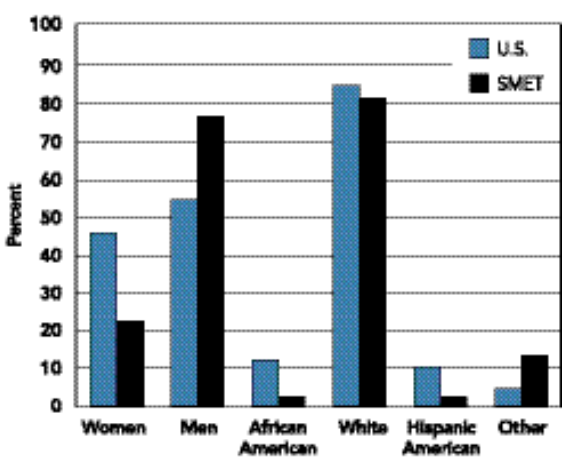
6. Doctoral Workforce: Traditional And Not-So-Traditional Career Paths

Women, African Americans, and Hispanic Americans are consistently underrepresented in the U.S. doctorally-trained SMET workforce, as seen in the composition of the SMET doctoral workforce compared to that of the overall workforce (see Figure 6-1) {54} {55}. The underrepresentation is most notable for underrepresented race/ethnic minorities than for women. These patterns vary somewhat by field, being most accentuated in mathematics, computer sciences, engineering, and the physical sciences, and least accentuated in the social sciences. These patterns reflect decisions and opportunities with regard to doctoral training over the past three decades and will change only as the proportion of SMET doctorate recipients who are women and underrepresented minorities changes (See Chapter 4 for a discussion of these trends). This chapter focuses on the distribution and salary of doctoral trained individuals across labor force sectors on a group-by-group basis.

Figure 6-1: Distribution of the U.S. Civilian and SMET Doctorally-Trained Labor Force by Gender and Race/Ethnicity, 1997



(Note: For the U.S. labor force, persons of Hispanic origin may be of any race and so are not mutually exclusive of the other racial categories).

Sources: U.S. Bureau of the Census, *Statistical Abstract of the United States: 1998*, National Science Foundation/SRS, Survey of Doctorate Recipients, 1997 {54}{55}.

6.1 Women a Small Percentage of SMET Faculty

As seen in Figure 6-2 {55}, doctorally-trained women are less likely to have full-time employment than are their male counterparts. (22.8% of the SMET labor force are women, while 29.5% of the not-full-time-employed are women.) Although the difference in full-time employment varies somewhat by field, this generalization holds within all of the broad fields.

