Free Executive Summary

Gender Differences at Critical Transitions in the Careers of Science, Engineering and Mathematics Faculty

Committee on Gender Differences in the Careers of Science, Engineering, and Mathematics Faculty; Committee on Women in Science, Engineering, and Medicine; National Research Council

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Assessing Gender Differences in the Careers of Science, Engineering, and Mathematics Faculty presents new and surprising findings about career differences between female and male full-time, tenure-track, and tenured faculty in science, engineering, and mathematics at the nation's top research universities. Much of this congressionally mandated book is based on two unique surveys of faculty and departments at major U.S. research universities in six fields: biology, chemistry, civil engineering, electrical engineering, mathematics, and physics. A departmental survey collected information on departmental policies, recent tenure and promotion cases, and recent hires in almost 500 departments. A faculty survey gathered information from a stratified, random sample of about 1,800 faculty on demographic characteristics, employment experiences, the allocation of institutional resources such as laboratory space, professional activities, and scholarly productivity. This book paints a timely picture of the status of female faculty at top universities, clarifies whether male and female faculty have similar opportunities to advance and succeed in academia, challenges some commonly held views, and poses several questions still in need of answers. This book will be of special interest to university administrators and faculty, graduate students, policy makers, professional and academic societies, federal funding agencies, and others concerned with the vitality of the U.S. research base and economy.

SUMMARY

The 1999 report, *A Study on the Status of Women Faculty in Science at MIT,* created a new level of awareness of the special challenges faced by women faculty in the sciences. Although not the first examination of the treatment of female faculty, this report marked an important historical moment, igniting interest in difficulties experienced by many women, particularly those at the higher levels of academia. Since the release of the MIT report, many other institutions have studied equity issues regarding their faculty, and several have publicly pledged to use their resources to correct identified disparities. Although academic departments, institutions, professional societies, and others have paid more attention to the topic in the last ten years, some experts are concerned that remedial actions have approached a plateau.

Unquestionably, women's participation in academic science and engineering (S&E) has increased over the past few decades. In the ten years prior to the start of this study, the number of women receiving Ph.D.s in science and engineering increased from 31.7 percent (in 1996) to 37.7 percent (in 2005). The proportion of women among doctoral scientists and engineers employed full-time, while still small, rose from 17 percent in 1995 to 22 percent in 2003. However, women continued to be underrepresented among academic faculty relative to the number receiving S&E degrees. In 2003, women comprised between 18 and 45 percent of assistant professors in S&E and between 6 and 29 percent of associate and full professors.

In 2002, Senator Ron Wyden (D-Oregon) of the Subcommittee on Science, Technology and Space of the U.S. Senate Committee on Commerce, Science and Transportation, convened three hearings on the subject of women studying and working in science, mathematics, and engineering. Soon after, Congress directed the National Science Foundation (NSF) to contract with the National Academies for a study assessing gender differences in the careers of science and engineering faculty, based on both existing and new data. The study committee was given the following charge:

> Assess gender differences in the careers of science, engineering, and mathematics (SEM) faculty, focusing on four-year institutions of higher education that award bachelor's and graduate degrees. The study will build on the Academy's previous work and examine issues such as faculty hiring, promotion, tenure, and allocation of institutional resources including (but not limited to) laboratory space.

The committee interpreted its charge to imply three tasks: update earlier analyses, identify and assess current gender differences, and recommend methods for expanding knowledge about gender in academic careers in science and engineering. It developed a series of guiding research questions in three key areas to organize its investigation: (1) academic hiring, (2) institutional resources and climate, and (3) tenure and promotion.

The committee also limited its exploration of science and engineering to the natural sciences and engineering, defined here as the physical sciences (including astronomy, chemistry, and physics); earth, atmospheric, and ocean sciences; mathematics and computer science; biological and agricultural sciences; and engineering (in all its forms).

Faculty and Departmental Surveys

Recognizing at the outset the need for new data, the committee conducted two national surveys in 2004 and 2005 of faculty and academic departments in six science and engineering disciplines: biology, chemistry, civil engineering, electrical engineering, mathematics, and physics. The first survey of almost 500 departments focused on hiring, tenure, and promotion processes, while the second survey gathered career-related information from over 1,800 faculty. Together the surveys addressed departmental characteristics, hiring, tenure, promotion, faculty demographics, employment experiences, and types of institutional support received. In addition to results from the surveys, the committee heard expert testimony, examined data from NSF, the National Center for Education Statistics (NCES), and professional societies, and reviewed the results of individual university studies and research publications.

