SOLVING THE EQUATION

How to Recruit More Women into Engineering and Computing
I attended a debate between [Illinois] 18th Congressional candidates [Rob] Mellon and [Darin] LaHood. It broke my heart when LaHood said the $7.25 federal minimum wage is sufficient.

VINOD GUPTA, AAUW SPRINGFIELD (IL) BRANCH MEMBER (“THE TIPPING POINT,” WINTER 2015)

I thought this (“Contraception ≠ Abortion,” Fall 2014) was one of the best in-depth articles on the differences of each contraception method that’s been embroiled in political controversy. Don’t think these differences were ever collected, summarized, and conveyed in easy-to-understand terms all in one place. This may be the reason for all the misinformation and misconceptions on the topic of birth control. How can we reach the masses with the right information?

MICHELE GUTTENBERGER

“Too many workers are unable to take the time they need.”

WHITE HOUSE STATEMENT ON GRANTING PAID SICK LEAVE TO FEDERAL CONTRACTORS

“[These men and women] ask for equal dignity in the eyes of the law. The Constitution grants them that right.”

U.S. SUPREME COURT JUSTICE ANTHONY KENNEDY’S MAJORITY OPINION LEGALIZING SAME-SEX MARRIAGE

CORRECTION

A caption in the Spring/Summer 2015 issue misattributed the M. Jean Jokipii Memorial Speech Contest to the AAUW Iron Mountain-Kingsford (MI) Branch. The contest was actually hosted by the AAUW Escanaba Area (MI) Branch. Both branches do inspiring work for women and girls.
Engineering and Computing’s Gender Crisis
BY BETH PEARSALL

Women have made huge strides in science, so why are they still so rare in two of the most lucrative and in-demand STEM jobs?

Coding the Future
BY ELIZABETH BOLTON

Will smartphone apps change the world? Our Tech Trek campers say yes.

Setting the Record Straight: Women in STEM History
BY KATHRYN BIBLER

Women were essential to building engineering and computing into the fields they are today. Here’s the untold story.

Princess or Geek: What Attracts Women to Science?
BY HANNAH MOULTON BELEC

STEM programs often use “geek” pride or “sparkle” science to recruit girls and women. But do these approaches do more harm than good?
AAUW’s National Conference for College Women Student Leaders opens doors.  
Don’t let the college women in your community miss out.

June 2–4, 2016  
University of Maryland, College Park  
www.nccws.org
Solving for XX

AAUW’s research has always broken ground for women in education, the workplace, and society. Our latest research focuses attention on an issue that resonates with many AAUW members: Why are there still so few women in the lucrative and in-demand engineering and computing fields?

There’s a well-known gender gap in science, technology, engineering, and mathematics (STEM) overall, but Solving the Equation: The Variables for Women’s Success in Engineering and Computing focuses in on two fields where we’ve seen the least progress in women’s representation, despite great gains in other STEM careers.

Women make up only 12 percent of engineers and 26 percent of computing professionals, meaning that the fields miss out on women’s talent—and women miss out on the financial security these increasingly important fields offer.

In this edition of Outlook, you’ll read about the problems that women face in these fields but also about the solutions. It’s no coincidence that our educational programs, such as AAUW National Tech Trek and AAUW National Tech Savvy, and our federal and state-based advocacy, on issues such as Title IX and STEM, are so effective and popular. We provide real opportunities for AAUW members and others to empower women and girls. AAUW is a trusted voice for change on these and so many other issues, and AAUW’s acclaimed research drives everything we do.

The cures for the world’s most pressing ills—environmental, economic, and technological—will be envisioned and built by people in engineering and computing. Think of AAUW alumna Jane Chen, who developed a low-cost incubator that helps premature and low-birthweight babies in places where medical care is difficult to access.

We can’t afford to lose out on women’s perspectives in building our future. There are so many ways to change the face of engineering and computing. We hope that this issue of Outlook will inspire you to get involved.
How do we solve this equation?

#Addwomen across the board.

The 2015 AAUW National Convention in San Diego was unforgettable. We can’t wait to see you in Washington, D.C., June 14–17, 2017.

@ywtfchicago: Wrapping up our day at #chitechsavvy! We had so much fun and are leaving fully inspired by the future STEM leaders we met today.

@BitchMedia: From @AAUW: This bold project exposes stereotypes faced by women of color. Bitch magazine was inspired by an AAUW Campus Action Project at the University of Maryland, Baltimore County.

@laurablyler: So happy to meet @AAUWFellowships recipients at #AAUW2015. Proud to support their work! AAUW fellows and grantees gathered at convention over the summer.
If we were honest about equal pay, this is what #thenew10 would look like.

From the AAUW Blog: In STEM Fields, Many Hire “John” over “Jennifer”

BY RENEE DAVIDSON

As if there’s not enough anecdotal evidence of women facing sexism in science, technology, engineering, and math (STEM) fields, one simple study exposed how adversely gender stereotypes and biases affect hiring outcomes for women in science. The study, which AAUW highlights in our research, found that women are being shortchanged in more ways than one.

For the study, researchers from Yale University asked more than 100 science faculty members at academic institutions across the country to evaluate one of two student résumés. The résumés were identical except for one small part: The candidate’s name was either John or Jennifer. Despite both candidates having the exact same qualifications and experience, science faculty members (women and men) were more likely to perceive John as competent and select him for a hypothetical lab manager position.

READ THE FULL POST ONLINE AT WWW.AAUW.ORG/BLOG.
ENGINEERING AND COMPUTING’S GENDER CRISIS
Valoy, an engineer in New York City, had the credentials for the job: a bachelor’s in civil engineering from Columbia University, with a focus in construction management and structural engineering. She also had the experience: a two-year internship with a construction company.

The remark was the start of what became a daily pattern of on-the-job sexism. “They’d call me ‘Baby’ to my face and tell me, ‘This is a man’s world.’ They’d say how weird and insulting it was having a ‘girl’ on-site,” Valoy says. “They thought I didn’t belong, and they made sure I felt that way every day.” Valoy had faced the idea that she didn’t fit in the field before. Coming from a neighborhood where few people attended college, Valoy says, “People thought I was crazy for applying to Columbia for engineering.”

Frustrated, Valoy took a job with a new company, this time in an office. She hoped that the climate inside would be more hospitable. And initially it did seem better—at least on the surface.

