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ABSTRACT

Responses from a national survey of engineers were used to compare background and career characteristics of male/female engineers (N=1961) differing in number of years since completing the bachelor of science degree (5 or less, 6-10, 11-15, 16-20 years). Findings indicate that parents of women engineers were more likely to hold college degrees and to be employed in professional positions than were the parents of male engineers. Among those who had received their degree more than 5 years ago, more women than men had obtained advanced degrees. Younger engineers/men made their decision to pursue engineering sooner than did older engineers/women. Work-related factors were rated as most important in influencing decisions to pursue engineering degrees. While men and women reported comparable levels of technical responsibility in current jobs, women reported lower levels of supervisory responsibility and lower salaries than did men, the descrepancy most apparent among engineers receiving the bachelor of science degree more than 10 years ago. Women also rated their jobs lower than did men on career advancement opportunities and were less satisfied with progress made in their careers. However, the vast majority reported satisfaction with current jobs, with older engineers reporting greater satisfaction than younger engineers. (Author/JN)

Engineering Careers: Women in a Male-Dominated Field

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Abstract

Responses from a national survey of engineers were used to compare the background and career characteristics of men and women engineers differing in the number of years since they completed their BS degrees (5 years or less, 6-10, 11-15, 16-20 years). The parents of women engineers were more likely to hold college degrees and to be employed in professional positions than were the parents of male engineers. Fewer women than men reported being married. Among those who had received their degree more than five years ago, more women than men had obtained advanced degrees.

Younger engineers and men made their decision to pursue engineering sooner than did older engineers and women. Engineers rated work-related factors as most important in influencing their decisions to pursue engineering careers.

While men and women reported comparable levels of technical responsibility in their current jobs, women reported lower levels of supervisory responsibility and lower salaries than men. The discrepancy was most apparent among engineers who had received their BS degree more than 10 years ago. Women also rated their jobs lower than did men on career advancement opportunities and were less satisfied with the progress they had made in their careers. However, the vast majority of engineers reported being satisfied with their current jobs, with older engineers reporting greater satisfaction than younger engineers.

Engineering Careers: Women in a Male-Dominated Field[1]

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During the past 10 years, there has been a dramatic increase in the number of women enrolled in engineering schools throughout the country. In 1972, women represented just 2.9% of the freshman engineering students and 2.3% of the full-time undergraduate engineering students (Engineering Manpower Commission, 1973). As of the fall of 1981, women represented 15.8% of the freshmen and 14.5% of the full-time undergraduates in engineering (Engineering Manpower Commission, 1982). This increase is a result of a number of factors, including better job opportunities for women in engineering, high-school recruitment programs, a greater sensitivity to sex-bias in career counseling among high-school guidance counselors and special programs for women engineering students at colleges and universities.

Together with the increased numbers of women in engineering and other male-dominated fields has come an increased interest in the characteristics of women who enter male-dominated fields (e.g., Lemkau, 1979; Greenfield, Greiner, & Wood, 1980; Matthews, Collins, & Cobb, 1974). Past research has found that women in male-dominated occupations generally come from intact families with high parental education and a high rate of maternal employment (Lemkau, 1979). Women in male-dominated fields also tend to place more importance on career-related success than do women in female-dominated fields (Greenfield, Greiner, & Wood, 1980). In addition, as a result of their small numbers in the field, women in male-dominated careers often suffer from feelings of isolation, lack of support from male colleagues, loneliness or sex discrimination (Kanter, 1977; Mathews, Collins & Cobb, 1974; Standley & Soule, 1974).

Studies of women in engineering have generally involved students rather than engineers in the field (Greenfield, Holloway & Remus, 1982; Ott, 1978a, 1978b). While some research studies found differences in academic preparation (Jagacinski & LeBold, 1981) and academic and career characteristics (Ott, 1978a) of male and female engineering students, other studies have reported similarities between male and female engineering students (Gardner, 1975; Greenfield, Holloway & Remus, 1982). In a longitudinal study of engineering students at Kansas State University, Lindholm and Hummel (1980) reported that, as the number of women entering engineering increased, their academic performance became more similar to that of their male colleagues; that is, it declined. It may be that women who entered engineering 10 years ago had to be at the very top of their high-school class. On the other hand, today there is greater acceptance of women in engineering so that, although women who are attracted to the field are very bright, perhaps they need not be brighter than their male classmates.

