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Making the Invisible Visible

A nyone who has met Dr. Lori Friedman would say that her passion for science is palpable. Even as a young child growing up in rural Iowa, Dr. Friedman always gravitated toward science and math. However, it wasn’t until she discovered microbiology in college that she began to see signs of where her early interests could possibly lead. In class, Dr. Friedman and her classmates swabbed doorknobs and grew the microscopic bacteria in petri dishes until they could see it.

“I loved taking something invisible, learning about it, and making it visible,” Dr. Friedman says. Her career since then has been devoted to understanding some of the invisible mysteries and mechanisms of cancer in order to discover treatments to fight the disease.

Dr. Friedman’s fascination with microbiology led her far from her Iowa roots to a PhD program at the University of California at Berkeley – a step she wouldn’t have considered had she not met a visiting woman scientist in Iowa, Dr. Beverly Dale, who became a mentor. Despite initially feeling like she had moved to a foreign country, Dr. Friedman thrived at UC Berkeley and proceeded to work with Dr. Mary Claire King, a preeminent geneticist focused in part on understanding inherited breast cancer. “It was science and technology, but applied in a real, meaningful way,” Dr. Friedman says.

During her formative teenage years, Dr. Friedman had watched her aunt suffer from and ultimately succumb to breast cancer. She saw first-hand the toll breast cancer had taken on the people she loved, and was compelled by the possibility of unraveling the inner workings of this devastating disease to potentially help people facing it in the future. Dr. Friedman followed this passion through her postdoctoral work at Cambridge, where she studied the function of the inherited breast cancer genes, BRCA1 and BRCA2. “We were at the point where we could tell whether women carried a mutation or not, but we still didn’t have any idea what to do for them,” says Dr. Friedman.

Uncovering cancer signaling pathways

Over the next 20 years, Dr. Friedman continued her dogged quest to understand the function of cancer genes and moved to Genentech in 2004 in hopes of translating her discoveries into medicines to help patients. It felt like a natural fit. “I spoke the language of small molecule drug discovery as well as cancer biology,” she says.

Dr. Friedman’s work now focuses on how signaling pathways inside cells can go haywire and drive cancer growth. She and her team have done extensive research around the role of PI3K, a protein inside cells that, when mutated, is implicated in cancer growth. While PI3K has long been viewed as a potential target for new cancer medicines, blocking PI3K has inherent challenges because of the protein’s important role in other key bodily functions. To address this challenge, Dr. Friedman’s team has been developing an arsenal of inhibitors specifically designed to shut down PI3K pathways that are over-active in some cancers, including breast cancer, without disrupting the protein’s other vital functions.

“If you could make a safe medicine targeting PI3K, you could potentially combine it with all of the standard regimens for numerous different cancers and hopefully make an impact on every one of them.”

These investigational medicines are still in various stages of preclinical and clinical testing. But if they ultimately prove to be safe and effective, Dr. Friedman hopes this new approach to treating breast cancer could one day be applied to a variety of other cancers that may also be driven by PI3K mutations. “If you could make a safe medicine targeting PI3K, you could potentially combine it with all of the standard regimens for numerous different cancers and hopefully make an impact on every one of them,” Dr. Friedman says, acknowledging that these transformations can take years to come to fruition. “I’m proud that my PhD work on inherited

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breast cancer helped launch the whole field. I hope that the work my team is doing now on PI3K, and in other areas of breast cancer research, could do the same thing."

While she's dedicated many years to studying genetic drivers of cancer, Dr. Friedman is constantly energized by other promising areas of scientific research and technology platforms that could translate into new breakthroughs for patients. One such realm lies in harnessing the power of the immune system to fight cancer, and creating ways to pull immune cells to specific locations on tumors to more effectively kill cancer cells. Another emerging technology is "degraders," small molecules that, unlike most, completely deplete the protein targets to deliver the intended therapeutic effect. Always on the horizon is the ever-evolving field of precision medicine, where molecular biology combined with insights from "big data" could be applied to help enable earlier diagnosis and zero in on specific treatments tailored to individual people.

With these and other new scientific insights, coupled with emerging technologies, the landscape of cancer treatment is changing fast. Dr. Friedman is optimistic: "When the technology evolves alongside the biology, it opens up tremendous opportunities for discovering and developing new medicines."

Lori Friedman, PhD, is senior director, Translational Oncology at Genentech. In this role, she leads a team of researchers focused on validation of new oncology targets, understanding compounds' mechanisms of action and mechanisms of resistance, in vitro and in vivo pharmacology, and using preclinical cancer models to predict who is most likely to benefit from potential new medicines. Friedman was trained in Molecular and Cell Biology, earning her PhD from the University of California, Berkeley and completing postdoctoral research at Cambridge University, UK. Prior to joining Genentech in 2004, Friedman was a research scientist at Exelixis, Inc. In addition to her current research, Friedman is a council member of the AACR Women in Cancer Research (WICR), a core team member of Genentech Women in Science and Engineering (gWISE), was honored with the Healthcare Businesswomen’s Association "Rising Star" award in 2014 and is a scientific editor of Cancer Discovery. Friedman has published 87 peer-reviewed scientific manuscripts and is an inventor on 24 issued patents.

Mentoring Women in STEM

Dr. Lori Friedman made her way to a senior position at Genentech partly because she was encouraged throughout her career by other woman scientists who mentored her to go beyond what she thought was possible – to a doctoral program and then a postdoctoral fellowship in England. Now she sits on the core team of gWISE (Genentech Women in Science and Engineering) to help other women develop the skills and confidence they need to grow their careers and become leaders. "We have a two-pronged approach in gWISE – to empower women to speak up and to influence leadership," she says. “People running meetings need to know that when women speak up, they should be heard—it’s a two-way street.”

Dr. Friedman is also on the board of a nonprofit called Project Scientist, which holds summer science camps for girls interested in STEM, more than a third of whom are funded through scholarships. She felt compelled to get involved with this project after attempting to send the younger of her two daughters to a tech camp; when she realized it was 80% boys, she wanted to support and cultivate camps where girls could truly shine. At Genentech, she is also engaged in the Futurelab science education program. Combined with her years of leadership in gWISE, she is working at both ends of the spectrum to help nurture young girls’ interest in STEM and to help women advance their careers in science.

“We are in a very challenging industry. It’s not easy to understand complex diseases like cancer and how to potentially treat them," she says. “We need to open up every possible opportunity for women to bring their best selves to work when they’re striving to tackle some of the world’s most devastating diseases.”
Innovation and Diversity at the Intersection

Looking to the future, the pace of innovation in STEM will depend on how well we leverage points of intersection—across disciplines, employment sectors, people and perspectives. The past decade has proven that the nexus points where science, technology, mathematics and engineering come together have produced the greatest breakthroughs in innovation: gene mapping and the development of personalized medicine would have been impossible without the contributions of high-throughput computing. We must adopt this same mindset in our approach to talent by drawing on the benefits of differences in race, class, and gender. Instead, we find ourselves grappling with the worst of intersectionality—a term that has come to refer to the complex, cumulative ways in which the effects of multiple forms of discrimination (such as racism, sexism, and classism) combine, overlap, or intersect to marginalize individuals or groups.