But it wasn’t long before she realized that the office environment was just as bad; the only difference was that the sexism wasn’t as overt. “It was more between the lines,” Valoy says. “Like it being implied that you’ll make copies for everyone or order lunch just because you are the only woman on the team. Little instances that build up and just boil inside of you.”

Experiences like Valoy’s are all too common for women in engineering and computing. According to AAUW’s latest research report, *Solving the Equation: The Variables for Women’s Success in Engineering and Computing*, close to 40 percent of women with engineering degrees either leave the profession or never enter the field. Women who leave are just as confident in their abilities and just as interested in the work as women who stay in engineering. The difference is in the work environment: Women who leave are less likely to have had training opportunities and support from co-workers or supervisors than women who stayed are. Women who leave are also more likely to have observed sexist behavior in their workplaces.

*Solving the Equation* looks at the hostile work environments, stereotypes, and biases that keep women from pursuing and staying in engineering and computing jobs. It also talks about what we can do—as employers, educators, professionals, and parents—to encourage more women to go into these critical, high-paying professions.

“Everyone—male and female—is going to experience roadblocks during their career,” says Lila Snyder, a mechanical engineer by training who earned her doctorate from the Massachusetts Institute of Technology. Snyder is the president of global e-commerce at Pitney Bowes. “But it’s how you respond to those roadblocks that matters.”

**Tearing Down Gender Bias**

Of all science, technology, engineering, and math (STEM) fields, engineering and computing have the lowest representation of women. Just 12 percent of engineers are women, and the number of women in computing has fallen from

__“I don’t work with girls.”__

That’s what a male manager told Patricia Valoy on her first day at the construction site, before walking away.
Valoy agrees that a support system is paramount. “There are so many really great STEM programs for elementary and middle school students, but what about girls in college? Or women who have just entered the field?” she asks. “Just because you’ve graduated and got a job doesn’t mean the hard part is over. In some ways, it’s just beginning. We need to support these women and educate them, without scaring them, about what they might face.”

Solving the Equation highlights several studies that show how stereotypes and biases often lead employers—both men and women—to select male candidates, regardless of qualifications. For example, in an experimental study, students acting as potential employers underestimated the mathematical performance of women compared with men. The participants hired lower-performing men over higher-performing women nearly a third (30 percent) of the time.

The good news is, there are ways to reduce gender bias and make engineering and computing open to more women. “Women are already making inroads in these fields, but without changes to the workplace climate it is unlikely that women will pursue and stay in these fields,” says Hill.

One way is for women to seek out supportive workplaces. They’re out there, Snyder promises. If you find yourself in an unhealthy environment, says Snyder, don’t stand for it. Seek out employers that provide clear paths for advancement, offer training and development opportunities, value and recognize employees’ contributions, root out uncivil behavior, and hold managers accountable for hiring and promotion decisions.

It is also critical that women surround themselves with mentors or what Snyder calls “sponsors,” people who support you, create opportunities, and push you to take risks, regardless of whether you think you are ready.

Valoy agrees that a support system is paramount. “There are so many really great STEM programs for elementary and middle school students, but what about girls in college? Or women who have just entered the field?” she asks. “Just because you’ve graduated and got a job doesn’t mean the hard part is over. In some ways, it’s just beginning. We need to support these women and educate them, without scaring them, about what they might face.”
There is still a prevailing misconception that boys are better than girls at math and science. But the research is clear: Girls can and do excel in these subjects. Yet women earn only 19 percent of engineering degrees and 18 percent of computing degrees.

_Solving the Equation_ recommends that educators and parents help by debunking the idea that you are born with math and science skills and that some people’s brains (read: boys’ brains) are hardwired for engineering and computing. Other recommendations include encouraging girls to tinker, take things apart, and put them back together.

“Growing up, there was never any bias in our house,” says Snyder, who recalls working on cars with her dad. “My parents used to tell me and my sister that we could do anything. They wanted us to imagine the possibilities. It was such an important and powerful foundation.”

Valoy remembers some missed opportunities growing up, like when she asked her dad for a microscope and he got her a doll.

“My dad believed in the traditional female roles and thought my sisters and I were just going to get married,” she recalls. “It was my mom who always told us we were amazing. She taught us that nothing could hold us back.”

**Trying to Solve the Equation**

Having women in engineering and computing matters. In less than 10 years, this country will need 1.7 million more engineers and computer scientists. “We can’t afford to ignore the talent of half the population,” says Hill.

There is no doubt that the lack of women in engineering and computing is a deeply rooted and complex social problem. But we know we can make engineering and computing more welcoming for women by addressing workplaces and bias. “Let’s roll up our sleeves and get to work,” says Hill.

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It’s a Thursday morning in a fluorescent-lit, state-of-the-art computer lab at Stockton University, a small public college tucked into the Pinelands of the Jersey Shore. Every few seconds an elephant’s trumpet blares throughout the room. The sound is coming from the Android tablet of 13-year-old Emma Rodriguez, who is testing an app she just built.

At nearby computers, Anjie Fakolade has created an alpaca that bleats like a goat, and Riley Lower struggles to find a free and fair use recording of “I am your father” to play over a photo of Darth Vader. She’s unsuccessful but undeterred. Instead she pairs a photo of R2-D2 with his distinctive bleeps, a recording more readily available.

By the end of the second day of the App Inventor course at this AAUW National Tech Trek camp, these girls and 27 other rising eighth graders have built a virtual fortune teller and their own smartphone version of whack-a-mole using an app creation platform developed by the Massachusetts Institute of Technology (MIT). And once they go home, they still have access to the color-coded, drag-and-drop interface, which allows them to build and publish their own apps in the marketplace.

The Ubiquity of Technology
TechCrunch reports that there are currently about 2.6 billion smartphone subscriptions worldwide, and that number is expected to hit 6.1 billion in 2020. So it’s no surprise that the biggest complaint levied at Tech Trek counselors in New Jersey was that the campers didn’t have unfettered access to their phones for the week. The handheld computer—and the applications that power it—are a way of life, and yet the United States still faces a serious shortage of computing professionals.