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When the ratio of men to women in a given field begins to change, it is quite possible that the characteristics and experiences of individuals entering that field may change. Today's woman engineering student is less likely to find that she is the only woman in her classes than was the woman engineering student 10 years ago. Kanter (1977) has suggested that, when the ratio of men to women in an occupational field decreases, more attention will be focused on the woman's competence rather than her uniqueness. Although the ratio of men to women in the field of engineering is still very high, the presence of just two or three women engineers in a given department might lead to different experiences than those that would occur with only one woman in the department. The research study reported here examines differences between men and women engineers who have been in the field for different lengths of time. Of special interest is the comparison of recent graduates (out of school 5 years or less) with those who have been in the field up to 10, 15, and 20 years. The variables examined include demographic and background characteristics, factors influencing decisions to study engineering, current job status, job values and job satisfaction, attitudes towards women in engineering and perceptions of the opportunities for women and minorities in engineering.

Method

A national survey of professional engineers was conducted during 1981 as part of the National Engineering Career Development Study. Samples of men and women engineers were identified with the help of the major engineering societies and several universities and colleges having engineering programs. Women and minorities were oversampled so that comparisons relevant to the purposes of the study could be made. The National Engineering Career Development Survey was sent to each engineer in the sample. The survey was 12 pages long and included sections covering employment, education, background characteristics, factors influencing decisions to study engineering, self-assessments of abilities and other traits, job values and job satisfaction. Two follow-up letters were sent to non-respondents. Surveys were returned by 2,852 engineers representing approximately 50% of the original sample.

The research presented here was limited to respondents who had received their BS degree within the past 20 years and were employed full-time in engineering at the time of the survey (N=1961). Men and women were assigned to one of four groups, depending upon the number of years since they had received their BS degree: (1) 5 years or less, (2) 6-10 years, (3) 11-15 years, (4) 16-20 years. Analyses were conducted in order to compare men and women engineers in these different BS groups on a variety of dimensions. Analysis of variance and chi-square procedures were used to test for significant differences. Because the sample size was so large and many tests were made, only differences significant beyond the .01 level are considered. However, results which are significant between the .01 and .05 levels will be noted in the tables for the benefit of the reader.

Results

Background and Demographic Characteristics

Table 1 presents information about the background and demographic characteristics of the respondents. The majority of our respondents were white, with

a greater percentage of women than men reporting their race as white. Men in our sample were more likely to be married than were the women ($p<.001$). Approximately one-half of the women were married, with slightly more of the women in the older BS groups reporting being married. The increase in the percentage of married respondents with the increase in years since BS was much more dramatic for men than for women. In terms of current educational level, the majority of engineers who had graduated more than five years ago had attained advanced degrees. Women in the older BS groups were more likely to have attained a degree beyond the BS than were the men in the older BS groups ($p<.001$).

The fathers of women engineers were more likely to hold professional positions than were the fathers of male engineers ($p<.01$). In fact, nearly one-fourth of the women's fathers were engineers themselves. In addition, the fathers of women engineers were more likely to have attained a BS or advanced degree than were the fathers of male engineers ($p<.001$). There was also a general trend for a greater percentage of fathers of recent graduates to have advanced degrees. Moreover, the mothers of women engineers were more likely to hold professional positions and were somewhat less likely to be homemakers than were the mothers of male engineers ($p<.001$). As with the fathers, the mothers of women and younger engineers were more likely to have bachelors or advanced degrees ($p<.001$) than were the mothers of men and older engineers. These results are consistent with previous studies of women in male-dominated fields (Lemkau, 1979; Standley & Soule, 1974; Valentine, Ellinger & Williams, 1975).

An examination of those engineers who reported being married revealed that approximately one-third to one-half of the women in each BS group were married to engineers. For each BS group, over 80% of the married women engineers had spouses who were engineers or professionals, while less than one-half of the wives of male engineers were engineers or professionals. Moreover, women's spouses were more likely to have BS or advanced degrees ($p<.001$) than were the the spouses of male engineers.

Career Decisions

Respondents were asked to indicate when they first considered a career in engineering and when they made their final decisions. Analysis of both variables revealed significant sex differences ($p<.001$ for each). Almost one-half of the men first considered engineering prior to their junior year in high school, with approximately 75% having considered it before entering college (see Table 2). On the other hand, one-third to one-half of the women first considered engineering after entering college. Among women in the two younger BS groups, about one-third first considered engineering after entering college, while this figure was closer to one-half for the two older BS groups. Among the men, more than one-half made their final decisions to pursue a career in engineering prior to entering college. Over one-half of the women made this final decision after entering college. There was also a significant difference among the BS groups in terms of their final decisions to study engineering, with the two younger groups tending to make the decision sooner than did the two older BS groups ($p<.003$).

