

## Introduction to Special Issue

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In 1929, civil engineer Elsie Eaves, the first female full member, senior member, and honorary member of the American Society of Civil Engineers, wrote a chapter on civil engineering for a book titled *An Outline of Careers for Women: A Practical Guide to Achievement*. In it she asserted,

“There is no sex to engineering, but there are customs, habits, and organizations of long standing which are an initial handicap to women and require more than average ability if she is to succeed in overcoming these barriers.” (Eaves 1929)

Eaves received her bachelor’s degree in civil engineering from the University of Colorado at Boulder in 1920, the first woman to do so at that institution. She went on to a long career as manager of the business news department of McGraw-Hill’s *Engineering News-Record*, where she pioneered in the development of construction cost indexes and reports on the status of the construction industry in the United States. Throughout her career, and indeed until many years past her retirement in 1963, Eaves remained one of a very small number of women in the engineering profession (Weingardt 2005).

Until the early 1970s, women constituted less than 1% of engineers in the United States, but things began to change, quickly at first and then more slowly. The percentage of women earning bachelor’s degrees from U.S. engineering schools rose from 0.8% in 1971 to 14.8% in 1985, the peak of engineering bachelor’s degree production in this country. The percentage of engineering degrees awarded to women continued to grow, but at a much slower rate, reaching a high of 20.6% in 2000 before slipping back to 18.6% in 2007. In terms of absolute numbers,

more than 1,000 women earned bachelor's degrees in engineering for the first time in 1976, growing more than ten times to exceed 10,000 in 1984 and then creeping to a peak of more than 15,000 in 2004 (Di Fabio et al. 2008).

Many explanations have been offered for the slow progress of women into engineering. In 1993, Betty Vetter, director of the Commission on Professionals in Science and Technology (formerly the Scientific Manpower Commission), observed, "Women have made considerable strides into the engineering workforce in the last decade, but the climate remains generally inhospitable in most employment situations."

While women still constitute less than 20% of undergraduates at U.S. engineering schools, a recent study of more than 75,000 engineering students at nine public universities found that once they begin engineering studies, women are just as likely as men to graduate with an engineering degree (Lord et al. 2009). However, an analysis of National Science Foundation data by the Society of Women Engineers found that women who earned bachelor's degrees in engineering in the mid-1980s were less likely than men to still be employed in engineering 20 years later. A 2005 survey of graduates of 21 engineering colleges conducted by the Society of Women Engineers found that while 71% of the male respondents believed that male and female employees performing the same jobs were treated equally where they worked, only 39% of the female respondents agreed (Frehill 2007).

The 2008 National Academy of Engineering report *Changing the Conversation: Messages for Improving Public Understanding of Engineering* focused on making engineering more attractive to the public in general and young women in particular by improving the image of engineering as a profession that directly influences quality of life. The study found that taglines such as "Engineers make a world of difference" and "Engineering is essential to our

health, happiness, and safety” resonated particularly well with girls.

However, it is not enough to attract young women into the profession, only to have them leave at midcareer. We must continue to examine the engineering workplace for unconscious bias and “microinequities” that can have long-term impacts on women’s careers. While blatant discrimination is for the most part a thing of the past, “customs, habits, and organizations of long standing,” as Elsie Eaves put it, still inhibit women’s progress. In 2008, ASCE published *Diversity by Design* to “provide practical, hands-on suggestions for how to foster, improve, and maintain a diverse and thriving workforce within the civil engineering profession” (Hatch 2008). This slim volume provides advice on recruiting, developing, and retaining diverse employees through understanding, mentoring, and communication. As leaders in the profession, ASCE members can continue to welcome women into engineering and strive to create workplaces in which all engineers can succeed.

In this special issue of *Leadership and Management in Engineering*, the authors highlight the accomplishments of women civil engineers and provide perspectives on leadership from women of diverse backgrounds in a variety of civil engineering careers. Diana Giraldo describes how three women are leading a major highway construction project in Washington State. Jeannine Wirth identifies key leadership traits for women at the highest levels of engineering consulting firms. Deborah J. O’Bannon and colleagues present findings from the evaluation of a leadership development program for women faculty in science and engineering. Shobha Bhatia and Jill Priest Amati describe a peer mentoring program for female graduate students in engineering. Your editor presents perspectives on leadership from female engineering deans. Patricia D. Galloway discusses how involvement in professional societies develops leadership skills. Jennifer M. Arndt shares her perspective on engineering outreach and a nontraditional

engineering career path. Melinda Luna gives a Hispanic engineer's experience, and Sandra Begay-Campbell provides a Native American perspective on leadership.

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