Continued on page 12
Instructor Sara Platt helps camper Julianna DiVentura during the App Inventor course at an AAUW Tech Trek camp in New Jersey. PHOTO BY SHAUN REILLY FOR AAUW
“People talk about a STEM crisis. There isn’t really so much a STEM crisis,” says Barbara Ericson, director of computing outreach for the Institute for Computing Education at Georgia Tech. Instead, there’s a computing crisis. Women make up just 26 percent of computing professionals, down from 35 percent in 1990. According to Ericson, in just five years, the United States will need more than 1 million jobs in computing, and it is nowhere near on a pace to fill them.

Part of the problem, says Ericson, who works with MIT to train App Inventor instructors and is an AAUW member, is how computer science is taught. Rather than focus on the day-to-day relevance, “the things that kids actually care about,” professors rely on the standard calculations and conversions, things kids “couldn’t care less about,” she says.

That’s where the middle school girls come in. Research, including AAUW’s 2010 report Why So Few? Women in Science, Technology, Engineering, and Mathematics, shows that middle school is a critical time for girls and their futures in STEM. It’s when their interests start to fall prey to the gendered notions of work—for example, that math and computers are for boys—and their career interests begin to diverge from those of boys.

That’s why, according to the New York Times, App Inventor was developed with user testing by “sixth graders, high school girls, nursing students, and university undergraduates who are not computer science majors.” The MIT software follows certain design principles that help keep kids in a summer camp engaged, says Ericson. “It has a low floor, so anybody can get started, wide walls so that people can go off on different takes, and a high ceiling so you don’t get bored.”

**Coding Will Change the World**

Those principles seem to be working. Many of the Tech Trek New Jersey campers said they planned to go home and keep working on their apps. Katie DeRitis dreams of making an app that would include profiles and adoption information on all the children at a local foster care center. Fakolade wants to create the ultimate list-making app that would guide her not only to all the stores she needs to visit but also to the correct aisle within the store. And Karla San Jose wants to make a social media app: “Something that everyone can use,” she says.

AAUW’s *Solving the Equation: The Variables for Women’s Success in Engineering and Computing* discussed the idea that, as Ericson explained, emphasizing the social relevance of computing is one way to make it appeal to a wider audience. That’s a daunting concept when discussing, say, an obscure field of engineering, but it seems to be intrinsic in apps, which are visibly changing lives every day.

The most famous app to come out of the App Inventor platform so far is one that responds automatically to text messages received while driving with “Please don’t send me text messages. I’m driving.” But
On a break from their App Inventor course at the AAUW National Tech Trek camp in New Jersey, a group of girls tossed out ideas for apps that might make them money in the future. That’s a conversation that couldn’t have taken place at the original Tech Trek, hosted by AAUW of California at Stanford University in 1998, a full nine years before the debut of the first iPhone and mobile applications as we know them.

Camp creator Marie Wolbach wanted to inspire middle school girls to pursue math and science studies and ultimately careers. So the early camps featured a murder mystery forensics class based on the then-popular CSI television show. That kind of hands-on, experiential learning has “always been at the forefront of Tech Trek camps,” says AAUW Vancouver (WA) Branch member Karen Manelis, who helped organize the early camps and now directs the AAUW National Tech Trek Washington sites. This everyday relevance led to tremendous success; the program has since spread to 11 other states.

But science and math are ever-changing fields, and Tech Trek has had to keep up with the times. Thanks to a grant from Verizon Foundation, coding with the App Inventor tool became a class offered at every camp in 2015. A grant from Symantec allowed campers at three sites, including Stanford, to participate in a class on cybersecurity, another rapidly growing field that wasn’t on the public’s radar back in 1998.

“One thing I like about Tech Trek and one of the reasons we got involved early on is that I think AAUW has seen a glimpse of the future, and they’re seeing Tech Trek as a successful path for their students,” says Verizon Foundation’s Phil Puthumana. And as that future continues to change, so will Tech Trek.

Creating a Generation of Creators

Of course, while girls are learning to code, they are also learning the math, logic, communication, and problem-solving inherent in computer programming. But now it’s being presented to students in a much more engaging way and is successfully drawing in some underrepresented audiences.

Phil Puthumana, a program manager for Verizon Foundation, which sponsored the rollout of the App Inventor course to all 21 AAUW National Tech Treks last summer, likens coding to learning a new language. “If you look at it that way,” he says, “just being literate in the world of technology is important. … If you can actually empower young minds to be able to develop the technology and break the black box, open it up and say, wow, this is not that complex, it opens up a whole new world to them.”

Ericson agrees. “I want [App Inventor students] to realize they can make things. I want them to not just be consumers of technology but makers of technology,” she says. “You need to know what a computer’s capable of so that you can use it to make your world better.”

The girls seem to be getting the message. Fakolade, who dreams of building the ultimate organization app, says she’d love to get a job making apps. “They’re mobile, they’re convenient, and they help people, and you help the world,” she says. “Even the president uses apps, and it’s just cool about the possibilities you have to help people.”

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Setting the Record Straight: Women in STEM History

Computer operators in the 1940s program ENIAC by plugging and unplugging cables and adjusting switches.
PHOTO COURTESY OF CORBIS
Continued on next page

Nearly 300 years later, the legacy of that kind of thinking is still with us. Gender discrimination and a host of other obstacles continue to keep women away from science, technology, engineering, and math (STEM) careers. But women’s extreme underrepresentation in engineering and computing jobs (see page 6) is especially discouraging given the roles that women played in the origins of these fields.

Mathematician and physicist Émilie du Châtelet translated Isaac Newton’s *Principia* and made discoveries that foreshadowed infrared technology, photography, and Albert Einstein’s E=mc². But even Voltaire, her admiring lover and likely intellectual peer, could not conceive of a woman having a brain equal to his. In 1740, he said of du Châtelet, “She was a great man whose only fault was in being a woman.”

As the workforce became more industrialized and urban, the face of engineering changed, too. Engineering grew into a profession, and an increasingly exclusive one, because of two main requirements: a college degree and field experience.

Toward the end of the 19th century, more engineering employers required workers with degrees—which many universities denied women until the 20th century. Elizabeth Bragg was the first woman to earn a U.S. engineering degree, in 1876, but decades later it was still rare. In 1920 the *Cornell Daily Sun* grumbled, “Three Coeds Compete with Men at Cornell University.” A 1925 University of Minnesota clipping warned, “Coed Engineers: Man’s Domains Are Again Invaded.” Moreover, following the 1896 *Plessy v. Ferguson* decision, U.S. universities were racially segregated, barring people of color from the top institutions.