Engineers rated the importance of a large number of factors which may have encouraged them to pursue a career in engineering. Each factor was rated for its importance on a four-point scale, ranging from "none" to "very". Summary

scales were formed by averaging individual's responses to related items. Five scales were developed: (1) people-related factors; (2) guidance-related factors; (3) work-related; (4) hobbies and activities; and (5) courses. Cronbach's coefficient alpha was computed for each scale, and these coefficients ranged from .67 to .87. Table 2 presents the mean scores obtained on each of these scales for men and women in the different BS groups.

The people-related scale was composed of eight items, including relatives, friends, engineers, college counselors and teachers. Analysis of the people-related scale values revealed a significant effect for BS group ($p<.001$). As can be seen in Table 2, people were a more important influence for engineers in the youngest BS group, than for older, or more experienced, engineers. It also appears that the people-related items were not highly important. The mean scale value for each group was approximately 2.0, which corresponds to "little" importance on the original four-point rating scale.

The second scale consisted of six items dealing with guidance instruments and activities, such as interest inventories, career education courses and guidance counselors. Analysis of the data obtained for this scale did not reveal significant differences among the groups. It also appears that the items on the guidance-related scale did not play a major role in the engineers' decisions to pursue a career in engineering, given the low mean values.

The work-related scale consisted of 12 items dealing with job characteristics (e.g. prestige, challenge, rapid advancement, liking for problem solving, security). There was a significant difference among the BS groups for this scale ($p<.001$). Examination of the means in Table 2 indicates that work-related factors were relatively more important for the younger BS groups than for the older BS groups. It also appears that work-related factors were fairly influential, given the potential range of the scale. For each group, the mean scale value for the work-related factors was higher than the mean scale values of the other four scales.

Fifteen items were included in the hobbies and activities scale. Some example items include science clubs, building electrical devices, hobby magazines and flying an aircraft. While these items were not very influential in an absolute sense, they were more important to male engineers ($p<.001$) and to engineers in the younger BS groups ($p<.005$) than to female engineers or engineers in the older BS groups.

The last scale consisted of seven items dealing with high school and college courses in math, science and engineering. Analysis of the data for this scale revealed a significant interaction effect ($p<.008$). An examination of the means in Table 2 shows that the courses were most important to women in the youngest BS group and least important to women in the oldest BS group. On the other hand, there was only minor variation in the importance ratings of courses for male engineers.

The overall pattern of means in Table 2 shows that most of the factors were rated as being more important by the youngest BS group than by the older BS groups. This may be partially a function of the relatively small amount of time since these engineers made their decisions to pursue careers in engineering. Engineers were asked to assess the importance of various factors to decisions

which were made in the past. It may be harder for the engineers in the older BS groups to remember how important various factors were to them, thus leading to generally lower ratings by the older groups. In general, the work-related items and courses received the highest importance ratings for each group.

Current Job Status

Engineers answered a number of questions about the characteristics of their current (1981) positions. Respondents rated their degree of technical responsibility on an eight-point scale, ranging from simple-routine work requiring no experience (Level 1) to complex tasks requiring thorough knowledge of standard guides (Level 6) through pioneering work requiring outstanding knowledge of the most advanced techniques (Level 8). While degree of technical responsibility tends to increase with experience (years since BS, $p<.001$), no sex difference was found for this variable. Figure 1 illustrates the pattern of these results. For illustrative purposes, the dimension of years since BS degree has been divided into a larger number of groupings in the figure than was used in the tables.

Respondents also reported their degree of supervisory responsibility. A nine-point rating scale was used, ranging from no supervisory responsibility (Level 1) to supervision of professional engineering and scientific personnel (Level 5) up to the highest administrative post (Level 9). Analysis of this variable revealed two main effects ($p<.001$ for each) and a significant interaction ($p<.004$). Figure 2 presents the percentages of men and women engineers indicating level 5 (supervision of professionals) or higher according to the number of years since their BS degree. As can be seen in the figure, there are only minor differences between men and women who have been out of college five years or less. However, the curve for men generally increases across the whole range of years since BS degree, while the curve for women tends to level out after about eight years.

A similar pattern can be seen in the salary curves depicted in Figure 3. Again, men and women reported comparable median salaries for the first seven or eight years of experience, but beyond that point women reported substantially lower salaries than did men (interaction effect, $p<.001$). The salary curve may be largely a function of the observed differences in supervisory responsibility. Management represents a popular career path among engineers and greater supervisory responsibilities are likely to be associated with higher salaries. A larger percentage of men (17.2%) than of women (10.4%) reported the principal function of their current job as being management. These results should be interpreted with some caution, because women in the older BS groups were more likely to have had a break of at least 6 months in their career than were men in the older BS groups. However, other studies have also found some divergence in the salary curves of men and women engineers after 10 years of experience (Jagacinski & LeBold, 1981; McAfee, 1974; Rossi, 1972).

