Special Feature: Women in Engineering

By Belinda Stasiukiewicz

Aspire. Advance. Achieve.

This is the slogan of the Society of Women Engineers. The organization, founded more than 60 years ago, is one of the leaders in the push to increase female interest in engineering. The society hopes that its members, and all female engineers in general, will aspire to become successful engineers, advance further in the field and achieve their goals.

For three days this coming October, the Society will host 6,000 women engineers in Baltimore, M.D., for its annual WE13 Conference – the "best way for women engineers to add to their own personal history of success."

Full STEM ahead

Billed as an opportunity to network, start or advance careers, or merely experience highly rated professional development offerings, WE13, which takes place Oct. 24-26, is among several yearly events hosted by the Society of Women Engineers.

Karen Purcell, PE, an electrical engineer, entrepreneur and author from Reno, Nev., spoke at the society's regional "Ride the Wave of Innovation" conference in 2012, held in Honolulu, Hawaii. Her topic: "Unlocking Your Brilliance," which is the title of her recently-published book.

According to her website, Purcell draws on her personal experience to inspire women to enter the science, technology, engineering and math (STEM) fields with confidence.

Purcell is the founder and president of PK Electrical, and has a non-profit organization to help women create futures in the STEM fields – STEMpire. She thinks young girls are too often ushered into more nurturing professions, like teaching and nursing, rather than technical or mathematical fields.

"It's an unwritten bias; the way we've all grown up. Boys get the science play sets, but that doesn't mean the girls aren't going to be good [at engineering.] Exposing them to STEM may strike their interest," she said.

In an average college engineering class today, men typically outnumber women significantly – nearly 80 percent male, according to a Northeastern University study. Coursework with a focus on electromagnetic compatibility (EMC) has even less females present in classes.

Though these statistics are mirrored in industry, women are increasing their representation in the STEM fields.

School factors

According to the Northeastern University study, titled, “Women in Engineering in the United States: Overview 1990-2010,” the percentage of female engineering enrollment remained predominately steady with a slight increase, from 16.5 percent in 1990 to 17.4 percent in 2006. In 2007, the same study found that the electrical and electronic engineering fields held one of the lowest percentages for women in the field, 8.6 percent, compared to the percentages for software or chemical engineering, which were 20.8 percent and 21.2 percent, respectively.

The presence of women in engineering varies throughout the world. While the Northeastern Study’s numbers hold true for the U.S., other countries have more equal representation of both genders in the field.

According to an article by the University of Pennsylvania, 40 percent of engineers in China are female, while 58 percent of engineers in Russia are female. However, not every European and Asian country follows this model. France, for example, has a 27 percent rate of women engineers under the age of 30. The article suggests this concerns company leaders who need to hire; and the reason for the small numbers of women could possibly come from a “conflict between family and professional life.”

An interesting argument to why women are represented less in engineering comes from economists Massimo Anelli and Giovanni Peri, who recently published a paper through the National Bureau of Economic Research titled, “The Long Run Effects of High-School Class Gender Composition.” Anelli and Peri assert that typical schools with students of both genders make it less likely girls will choose a career like engineering.

The study analyzed a database of 30,000 Italian students who graduated from high school between 1985 and 2005. It found that girls who attend an all-girls school are more likely to choose a high-paying STEM major, while girls who attend a mixed-gender school are more likely to choose a humanities major, which will lead to a lesser-paying job.

Kate Stuckman, a senior at Texas A&M University, is among the few women who plan to enter the electrical engineering field. She is excited to make her mark in the industry and classes where “teachers always know my name.”

“I was meant to be an engineer. I like math and the theoretical side of it,” she said, “But I wanted to be doing something in society and applying theoretical concepts to solve real world problems.”

Stuckman plans to pursue a master’s and perhaps a Ph.D. in wireless communication and wireless coding research. She has found support from her professors, mentors and peers throughout her education.

“In electrical engineering I’m in the minority. But it hasn’t been an issue at all,” she said. “By no means do I give up my femininity. It’s never been an issue of people underestimating my capabilities.”

Stuckman does recognize that gender issues may come up in the workplace eventually, however.

“I have heard [of challenges] once you get into industry. It’s such a male dominated field. But it’s best to be prepared [for any situation].”

Sydney Baker, a senior engineering student at Worcester Polytechnic Institute (WPI), has also had a positive experience in school but anticipates the challenges her chosen career may bring.
“While the professors I have been in contact with have treated women fairly, I have found that my male peers have underestimated my skills from time to time,” she said. “[But] as long as you worry about putting your best foot forward and making a name for yourself based on your own performance, I’ve found that gender does not matter.”

Miryam Becker, an engineering student at WPI, says the school has a student body rate of 30 percent female, but she doesn’t believe it affects students’ perceptions or efforts.

“The women at WPI are here because they know that they have the same potential as men to do great things, even and especially in the field of engineering,” she said. “The population difference is noticeable, even just walking around campus, but honestly the women here are just as motivated, passionate, and intelligent as the men so I do not feel out of place or lesser than anyone else. Everyone works hard and does their best, and that puts everyone on a level playing field.”