The *Plessy* ruling was eventually overturned, of course, and it has since been proven that higher education does not hurt women’s health (a common fear at the time), but vestiges remain. Today, the engineering field is still vastly white and male, with Hispanic women and black women making up just 1 percent of the field each, according to AAUW’s *Solving the Equation: The Variables for Women’s Success in Engineering and Computing.*
Professional engineering began to require a degree and training in the field.

Further excluding women from the profession, some practical engineering training moved out of the craftsman’s shop and into the wilderness, calling for strapping, adventurous men to learn from the American landscape. Frehill’s research describes an 1893 Engineering News series that advised engineering schools to host summer camps where “anyone with a spark of manhood” could learn skills while “developing their physique.” While some engineers continued to be trained in the apprenticeship tradition, many employers began to favor workers from the outdoor camps. This model conveniently omitted women; a rugged camp was no place for ladies. Ultimately, it meant that a woman who sought an engineering position beyond tracing could be rejected instantly because she didn’t hold an engineering degree and hadn’t spent time training in the field.

With those two requirements, the pool of people who could be engineers shrank to the higher echelons of society—largely excluding people of color, women, and the lower class.

Today, women like Mae Jemison, Mary Barra, and Marissa Mayer have found success in engineering. But the field remains hostile to women and minorities. AAUW’s Solving the Equation found that the number of women engineers who leave the field increases dramatically over time, with just 19 percent of female graduates (compared with 39 percent of male graduates) remaining in engineering 30 years after receiving their degree. The women who leave most often cite hostile work climates and few opportunities for development.

From Female “Computers” to Male Innovators

In 1843, Ada Lovelace wrote the first mathematical algorithm for a machine—before that machine was even built. The machine she wrote it for was never finished. But a century later, when the technology came around, a machine finally ran code without human calculation, just as Lovelace had envisioned it—making her the first computer programmer.

Women were also crucial to helping computing gain steam in the mid-20th century. When the ENIAC (Electronic Numerical Integrator and Computer), one of the first electronic computers, was built by the U.S. military, 80 women “computers” were recruited to run the ballistics trajectories, which involved solving complex differential equations by hand. The machine was a 30-ton monster of 3,000 manual switches and dozens of cables, which had to be adjusted to run data sequences. After the war, one of the ENIAC team leaders, Betty Jean Jennings, joined a group that turned the manual machine into the world’s first stored-program computer. The woman-operated ENIAC was thus the ancestor to computer giants like Microsoft and Apple.

At the same time as ENIAC, a similar operation was running in Britain: the team that would crack the Nazi message encryption code, Enigma, and unveil Axis military movements. Alan Turing is credited with inventing the machine that cracked Enigma, but two-thirds of the 10,000 people who worked on decoding at the project’s Bletchley Park headquarters were women. Women ran equations and manually set and reset sequences on the machine every 24 hours. Until 1999, the decoding projects at Bletchley Park were completely classified, so most of the women (and men) involved spent much or all of their lives without revealing their part in shortening the war.

The computing work that women did at this time was considered clerical, not elite. But as the field grew and gained prestige—and as “computing” jobs evolved into coding and programming—women found themselves discouraged from entering it. Many companies in the 1950s and 1960s even used sexist personality tests to screen applicants, favoring stereotypically masculine characteristics. As historian Nathan Ensmenger notes, this gender-biased testing created a vicious cycle: “The primary selection mechanism used by the industry selected for antisocial, mathematically inclined males, and therefore antisocial, mathematically inclined males were over-
DO YOU KNOW THESE STEM HISTORY MAKERS?

You might not think of home economics as a “hard” science, but when AAUW co-founder Ellen Swallow Richards started the field, it was one of women’s only pathways to engineering and chemistry. Running a 19th-century home was an all-consuming task, one that Richards sought to make easier for women to give them room for other pursuits, such as education. Her work streamlined nutrition and hygiene, lighting and heating, and budget management. Home economics shared many principles with engineering, as AAUW’s Solving the Equation: The Variables for Women’s Success in Engineering and Computing points out:

Whereas agricultural engineering majors took apart and inspected tractors, home economics majors disassembled and evaluated stoves. While mechanical engineering majors learned the thermodynamics behind diesel engines, home economics majors learned about the physics of refrigeration.

Another trailblazer with AAUW connections, AAUW Achievement Award winner Grace Hopper laid similar groundwork for computer science. Around the time women and men at Bletchley Park were cracking the Nazi Enigma code, Hopper was working on UNIVAC, the world’s first commercially available computer. Later, she came up with a way to program computers using words (code) rather than numbers (algorithms). Her language became known as COBOL, or Common Business Oriented Language, which is still widely used today.

And did you ever wonder where the term “computer bug” came from? Hopper coined the term after a moth flew into the computer she was working on and jammed the machine. When she removed the moth, she said the computer was “debugged.”

It’s a sad thread woven throughout history: Women’s successes tend to be overshadowed, or overtaken, by men. Think of the progression from women-led midwifery to male-dominated obstetrics, seamstressing to high-fashion design, or bookkeeping to financial management.

If history is written by the victors, then it’s our job to set the facts straight.

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Princess or Geek: What Attracts Women to Science?

BY HANNAH MOUTHON BELEC
Continued on next page

Most people seem to agree that there’s a gender diversity crisis in the science, technology, engineering, and mathematics (STEM) fields—and the situation is especially alarming in engineering and computing. What people don’t agree on is how to fix the problem.

Marketing aimed at recruiting girls into STEM tends to fall into one of two distinct categories: Let’s call them geek pride and sparkle science. The former usually has “geek” in the title and encourages people to reclaim a word that used to be synonymous with social failure, and the latter often applies STEM to stereotypically “girly” topics like princesses, makeup, and the color pink.

Appealing to women on either end of the geek-sparkle spectrum—if they’re even on opposite ends—has generated fierce debate, fueled by research, stereotypes, market demands, and frustration from women in the field.