It is our mission at AWIS to champion the benefits of diversity—in gender, race, nationality, ability and sexual orientation—to empower women in STEM and better serve as advocates for equity. Our members reflect this commitment: they are diverse in race, nationality, sexual orientation, and represent various STEM industries, disciplines and perspectives. AWIS members, allies and supporters are living examples of the best of “life at the intersections.” Take, for example, Rachel Haurwitz, PhD, who was awarded the AWIS Next Generation Award at our 2018 Innovation and Inclusion Summit. Dr. Haurwitz is a biochemist spearheading the revolutionary field of genome editing for new medical therapies and bio-based products at the intersection of chemistry and cellular engineering.

Another prominent scientist and innovator is Maria Artunduaga, MD, MPD, MTM, founder of Respira Labs, who works to enhance the quality of life of people living with chronic obstructive pulmonary disease. Dr. Artunduaga is a member of AWIS’ STEM to Market (S2M) program, which helps entrepreneurs bring their innovative product to market. New AWIS member, Cipriana D.T. Eckford, PE, PTOE, is a senior project engineer at a prominent national firm and an entrepreneur, running her own professional photography company specializing in conference and corporate event coverage and storytelling.

As National Chair of the leading advocacy group for women in STEM with a network of 100,000 members and partners worldwide, I will continue to fight against the ways in which intersectionality has been used to exacerbate the differences among us and advocate for what is best and most value-creating about diversity. I know that this is not only the right thing to do, it is the smart thing to do.

I challenge you to do the same in 2019!

Kind regards,

Susan Windham-Bannister, PhD, President
AWIS National Governing Board
Inclusion and Innovation

For years women have led the charge for the innovation that has driven this country and its economy to greatness. AWIS research shows that when women establish and lead companies, their returns and revenue grow up to three times higher than businesses created and led solely by men. As recent as the November 2018 midterms, at least 123 women from diverse backgrounds have also earned the overdue recognition of being elected to the 116th Congress – with 10 men and women in STEM.

Improving diversity on its own does not alleviate the problem. Diversity is a factual measure and it is based on a decision or election. Inclusion on the other hand is a choice everyone makes every day. Diversity is getting an invitation to the party and inclusion happens when you are invited to the dance floor.

Sameness ultimately leads to ignorance, while diversity of thought breeds innovation. Let’s take the economic crises we faced in 2008 that led us to the great recession for example. The decision makers leading up to the financial crises were mostly men, there was very little gender diversity then. Rebounding from the crises took a lot of innovation, this was achieved by including women at very senior levels in housing and finance sectors. It’s also fascinating to see women leveraging their STEM backgrounds to become engaged in the FinTech movement. The specifics are featured in The Influence of FinTech article on page 8.

Corporations, investors, businesses, government agencies and colleges and universities need to rethink their diversity goals and instead focus on inclusion. Establishing a workplace with an inclusive and accepting worldview changes entire institutions and encourages employees to thrive. When employees no longer worry about fitting into the workplace culture, they are free to express creativity. That organic creativity breeds innovation.

Thank You

Karene Richards
AWIS Interim Executive Director
Finance Chair, AWIS National Governing Board
Gender, Race, and Measures of Innovation

When measuring innovation and its impact on our knowledge-based economy, states look at a number of different factors including measures for: economic well-being, research and development, commercialization, innovative organizations in the region, and education and workforce, particularly in science and engineering. While measures in these areas are important, what is often missing from them is an inclusion lens. Here we take a look at a couple of these measures from an inclusion perspective and ask: who gets to innovate and access the capital that comes along with being an innovator?

Sources:

- https://magazine.awis.org/publication/?i=491204
- AWIS Analysis of NSF NCSES publicly available data: https://www.nsf.gov/statistics/data.cfm

### 2015 Patents awarded to...
- Women 18%
- Men 81.8%
- Women of Color Data unavailable

### 2017 Venture Capital Dollars Invested in companies led by...
- Women 2.2%
- Women of Color 0.2%

### 2014 STEM bachelor’s degrees awarded to...
- Women 58.4%
- Men 41.6%
- Women of Color 23.2%

### 2014 STEM master’s degrees awarded to...
- Women 62.2%
- Men 37.8%
- Women of Color 24.4%

### 2014 STEM doctoral degrees awarded to...
- Women 51.5%
- Men 48.5%
- Women of Color 17.8%

### 2015 Employment in STEM fields by STEM-educated...
- Women 26.6%
- Men 73.4%
- Women of Color 10.9%

### 2015 Average annual wages earned in STEM by...
- Men $90,000
- Women of Color $64,000
- Women $68,000

### 1997-2015 Business growth in companies owned by...
- Men 94.1%
- Women 28.5%
- Women of Color 7.5%
Genentech’s mission is the true mission of science: committing every moment of every day to a broader charge of social responsibility.

We support the future of science and medicine, the scientists who dedicate their lives to it, and the patients who depend on it.

THE FUTURE OF SCIENCE IS HERE.
The Influence of FinTech

By Karene Richards, CEO, The Karene Group, LLC
AWIS Benefactor Member since 2016

FinTech is expanding and is the T, E and M in STEM. As a capital markets quantitative expert and women’s advocate with more than 14 years in the investment banking industry, this is great news to me.

What is FinTech? It depends on who you ask. In brief, I view it as improving the financial ecosystem so that consumers and businesses have access to a wide form of assets.

Throughout my career I have had the privilege of integrating finance and technology, including in 2010 when I built the first carbon finance model for the World Bank in addition to a mortgage backed security model that generated $25M for Route 66 Ventures.

For many across the world, FinTech is a movement that challenges the norms of traditional banking. It improves upon transaction speed and transparency. The use of smartphones for mobile banking, investing services and cryptocurrency are examples of technologies aiming to make financial services more accessible to the public. Originally, the term served to explain technology applied to the back-end of established consumer and trade financial institutions.

FinTech is a new opportunity to leverage technology and innovation to compete with traditional methods in the delivery of financial services. The industry addresses many problems that traditional banking has not yet resolved, such as lending to newly-created small businesses, transparent banking, fees, and providing secured loans to help unbanked and underbanked consumers build credit.
From the private sector to consumers, FinTech is changing the way the world lives with finances. Digital wallets are becoming the norm. While immediate access and mobility is key in FinTech, so is the need to address language barriers and working with the more than 100 million unbanked or underbanked consumers.

Last October while serving as a moderator on a FinTech panel at the Wonder Women in Tech Conference, I had the opportunity to learn more about how FinTech is expanding its influence beyond retail and commercial banking and into alternative investments. Traditionally alternative investments have been known for their high transaction costs, very low transparency and the arduous task of due diligence. Things have changed for the better in this space.

With me on the Wonder Women in Tech panel was Natasha Bansgopaul, co-founder of DarcMatter, a global alternative investment platform that operates in 62 countries. Bansgopaul created DarcMatter to introduce innovation and technology to resolve the complexity of investing by improving transparency and access, decreasing costs for the investor and consumer, eliminating intermediaries, and reducing the due diligence process from weeks to days.

Other panelists included Rania Succar, VP and business leader for QuickBooks Payments and Capital at Intuit; Yadi Younse, co-founder and chief marketing officer of Motiv; and Michelle O’Connor, director of communications and community at Uphold. Each shared their perspectives on the FinTech industry.