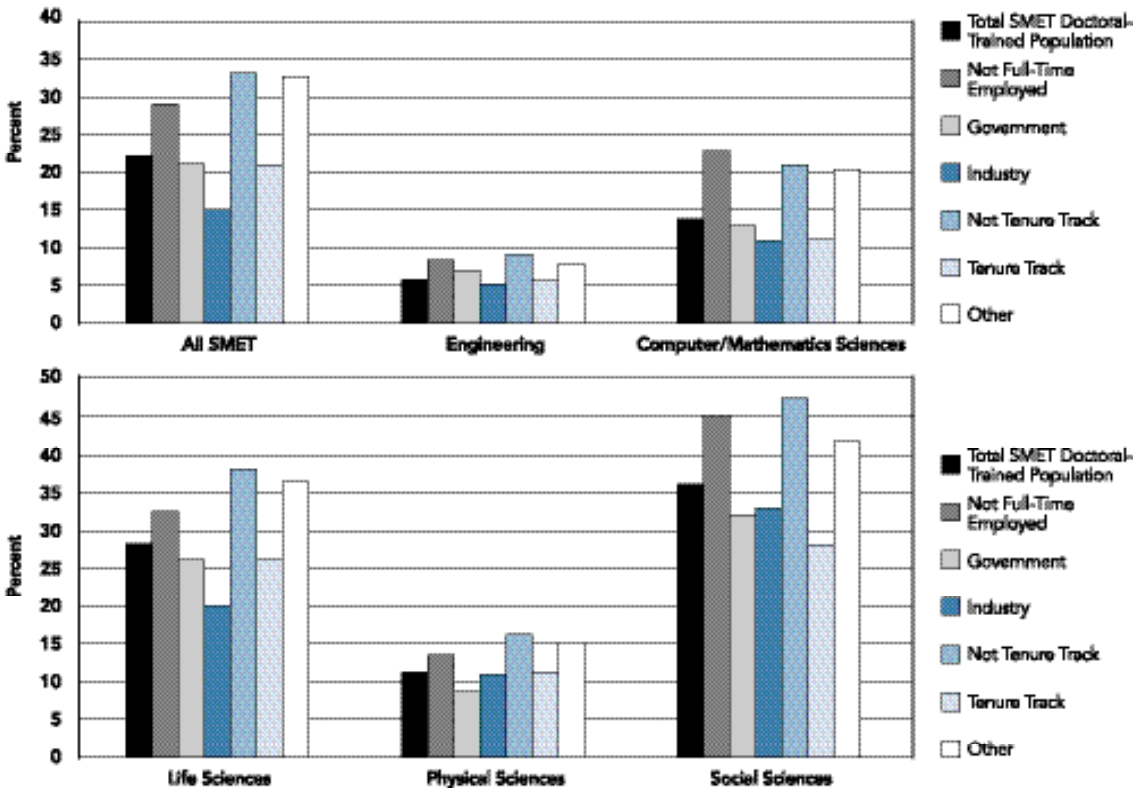
The composition of tenure-track faculty at U.S. universities and colleges corresponds fairly closely to the composition of the SMET doctorally-trained population: 20.5% of tenure-track faculty is female compared to 22.8% of the doctoral population. Likewise, the composition of SMET doctoral personnel working for the government reflects the composition of the doctoral population: 21.2% vs. 22.8%. Doctorally-trained women, however, are underrepresented in industry (15.4%) and overrepresented (32.9%) among "non-faculty"—those working at colleges and universities in non-tenure-track teaching, research associate, or postdoctoral positions. Indeed, approximately 1 in every 3 of those employed full-time in a "non-faculty" position was a woman, as were those in the "other positions" (i.e., full-time employment in educational institutions other than four-year colleges and universities and in the non-profit sector).

Disproportionate employment of women in the non-faculty and "other" sectors suggests that women have less access to career paths that foster research independence and are heavily concentrated instead in positions that lack permanence and often the ability to follow an independent research agenda. With a few exceptions, these patterns hold when the SMET fields are disaggregated.

Among tenure-track faculty, women are consistently more likely to be found in the junior than senior ranks. In the natural sciences and engineering, for example, in 1995 women made up only 12% of the senior faculty (associate and full professors) at U.S. universities and four-year colleges; among the top 90 U.S. research universities, less than 10% of senior faculty in these disciplines were women {56}.

The plight of female faculty, especially in senior positions, drew widespread attention in 1999 when the Massachusetts Institute of Technology (MIT) released a report admitting widespread practices that adversely impacted the research careers of women within the university. At the time that MIT began its investigation (initiated by female faculty) there were only 14 tenured women among a total tenured faculty of 280. Senior female faculty complained of subtle differences between

Figure 6-2: Percentage Representation of Women Within Labor Force Sectors and Selected Degree Fields, 1997



Source: National Science Foundation/SRS, *Survey of Doctorate Recipients, 1997* {55}.

the circumstances of men and women, that lab space, university research awards, teaching loads, and departmental support favored senior male faculty. For instance, in one MIT department senior male faculty had roughly 95 square meters more lab space than their female peers {56}.

Differences in salaries between men and women only reinforce the skewed picture of the doctorally-trained workforce. (Figure 6-3, 6-5 and 6-7) shows the median salaries of SMET workers with doctorates employed full-time in 1997 by gender, disability status, and race/ethnicity. In 1997, the median salary for SMET doctorates employed full-time was $67,000 for men, compared to $50,500 for women. (Figure 6-3) {55}. The gap is largest in the life, physical, and social sciences and smallest in computer and mathematical sciences and engineering.

To summarize, the evidence indicates that women in the SMET full-time workforce disproportionately make up the non-tenure-track academic and "other" workforce and on average receive lower salaries than men. Women are also more likely than their male counterparts to be in the non-full-time workforce. Of SMET doctorate recipients employed part-time in 1997, women accounted for almost 30%. A variety of factors contribute to doctorally-trained women being overrepresented in these frequently less rewarding careers. These include a lack of family-friendly policies in traditional academic and industry workplaces and an absence of programs designed to provide the non-faculty workforce opportunities to develop independent research agendas. In addition, as noted in Chapter 5, gender differences can be explained, in part, by differences in the age distribution of men and women in the SMET workforce.