**The Geek Girl Movement**

What is a geek? Sarah Grant, a volunteer who helps put together the annual Geek Girl Con, says it’s “someone who is passionate about something, anything from books to role-playing games to writing to baseball to stock-car racing.” The Geek Girl Con women would know; the event celebrates women and girl geeks and empowers them to pursue their passions, whether that’s science and technology or comics and video games. Programs as varied as the grassroots Girl Geek Dinners, the nonprofit Geekbus, and the White House’s We the Geeks are banking on the appeal of the word to help bring more women and minorities to STEM.

While this increasingly diverse set of self-proclaimed geeks may be gathering to celebrate everything from video games to superhero movies at conventions nowadays, the stereotype of the engineering or tech geek (white, male, antisocial, awkward) is still a huge problem for STEM, according to some.

A 2009 study published in the *Journal of Personality and Social Psychology* found that when environments were too geeky (that is, stereotypically associated with computer science), “women were consistently less interested in joining the domain than men.” The study explored whether an emphasis on video games and even *Star Trek*-themed room decorations affected women’s interest in pursuing computer science in school or work. The researchers found that these tech-geek stereotypes, including the decorations, signaled a masculine environment that women consistently chose to opt out of because they felt like they didn’t belong.

The study also found that easy changes in the environment, like having neutral art or nature decorations, helped. According to the authors, society communicates that a woman “should dream in code, watch *Star Trek,* and read science fiction to be a computer scientist.” The study further suggested that “changing the field of computer science so that those who do not fit the present stereotypes feel that they have a place in the field will go a long way toward recruiting women.”

**Science with a Sparkle**

The Carnegie Science Center in Pittsburgh didn’t use the Starship Enterprise to advertise its Science with a Sparkle program, a one-afternoon course for Girl Scouts about cosmetic chemistry that earned ire on social media from both Girl Scouts and STEM enthusiasts. The course was the only entry in the center’s programming for Girl Scouts, whereas the Boy Scouts’ list was much longer and included engineering, robotics, and other STEM-related offerings. Critics thought the center was relying on condescending and damaging stereotypes about what girls are interested in.

The science center later released a statement saying that no Girl Scouts signed up for other STEM courses when they were offered, but the incident still stung. “You’re offering
Do the Pros Think Geek or Pink?

STEM professionals are unsurprisingly split about the different recruiting approaches and how harmful the stereotypes are to their fields. Some tech industry workers agree that the stereotype of STEM being synonymous with “geek” is true, though it comes with a dark side. “Developers seem to bond over geek culture,” said a woman web developer who has been in the field for five years and who asked not to be identified. “But what of the developers who don’t quite fit in that mold?”

As more STEM programs targeting women and girls have been developed, the trend of using stereotypically girly things in those efforts—whether that means including princesses, adding sparkles, or using the color pink—has met with some criticism. Likewise, professional groups that say they are for “web divas,” engineering schools that use pink and purple script fonts, and toys (such as Legos) that come preassembled only in the girls’ version have all faced backlash for their use of this tactic.

Indeed, some research has shown that “pinkifying” STEM might be counterproductive to attracting women and girls. A 2012 University of Michigan study found that STEM role models who were more feminine reduced middle school girls’ confidence in STEM; researchers said the combination of femininity and success seemed particularly “unattainable” to some girls.

Both approaches have been discouraged by different researchers.

A CONFERENCE FOR THE WHOLE STEM SPECTRUM

If you’re looking for a varied way to inspire girls to pursue science, technology, engineering, and mathematics (STEM), you should get involved with a program that offers everything from cryptology to epidemiology. The one-day AAUW National Tech Savvy conferences are hosted by AAUW branches and states, with grant funding and organizational help from AAUW. The program was founded in 2006 by Tamara Brown of the AAUW Buffalo (NY) Branch but went national in 2014; Tech Savvy events are being held at 18 national sites this year.

Every event is geared toward inspiring girls in sixth through ninth grade in STEM, and Tech Savvy also offers a unique opportunity for the girls’ families to learn about the promising careers girls can pursue in STEM and to ask questions about college readiness.

The hands-on sessions that girls choose from are wide-ranging. Here’s a small sample of the sessions that were offered at the AAUW Cortland (NY) Branch’s event in 2015: creating human circuits to show how solar energy works, using math to learn code-breaking and hacking, learning how to build a webpage from scratch, experimenting with textiles and dye methods, and figuring out how atmospheric pressure affects boiling points and sound waves.

Find out more and learn how you can get involved by searching for Tech Savvy at www.aauw.org.
video game. “Sometimes this is called ‘poor cultural fit’... but ‘company culture’ isn’t the same as [video game] fandom culture and never should be.”

But engineer Tricia Berry, of the Women in Engineering Program at the University of Texas, Austin, thinks that the geek stereotype is not just untrue but also ineffective. “When we attribute these ‘geeky’ things to being an engineer or other STEM professional, we can exclude all of those who don’t like those things,” says Berry. “Middle school girls, for example, who do not want to be seen as geeky may opt out of STEM opportunities if they believe you have to like Star Trek to be a part of the STEM club.”

Debbie Sterling, the Stanford University-educated inventor of GoldieBlox toys, doesn’t consider herself a geek. “If there’s anything I’ve learned, it’s that there’s no black-and-white definition of what engineers and tech workers should look like or be into,” Sterling says. “Many people would say I don’t necessarily fit the typical description, and I kind of love breaking that mold.” Sterling’s toys have faced some backlash because they’re pink and involve princesses; yet they also are very popular with girls and teach concepts like torque, prototyping, and propulsion.

Front-end developer Audrey Brockhaus at Arizona tech company Meltmedia, who switched careers a few years ago and has been in the field for a year, admits that she doesn’t identify with either the pink or the geek approach. “I feel a little bit embarrassed by a lot of the ‘yay girls!’ stuff that goes on. I guess it’s the implication that women need so much help and are so easily manipulated.”

Other women in STEM just want to avoid pigeonholing. “If it works, it works,” said another tech professional, who wanted to be anonymous. “I started coding my profile on a site that may have been perceived as ‘for little girls,’ and it encouraged HTML and CSS customization, which led me to dabble in code at a younger age than many,” she said. “No need for a one-size-fits-all formula to usher girls into the field. Try anything and everything.”