During the panel, Succar shared the cashflow problem for small businesses and explained how the company used technology to resolve them. According to Intuit, 41% of small businesses are denied credit, and many are unable to grow in a business cycle where they need capital the most. By leveraging QuickBooks data, the company provides lending to small and young businesses. In addition, QuickBooks grants access to capital in order to pay small businesses faster and, more importantly, to facilitate growth when it’s needed most.

It’s no secret that traditional banking impacts the public and private sector. Consumers are in search of faster, more transparent and efficient ways to do their banking without having to go to a bank and incur increasing fees. While most of us keep a physical, traditional wallet, many are converting to a digital wallet, a high-tech update to traditional wallets. Digital wallets allow people to hold, send, and receive money through electronic transactions and offer benefits including enhanced security, mobile accessibility, greater convenience and financial flexibility.

Both Yadi Younse, cofounder and chief marketing officer, Motiv, and Michelle O’Connor, director of communications and community at Uphold are also maximizing their business by creating products that leverage innovation and technology to provide banking solutions to the consumer.

Many countries are already transitioning to digital wallets and mobile payments as a primary means of transacting. By 2020 digital payments are expected to hit $726 billion.

Karene Richards is the Interim Executive Director of AWIS and Finance Chair of the AWIS National Governing Board. Ms. Richards is a capital markets quantitative expert and women’s advocate with over 14 years of experience in the investment banking industry. Most notably, she built the first carbon finance model for the World Bank in addition to a mortgage backed security model that generated $25M for Route 66 Ventures. She received a Master of Financial Mathematics and Statistics from Columbia University and Bachelor in Electrical Engineering from Howard University. Ms. Richards is a member of Women in Housing and Finance and has been an AWIS benefactor since 2016.
Scientists looking for jobs after completing their training may soon have a new tool that helps them evaluate various career paths. The new tool uses a method that was developed by scientists at the National Institute of Environmental Health Sciences (NIEHS), part of NIH. The method differs from others in that it separates employment trends in biomedical science by sector, type, and job specifics. The creators hope this novel approach will be useful throughout NIH, as well as for academic and research institutions around the world.

Led by Tammy Collins, PhD, director of the NIEHS Office of Fellows’ Career Development, team members collected detailed career outcomes for more than 900 NIEHS postdoctoral fellows over the past 15 years. Postdoctoral fellows, or postdocs, are scientists who have received their doctoral degrees and are participating in a program that offers additional training.

Lead author and NIEHS computer scientist Hong Xu analyzed the data using the R Project for Statistical Computing, a free online program that displays data using graphs and charts. Shyamal Peddada, PhD, former NIEHS head of the Biostatistics and Computational Biology Branch, served as key advisor. The study appeared online in the journal Nature Biotechnology and is the first standardized method for categorizing career outcomes of NIEHS postdocs.

“As we sought to determine how to make sense of detailed career outcomes in a standardized way, we used a bottom-up approach, rather than forcing the data into any particular naming system already being employed,” Collins said. “We looked at what our post docs were specifically doing and asked what is the most logical way to categorize and visualize the information.”

The study found distinct differences between United States and international postdocs in the kinds of jobs they landed. In an almost 2-to-1 ratio, international postdocs were going into academic positions to do basic research. However, analysis of the total number of international postdocs specifically entering academic positions showed that 70 percent of this subpopulation entered them abroad. Postdocs in the U.S. tended to enter for-profit companies to do applied research. Overall, nearly half of NIEHS postdocs went into the academic sector, which was surprising to some, since many young scientists thought that doing a government postdoc would prevent them from getting a tenure-track position in academia.

“The new method developed by Dr. Collins and her team will help science administrators better understand the numerous factors that contribute to career decisions of their trainees,” said NIEHS Scientific Director Darryl Zeldin, MD.

The study categorized career outcomes for NIEHS postdocs by sector, type, and job specifics. The authors envision that this approach will help young scientists make career decisions based on data and not anecdotal evidence. (Photo courtesy of NIEHS)
As president of the NIEHS Trainees Assembly, an organization that fosters the professional development of NIEHS postdocs, Kathleen McCann, PhD, said the study will be incredibly useful for current and future trainees.

“It also demonstrates that NIEHS is an excellent place to train, no matter your career goals, because NIEHS alumni have successfully moved into jobs ranging from basic or applied research, to science writing and communications, to teaching,” she said.

The careers project began in 2013 as a way to establish a snapshot of career trajectories for NIEHS postdocs and to report the findings to NIH. Collins said she was pleased to see other institutions commit to similar efforts. In 2016, the University of California, San Francisco released the first paper on institutional postdoctoral career outcomes, setting a standard for others to follow. Also, a group called Rescuing Biomedical Research independently came up with a similar careers naming system. A few months after NIEHS submitted its findings for publication, the group published an in-depth report on how they plan to classify career outcomes at their institutions.

Collins and Xu are refining a way to visualize data using the R software and plan to release additional information on NIEHS career outcomes online. Releasing the information to the public would allow individuals or institutions to upload data from an excel spreadsheet into the new tool and readily see and compare their own employment trends.

Reprinted with permission from the National Institute of Environmental Health Sciences (NIEHS).
At a university in New York City in the 2000s, a professor warned me that I wouldn’t get into any PhD programs if I kept “looking” the way I did. During a single tenure-track job interview in 2011, 13 people asked me: “Do you have a wife?” And when I was an assistant professor, a colleague pulled aside a candidate for a postdoctoral position in my lab to let him know that I’m gay, just in case it would be a problem. I doubt these people had bad intentions; much has changed since 1975, when gay men and lesbians were still banned from federal employment in the United States.

After all, after marking the first International Day of LGBTQ+ People in Science, Technology, Engineering and Maths (STEM) this year with plenty of mainstream sponsors, from the American Association for the Advancement of Science to the Wellcome Trust. However, heteronormative assumptions still create less conscious forms of bias and an unwelcoming environment that puts scientists from sexual and gender minorities (LGBTQ) at a disadvantage.

Science should care more. People who identify as LGBTQ are leaking out of the scientific pipeline in similar ways to women and those from minority ethnic groups. However, many initiatives to increase diversity do not support them. Including LGBTQ people in diversity initiatives would foster representation, and it could bring in perspectives that improve science itself.

Less Visible Losses
Research on LGBTQ people in STEM is scarce and complicated. Data are hard to collect, not least because sexual identity can be fluid or deliberately concealed. Existing studies are sobering. Estimates suggest that LGBTQ people are 17–21% less represented in STEM fields than expected. Male undergraduates from sexual minorities are much more likely than their straight counterparts to drop out of STEM degrees (see ‘Leaky Pipeline’), even though they’re more likely to pursue practical research experience. In fact, they are dropping out of STEM degrees at a higher rate than women overall.

When LGBTQ people continue in STEM, they report more negative workplace experiences than do their counterparts in other industries or than do non-LGBTQ scientists. Among sexual-minority STEM faculty members who are out at work, 69% report feeling uncomfortable in their department.
Of course, the problems run much deeper than science. In the United States, as elsewhere, LGBTQ people face significant disadvantages; these disproportionately affect LGBTQ people of color. More than one-third of states in the United States lack statutes to protect people from being fired or denied promotion because of their sexual orientation or gender identity. Young LGBTQ people often face rejection or outright abandonment by their parents and are much more likely to be homeless than are young non-LGBTQ people; LGBTQ adults are more vulnerable to poverty.

