

Consequences of the Gendered Culture of Engineering

By Lara K. Schubert, P.E.

n my February column, I challenged engineers to think about the culture of structural engineering. The workplace that I described is now one where about half the engineers are women, but the gendered culture of engineering is still not extinct. Challenges particular to women persist in the field. Again, I encourage you to think about the invisible culture of your own workplace and the culture of structural engineering more broadly. This follow-up piece shows how some aspects of this culture may be particularly stifling for women.

In a study for the National Bureau of Economic Research, Jennifer Hunt shows that women are not only more likely to leave engineering than men, but also more likely to leave engineering than other fields. Based on my own experience and others' work on the perceptions of women in related fields of science, technology, and mathematics, I offer some possible contributing factors for this phenomenon. With this information, engineers in management positions will be better equipped to retain women, rather than losing the expertise and talents of this population; and, female engineers might be better able to understand some of their difficulties and be more likely to believe in the possibility of change.

At the beginning of my career, I knew little about day-to-day engineering. Consequently, my first year was a period of intense absorption. From close observations of other engineers, I perceived that a good engineer has sound arguments not only for design decisions but also all other assertions. This pressure to be an expert in everything meant always arguing a position rather than admitting being wrong. This demeanor comes freely for some and is cultivated by others.

As I struggled to learn analysis methods and code requirements on the job, I consistently asked a senior engineer for help and wondered how others knew it all. After many months, I had an extraordinary epiphany, realizing two important truths: everyone makes mistakes and no one knows everything. This finally freed some conceptual space for me to work. If only this had been transparent at the start and inquisitiveness clearly valued over

"Self-confidence is crucial in advancing and enjoying a research career. From an early age, girls receive messages that they are not good enough to do science subjects or will be less liked if they are good at them." — Ben Barres

mastery, I would have been able to muster self-confidence much more quickly. A culture that intentionally affirms inquiry, recognizes that mistakes are unavoidable, and institutes collaboration to ensure appropriate design accordingly will free engineers to grow in their profession.

Initial intimidation may be universal for inexperienced engineers, but it has a substantial impact on women who more commonly struggle with lack of self-confidence. Research sponsored by the National Science Foundation reported this challenge for women in science, technology, engineering and mathematics (STEM) fields. Girls assess their own mathematical abilities at a lower level than boys with similar achievements. This lack of self-confidence aligns with the fact that people are more likely to doubt women's competence, intensifying the pressure that a beginning female engineer puts on herself. A New York Times article in September 2012, Bias Persists for Women of Science, confirmed yet again that both women and men tend to favor male candidates.

Ben Barres wrote about perceptions based on gender in a compelling article in the July 2006 issue of Nature. Barres is a neurobiology professor at Stanford who started his career as a woman. He has a unique perspective because early in his career he went through hormone treatments to transition from female to male. Barres argues that the main factor for the gender disparity in science is social. Because people generally assume that women are worse at science, women lack the selfconfidence that more men enjoy. He cites a study showing that the bar is set higher for women scientists; it found that women applying for a research grant needed to be 2.5 times more productive than men in order to be considered equally competent.

Barres's own experience is telling. He recalls that, shortly after his sex change, a faculty member was heard to say, "Ben Barres gave a great seminar today, but then his work is much better than his sister's." Barres's "sister" was simply Ben as a woman. Clearly his work was not different, but it was assessed differently based on the gender of the researcher.

While biases are not easily changed, transforming the culture of structural engineering is possible. An important step is to create a culture in which engineers can retain respect when they admit that they do not know something. Women need to feel both respected and included. Such a transformation requires selfreflection within the field itself, as well as by principals who provide intentional supportive mentoring and begin to see the unacknowledged culture of engineering with a critical lens in order to open it up.

If structural engineers think about how the culture of engineering colludes with societal pressures on women (and other under-represented populations), aspects of the culture may begin to change and allow more talented female engineers not only to enter the profession, but also to stay, grow, and advance.

Perhaps if I had perceived such success to be possible, I would still be a full-time engineer. While I enjoy aspects of engineering, I was not able to see the prospects for change before gaining a certain distance from the profession. I hope that what I have learned will help all engineers to see the culture of engineering and the potential for transformation. Subsequently, others who do not fit the typical model of an engineer, but have desire and skill, will choose to stay in the profession, forcing the model to change and helping the field itself to flourish.

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