6.2 Minorities Take a Different Academic Path

The traditional career path for doctoral recipients has been a tenure-track position in academe. Considering underrepresented minorities as a group, Figure 6-4 shows that, in 1997, underrepresented minorities were more likely to find full-time tenure-track positions than to be employed in non-tenure track positions within academia and in "other" positions. Underrepresented minorities are less likely to be outside the full-time workforce and to be in the industrial sector than are other members of the doctoral population. The traditional career path for doctorate recipients has been a tenure-track position in academe. Figure 6-4 {55} shows that, in 1997, underrepresented minorities were relatively likely to find full-time tenure-track positions when compared to race/ethnic groups that are not considered underrepresented (whites and Asian Americans). Underrepresented minorities are also relatively likely to be employed in non-tenure track positions within academia and in "other" positions. Underrepresented minorities are less likely to be outside the full-time workforce and to be in the industrial sector than are other members of the doctoral population.

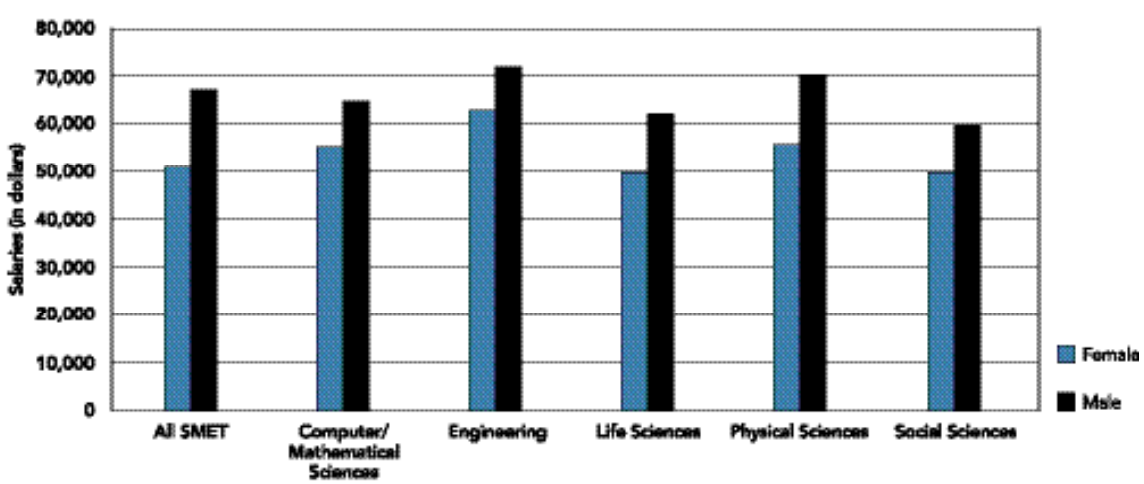
The high rate of employment in traditional career positions among underrepresented minorities holds within broad degree fields. It is likely that at least some of the reason for the success of underrepresented minorities on this measure is attributable to extraneous factors such as the relatively young age of the doctorally-trained underrepresented minority population. It is also quite possible that the difference

One Woman's Impressive Contribution

Gail K. Naughton, President and COO of Advanced Tissue Sciences, is a co-founder of this company and co-inventor of its core technology. At age two, a toddler named Dominic suffered serious burns from spilling boiling coffee on his neck and chest. Dominic would typically require twice daily painful dressing changes, up to two weeks of hospitalization, and terrible scarring.

Dominic was the first patient to receive TransCyte™, a tissue engineered burn treatment which Gail Naughton co-invented. Within minutes of TransCyte application, Dominic was pain-free, and he was able to go home with parents the same day. The Dominics of the world would not be receiving the benefits of tissue engineering if not for Dr. Naughton. How many other life-changing technologies are not being developed due to the underutilization of the talents of scientists and engineers such as Gail Naughton, who are women, minorities, and persons with disabilities?

