who are eligible can apply to any of the research programs supported by the Foundation. The best general source of information on application procedures, telephone numbers of the various research programs, etc., is Grants for Research and Education in Science and Engineering, (NSF 90-77). It may be ordered from:

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