Invisibility is a problem for LGBTQ scientists. In my experience, most undergraduates do not know of a single LGBTQ scientist. Nor do they often realize that the founders of entire scientific disciplines, such as the father of artificial intelligence, Alan Turing, were gay or that they faced persecution — for Turing, a sentence of chemical castration, believed to have contributed to his suicide. When I took my first faculty job in 2012, I was, to my knowledge, the only gay assistant professor on campus. As someone starting out, I decided not to actively disclose my sexual orientation to students. Still, rumors spread. Undergraduates in entirely unrelated areas such as engineering or chemistry came to my office under the guise of a vague connection to my field of social neuroscience. Their real motive, left unstated, was to see proof of a gay scientist.

I understand. I didn’t meet a senior gay scientist until two years into my faculty career. At a small conference in the mountains, a former mentor advised me to seek out a senior scientist to discuss mutual research interests. At first, I was embarrassed that I’d never come across his work, but I soon recognized that we had no research overlap. We didn’t even study the same species. As we spoke, I realized what my mentor saw that we had in common. Still, when the scientist casually but deliberately slipped a mention of his husband into conversation, I was shocked. I told him that I had never met a senior gay scientist before, and he said he rarely met any gay scientists at all. We went hiking for the rest of the afternoon. Just being able to talk science with a more senior researcher who was ‘like me’ was a powerful signal that I had a place in the scientific community.

Common advice to retain and recruit a diverse scientific workforce is to make sure that students, trainees and faculty members from under-represented groups can connect with other members of those groups. Yet, a 2013 survey suggests that more than 40% of LGBTQ workers in STEM are not out to colleagues. The survey also found that most respondents could not name a single LGBTQ faculty member at the universities where they got their degrees. The culture in STEM fields might be at fault, so might university policies. LGBTQ scientists are less likely to be open at institutions that do not offer same-sex partner benefits or support name changes during a gender transition.

In science, where our personal lives already take a back seat, it can feel unprofessional or career-damaging to
Gender Matters: Women Disproportionately Report Sexual Harassment in Male-Dominated Industries

The steady avalanche of survivors’ stories about experiencing sexual harassment is a potent reminder of the pervasiveness of workplace sexual harassment, even decades after such misconduct was declared illegal by the courts. Women and men from all walks of life experience sexual harassment at work. Sexual harassment is defined as unwanted comments, requests, or actions of a sexual nature that are made a term or condition of employment, used to interfere a workers’ work performance, or severe or pervasive enough to create a hostile working environment.

Although researchers have examined many different aspects of sexual harassment—such as the frequency of charges, the experiences of different types of workers, and promising prevention strategies—there remain unanswered questions about sexual harassment’s impact, scope, roots, and reach. In particular, too little research has focused on gender differences in sexual harassment charges, and how gender may play a role in where claims arise and who is targeted. A deeper understanding of the different experiences of women and men and the role of gender in the occurrence of sexual harassment may help pinpoint specific problems and areas where targeted interventions are most needed.

Understanding the Data on Sexual Harassment Charges

The public discourse often discusses sexual harassment as a problem that primarily confronts women. Although researchers have examined many different aspects of sexual harassment—such as the frequency of charges, the experiences of different types of workers, and promising prevention strategies—there remain unanswered questions about sexual harassment’s impact, scope, roots, and reach. In particular, too little research has focused on gender differences in sexual harassment charges, and how gender may play a role in where claims arise and who is targeted. A deeper understanding of the different experiences of women and men and the role of gender in the occurrence of sexual harassment may help pinpoint specific problems and areas where targeted interventions are most needed.

A deeper understanding of the different experiences of women and men and the role of gender in the occurrence of sexual harassment may help pinpoint specific problems and areas where targeted interventions are most needed.

The available data show that sexual harassment does have a disproportional impact on women. Multiple surveys indicate that a majority of women report experiencing sexual harassment at some point their lives, often starting at a young age. The ramifications of sexual harassment for women are enormous. Researchers have found that women who experience workplace sexual harassment may be more likely to experience financial stress, have lower job satisfaction, and have higher turnover intentions and actual quit rates than women who don’t experience sexual harassment. But sexual harassment is not solely a women’s problem. Data reported by the Equal Employment Opportunity Commission (EEOC), the main federal agency responsible for receiving and investigating work-
place sexual harassment charges, show that in fiscal year 2017 just less than one-fifth—16.5 percent—of the sexual harassment charges received by the agency were filed by men, with the remaining 83.5 percent of the charges filed by women. While these numbers make clear that women, who comprise approximately 47 percent of the workforce, are disproportionately more likely file sexual harassment charges relative to their share of the workforce, they also demonstrate that a noteworthy portion of these charges are filed by men as well.

But before drawing larger conclusions from the EEOC’s sexual harassment charge data, it is important to put the data into a broader context. The EEOC received more than 84,000 discrimination charges in FY 2017 and nearly one-third of these charges involved an allegation of some form of harassment, either on the basis of sex, race, national origin, or some other factor. Looking specifically at these harassment charge filings, almost half—46 percent—involved an allegation of sex-based harassment.
These sex-based harassment charges include charges alleging harassment of a sexual nature—commonly referred to as sexual harassment—and charges alleging harassment that is nonsexual but based on an individual’s gender, such as harassment using derogatory terms about women. Sexual harassment is considered illegal sex discrimination in violation of Title VII of the Civil Rights Act of 1964 (Title VII), the landmark federal employment discrimination law enforced primarily by the EEOC.

More than half of sex-based harassment charges filed with the EEOC in FY 2017 involved allegations of sexual harassment, totaling just less than 6,700 charges. However, the sexual harassment charges filed with the EEOC represent only a portion of the incidents involving workplace sexual harassment that occur each year. Sexual harassment charges also can be filed with state agencies—called fair employment practices agencies—that are established by local jurisdictions to receive employment discrimination complaints. Many of these agencies have agreements with the EEOC and can process sexual harassment charges that fall within the EEOC’s jurisdiction. But these agencies also can receive sexual harassment charges filed under different state laws that fall outside of the EEOC’s scope.

When the sexual harassment charges within the EEOC’s jurisdiction—both those filed with state agencies and those filed directly with the EEOC—are combined, the total number of sexual harassment charge filings in FY 2017 rises to nearly 10,000 charges. Other charges, such as those filed under individual state laws, are not
Gender Matters

Included in this number. Furthermore, a comprehensive study on harassment conducted by a special EEOC task force concluded in 2016 that sexual harassment is severely underreported. According to the study, an estimated 70 percent of workers who experienced sex-based harassment never formally report it. Thus, while the EEOC’s data can be very informative, it may only reflect the tip of the iceberg.

Analyzing Sexual Harassment Charges by Gender and Industry

Examination sexual harassment charge data with industry and gender breakdowns provides a good starting point for evaluating differences between women and men in sexual harassment charge filings. Unpublished EEOC data from FY 2010-FY 2015 shows that there were just less than 45,000 sexual harassment charges filed during this time period. Approximately 45 percent of these charges—almost 20,000 filings—included information on the industry where the charge arose.