Job Values and Job Satisfaction

Engineers rated a large number of job characteristics in terms of how important each was to them personally and to what extent each factor characterized their current positions. These ratings were made on four-point scales, ranging from "none" to "very". The importance ratings were factor analyzed for the pur-

pose of scale development. On the basis of this analysis, three scales were formed by averaging related items. The first scale dealt with intrinsic work characteristics (e.g., "opportunity to innovate and propose new ideas," "opportunity to work on problems for which there are no ready-made solutions."). The second scale involved career advancement (e.g., "a chance to exercise leadership," "adequate preparation for top level careers," "opportunity to move into a management career"), and the third factor involved aspects of the work environment (e.g., "flexible working hours," "pleasant people to work with," "I know exactly what my work responsibilities are"). Cronbach's coefficient alpha indices for the scales ranged from .76 to .82. Table 3 presents the mean scale scores for men and women in the various BS groups. The intrinsic factor was quite important to all respondents, regardless of sex or BS group. Analysis of the career-advancement factor revealed a significant interaction effect ($p<.002$). As can be seen in Table 3, career advancement was highly important to most groups but was rated somewhat lower by women in the two older BS groups than by any of the other groups. Finally, there was a significant difference among the BS groups in terms of the work-environment factor, with the younger BS groups placing greater importance on this factor ($p<.001$) than the older BS groups.

Scales were also formed for the ratings of how characteristic each factor was of engineers' current jobs in the same manner as for the importance ratings. Alpha coefficients for the characteristic rating scales were .89 for intrinsic, .85 for career advancement and .75 for work environment. As can be seen in Table 3, the means for the characteristic rating scales are generally lower than the means for the importance rating scales. This difference might be expected because the importance ratings represent an ideal and the characteristic ratings represent the reality. There was a significant difference among the BS groups on the intrinsic factor, with the older BS groups rating their positions higher on the intrinsic scale than did the younger BS groups ($p<.001$). For the career advancement factor, men rated their jobs higher than did women ($p<.003$). However, the interaction effect also approached significance ($p<.013$), which is reflected in the fact that there is little difference between the career advancement ratings of men and women in the youngest BS group but a substantial difference between the ratings of men and women in the other three BS groups. Given the lower ratings of the women in the two older BS groups, it should also be recalled that these two groups rated the career-advancement factor as being less important than did the other groups.

Finally, a significant difference was found among the BS groups for the work environment factor ($p<.008$), even though there is little variation among the means for this factor. The youngest and the oldest BS groups rated their positions higher on this factor than did the other BS groups. Again, it should be noted that this factor was more <u>important</u> to the youngest BS group than to the older BS groups..

Engineers also rated the extent to which they were satisfied with their work in their current position (five-point scale) and their satisfaction with their progress in their occupation (four-point scale). The group means for these variables are also presented in Table 3. Although a large majority of the respondents were satisfied with their work (rating of 4 or 5), a significant difference was found among the BS groups ($p<.006$), with a higher mean satisfaction rating for the older BS groups than for the younger BS groups. In terms of

career progress, there was a significant difference between the ratings of men and women ($p<.001$), with men expressing greater satisfaction with their progress than did the women.

Women and Minorities in Engineering

The survey included seven items dealing with opinions concerning working women. Respondents indicated whether they agreed or disagreed with these statements, using a four-point scale ranging from "strongly disagree" to "strongly agree". Some example items include: "It is acceptable for women to assume leadership roles in industry as often as men;" "Women possess the self-confidence required of a good engineer." Ratings for these items were averaged in order to provide a single measure of attitudes towards women in the work force. The alpha coefficient computed for this scale was .85. Group means for this variable are presented in Table 4. Women expressed significantly more favorable views than did men ($p<.001$). Although the interaction effect was not significant, it is interesting to note that, among the women, the youngest BS group had the least favorable attitudes, while among the men the oldest BS group had the least favorable attitudes. Although a sex difference was found on this scale, men did generally agree with most of the statements, but women were more likely to agree strongly with the statements than were the men.