As it would be impossible to survey all "science, engineering, and mathematics (SEM) faculty at four-year institutions of higher education," the committee limited the scope of the surveys in four important ways. These limitations must be kept in mind in the interpretation of the survey results:

1. The data present a snapshot in time (2004 and 2005), not a longitudinal view.

2. Six disciplines are examined: biology, chemistry, civil engineering, electrical engineering, mathematics, and physics;

3. Institutions are limited to major research universities, referred to as Research I (RI) institutions; and

4. Only full-time, regularly appointed professorial faculty who are either tenure eligible or tenured are included.

In other words, except in its review of historical data and existing research, the report does not examine gender differences outside of the six disciplines covered in the surveys nor at institutions other than R1 universities. It also does not examine the careers of instructors, lecturers, post-docs, adjunct faculty, clinical faculty, or research faculty, who may experience very different career paths.

Many of the "whys" of the findings included here are buried in factors the committee was unable to explore. We do not know, for example, what happens to the significant percentage of female Ph.D.s in science and engineering who do not apply for regular, faculty positions at Research I institutions, or what happens to women faculty members who are hired and subsequently leave the university. And we know little about

female full professors and what gender differences might exist at this stage of their careers.

We do know that there are many factors unexplored here that play a significant role in women's academic careers, including the constraints of dual careers; access to quality child care; individuals' perceptions regarding professional recognition and career satisfaction; and other quality-of-life issues. In particular, the report does not explore the impact of children and family obligations (including elder care) on women's willingness to pursue faculty positions in R1 institutions or the duration of postdoctoral positions.

Comparisons to Other National Academies' Reports

This report does not exist in isolation. The committee has benefited greatly from three other National Academies' reports on women in academic science and engineering. In 2001 the Committee on Women in Science and Engineering (CWSE) published *From Scarcity to Visibility: Gender Differences in the Careers of Doctoral Scientists and Engineers*," a statistical analysis of the career progression of matched cohorts of men and women Ph.D.s from 1973 to 1995. The 2005 CWSE report, *To Recruit and Advance: Women Students and Faculty in U.S. Science and Engineering,* identifies the strategies that higher education institutions have employed to achieve gender inclusiveness, based on case studies of four successful universities.

A third report, *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering*, was released in 2006 under the aegis of the Committee on Science, Engineering, and Public Policy (COSEPUP). The study committee was charged to "review and assess the research on sex and gender issues in science and engineering, including innate differences in cognition, implicit bias, and faculty diversity" and "provide recommendations . . . on the best ways to maximize the potential of women science and engineering researchers." The committee considered all fields of science and engineering (including the social sciences) in a broad range of academic institutions, relying primarily on existing data and the experience and expertise of committee members. Its report provides broad policy recommendations for changes at higher education institutions.

In contrast, the current report examines new information on the career patterns of men and women faculty at R1 institutions—with particular focus on key transition points that are under the control of the institutions. The findings and recommendations here are based primarily on the data from our two surveys, which were not available to the COSEPUP committee.

Like the COSEPUP committee, this committee found evidence of the overall loss of women's participation in academia. That loss is most apparent in the smaller fraction of women who apply for faculty positions and in the attrition of women assistant professors before tenure consideration. Unfortunately, our surveys do not shed light on why women fail to apply for faculty positions or why or if they leave academia between these critical transition points--underscoring the fact that our work is not done.

Our survey findings do indicate that, at many critical transition points in their academic careers (e.g., hiring for tenure-track and tenure positions and promotions), women appear to have fared as well as or better than men in the disciplines and type of institutions (R1) studied, and that they have had comparable access to many types of institutional resources (e.g., start-up packages, lab space, and research assistants). These findings are in contrast to the COSEPUP committee's general conclusions that "women who are interested in science and engineering careers are lost at every educational transition" and that "evaluation criteria contain arbitrary and subjective components that disadvantage women."