Whether these girly and geeky stereotypes are effective, harmful, or outdated is still up for debate, but it’s clear that many more recruitment options are needed to get and keep women in engineering and tech fields (see sidebar). In the end, it’ll take all kinds of workers and all kinds of approaches to engineer creative solutions to today’s and tomorrow’s problems.

Hannah Moulton Belec is the Outlook senior editor and can be reached at belech@aauw.org. She isn’t particularly geeky or sparkly.
Your national office at work

AAUW Elects 2015–17 Board and Decides on Bylaws and Public Policy Program Changes

The polls closed June 19 in the AAUW National Election, during which members voted almost exclusively online to decide on AAUW’s leadership, five bylaws amendments, and 12 changes to the Public Policy Program. Twelve percent of members voted, more than double the 5 percent quorum required.

Elected to the AAUW Board of Directors were Board Chair Patricia Fae Ho, Board Vice Chair Alicia Hetman, and directors Susan Barley, Malinda Gaul, Eileen Hartmann, Ellie Hill, Traci Jensen, Melissa Johnsen, Dot McLane, Rebecca Norlander, Glenda D. Price, and Pam Thiel. The new board appointed Joanna Amberger, Janet Bunger, and Anthony J. Hill as directors. Subsequently, Bunger was named board finance vice chair and Hartmann was named board secretary. For more information and results on the AAUW Bylaws and Public Policy Program proposals, visit www.aauw.org/resource/national-election.

AAUW Supports Campus Sexual Assault Case

Over the summer, the AAUW Legal Advocacy Fund adopted a new case, Burhans v. Yale, that may shine a light on retaliation against administrators and advocates working to protect students. Plaintiff Susan Burhans claims she was discriminated against and eventually fired from her job at Yale University after trying to get sexual assault survivors access to resources and after notifying administrators that the university’s sexual assault complaint procedures violated Title IX. The 1972 law covers gender discrimination, including campus sexual assault and harassment, and also protects employees against retaliation if they speak up. This case highlights the crucial role administrators and campus professionals play in keeping campuses safe and the importance of making sure they can do their jobs.

The Title IX Resources Branches Need

Did you know that Title IX requires every school to designate at least one employee to coordinate the school’s compliance with the law? This person is sometimes referred to as the Title IX coordinator. Many schools don’t have one, and until recently, many coordinators had little information about what their jobs were or how to do them. So it was exciting when the U.S. Department of Education released a free manual and other resources this summer to help remedy the problem. What’s even more thrilling is that AAUW members can help spread the news.
You can visit www.aauw.org/resource/titleixdelivery to get all the information you need to help make sure that your local schools have Title IX coordinators and that they understand the scope of their jobs.

**Updated Salary Negotiation Workshops Debut**

In September and October, AAUW debuted updated curricula for our signature salary negotiation workshops, AAUW Work Smart and AAUW Start Smart, which target working women and college women, respectively. The new, more interactive and inclusive materials were developed with the help of the many facilitators and campus contacts who have previously been involved with AAUW’s salary negotiation workshops.

An event in Boston in September marked the start of an initiative to train half of the city’s working women, 85,000 people, to learn to negotiate their salaries through AAUW Work Smart. AAUW is collaborating with the Boston mayor’s office to offer the workshops in an effort to close the gender wage gap in the city, where women working full or part time make only 84 percent of what men make.

But Boston is just the beginning. AAUW Work Smart has already spread to Pennsylvania, and AAUW Start Smart workshops will be held at dozens of college and university campuses this fall and spring. You can get involved by hosting a workshop or training to be a facilitator. For more information, e-mail salary@aauw.org or visit www.aauw.org and search for salary negotiation.

**See AAUW’s Impact in Your State**

AAUW’s work at the national level is impressive, but it’s also important to see how AAUW is changing things in our own backyards. You can find out what’s happening in your state with the recently released state impact lists, which show how AAUW’s work on public policy, on campus, in research, and in the media is affecting women in all 50 states. To check out your state list, visit www.aauw.org/resource/aauw-state-impact.

**New AAUW Diversity and Inclusion Tool Kit**

A brand-new resource is available to help your branch or state with diversity and inclusion efforts. The tool kit is available for download now and includes concrete ideas and step-by-step guides that members can use to make AAUW even more welcoming. Look for “Tool Kits” under the Resources tab on www.aauw.org.
Penn State Students Host Weeklong Empowerment Event

In October, the AAUW student organization at Pennsylvania State University hosted its second Women's Empowerment Week, where they addressed a different issue every day for five days. Their first such event was in the spring, and they plan to host one every semester. The fall event focused on sexual violence, voter registration, the gender pay gap, and a women's empowerment fair in collaboration with other groups on campus.

President of the AAUW student organization Jordan Glover founded the group last year. She learned about AAUW through her mother, who is a member of the AAUW State College (PA) Branch. Glover, who is a junior majoring in human development and family studies, says that the weeklong events appealed to student organization members because the approach allowed them to address a variety of feminist issues, though she says equal pay is the group's signature issue. "It is something that directly affects us so much and is a very real issue," she says.

Healing from Violence through Writing

In 2013 Patricia Schaefer Röder and other AAUW of Puerto Rico members launched a project that offered writing workshops for survivors of domestic violence. Healing through Writing was presented, in Spanish, to women living in shelters to help them tell their own stories and express their feelings. The branch has continued the program; three participants from the most recent workshops entered a poetry contest, and their poems were chosen by an international panel of writers to be included in an anthology, Di Lo Que Quieres Decir (Say What You Mean), published by Scriba NYC. For the participants and other women in shelters, says Röder, the honor is an assurance that what they have to say is valued.

Move Over, Scripps: AAUW Branch Hosts Adult Spelling Bee

Can you spell “terpsichorean”? The AAUW Coeur d’Alene (ID) Branch asked teams of adults to tackle such words in the fourth year of the branch’s spelling bee for adults, which is a fundraiser for the branch’s local scholarship program. The event attracted nine teams plus sponsors, raised $3,100, and garnered enthusiastic media coverage. The Coeur d’Alene Press described the final standoff between the Bee's Knees and Highway to Spell teams as a “blitz of words that would have left Noah Webster checking his own dictionary.”