Because industry information was not available for every charge, the data has limitations. Nonetheless, it does offer a unique snapshot that can provide some initial insights and inform future research. Overall, women and men file sexual harassment charges across all industries. The bulk of the charges are filed by women and vary by industry.

The breakdown in charges by gender does not tell the entire story, in part because different percentages of women and men work in different...
Robots are designed in a world alive with gender norms, gender identities, gender relations. Humans—whether as designers or users—tend to gender machines because, in human cultures, gender is a primary social category.

But there is a danger here. As soon as users assign gender to a machine, stereotypes follow. The danger is that gendering robots may reinforce gender inequalities by hardening current stereotypes. Designing hardware toward current human stereotypes may amplify those stereotypes into the future.

All products—whether cars, surgical instruments, chairs, or robots—need to be designed with sex (biological characteristics) and gender (cultural attitudes and behaviors) in mind. Products that meet the needs of complex and diverse groups enhance global competitiveness and sustainability. Does this mean that robots should be gendered? Does gendering robots enhance collaboration with humans?
The challenge for designers is: 1) to understand how gender becomes embodied in robots; 2) to design robots that promote social equality. Robots provide new opportunities to create more equitable gender norms. How can we best design both efficient and socially-responsible robots?

**What genders a robot?**

How would you “read” this robot? Pepper is an embodied social robot produced by the Japanese company, Softbank. Softbank insists Pepper is gender neutral (for one thing Japanese does not use gendered pronouns in the same way as English, although it has distinct masculine and feminine manners of speech). Softbank’s current website nonetheless refers to the robot as “he.”

How is gender embodied in robots? How would you “read” this robot?

**Voice:** Voices is a primary determinant of gender. Voices are full of cultural information. Pitch indicates whether it is a male, female, or child’s voice. Lower voices carry more authority in Western culture. For example, Margaret Thatcher, the first woman prime minister in the United Kingdom, trained with a vocal coach from the National Theatre to lower her voice. As soon as a robot is perceived as male or female, a full array of gender stereotypes is overlaid on the mechanical device. Pepper has a childish voice—childish voices are less gendered than adult voices and, importantly, perceived as non-threatening. Pepper uses natural language, meaning that phrases were spoken by either a boy or a girl, although it’s hard to tell which. The makers duck this issue, saying instead that Pepper has three vocal styles: neutral, joyful, and didactic and recommend most often using Neutral.

**Name:** “Pepper” is nicely non-gendered.

**Anatomy:** Pepper’s anatomy is somewhat confusing. With the absence of hair, the head looks boyish, but the clinched waist and skirt-like legs seem feminine. We should remember that long skirts were part of traditional men’s attire. Color: Researchers have shown that a few gender “cues” lead people to assign gender to a robot. One human-robot interaction group found that a man’s black hat or women’s pink earmuffs were enough for users to perceive a robot as

Gender norms are produced through social institutions (such as families, schools, workplaces, laboratories, universities, or boardrooms) and wider cultural products (such as textbooks, literature, films, and AI). Gender norms refer to social attitudes about what behaviors, preferences, products, professions, or knowledges are appropriate for women, men, and gender-diverse individuals and may influence the development of robots.
People tend to treat robots as they treat other people, and people may also treat people in the way that they treat robots—in what one might call a vicious circle.

male or female. Interestingly, when no cues were present, users tend to perceive the robot as male (maybe because in many languages, German for example, the word “Roboter” is masculine; Western culture has a masculine default. Color is also an issue for ethnicity. Most robots—plastic or otherwise—are white, which places the robot culturally.

**Character:** Pepper was designed to be approachable, genuine, engaging, smart, polite and playful. I have not yet had a chance to study whether Pepper is harassed by humans and what the programmed responses might be, but let’s take Siri, Apple’s well-known virtual assistant. Siri—with programmed and learned responses—was designed to be “slightly sassy and demure,” in her assistant role. Siri—and the other female virtual assistants—are often harassed. In response to human harassment, Siri’s programmers have made Siri’s responses less polite and more assertive. This is important; how humans treat machines might have implications for human-human interaction.

This “reading” of Pepper depends on many things: the gender norms and stereotypes in the society where the robot is used, the domain in which the robot is used, the appearance of the robot, the gender of the user, the educational background of the user, among other factors. In other words, Pepper will be read differently in its native Japan than in North America, Kenya, Korea, Iceland, or Italy. How a robot is gendered—by designers or users—is important. Gender assignment triggers gender stereotypes and evokes expectations for robot-human interactions.

**Robot Touch**

Social robots are entering our lives in healthcare, elderly care, teaching, and entertainment. Social touch is an important part of human non-verbal communication. Emotions such as anger, fear, and happiness can be accurately communicated by touch, and more complex emotions like envy can be communicated by people who are close, such as romantic couples.

Engineers are designing new ways to communicate touch virtually through haptic devices. Some argue that haptic interactions help humans bond with robots. This raises questions about how touch should be employed in robotics. Should robot touch follow human conventions? How does gender factor into the equation of social touch?

As engineers seek to reproduce human social touch as closely as possible, it is important to understand the strong (largely unwritten) rules of etiquette governing human social touch. The social aspects of touch lie in the interaction between two humans. The meaning of touch depends on: 1) the overall social context in which they touch; 2) the relationship between the people touching; 3) the purpose of the touch; and 4) the broader gender norms & relations governing social interaction in particular cultures.

This is demonstrated in a study of 886 women and 482 men from Finland, France, Italy, Russia, and the United Kingdom. Researchers found that partners are allowed to touch all body areas, while strangers have limited access. Overall women, such as mothers, sisters, female friends, and even strangers were allowed to touch wider body areas across their entire social network than men, who may be...
fathers, brothers, friends, or strangers. Women’s touch was also rated more pleasant by both men and women. Hands and shoulders are the most accessible body areas; head, neck, or buttocks are typically off limits except for those in close relationships.

An important study found that norms governing access to specific body regions for humans also govern human-robot interaction. In the study, participants were told they were engaged in an interactive anatomy lesson. The robot used was the 23-inch NAO (designed by Aldebaran Robotics, a French robotics company, now owned by SoftBank) made of white plastic with various accent colors. Participants and little trouble when asked to touch accessible regions on the robot, such as its hands and feet. But they experienced increased physiological responses (electrodermal arousal) when asked to touch the robot’s buttocks or genitals, despite the fact that the plastic robot has no genitalia. In other words, they responded to the request to touch the plastic, childlike robot in the same way they would have responded to a human.

This study did not analyze gender, but other researchers have found that etiquette for humans touching robots also tends to follow gender conventions. In one experiment in which participants were asked to “clean” virtual dirt particles from a virtual person, subjects of both genders used less force with female representations than male representations. They also used more force on the person’s torso than on their face.

Research into robot-initiated touch is in its infancy, and few studies have considered how user gender interacts with robot “gender” (as established by social cues). Human-robot interaction experts caution that effective robot-initiated touch will depend on robots following rules of appropriate social (human) behaviors.