After providing a brief overview of the Status of Women in Academic Science and Engineering in 2004 and 2005 in Chapter 2, the report presents the results of the survey findings in the three areas: Academic Hiring (Chapter 3), Climate, Institutional Resources, Professional Activities, and Outcomes (Chapter 4), and (Tenure and Promotion (Chapter 5). Chapter 6 provides an overall summary of key findings and recommendations, including questions for future research.

Key Findings

The surveys of academic departments and faculty have yielded interesting and sometimes surprising findings. **For the most part, men and women faculty in science, engineering, and mathematics have enjoyed comparable opportunities within the university, and gender does not appear to have been a factor in a number of important career transitions and outcomes.** The findings below provide key insights on gender differences in Academic Hiring (Chapter 3), Climate, Institutional Resources, Professional Activities, and Outcomes (Chapter 4), and (Tenure and Promotion (Chapter 5). Complete findings in each of these areas can be found at the end of the relevant chapter and are summarized in Chapter 6.

As a foundation for understanding the survey findings, it is important to remember that **although women represent an increasing share of science, mathematics, and engineering faculty, they continue to be underrepresented in many of those disciplines.** While the percent of women among faculty in scientific and engineering overall increased significantly from 1995 through 2003, the degree of representation varied substantially by discipline, and there remained disciplines where the proportion of women was significantly lower than the proportion of men. Table S-1 shows the percent of women faculty in selected scientific and engineering disciplines during this time period at the assistant, associate, and full professor levels.

TABLE S-1 Representation of Women in Faculty Positions at Research I Institutions by Rank and Field (%) 1995–2003.

	Assistant Professor					Associate Professor					Full Professor				
	1995	1997	1999	2001	2003	1995	1997	1999	2001	2003	1995	1997	1999	2001	2003
Agriculture	17.8	18.6	19.6	18.1	27.2	12.7	12.5	10.7	17.6	13.9	4.9	5.2	6.1	6.6	8.0
Biology	35.6	38.2	36.0	37.0	38.8	26.0	24.3	26.3	30.2	31.2	14.0	14.7	15.8	18.0	20.8
Engineering	14.2	12.7	12.8	14.8	16.6	4.8	6.4	9.6	9.3	11.7	1.8	1.4	2.3	2.7	3.8
Health Sciences	69.1	66.9	64	64.7	66.5	65.6	65.1	64.9	64.5	59.1	35.1	38.9	45.3	48.0	59.0
Mathematics	18.7	22.0	26.5	25.2	26.6	10.4	14.4	14.9	15.8	16.3	7.6	5.9	9.9	10.0	9.7
Physics	25.1	25.6	24.6	25.4	24.1	9.5	13.4	14.8	16.7	19.5	4.3	4.6	5.9	6.8	7.6

SOURCE: National Science Foundation, Survey of Doctoral Recipients, 1995-2003. Tabulated by NRC.

In 2003, women comprised 20 percent of the full-time employed S&E workforce and had slowly gained ground compared to men in the full-time academic workforce; by 2003, they represented about 25 percent of academics. Women's representation in the academic workforce, of course, varied by discipline: in the health sciences, women were the majority of full-time, employed doctorates, while in engineering they were less than 10 percent. The greatest concentration of women among full-time academics was at medical schools; the lowest was at Research II institutions.

Academic Hiring (Chapter 3)

The findings on academic hiring suggest that many women fared well in the hiring process at Research I institutions, which contradicts some commonly held perceptions of research intensive universities. If women applied for positions at RI institutions, they had a better chance of being interviewed and receiving offers than male job candidates had. Many departments at Research I institutions, both public and private, have made an effort to increase the numbers and proportions of female faculty in the sciences, engineering and mathematics. Having women play a visible role in the hiring process, for example, has clearly made a difference. Unfortunately, women continue to be underrepresented in the applicant pool, relative to their representation among the pool of recent Ph.D.s. Institutions may not have effective recruitment plans, as departmental efforts targeted at women were not strong predictors in these surveys of an increased proportion of women applicants.