Branch member Maxine Sullivan has found that the bee is a very effective fundraiser and says that the event has helped
revitalize the branch and inspired tremendous enthusiasm within the community. “There are spelling nerds among us, and I’m one of them,” she says. “We don’t get many chances to show off.” There is no residency requirement for entering, so maybe it’s time to visit your AAUW friends in Idaho for the 2016 bee. Lists of practice words are already posted on the branch’s website.

Volunteer Reading Program Boosts Literacy for Youngsters

Members of the AAUW San Luis Obispo (CA) Branch have been collaborating with the local Friends of the Library to offer reading help to K–3 students at two local schools. Through the In-School Reading Program, teachers choose when and how many volunteers they’d like in their classrooms, and the volunteers go in once or twice a week to read with individual students. Branch member Linda Thompson says that there’s a lot of enthusiasm for the program at the schools and within the branch and that reading scores went up after the program started. At the end of the school year, every student in the classes receives a free bag of books to take home. “It’s wonderful to see the joy of the children when they realize they can keep the books for their very own,” says AAUW program co-coordinator Dolores Soll.

California Branch Mobilizes against Violence on Campus

In 2014 when a shooter killed six students near the campus of the University of California, Santa Barbara, it hit close to home for AAUW member and retired teacher Arlene Jones. Her granddaughter was about to head off to college, and Jones was deeply concerned about what she called the “culture of violence” on campus. Jones and the AAUW Oakdale-Riverbank-Escalon (CA) Branch decided to start a conversation in their community. After months of reaching out to local colleges and universities, law enforcement, mental health professionals, women’s centers, and like-minded groups, the branch organized a forum in Modesto, California, that drew a crowd of 500. The event addressed bullying, signs of mental illness, gun violence, and family issues. Since the initial forum, the branch has collaborated with other AAUW members; the League of Women Voters; California State University, Stanislaus; and the Stanislaus County Department of Education to keep the conversation going in a series of events in the community.

Volunteers with the AAUW San Luis Obispo (CA) Branch reading program

PHOTO COURTESY OF JOAN DRAKE

PHOTO COURTESY OF JOAN DRAKE
Have you been mesmerized by the images NASA has been releasing of Pluto? As it turns out, an AAUW fellow was on the flyby team.

“It’s been electric working on a mission to a new world,” says 1997–98 AAUW American Fellow and astrophysicist Kimberly Ennico Smith. She is deputy project scientist for NASA’s New Horizons mission, which captured the unprecedented photos.

The mission represents a leap forward for women, who make up 25 percent of the team. While still far from equal, it’s a relatively high proportion in a field historically dominated by men.

Like many women in science, technology, engineering, and math (STEM) fields, Smith was often surrounded by men in college courses and has faced stereotypes, finding that her age and gender made people question her work. “Things will be tough” for women in STEM, she says, but we can “become empowered to change those things.”

She suggests one simple way that STEM employers can bring in more women: Make efforts to thwart unconscious gender bias. That means thinking twice about phrases like “manned space flight.”

Another solution is to diversify the images associated with science. Coverage of the women-led New Horizons mission team will certainly help do that.
2015–16 Fellow and Grantee Highlights

**Milecia Matthews**
Selected Professions Fellow Milecia Matthews is pursuing a master’s degree in mechanical engineering with a concentration in control systems at Oklahoma State University. Her research focuses on collaborative robotics (“co-robots”) and communication between machines and humans. Outside the lab, she spends time traveling the world, working on cars, and tinkering with gadgets.

**Caitlyn Collins**
For her dissertation, American Fellow Caitlyn Collins interviewed 135 working mothers to look at how different ideals of motherhood, gender, and employment affect mothers in four very different countries. Collins studies at the University of Texas, Austin.

**Juliet Ohemeng-Ntiamoah**
Environmental engineer Juliet Ohemeng-Ntiamoah is determined to help developing countries alleviate environmental and energy challenges. An International Fellow from Ghana, she is studying alternative energy sources for her doctoral research in environmental engineering at Tennessee Technological University, focusing on the practice of converting organic waste to environmentally sustainable biogas.

**Stephanie Armesto**
Career Development Grantee Stephanie Armesto studies occupational therapy at Linn-Benton Community College in Albany, Oregon. After graduation she plans to use her degree to help children through animal-assisted therapy. She is committed to helping others and hopes to become an innovator in her field.

**Tanya Erzen**
Community Action Grantee Tanya Erzen directs the Freedom Education Project Puget Sound in Gig Harbor, Washington. The accredited project, which takes place inside the Washington Corrections Center for Women, creates opportunities for women prisoners through a robust college preparatory program in reading, writing, and mathematics. The program also trains current students in the prison as peer tutors.

**May Elmofty**
International Fellow May Elmofty of Egypt researches the connection between gender discrimination and cancer. Currently pursuing a master’s degree in cell and molecular biology at San Francisco State University, Elmofty works in the university’s Health Equity Institute, where she is investigating the link between social and ecological variables, such as discrimination and racism, and the prevalence of breast cancer among minority women.
When we envision the future, we see a world of never-ending possibility. But that future will never be realized unless we prepare today’s students for tomorrow’s challenges. That’s why it is vitally important for young people to study science, technology, engineering and math. And it’s also why Lockheed Martin is proud to support the American Association of University Women (AAUW).

Learn more at lockheedmartin.com

Symantec is a proud supporter of AAUW.

Read our 2015 CR Report highlighting our work with AAUW at:
www.symantec.com/corporate_responsibility
California Passes Unprecedented Equal Pay Law

In early October, Gov. Jerry Brown signed the California Fair Pay Act, which requires equal pay for workers doing “substantially similar work,” clarifies employer defenses to pay discrimination claims, and protects employees from retaliation if they are in proceedings to enforce these protections. AAUW of California members sent more than 2,500 messages to state legislators urging them to pass the law.

By requiring equal pay for “substantially similar work,” the law establishes that workers might not have to have the same exact jobs to fight unfair pay. “For example, a female housekeeper who cleans rooms in a hotel could challenge the higher wages being paid to a male janitor who cleans the lobby and banquet halls,” according to a statement from the bill’s co-sponsors. The law further requires employers to show that differences in pay are due to factors other than gender. The California Fair Pay Act is being hailed as the most progressive equal pay law in the country; it goes into effect January 1.

AAUW members and staff met with U.S. Treasurer Rosie Rios (right).

A Woman Will Grace the $10 Bill, but Who?