Can Robots be Designed to Promote Social Equality?
People tend to treat robots as they treat other people, and people may also treat people in the way that they treat robots—in what one might call a vicious circle. As robots become more present social agents, the challenge is for interdisciplinary teams of designers to creating a virtuous circle of cultural change by building toward social equality. This is how it might work: Culture (consisting of gender norms and stereotypes) influences robot designers. Current gender norms are sometimes unintentionally built into hardware (robots). This can influence users, especially children, and their expectations of robot. Designers, by acting intentionally, can design robots that encourage social equality. Studies show that changing implicit attitudes and behaviors is more difficult than change implicit attitudes. Nonetheless, roboticists have the opportunity to intervene in this cultural cycle by creating hardware that promotes social equality, this is helping users rethink gender norms and eventually reconfiguring gender norms.

“The Robots are Coming!” continues on page 58 →
Gender Disparities on Mathematical Sciences Editorial Boards

By Chad M. Topaz, Professor of Mathematics
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We work in mathematics and computer science: two fields where men far outnumber women. This inequality concerns us. We want our fields to advance human knowledge as much as possible. To this, we need the best people involved, and this assuredly includes women. Unfortunately, girls and women face many barriers to participating in mathematics and other STEM fields, ranging from stereotypes conveyed in early childhood to workplace policies unfavorable to women to implicit and explicit bias and much more.

As of 2016, women constituted 58% of bachelor’s degree recipients, but only 41% within the mathematical sciences. Women account for 31% of new PhDs in the mathematical sciences, and merely 16% of faculty in mathematical sciences departments at doctoral granting institutions, demonstrating the leaky pipeline effect.

At the far end of the pipeline, one can argue, are journal editors, who in some ways are the leaders of an academic field. They serve as the gatekeepers of publishing, controlling to some extent a field’s intellectual discourse, and certainly controlling the publishing fates of many individual scholars. Journal editorships also convey prestige, play a positive role in professors’ tenure decisions and can offer important opportunities for networking. Finally, there is the so-called role model effect, meaning that the demographics of a field’s leadership can influence who is retained in the field.

Realizing that no one had quantified gender representation on mathematics journal editorial boards, we decided to do it ourselves in order to assess whether the leaky pipeline really did leak up through the highest echelon of the field and to provide a benchmark against which we could measure any changes in gender representation over time. In this article, we summarize our study, which was reported in Topaz and Sen (2016).

Methods
Much of our proposed research hinges on using Amazon Mechanical Turk (MTurk, for short), a crowdsourcing platform for Human Intelligence Tasks (HITs) online, particularly tasks that can’t be easily automated by a computer.

The study used MTurk because information about journal editorial boards is stored all over the internet in a variety of formats. The only way to get all the information is to look it up, journal by journal, and type all of the information into a consistent format. This sort of task is ideally suited to MTurk. The MTurk ecosystem consists of requesters and workers. Requesters are the people who post HITs that they would like completed. Along with the description of the HIT, the requester posts a fee that the worker will earn. Workers see lists of HITs online and can choose which ones to complete. When the work is complete, the requester can approve or reject the work. If the work is approved, the worker gets paid.

There are several mechanisms for quality control of the work obtained through MTurk. The requester always retains the right to reject work. Furthermore, the requester can set conditions that workers must meet to even undertake the HIT. For this project, we only allowed workers who had completed at least 1,000 HITs (so they were experienced with the platform).
and who had at least a 99% approval rating on past work (so they had a demonstrated track record). To further ensure valid data, we required that each HIT be completed by multiple workers.

We began our project with all 605 mathematical sciences journals that are indexed by Thomson-Reuters Journal Citation Reports (JCR). We could only obtain the abbreviated journal titles from JCR, so we gave these abbreviations to MTurk workers and asked them to provide us with the full journal titles and a editorial board listing URL. Each journal was looked up by three workers. For 435 of the journals, workers were able to resolve the full journal title and get confident agreement on the entire editorial board membership, resulting in a database of over 13,000 editorships, including editor names, titles, and addresses.

Finally, we had to infer the gender of each editorial board member. First, we used the genderize.io database, which at the time we used it, contained 216,286 unique first names spanning 79 countries and 89 languages. Each first name carries with it the number of times it was known to be associated with a man and known to be associated with a woman in the underlying data set. For instance, querying the name “Alex” returned a count of 5,856 instances, of which 87% were associated with men. We used the database to look up each first name in our list of editorships and we accepted the gender prediction if the most likely gender had a score of at least 85%. In the end, we used genderize.io predictions for about half of our editorships.

For the other half, we inferred the gender using MTurk. We asked workers to guess the gender (woman, man, or nonbinary) associated with a given editor based on the editor’s name, and other information found on the internet, including text and images related to the editor. Workers were asked to indicate their degree of certainty in the gender they guessed. We recognize that an individual’s gender may not fit neatly into traditionally used categories and that gender is most appropriately expressed and explained by that individual. Still, we must have gender data in order to begin quantifying the representation of women, and so we proceeded, cognizant of the limitations of our study. For each editorship, we used the gender inference and confidence rating of five workers to create an aggregate gender score ranging from -1 (assuredly a man) to +1 (assuredly a woman), with a score of 0 being the dividing point for our gender inference.
In addition to performing gender inference, we augmented and cleaned the data a bit. At the journal level, we downloaded 5-year impact factors from JCR, classified each journal as “pure,” “applied,” or “both,” and determined the publishing house from which each journal originated. At the individual editorship level, we geocoded any geographic information associated with an editor (e.g., their university or their city), and we collapsed the plethora of editorial board titles (editor, editor-in-chief, associate editor, member, etc.) into three categories: “editor,” “managing,” and “other.”

**Challenges and Surprises**

One of the greatest challenges in analyzing our data was dealing with potential inaccuracies or biases in our gender inference procedure. To account for this, we divided the data into different strata: names determined as male by genderize.io, names determined by female as genderize.io, and then names with MTurk gender inference scores divided into 11 bins ranging from -1 to +1. From each stratum, we sampled 30 names randomly and ourselves inferred the gender using information on the Internet. We calibrated our data based on the findings. For instance, in our data set, 783 names were determined to be female by genderize.io. We sampled 30 of these and found that 25 were women but 5 were actually men. Therefore, for the remaining 753 names in the stratum, we counted each one as 5/6 woman and 1/6 man. Though this might seem strange, it results in more accurate data; we believe our data overall has approximately 97.5% accuracy.

One of the most amazing, surprising, and inspiring parts of this project was the Amazon MTurk worker community. This community is amazingly fast and efficient. We ran over 6,500 names through our MTurk gender inference procedure. Since we had each name inferred by five workers, this totals 32,500 tasks. It took merely a few hours for the MTurk workers to complete this work. At the same time, we received many helpful, personal messages from MTurk workers. They wrote sometimes to ask for clarification, so that they could produce top-quality work for us, and other times to make suggestions for modifications to our web form that would improve the data gathering process.
Results

We caution that these results were gathered in 2016, and that journal editorial board compositions may have shifted since the time of the study. Overall, we found that 8.9% of editorships in our data set were held by women. This signals a degree of underrepresentation even lower than the 16% research faculty level mentioned earlier.