Respondents were asked to evaluate the opportunities for minorities in engineering relative to whites. A five-point scale was used, with 1 indicating minorities have better opportunities, 3 meaning equal opportunities for minorities and whites and 5 meaning that whites have better opportunities. A significant difference among the BS groups was found ($p<.001$), with the younger BS groups being more likely than others to indicate that minorities have better opportunities and the older groups being more inclined than others to indicate that whites have better opportunities. The group means can be found in Table 4.

Respondents also rated engineering opportunities for women relative to men. Again, a five-point scale was used, with high scores signifying that men have better opportunities than women. Significant effects for sex ($p<.001$) and for BS group ($p<.001$) were found on this variable. As can be seen in Table 4, men in the two younger BS groups were somewhat more inclined than others to believe that women have better opportunities than men. As compared to men, women endorsed the opinion more strongly than men that men have better opportunities in engineering than do women. In general, the greater the number of years since completing their BS degrees, the more likely engineers were to endorse this opinion.

Discussion

Although men and women engineers appear to differ in many background characteristics, they appear to be influenced by similar factors in their decisions to pursue a career in engineering. It is notable that the more recent engineering graduates made their decision to pursue careers in engineering earlier than did the older graduates. This was true of both male and female engineers. It thus appears that efforts to recruit women into the field of engineering during high school have been somewhat successful. However, it is also noticeable that guidance-related factors were rated fairly low in importance relative to influencing the respondents to pursue careers in engineering. There may still

be room for progress in this area through special recruitment efforts designed to attract women and minorities into engineering. Efforts to inform students about career opportunities in engineering during their freshman year of high school could help to overcome the problem of students not taking the necessary prerequisite courses during high school (e.g. math and science).

Pre-college summer seminars may be another way of providing prospective students with information about engineering careers. While many colleges and universities have made efforts to develop such programs, only a small proportion of the potential pool of students is being reached. In this study, approximately 80% of the engineers indicated that pre-college seminars were of no importance in influencing them to pursue a career in engineering. It is highly likely that most of these people never had a chance to attend a pre-college summer seminar.

Evidence of differences in the career advancement opportunities for men and women in engineering is quite disturbing. Women in the older BS groups reported lower levels of supervisory responsibility and lower salaries than did men. Women also rated their jobs lower than did men in terms of career advancement and were less satisfied with the progress they had made in their careers. Further evidence of this apparent inequity was found in terms of engineers' perceptions of the opportunities for women in engineering. Both women and older graduates (men and women) tended to endorse the opinion that men have better opportunities in engineering than do women. Moreover, McAfee (1974) has reported that women in engineering are less likely to be promoted than are men. In the present study, the discrepancy between men and women seems most apparent among the two oldest BS groups, i.e., engineers who were probably in the field at the time of McAfee's study. It is possible that the opportunities for women in engineering are changing as the number of women in engineering increases. No appreciable difference in supervisory responsibility was observed among engineers in the first BS group (out less than 5 years).

Respondents also indicated their starting salaries for their first position after attaining the BS degree. Starting salaries were comparable for men and women in the two younger BS groups; however, men reported higher starting salaries than did women in the older BS groups. Nevertheless, women also reported lower levels of supervisory responsibity than did men on their first jobs.

The reason(s) for these discrepancies in the positions of male and female engineers cannot be determined from this study. McAfee (1974) suggested that women are not promoted as often as men, because employers expect women to drop out of the labor force in order to raise children. However, McAfee also pointed out that labor force statistics show that women in professional positions work as many years as do their male colleagues. Rossi (1972) suggested that women may have lower salaries because they do not pursue advanced degrees. However, the present study shows that women in the older BS groups are more likely than their male colleagues to have obtained advanced degrees. Perhaps women do not have the management training required for supervisory positions, but women in our sample were more likely than were men to be pursuing or planning to pursue an MBA. It may also be that women are not given the opportunity to demonstrate their management abilities and, therefore, are less likely to be promoted. On the other hand, it is possible that the equity of the jobs of the younger gradu-

ates in our sample is a result of affirmative action legislation and that it will just be a matter of time before women are promoted to higher supervisory levels.

Whatever the reason(s) for this apparent inequity, it seems important that women be assured of equal opportunities in the field of engineering if we are to continue to tap this talented pool of potential engineers.