Figure 6-3: Median Salaries (in dollars), Full-Time Employed SMET Doctorates, by Field and Gender, 1997



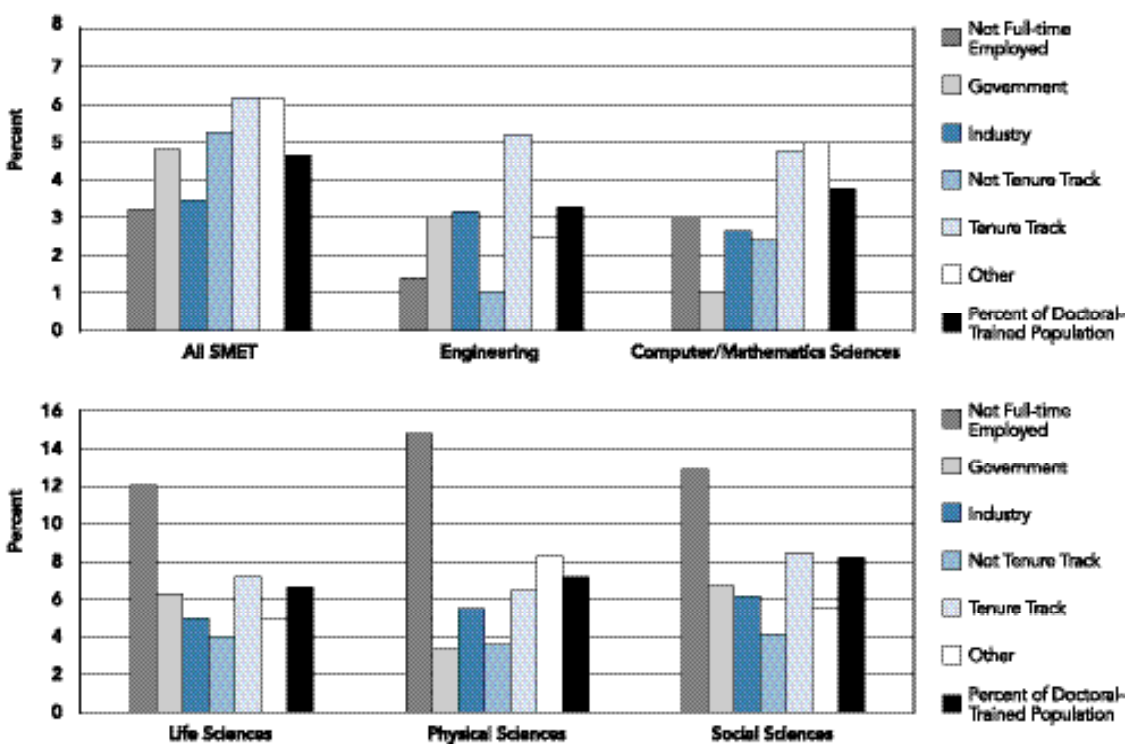
Source: National Science Foundation/SRS, *Survey of Doctorate Recipients, 1997* {55}.

reflects successful affirmative action policies within academia. Or it may reflect a strong desire on the part of these individuals to enter academic positions where they can act as role models for young people. Still given their extremely low representation in the overall Ph.D. - trained population—fewer than 1 in 33 of U.S. tenure-track faculty are African American and fewer than 1 in 40 Hispanic Americans—students remain extremely unlikely to be taught by an underrepresented minority.

While employment patterns for underrepresented minority members have mimicked to some extent those for whites, salary patterns suggest very different labor market rewards across race/ethnic groups among the doctoral population (see Figure 6-5) {55}. For all SMET fields in 1997, the median annual salary for whites was $9,000 more than for Hispanic Americans and $7,000 more than for African Americans. Native Americans earned substantially less than all other underrepresented minorities, while Asian Americans earned median salaries closely resembling those of whites, except in the social sciences and life sciences where the differences were $7,000 and $10,000 less, respectively. The gap between whites and underrepresented minorities was narrowest in engineering, followed closely by mathematics and computer sciences, and widest in the physical and social sciences. A portion of the salary gap can be explained by differences in job experience due to age, as minorities in the SMET workforce are typically younger than their white counterparts. {55}