The median journal’s board had merely 7.6% of its editorships held by women. There were 51 of the 435 journals that had no women editors. This group included some of the most prestigious mathematics journals, such as *Annals of Mathematics*, *Communications on Pure and Applied Mathematics*, *Inventiones Mathematicae*, *Journal of Algebraic Geometry*, *Journal of Differential Geometry*, and *Mathematische Zeitschrift*.

To further explore our data, we grouped by published house of each journal. The median publisher has 7.3% of editorships held by women. Restricted to publisher comprising at least 100 editorships, the publishers with the highest representation of women are all professional societies and university presses: SIAM Publications, the American Mathematical Society, Oxford University Press, and the American Institute of Mathematical Sciences. Only SIAM Publications was statistically significantly higher than the background level.

Similarly, we grouped editorships by country and found that the median country had 6.3% of editorships held by women. No countries had a statistically significantly higher representation of women than the background level, but two countries – Russian and Japan – were lower.

We found no statistically significant difference in gender representation between groups having different editorial board titles when grouped as “editor,” “managing,” and “other.” Perhaps a finer-grained treatment of these titles, as opposed to collapsing them into three groups, might shed more light.
Using a statistical test that assesses associations between variables, we found a statistically significant but small positive association between a journal’s impact factor and the proportion of its editorships held by women.

**Conclusion**

Before undertaking this study, some professional colleagues told us, effectively, “The representation of women on editorial boards is low, but it just reflects the low representation in the field overall.” Our data show that this is not, in fact, true.

In addition to our overall (low) count of women on editorial boards, we were surprised to find groups (journals, publishing houses, and countries) that were statistical outliers, with either higher or lower representation of women than the background level.

While the study quantifies gender representation on editorial boards, it does not explain it. Further studies might ask: Why are there so few women on editorial boards? Are they not being considered as part of the potential pool? Are they being considered, but, in the end, not being asked? Are they being asked but refusing the invitations? Once we better understand why, perhaps the field can develop policies and procedures that increase gender diversity on boards.

Chad M. Topaz, Professor of Mathematics, Department of Mathematics and Statistics, Williams College. Chad Topaz is an applied mathematician at Williams College. Chad examines problems in biology, chemistry, physics, and the social sciences through several lenses, including modeling, analysis, topology, geometric dynamical systems, numerical simulation, and experiment, all with an eye towards understanding and predicting complex behavior. Outside of his mathematics research, Chad uses data science tools to research diversity and representation in mathematics, art, and other fields.

Shilad Sen is a computer scientist at Macalester College, Department of Mathematics, Statistics and Computer Science. Shilad works at the intersection of computer science, social science, and data science to improve how computer systems make use of peoples’ data. He particularly measures geographic, racial, economic, and gender inequalities in user-contributed data and the effects those inequalities have on algorithms, computer systems, and the people who computer systems ultimately serve.
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As a metaphor in education, the term pipeline has long described the process of the social production of faculty. The links that make up the faculty pipeline usually refer to the credentials of educational achievement that culminate in the doctorate in a field of specialization. These credentials or milestones—undergraduate and graduate as well as postdoctoral experiences—also offer a lens through which to understand where and why under-utilization occurs for some populations—the difference between individuals with the requisite credentials and their actual participation—and not for others. These “leaks” as they are known, refer to points where individuals exit from the pipeline. “Leaks” are not accidents. A vast and growing body of scholarship has documented the differential experiences of and informed interventions to improve the presence and success of white women as well as women and men of color from historically under-represented racial minorities (URM) in the science, technology, engineering, and mathematics (STEM) fields. Translating these insights into practice is indispensable in order to transform the STEM professoriate of the future. It is simply not enough to be personally committed to diversity. This imperative animated the Building Our Own Pipeline to the STEM Professoriate in 2017-2018 at the University of California, Irvine (UCI). The goal was to hire eight former University of California (UC) President’s/UC Irvine Chancellor’s Postdoctoral Fellows into four STEM schools (biological sciences, engineering, information and computer sciences, and physical sciences). This program ultimately yielded five faculty in the biological sciences, two in information and computer sciences, and one in engineering. These early career scientists not only added to the research and teaching capacity of the campus but also changed the compositional diversity of the faculty. Five of the eight new faculty are women (three in biological sciences, one in information and computer sciences, and one in engineering). By Douglas M. Haynes, PhD, Vice Provost for Academic Equity, Diversity and Inclusion and Director of the ADVANCE Program, UC Irvine. AWIS Institutional Partner since 2005

To ensure a diverse faculty, the campus has adopted a comprehensive recruitment strategy. It consists of hiring to national availability, engaging the broadest cross section of talented researchers and scholars, and infusing accountability with data at key milestones in the search process.
in engineering). Five of the eight are from URM (three African Americans and two Hispanic/Latinx). Two of the eight are women of color—a population that is severely under-represented in STEM faculties across the United States—representing one African American woman in engineering and one Hispanic/Latinx in biological sciences. The impact of the pilot program also contributed to dramatic improvements in the racial and ethnic diversity of regular hires. The overall percentage of URM hires increased from 5.9% during a combined period of 2015-2016 and 2016-2017 to 40.9% in 2017-2018.

These outcomes were not an accident. As a Minority Serving Institution, inclusive excellence animates UCI’s strategic plan for a Bright Past. Brilliant Future. Launched in 2015-2016, this plan calls for hiring 250 net new faculty in five years. To ensure a diverse faculty, the campus has adopted a comprehensive recruitment strategy. It consists of hiring to national availability, engaging the broadest cross section of talented researchers and scholars, and infusing accountability with data at key milestones in the search process.

This strategy is fortified in three key ways. All applicants for faculty positions are required to submit a statement on contributions to diversity. When deans outreach to national peers, they draw particular attention to the campus commitment to inclusive excellence. School-based Equity Advisors provide operational accountability. They share best practices with committees while monitoring searches at key milestones. They have the authority to pause any search in which there is a divergence between field national availability and the characteristics of the applicant pool and proposed short-list.

On top of this foundation, a $450,000 California state employment grant for Advancing Faculty Diversity enabled the campus to combine existing programs into a coherent two-part strategy known as Building Our Own Pipeline to the STEM Professoriate. It incentivized the hiring of former fellows and invested directly in their future career success as an explicit part of the recruitment process. The first part relied on the salary incentive program associated with the UC President’s Postdoctoral Fellowship Program. For over three decades, this fellowship program has cultivated a diverse pool of scholars and scientists for faculty careers inside and outside the University of California. Identified through a very competitive application process, selected fellows are mentored by a senior faculty mentor and hosted by a department for one to two years at one of the ten campuses in the UC and three national laboratories. This experience affords fellows time to advance their research programs. Mentors facilitate access of postdoctoral scholars to professional networks and to career development opportunities. Beginning in 2003, the UC Office of the President incentivized the hiring of former fellows by subsidizing the salary and benefits (up to $85,000) for the first five years.

“Building Our Own Pipeline” continues on page 58
Like it or loathe it, in most scientific fields high-profile journal publications are the cornerstone for academic success. Yet somehow, in the search to understand the under-representation of women at higher levels of academe (whether it be Ivy League universities or full professorships), the role of high-impact journals has received little scrutiny.

We collected author information from 15 high-profile neuroscience journals from the MEDLINE database, the online repository that contains records of almost every published peer-reviewed neuroscience article, assessing every publication over a twelve-year period beginning in 2005. We then cross-referenced the first and last authors of those 166,000 articles with the Genderize.io database to predict the gender of the authors.