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TABLE 1
Background and Demographic Characteristics of Sample

	YEARS SINCE BS DEGREE								Significance of Tested Effects:		
	0-5 Yrs.		6-10 Yrs.		11-15 Yrs.		16-20 Yrs.				
	M	F	M	F	M	F	M	F	Sex	YrBS	Int.
Race											
Black	6%	3%	9%	4%	4%	3%	0%	0%	z	z	
Hispanic	11	2	8	2	5	3	0	0			
Asian	1	3	4	3	5	5	11	0			
White	78	91	72	89	79	89	83	100			
Foreign National	4	1	7	3	7	0	6	0			
Marital Status											
Married	51%	45%	76%	53%	87%	60%	92%	55%	z	z	z
Educational Level											
BS degree	63%	77%	38%	19%	20%	14%	18%	0%		z	z
MS degree(s)	36	24	55	76	66	60	52	73			
Ph.D.	1	0	7	5	14	26	30	27			
Father's Occupation											
Engineer	15%	23%	9%	24%	13%	28%	13%	19%	z		
Professional	42	41	39	42	36	33	42	52			
Other	43	36	52	34	51	39	45	29			
Mother's Occupation											
Engineer	0%	1%	0%	0%	0%	0%	0%	0%	z		x
Professional	18	22	12	25	13	35	13	10			
Homemaker	51	44	55	43	55	46	66	52			
Other	31	33	33	32	32	19	21	38			
Spouse's Occupation[a]											
Engineer	5%	58%	2%	48%	1%	34%	0%	29%	z		
Professional	38	25	33	35	35	53	46	57			
Homemaker	22	0	36	1	39	0	37	7			
Other	35	17	29	16	25	13	17	7			
(No. of Cases)	(274)	(263)	(276)	(69)	(115)	(32)	(70)	(14)			
Father's Education											
BS degree or higher	35%	50%	23%	43%	22%	40%	33%	38%	z	z	
Mother's Education											
BS degree of higher	24%	29%	15%	28%	13%	22%	17%	19%	z	z	
Spouse's Education[a]											
BS degree or higher	48%	84%	53%	79%	52%	82%	64%	71%	z		
(No. of Cases)	(554)	(600)	(395)	(127)	(140)	(47)	(78)	(21)			

[a]Based on respondents who were married.

x: $p<.05$; y: $p<.01$; z: $p<.001$

TABLE 2

Time of Decision to Pursue a Career in Engineering and Importance Ratings of Factors Influencing the Decision to Pursue a Career in Engineering

	YEARS SINCE BS DEGREE								Significance of Tested Effects:		
	0-5 Yrs.		6-10 Yrs.		11-15 Yrs.		16-20 Yrs.				
	M	F	M	F	M	F	M	F	Sex	YrBS	Int.
Time of Career Decision											
First Considered Engineering											
First two years H.S.	43%	18%	44%	34%	45%	37%	49%	38%	z	x	
Last two years H.S.	40	48	43	34	29	18	36	12			
After Entering College	17	34	13	32	26	45	15	50			
Final Decision											
First two years H.S.	12%	4%	13%	9%	18%	15%	15%	6%	z	y	
Last two years H.S.	47	36	53	37	37	27	39	38			
After Entering College	41	60	34	54	45	58	46	56			
Factors Influencing Career Decision (Mean Importance Ratings)[a]											
People-Related	2.03	2.15	1.93	1.88	1.89	1.96	1.94	1.92		z	
Guidance-Related	1.43	1.43	1.38	1.21	1.40	1.23	1.48	1.37		x	
Work-Related	2.86	3.00	2.78	2.86	2.66	2.78	2.69	2.59		z	
Hobbies and Activities	1.80	1.48	1.74	1.40	1.68	1.37	1.65	1.33	z	y	
Courses	2.56	2.66	2.60	2.40	2.52	2.44	2.53	2.26		x	y

[a]Four-point scales; higher numbers indicate greater importance.

x: $p<.05$; y: $p<.01$; z: $p<.001$

TABLE 3
Job Values and Job Satisfaction

	YEARS SINCE BS DEGREE								Significance of Tested Effects:		
	0-5 Yrs.		6-10 Yrs.		11-15 Yrs.		16-20 Yrs.				
	M	F	M	F	M	F	M	F	Sex	YrBS	Int.
Importance Ratings											
Intrinsic Factor	3.43	3.38	3.42	3.43	3.38	3.48	3.43	3.32			
Career Advancement	3.25	3.32	3.31	3.21	3.21	3.13	3.28	3.13		x	y
Work Environment	3.37	3.41	3.34	3.27	3.17	3.25	3.18	3.18		z	
Characteristic Ratings											
Intrinsic Factor	2.95	2.86	2.99	2.88	3.12	3.09	3.10	3.10		z	
Career Advancement	2.89	2.88	2.93	2.72	2.93	2.72	2.95	2.79	y		x
Work Environment	3.04	2.98	2.98	2.86	2.94	2.87	3.00	2.94		y	
Satisfaction Ratings											
With Work	4.02	3.89	4.03	3.70	4.15	4.11	4.16	4.10	x	y	
With Career Progress	2.69	2.57	2.63	2.35	2.64	2.34	2.62	2.38	z	x	