1. **Women account for about 17 percent of applications for both tenure-track and tenured positions in the departments surveyed. In each of the six disciplines, the proportion of applications from women for tenure-track positions was lower than the percentage of PhDs awarded to women.** (Findings 3-1 and 3-3)

Table S-2 shows the percentage of women in the pool at each of several key transition points in academic careers: award of PhD, application for position, interview, and job offer. Although there was wide variation by field and department in the number and

proportion of female applicants for faculty positions, the proportion of applications from women in each discipline was lower than the percentage of doctoral degrees awarded to women. This was particularly the case in chemistry and biology, the two disciplines in the study with the highest proportion of female PhDs. The mean proportion of female applicants for tenure-track positions in chemistry was 18%, but women earned 32% of the PhDs in chemistry from Research I institutions from 1999-2003. Biology (24% in the tenure-track pool and 45% in the doctoral pool) also showed a significant difference.
The fields with lower percentages of women in the Ph.D. pool had a higher propensity for those women to apply. Electrical engineering (10% in the tenure-track pool and 12% in the doctoral pool), mathematics, and physics, for example, had modest decreases in the applicant pool.

The proportion of applicant pools that included at least one woman was substantially higher than would be expected by chance. However, there were no female applicants (only men applied) for 32 (6 percent) of the available tenure-track positions and 16 (16.5 percent) of the tenured positions.

TABLE S-2 Transitions from Ph.D. to tenure-track positions by field at the Research I Institutions Surveyed (%)

	Doctoral Pool	**Pools for Tenure-Track Positions**		
	% women Ph.D.s (1999-2003)	Mean % of applicants who are women	Mean % of applicants invited to interview who are women	Mean % of offers that go to women
Biology	45	26	28	34
Chemistry	32	18	25	29
Civil Engineering	18	16	30	32
Electrical Engineering	12	11	19	32
Mathematics	25	20	28	32
Physics	14	12	19	20

SOURCE: Survey of departments; Ph.D. data is from NSF, WebCASPAR.

2. **The proportion of women who were interviewed for tenure-track or tenured positions was higher than the percentage of women who apply.** (Finding 3-10)

For each of the six disciplines in this study the mean percentage of females interviewed for tenure-track and tenured positions exceeded the mean percentage of female applicants. For example, the female applicant pool for tenure-track positions in electrical engineering was 11 percent, and the corresponding interview pool was 19 percent.

3. **The proportion of women who received the first job offer was higher than the percentage who were invited to interview.** (Finding 3-13)

Tenure-track women in all of these disciplines received a greater proportion of first offers than their proportion in the interview pool. For example, women were 21 percent of the interview pool for tenure-track electrical engineering positions and received 32 percent of the first offers. This finding is also true for tenured positions with

the notable exception of biology, where the interview pool was 33 percent female and women received 22 percent of the first offers.

4. **Most institutional and departmental strategies proposed for increasing the proportion of women in the applicant pool were not strong predictors of the percentage of women applying. The proportion of females on the search committee and having a woman chair the search committee, however, did have a significant effect on recruiting women.** (Findings 3-7 and 3-8)

Departments have not generally been aggressive in using special strategies to increase the gender diversity of the applicant pool. Most of the policy steps proposed for increasing the proportion of women in the applicant pool (such as targeted advertising, recruiting at conferences, and contacting colleagues at other institutions) were done in isolation, with almost two-thirds of the departments in our sample reporting they took either no steps or one step designed to increase the gender diversity of the applicant pool.

It does appear that women were more likely to apply for a position if a woman was chairing the search committee. The proportion of females on the search committee and whether a woman chaired the committee were both significantly and positively associated with the proportion of women in the applicant pool.

Professional Activities, Climate, Institutional Resources, and Outcomes (Chapter 4)

The survey findings with regard to climate and resources demonstrate two critical points. First, discipline matters, as indicated by the difference in the amount of grant funding held by men and women faculty in biology, but not in other disciplines. Second, institutions have been doing well in addressing most of the aspects of climate that they can control, such as start up packages and reduced teaching loads. Where the challenge may remain is in the climate at the departmental level. Interaction and collegial engagement with one's colleagues is an important part of scientific discovery and collaboration, and here women faculty were not as connected.

5. **Male and female faculty appeared to have similar access to many kinds of institutional resources, although there were some resources for which male faculty seemed to have an advantage.** (Findings 4-1 through 4-5)

Survey data revealed a great deal of similarity between the professional lives of male and female faculty. In general, men and women spent similar proportions of their time on teaching, research, and service; male faculty spent 41.4 percent of their time on teaching, while female faculty spent 42.6 percent. Male and female faculty members reported comparable access to most institutional resources, including start-up packages, initial reduced teaching loads, travel funds, summer salary, and supervision of similar numbers of research assistants and postdocs.