The U.S. Department of the Treasury announced in June that it plans to put a woman on the $10 bill in 2020 to commemorate the 100th anniversary of women securing the right to vote. AAUW members were invited by U.S. Treasurer Rosie Rios to meet with her and share suggestions for who should be on the new $10. Treasury Secretary Jack Lew has said that he’d like Alexander Hamilton, who is currently on the $10 bill, to remain on the currency somehow. An AAUW poll favored scientist Barbara McClintock, and Harriet Tubman led a poll of AAUW student organization members.

Little Change in the Gender Pay Gap

According to new U.S. Census data, women now make 79 cents for every dollar men make. That figure had been 78 cents, but the change isn’t statistically significant, according to AAUW’s research. The latest statistics by race show that African American women are paid 63 percent of what white men are paid, Hispanic and Latina women are paid 54 percent, American Indian and Alaska Native women are paid 59 percent, Native Hawaiian and Pacific Islander women are paid 62 percent, white women are paid 78 percent, and Asian American women are paid 90 percent. The worst state for women’s pay compared with men’s is Louisiana (65 percent), and the best is the District of Columbia (90 percent). For more information, check out AAUW’s The Simple Truth about the Gender Pay Gap.
A career in science, it’s not always what you think

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Executive Order Could Help Campaign Finance Reform

It’s been more than five years since the U.S. Supreme Court issued its Citizens United decision, allowing super-rich donors and giant corporations to pour billions of dollars into elections, much of it in the form of secret money.

To combat this, AAUW recently signed a letter to President Barack Obama asking him to issue an executive order requiring government contractors to disclose their political spending, which could meaningfully curtail secret corporate spending in elections. A 2015 New York Times and CBS News poll showed that more than 80 percent of Americans support fundamental change or a complete overhaul of the way political campaigns are funded, with 75 percent supporting disclosing the identity of donors to independent political groups. AAUW members voted in 2013 to add campaign finance reform to the AAUW Public Policy Program.

D.C. Introduces Bill for 16 Weeks of Paid Parental Leave

Workers in Washington, D.C., might have access to unprecedented time off to care for children if the D.C. Council passes the Universal Paid Leave Act of 2015, which would offer 16 weeks of pay up to $3,000 a week for the arrival of a new child or other family and medical leave. Almost all people working full or part time in D.C. would be eligible, aside from some federal employees, and the program would be funded by taxes on private employers and on D.C. residents. The proposal came after the city received a grant from the U.S. Department of Labor to investigate ways to implement paid family leave. Other cities and states have been using federal grants to design local policies in the absence of federal progress on paid leave. California, New Jersey, and Rhode Island have state policies in place, but the United States remains the only industrialized nation to not mandate paid parental leave for workers nationally.

Women Coaches Break Barriers in Men’s Pro Sports

In October, the Oakland Athletics hired Major League Baseball’s first woman coach, Justine Siegal. It’s only a temporary job, but it’s still a major first for women in professional sports. Siegal had already blazed trails by being the first woman to pitch batting practice for several teams in 2011. Women have been making strides in other men’s sports arenas in the past few years: The NBA hired its first and second women coaches, Becky Hammon and Nancy Lieberman, and the NFL hired its first woman coach, Jen Welter.
The Untold Herstory of Science

BY RACHEL WALLACE

When you think of history makers in genetics, environmental science, or physics, who comes to mind? If your answer doesn’t include any women, perhaps you should read Rachel Swaby’s *Headstrong: 52 Women Who Changed Science—and the World.*

Each well-researched vignette highlights interesting achievements by women in science, technology, engineering, and math. But it’s the drama of discrimination that makes each story compelling and each woman extraordinary. The brilliant Russian mathematician Sophia Kovalevski, for example, had to convince a professor to tutor her privately because women were banned from universities. Embryologist Hilde Mangold’s adviser added his name to her thesis after giving it a less than perfect grade, and for all his effort on her paper, he earned the Nobel Prize. (He graciously mentioned Mangold in his acceptance speech.)

History has often added such insult to injury. When she was alive, the French physicist Émilie du Châtelet was hailed as a genius worthy of Horace and Isaac Newton. Today she is remembered mostly as a mistress and muse of Voltaire, even though, as Swaby notes, “By the time of her death, she had become a far more accomplished Newtonian scholar than Voltaire.”

Students and others unfamiliar with the fields won’t have much trouble understanding Swaby’s largely accessible descriptions of each achievement and discovery. Her occasional use of colloquialisms and slang, however, may distract readers—after all, this is a book declaring that women’s achievements are a serious subject.

HEADSTRONG: 52 WOMEN WHO CHANGED SCIENCE—AND THE WORLD

BY RACHEL SWABY—BROADWAY BOOKS, $16

But the real problem with *Headstrong* is that, even though it tries to fill in the gaps in science’s selective memory, it leaves out half the world’s women. Not one woman profiled comes from Africa, Asia, or Latin America—a glaring omission that is not addressed or explained.

The one exception is Chien-Shiung Wu, the Chinese-born physicist who overturned what was considered a fundamental law of physics. She’s also one of several women AAUW history buffs will recognize among the profiles as AAUW members, awardees, fellows, and even founders. That alone might make this a worthy book club selection.

Rachel Wallace is a writer living in Washington, D.C. You can reach her at rachel.lillian.wallace@gmail.com.
Be a navigator!

Help chart the course for women and girls.

Women have made great progress, but equality is still on the distant horizon. Charting the Course, a new $1 million fundraising campaign, will support AAUW’s community programs across the country, helping all women sail toward a brighter tomorrow.

Donate today at www.aauw.org/chartingthecourse.

Have questions or need more information? Contact Toni Johnson at chartingthecourse@aauw.org.
From the Archives

Ellen Swallow Richards, the first female professor at the Massachusetts Institute of Technology, is shown here with other chemistry faculty members. MIT refused to confer Richards’ doctorate in chemistry, even though she had completed all the requirements. In 1876, Richards established the Women’s Laboratory at MIT and remained an instructor on the campus until 1911. She founded AAUW in 1881 with her mentee Marion Talbot to improve opportunities for “university women.” She also founded the field of home economics, which has never been given due credit as an academic subject even though its roots are in engineering and chemistry. Photo courtesy of the MIT Museum.