x: $p<.05$; y: $p<.01$; z: $p<.001$

TABLE 4
Women and Minorities in Engineering

	YEARS SINCE BS DEGREE								Significance of Tested Effects:		
	0-5 Yrs.		6-10 Yrs.		11-15 Yrs.		16-20 Yrs.				
	M	F	M	F	M	F	M	F	Sex	YrBS	Int.
Attitudes Towards Women[a] in the Workforce	2.93	3.49	2.93	3.57	2.89	3.60	2.76	3.60	z		
Opportunities for[b] Whites/Minorities	2.78	2.81	2.90	3.23	2.92	3.15	3.21	3.76	x	z	
Opportunities for[c] Men/Women	2.78	3.26	2.93	3.71	3.17	3.73	3.34	4.18	z	z	

[a]Four-point scale; higher values indicate more favorable attitudes.

[b]Means > 3.0 indicate Whites have better opportunities.

[c]Means > 3.0 indicate Men have better opportunities.

x, $p<.05$; y, $p<.01$; z, $p<.001$

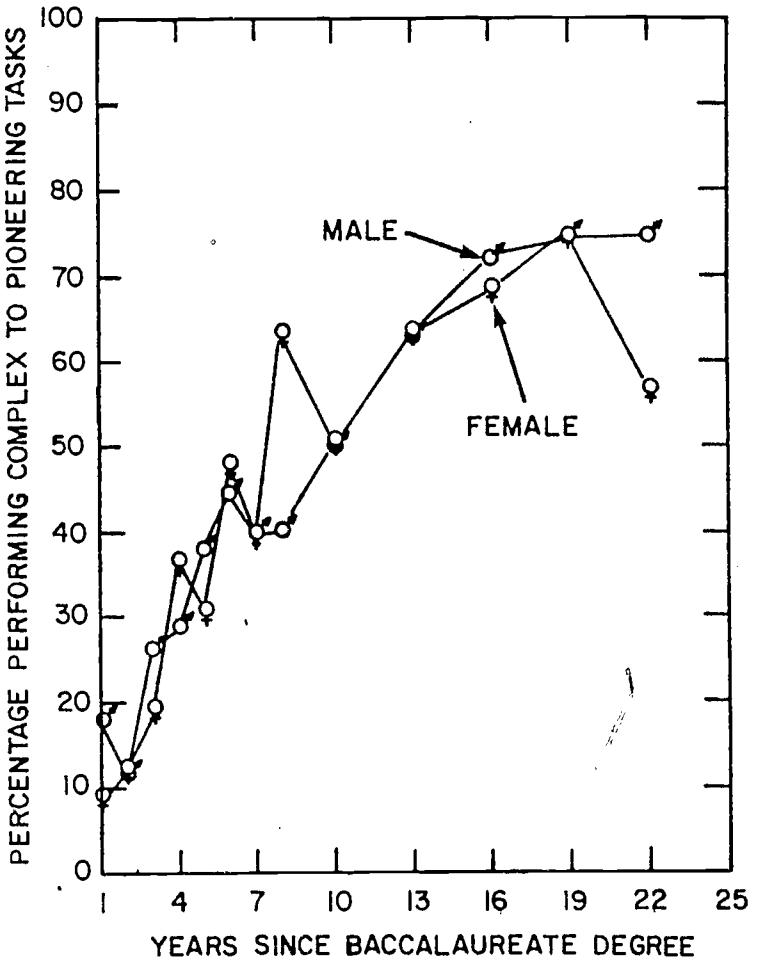

Figure 1 Percentage of Men and Women Engineers Reporting High Technical Responsibility (viz., Complex to Pioneering Work) by Years Since BS Degree.