Men appeared to have had greater access to equipment needed for research and to clerical support. At first glance, men seemed to have more lab space than women, but this difference disappeared once other factors such as discipline and faculty rank were accounted for.

6. **Female faculty reported that they were less likely to engage in conversation with their colleagues on a wide range of professional topics.** (Findings 4-6, 4-7 and 4-8)

There were no differences between male and female faculty on two of our measures of inclusion: chairing committees (39 percent for men and 34 percent for women) and being part of a research team (62 percent for men and 65 percent for women). And although women reported that they were more likely to have mentors than men (57 percent for tenure-track women faculty compared to 49 percent for men), they were less likely to engage in conversation with their colleagues on a wide range of professional topics, including research, salary, and benefits (and, to some extent, interaction with other faculty members and departmental climate). This distance may prevent women from accessing important information and may make them feel less included and more marginalized in their professional lives. Men and women faculty surveyed did not differ in their reports of discussions with colleagues on teaching, funding, interaction with administration, and personal life.

7. **There is little evidence across the six disciplines that men and women have exhibited different outcomes on most key measures (including publications, grant funding, nominations for international and national honors and awards, salary, and offers of positions in other institutions). The exception is publications, where men had published more than women in five of the six disciplines. On all measures, there were significant differences among disciplines.** (Findings 4-9 through 4-14)

Overall, male faculty had published marginally more refereed articles and papers in the last three years than female faculty, except in electrical engineering, where the reverse was true. Men had published significantly more papers than women in chemistry (men: 15.8; women: 9.4) and mathematics (men: 12.4; women: 10.4). In electrical engineering, women had published marginally more papers than men (7.5 for women compared with 5.8 for men). The differences in number of publications between men and women were not significant in biology, civil engineering, and physics.

There were no significant gender differences in the probability that male or female faculty would have grant funding, i.e., be a principal investigator or co-principal investigator on a grant proposal. Male faculty had significantly more research funding than female faculty in biology; in the other disciplines, the differences were not significant.

Female assistant professors who had a mentor had a higher probability of receiving grants than those who did not have a mentor. In chemistry female assistant professors with mentors had a 95 percent probability of having grant funding versus 77 percent for those women without mentors. Over all six fields surveyed female assistant professors with no mentors had a 68 percent probability of having grant funding versus 93 percent of women with mentors. This contrasts with the pattern for male assistant professors; those with no mentor had an 86 percent probability of having grant funding versus 83 percent for those with mentors.

Overall male and female faculty were equally likely to be nominated for international and national honors and awards, although the results varied significantly by discipline. Gender was a significant determinant of salary among full professors; male full professors made, on the average, about 8 percent more than females, once we controlled for discipline. At the associate and assistant professor ranks, the differences in salaries of men and women faculty disappeared.

Tenure and Promotion (Chapter 5)

The findings related to tenure and promotion indicate the importance of addressing the retention of women faculty in the early stages of their academy careers; not as many were considered for tenure as would be expected, based on the number of women assistant professors. Retention was particularly problematic given the increased duration of time in rank for all faculty. Both male and female faculty utilized stopping the tenure clock policies--spending a longer time in the uncertainty of securing tenure--but women used these policies more. Women faculty who did come up for tenure were as successful or more successful than men, so one of the most important challenges may be increasing the pool of women faculty who make it to that point.

8. **In every field, women were underrepresented among candidates for tenure relative to the number of women assistant professors. Most strikingly, women were most likely to be underrepresented in the fields in which they accounted for the largest share of the faculty – biology and chemistry.** (Finding 5-1)

In biology and chemistry, the differences were statistically significant. In biology, 27 percent of the faculty considered for tenure were female, while women represented 36 percent of the assistant professor pool. In chemistry those numbers were 15 percent and 22 percent respectively. This difference may suggest that women assistant professors were more likely to leave before being considered for tenure than men were. It might also reflect increased hiring of women assistant professors in recent years (compared with hiring 6 to 8 years ago).