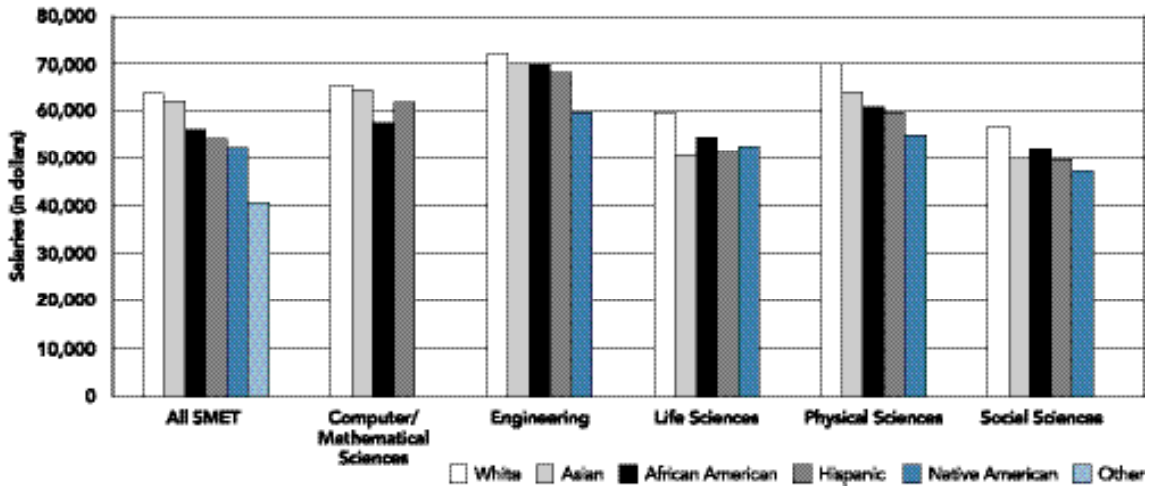
The low number of Hispanic Americans and African Americans in the SMET workforce can be changed only by increasing the flow from these populations into the doctorally-trained workforce. Policies to achieve that include ensuring the widespread availability and enhancement of SMET educational opportunities in grades K-12 to equip all students with the skills and interests required to pursue doctoral training.

Figure 6-4: Percent Within Each Sector



Source: National Science Foundation/SRS, *Survey of Doctorate Recipients, 1997* {55}.

Figure 6-5: Median Salaries (in dollars), Full-Time Employed SMET Doctorates, by Race Ethnicity, 1997



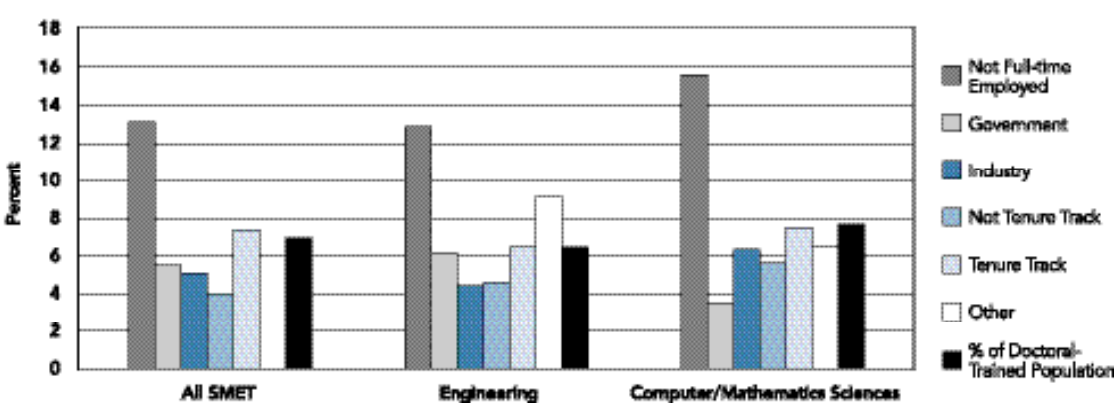
Note: Other category is suppressed due to small sample size.

Source: National Science Foundation/SRS, *Survey of Doctorate Recipients, 1997* {55}.