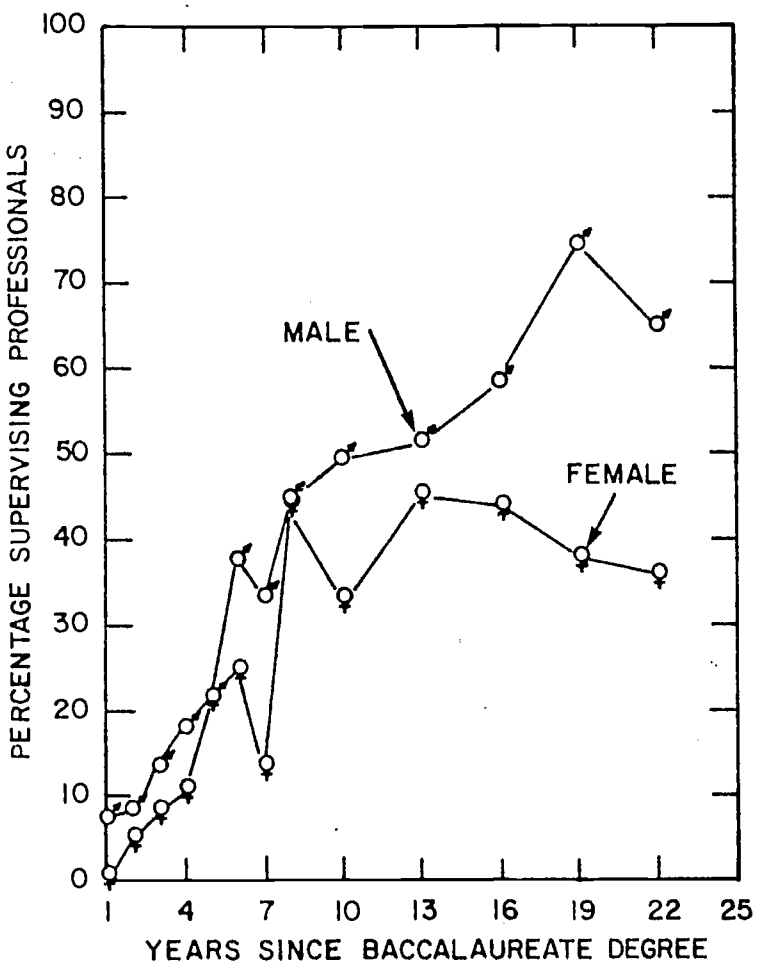

Figure 2 Percentage of Men and Women Engineers Supervising Professional or Managerial Personnel by Years Since BS Degree.

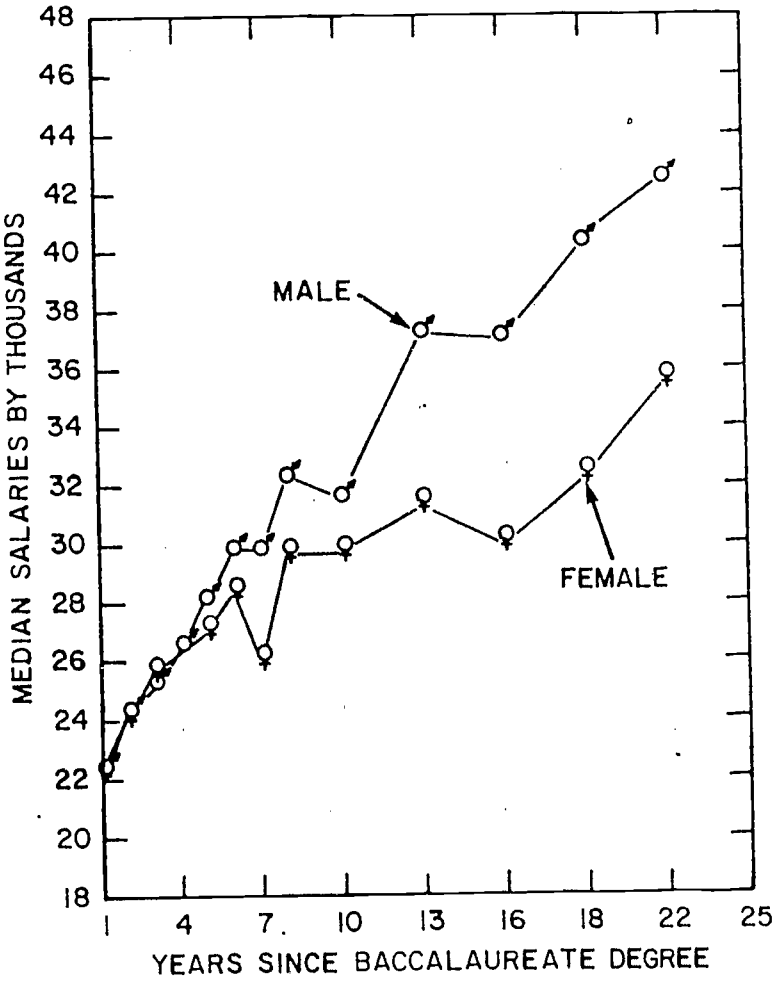

Figure 3 Median Salaries in Thousands of Dollars for Men and Women Engineers by Years Since BS Degree.