9. **Women were more likely than men to receive tenure when they came up for tenure review.** (Findings 5-2, 5-3, and 5-4)

In each of the six fields examined in this survey, women were tenured at the same or a higher rate than men (an overall average of 92 percent for women and 87 percent for men). It appears that women were more likely to be promoted when there was a smaller proportion of females among the tenure-track faculty. Discipline, stop-the-clock policies, and departmental size were not associated with the probability of a positive tenure decision for either male or female faculty members who were considered for tenure. Both male and female assistant professors were significantly more likely to receive tenure at public institutions (92 percent) than private institutions (85 percent).

10. **No significant gender disparity existed at the stage of promotion to full professor.** (Findings 5-6 and 5-7)

For the six disciplines surveyed, 90 percent of the men and 88 percent of the women proposed for full professor were promoted—a difference that was not statistically significant, after accounting for other potentially important factors such as disciplinary differences, departmental size, and use of stopping-the-clock policies**.** Women were proposed for promotion to full professor at approximately the same rates as they were represented among associate professors.

11. **Women spent significantly longer time in rank as assistant professors than men did.** (Findings 5-8 and 5-9)

Although time in rank as an assistant professor has increased over time for both men and women, women showed significantly longer durations than men. It is difficult to determine whether these apparent differences might be explained, at least in part, by individual and departmental characteristics such as length of post-doctoral experience and stopping-the-clock for family leave. Both male and female faculty spent longer in assistant professor ranks at institutions of higher prestige.

12. **Male and female faculty who stopped the tenure clock spent significantly longer as assistant professors than those who did not (an average of 74 months versus 57 months). They had a lower chance of promotion to associate professor (about 80 percent) at any time (given that they had not been promoted until then) than those who did not stop the clock. Everything else being equal, however, stopping-the-clock did not affect the probability of promotion and tenure; it just delayed it by about a year and a half.** It is unclear how that delay affected women faculty, who were more likely than men to avail themselves of this policy. (Finding 5-10)

Although the effect of stopping-the-clock on the probability of promotion and tenure is similar for both men and women faculty, 19.7 percent of women assistant professors in the survey sample availed themselves of this policy compared to 7.4 percent of male assistant professors. At the associate professor level, 10.2 percent of female faculty versus 6.4 percent of male faculty stopped the tenure clock.

Recommendations

The survey data suggest that positive changes have happened and continue to occur. At the same time, the data should not be mistakenly interpreted as indicating that men and women faculty in math, science, and engineering have reached full equality and representation, and we caution against premature complacency. Much work remains to be done to accomplish full representation of men and women in academic departments.

Many of the survey findings point out specific areas in which research institutions and professional societies can enhance the likelihood that more women will apply to faculty positions and persist in academia up to and beyond tenure and promotion.

Changes in the faculty recruitment and search process, enhancement of mentoring programs, broader dissemination of tenure and stop-the-clock policies, and investigation of the subtle effects of climate on career decisions can all help. Increased data collection, of course, is also necessary. Specific recommendations for institutions and professional societies are delineated in Chapter 6.

Questions for Future Research

This study raises many unanswered questions about the status of women in academia. As noted at the onset of this report, the surveys did not capture the experiences of PhDs who never apply for academic positions, nor of women faculty who have left at various points in their academic careers. We also recognize that there are important, nonacademic issues affecting men and women differentially that impact career choices at critical junctures. Fuller examination of these issues (for example, topics relating to family, children, home life, care of elderly parents) will shed greater light on career choices by women and men and should yield suggestions on the types of support needed to encourage retention of women in academic careers. Below are suggestions for future research:

A Deeper Understanding of Career Paths

1. Using longitudinal data, what are the academic career paths of women in different science and engineering disciplines from receipt of their Ph.D. to retirement?

2. Why are women underrepresented in the applicant pools and among those who are considered for tenure?

3. Why aren't more women in fields such as biology and chemistry applying to RI tenure-track positions, as discussed in Finding 3-3?

4. Why do female faculty, compared to their male counterparts, appear to continue to experience some sense of isolation in more subtle and intangible areas?

5. What is the impact of stop-the-clock policies on faculty careers?

6. What are the causes for the attrition of women and men prior to tenure decisions, if indeed attrition does take place?

7. To what extent are women faculty rewarded beyond promotion to full professor?

8. What important, nonacademic issues affect men and women differentially that impact their career choices at critical junctures?