Industry gains, past and present

In industry, women engineers are undeniably making a mark.

Candace Suriano, an EMC engineer and owner of Suriano Solutions, is the author of numerous papers on electromagnetic compatibility and hosted works shops at several IEEE EMC events. Her interests are primarily in the area of electromagnetic modeling, and she feels that women make great engineers.

*“*Women bring flexibility and a lower cost,” she said. “Many women go in and out of the workforce or would like to work less hours; this lowers the cost of an engineer.**”**

Suriano’s sage advice to the aspiring female engineer is this: Learn to play with math. Use math games, work with tools and increase your ability to understand process engineering and how things are made.

The history of women in engineering had a late start in the 19th century. Women began receiving patents for inventions: Tabitha Babbit, an American toolmaker, invented the first circular saw in 1813; while English Sarah Guppy patented a design for bridge foundations in 1811. The first woman to receive an engineering degree was Nora Stanton Blatch Barney, granddaughter of famous women’s right activist Elizabeth Cady Stanton, who received a civil engineering degree from Cornell University in 1905. These women were pioneers in the industry, and by the end of the 20th century, women were more visible in the engineering field. However, they are still the extreme minority.

Fun at work

For Mary Alcaraz, PE, LC, CEM, LEED, AP, going to work is fun – even after 23 years. The suburban Philadelphia married mother of two is an electrical engineer with EwingCole, headquartered in Philadelphia, with offices in Irvine, Calif. and Washington, D.C.

Whenever the opportunity arises, Alcaraz urges young women to consider a career in engineering, including her own 12-year-old daughter.

“We need engineers in general,” she said.

A Penn State graduate, Alcaraz is a supporter of Drexel University’s co-op program, which provides six months of classroom training and six months out in the field.

“That way, students really get to know what they like,” she said.

When she was a newcomer, Alcaraz said she didn’t have any women mentors. Today, she tries to guide the younger employees.

In the last 10 years, Alcaraz said she’s found herself working with more females. To her, the gender growth has been slow, but sure.

Playing smart

Girls’ STEM interest is the focus of other women engineers who are trying to get young students to consider it as a career. In 2012, Debbie Sterling, a Stanford University engineer, founded GoldieBlox, Inc., a toy company that creates toys that develop skills and teach basic engineering principles through the adventures of a girl engineer, “Goldie.”

“By designing construction toys from the female perspective, we aim to appeal to a broader audience of children and parents who previously considered engineering a ‘boys’ club.’ By challenging this stereotype, we hope [Sterling and Goldie] will inspire more girls to become engineers,” the company said on its website.

Purcell hopes students can follow her example and explore the field, at an age younger than she was when she started.

“I was doing well in science and math and I was fortunate to have a physics teacher in high school who suggested I consider engineering as a career,” she said. “In college, it took until the end of sophomore year before guys realized ‘she does know what she’s doing.’ “

Purcell believes girls today have more opportunities to explore engineering careers, due to the increase in technology and efforts extended to budding engineers. She references the Girl Scouts, which includes 2.4 million girls ages 5-17 and has created a STEM program in recent years that introduces math and science to scouts at a young age.

“Girl Scouts introduces girls of every age to STEM experiences relevant to everyday life. Whether they’re discovering how a car’s engine runs, how to manage finances, or exploring careers in STEM fields, girls are fast-forwarding into the future,” the Girl Scouts website says.

The organization has also conducted in-depth studies on girls’ views of technology. “Generation STEM: What Girls Say about Science, Technology, Engineering, and Math” is a national research report by research analyst Kamla Modi, Ph.D.; director of research and outreach Judy Schoenberg, Ed.M.; and

senior researcher Kimberlee Salmond, M.P.P; which investigates girls' interest in STEM. The report consists of a literature review, focus groups and survey results from 1,000 girls across the country.

The study found that "Girls are overwhelmingly interested in STEM."

Shaping solutions

Regardless of whether women feel challenges of their gender in the workplace or not, the Society of Women Engineers continues to serve as a national organization dedicated to helping women succeed in engineering. The society recognizes the need for a support system where women can come together and make changes in their field.

According to a statement in its 2011 Annual Report, "As engineers, each day we shape solutions to a myriad of challenges. But more than that, we create products and services that shape lives all around the world. And, as the Society of Women Engineers, we collectively shape the lives of women in engineering and technology everywhere."

The Society of Women Engineers' chapters are also committed to hosting events and activities to pique girl's interest in STEM.

Stuckman is her chapter's internal vice president – she is responsible for delegating tasks and overseeing all of the officers who chair the society's numerous events.
"We have a high school summer camp, outreach programs for grades K-12 and a program that matches undergraduates to women in the industry," she said. "My job is making sure all programs run smoothly. We want to get kids more active in STEM activities," she said.

As Stuckman finishes her senior year at Texas A&M and prepares for graduate school and beyond, she, too, has some advice for upcoming engineers.

"Don't give up. Take advantage of the resources that are available to you. Find ways to meet other people and don't be intimidated," she said. "Don't feel like you're not as good as anybody else; prove them wrong. Go into it with an open attitude."