6.3 Full-Time Employment Less Likely for Persons with Disabilities

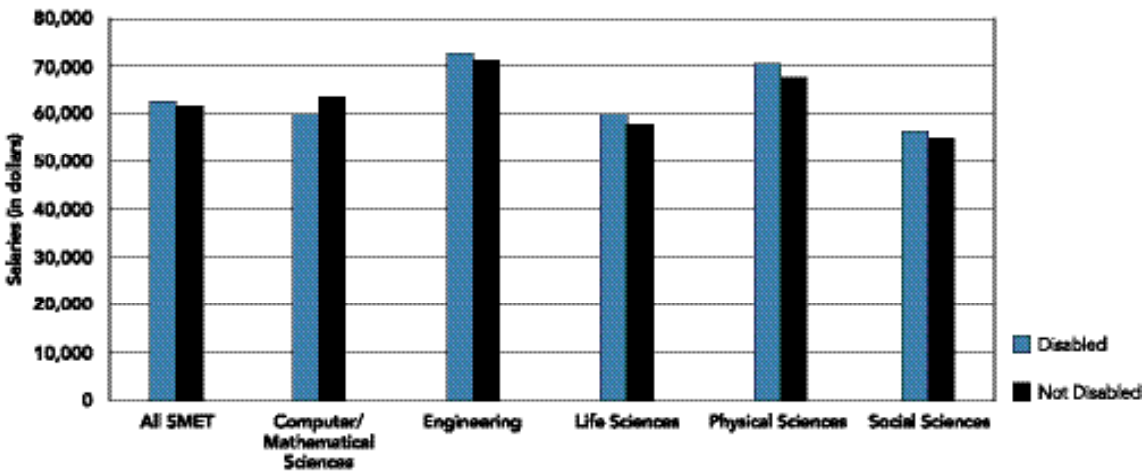
The limitations on available data on persons with disabilities allows only a limited view of their labor force experiences. (See sidebar on page 11) Figure 6-6 {55} shows the share of SMET doctoral recipients for different labor force sectors by disability status and educational field in 1997. Persons with disabilities are less likely to be employed full-time than are individuals without disabilities. Despite this, persons with disabilities are relatively on par in tenure-track academic positions, comprising 7.3% of SMET doctorates and 7.5% of full-time workers in tenure-track positions. Those with disabilities are modestly underrepresented in industry and government, where their share of employment for all SMET fields ranged from 5.4–5.7%.

Figure 6-6: Persons with Disabilities Within Employment Sectors and Selected Degree Fields, 1997



Source: National Science Foundation/SRS, *Survey of Doctorate Recipients, 1997* {55}.

Figure 6-7: Median Salaries (in dollars), Full-Time Employed SMET Doctorates, by Disability Status, 1997



Source: National Science Foundation/SRS, *Survey of Doctorate Recipients, 1997* {55}.

Underrepresentation in government is noticeably more pronounced in mathematics and computer sciences and in the physical sciences.

In terms of median salary (see Figure 6-7) {55}, those with and those without disabilities earn much the same; only in mathematics and computer sciences did those with disabilities earn less (a difference of $4,000) than those without disabilities. One explanation for the slightly higher salaries among most SMET workers with disabilities is that the incidence of disability tends to increase with age, and thus many of those who self-report a disability may occupy more senior and higher-paid positions (see discussion of workforce participation rates among those with disabilities in section 5.3).{55}

What is most striking, however, is the number of persons with disabilities not employed full-time. In 1997, almost one-third of doctorally-trained individuals with disabilities were either out of the labor force, unemployed, or working part-time; more than one in eight of the "not-full-time" population consisted of persons with disabilities. This overrepresentation suggests that persons with disabilities may have difficulty in securing full-time employment. (There does not seem to be evidence among doctoral recipients that persons with disabilities trained in SMET fields leave SMET occupations at a significantly greater rate than those without disabilities. Persons with disabilities are not disproportionately leaving SMET, but are simply not choosing or receiving full-time employment).

Two avenues can improve the SMET workforce participation rates of persons with disabilities. First are continued efforts to educate institutions with regard to the contribution those with disabilities make in SMET. Funding incentives should be established to provide supplemental support to assist those with severe disabilities participating in the workforce. Second, advances in assistive technology should be incorporated into strategies to facilitate more individuals with disabilities in entering in the SMET workforce. These could include promotion of and training programs in both workplace-based equipment, such as voice recognition systems, automated Braille printout, and robotic devices, and in the new information technologies that allow research to be carried out virtually or through remote access.