Expanding the Scope

9. How important are differences among fields?

10. What are the experiences of faculty at Research II institutions?

11. What are the experiences of part-time and non-tenure track faculty?

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Policy and Global Affairs

Committee on National Statistics
Division of Behavioral and Social Sciences and Education

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2007-2009

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PREFACE

Difficult tasks are often very simply stated. This committee was asked by Congress to "conduct a study to assess gender differences in the careers of science, engineering, and mathematics (SEM) faculty, focusing on four-year institutions of higher education that award bachelor's and graduate degrees. The study will build on the Academy's previous work and examine issues such as faculty hiring, promotion, tenure, and allocation of institutional resources including (but not limited to) laboratory space." That such an assessment would be daunting was well understood by the committee. The importance of the study provided more than ample motivation to keep the committee engaged and focused on crafting an objective report that would advance our knowledge on the status of women academics in science and engineering at the nation's top universities.

To address its charge, the committee drew on a large number of scholarly studies, survey data collected by federal agencies and professional societies among others, self-assessments conducted by universities—as well as a number of experts brought in to meet with the committee. After reviewing the above information, the committee determined to conduct two comprehensive surveys. These surveys were sent to the major research universities across the United States during 2004-2005. The surveys focused on biology, chemistry, civil and electrical engineering, mathematics, and physics. One focused on almost 500 departments in these disciplines and the other was sent to more than 1,800 faculty. These surveys bring much needed additional information to the table. The survey of departments collected information on departmental characteristics, hiring, tenure and promotion decisions, and related policies. The survey of faculty focused on demographic characteristics, employment history, and institutional resources received. The committee was delighted with the response to the surveys. The departmental survey had about an 85 percent response rate and the faculty survey had a response rate of about 77 percent. The committee extends their thanks to everyone who filled out the questionnaires, which were undoubtedly time consuming. Respondents were very open with their information, as they were promised confidentiality. While the data must remain restricted to maintain that confidentiality, we believe these data could be used in further studies for the benefit of the scientific community without violating the confidentiality of respondents.

A related point is that while the committee examined a tremendous amount of information, a comprehensive and conclusive assessment of faculty careers remains in the future. The committee has done all it can given its resources to advance our understanding of this important issue, but additional research and study remain. If it could, this committee would have continued expanding, refining, and enhancing its analysis. The committee trusts that others will be encouraged to pursue further some of the avenues the committee has started down and to answer some of the questions that arose in this report, drawing on their own innovative approaches to examining the trajectory of academic careers of men and women.

Claude Canizares
Co-Chair

Sally Shaywitz
Co-Chair

ACKNOWLEDGMENTS

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Academies' Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the process.

We wish to thank the following individuals for their review of this report:
Robert Birgeneau, University of California, Berkeley; Claudia Goldin, Harvard University; Susan Graham, University of California, Berkeley; Jo Handelsman, University of Wisconsin; Maria Klawe, Harvey Mudd College; J. Scott Long, Indiana University; Colm O'Muircheartaigh,University of Chicago; Barbara Reskin, University of Washington; Johanna Levelt Sengers, National Institute of Standards and Technology; and Richard Zare, Stanford University.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Stephen Fienberg, Carnegie Mellon University and Mildred Dresselhaus, Massachusetts Institute of Technology. Appointed by the National Academies, they were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution..

We would like to thank all the faculty and departments who took the time to complete our surveys. We greatly appreciate the effort and the report could not have been a success without their help. In addition, the committee would like to thank staff of the project for their assistance, including Charlotte Kuh, deputy executive director of Policy and Global Affairs Division; Catherine Didion, the current director of CWSEM; Michael Cohen, senior program officer of CNSTAT; Marilyn Baker, director for reports and communications for the Policy and Global Affairs Division; Jong-on Hahm, who managed the project as the former director of CWSE; Peter Henderson, who took over as study director and interim director of CWSE; John Sislin, program officer; Jim Voytuk, senior program officer and George Reinhart, former senior program officer for their assistance with data and surveys; Elizabeth Briggs; Jessica Buono; Jacqueline Martin; Amber Carrier; Melissa McCartney; Norman Bradburn, who consulted on the surveys and data; John Tsapogas for assistance with SDR data; and Dan Heffron for assistance with NSOPF data; and Rachel Ivie and Roman Czujko and everyone at the American Institute of Physics, who implemented the surveys.

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