We began by looking at first authors – the place in the author list that traditionally is held by the graduate or postdoctoral researcher who does the hands-on research. In the US and Europe, more than 50 percent of graduate students and 40 percent of postdoctoral neuroscience researchers are women. Yet, as can be seen in Figure 1, fewer than 25 percent of first authors in the journals Nature and Science were women.

Subjectively, most scientists feel that a great deal of progress has been made in terms of gender disparities over the last decade. So, it surprised us that the percent of women first and last authors in Nature, Science, and several other neuroscience journals have been almost perfectly constant over the last 10 years; on average the rate of increase in female representation was less than one percent per year for first authors and less than half a percent per year for last authors.

Our study, published online and highlighted in a letter printed in the journal Nature, focused on neuroscience. We made our code accessible, and we’re thrilled that researchers in other fields are already beginning to examine the gender breakdown of bylines in their own disciplines.

We didn’t expect it to be quite that bad ...

At one level our results were unsurprising. There is an extensive literature showing that the achievements of women are undervalued at almost all points in their careers. What was unexpected is that publishing in high profile journals seems to be particularly heavily weighted against women, see Figure 2.

Our benchmarks for expected publication rates were chosen to factor in as much ‘endemic’ bias as possible. For example, our benchmark for last author publication rates was based on NIH grants, a measure that reflects the

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**Figure 1**

![Figure 1](image-url)
scientific success of a lab after having factored in multiple sources of bias. (A recent feature in September AWIS describes gender disparities in funding in more detail.) Even when compared to this benchmark, the representation of women within high-profile journals was dismal.

This suggests to us that addressing bias within these journals should be a priority for our scientific community.

**Time to stop ‘admiring the problem’**

It’s easy to worry that articles like this may be counterproductive – demoralizing young women scientists instead of energizing them. But the ‘open science’ movement has demonstrated that journals are susceptible to pressure from scientists. As both the manufacturers, inspectors, and consumers of their content, we can demand change. Seventy-six percent of scientists believe double-blind review is an effective peer review system: less than half of scientists say that about single-blind reviewing.

Next time you send an article to a high-profile journal, write an additional letter to the editor, asking the journal to take concrete steps to ensure equity. Ask your male colleagues to do the same. For example:

- Demand that journals collect and publish data about gender and nationality for article submissions, editorial decisions, and acceptances. Researchers should have access to the information that will allow them to avoid (or even boycott) journals with a poor track record for equity.

- Ask that reviewers be given more detailed review criteria – such as requirements to explain their ratings of significance and impact, as well as their assessment of scientific quality, as is done at the NIH and the National Science Foundation.

- Ask journals to justify their refusal to implement mandatory double-blind reviewing given the strong evidence for the current under-representation of women and other scientific communities.

- Ask that reviewers be given more detailed review criteria – such as requirements to explain their ratings of significance and impact, as well as their assessment of scientific quality, as is done at the NIH and the National Science Foundation.

**The myth of “optional” double-blind review**

Some journals have attempted ‘optional’ double-blind review where authors can choose to remain anonymous. But the whole point of double-blind review is to remove as much information about the author as possible, focusing the review solely on the quality of the scientific work. Making the choice to remain anonymous is a strong cue to a reviewer that the author either doesn’t belong ‘to the club’ or worse ‘has something to hide.’ Conversely, authors with name recognition or that belong to prestigious institutions have an incentive not to participate in double-blind reviews. Regarding optional double-blind review as an acceptable alternative involves a fundamental misunderstanding of the nature of bias.

Discrimination doesn’t only arise from the work of certain subgroups being judged more harshly. In-group favoritism (e.g. academics from the same country or institution) and ‘fame bias’ (the number of previous publications in high profile journals or the prestige of an institution) may play an even stronger role in perpetuating an uneven status quo. Indeed, one of the main arguments put forward against double-blind peer review “the track-record of the laboratory matters” is based on this very idea. Because of course it isn’t the track-record that is being evaluated – it’s the track-record as known by the reviewer.

Unsurprisingly, when Nature Publishing Group implemented optional double-blind review, very few authors selected that option, and those who did were usually from non-US/European universities or less prestigious institutions – authors who were unlikely to benefit from positive bias.
Rainforest Ecology in the Anthropocene

By Dorian Russell
Environmental Scientist
AWIS Junior Member since 2016

Three quarters of primate species are experiencing population decline (Estrada et al. 2017). Human activities are accelerating the global extinction rate of species to several orders of magnitude higher than the natural, background rate of extinction – this effect has been so severe that many are calling for an official naming of a new geologic epoch, “the anthropocene” (Crutzen 2002). As an early-career conservation biologist, I'm seeking to anchor the research I do in understanding how primate behavior and ecology is changing in the face of anthropogenic challenges like climate change, forest loss, and human-wildlife interaction.

Very few primate species range outside of tropical zones (Harcourt 2006). One might imagine that given concentrations of high diversity and vast habitat loss in tropical zones, a high
number of ecological studies would reflect the intensity of risk to biodiversity. However, there is a startling lack of focus on tropical ecology, especially in human-altered environments. Two major phenomena are occurring in ecological field sciences: 1) a latitudinal bias, and 2) a pristineness bias. Latitudinal bias is reflected in that majority of ecological studies are completed in North America and Europe, while ironically, more biodiverse tropical regions are understudied (Martin, Blossey, & Ellis 2012). Pristineness bias is equally disquieting – ecologists tend to study pristine environments undisturbed by human activity (Martin, Blossey, & Ellis 2012). A great deal about the evolutionary and life history information of organisms in pristine environments important for baseline comparisons to organisms in degraded habitats, in the face of an extinction crisis, can be learned. However, the next generation of scientists must acknowledge and investigate changing ecologies in context to the anthropocene.

**Setting out for conservation**

Combining my training in the environmental sciences and my passion and concern for biodiversity conservation, I’ve framed my work around investigating primate behavior and habitat quality in the face of forest fragmentation. Forest fragmentation occurs when formerly continuous rainforests are partially destroyed, leaving a landscape of smaller forest patches. I am curious to learn what happens to primates that remain in these forest fragments. Specifically, I want to know whether habitat quality in the middle area of the fragment (the “core”) far from human activity is consistent with habitat quality in the outer-regions of the forest fragment (the “edge”) directly bordering human activity and deforestation. Further, I want to know whether the primates themselves show any differences in behavior – are they venturing into the edge? Are they able to find suitable food resources in the edge? Conservation concerns arise from these questions – if forest fragments do not offer the full geographic extent as high-quality habitat, we may be overestimating the amount of habitat left.

I’ve applied these questions at the La Suerte Biological Field Station, a field station situated in a tropical rainforest fragment engulfed by cattle ranching operations and industrial-scale monoculture-style agricultural fields of pineapple, banana, and coconut crops in northeastern Costa Rica. I focused on a population of mantled howler monkeys, a primate that extirpated in regions of Central America due to a combination of hunting and habitat loss pressures (Daily, Ceballos, Pacheco, Suzán, & Sánchez-Azofeifa 2003). Howler monkey behavior is relatively well-understood, and they have easy-to-spot, large bodies. This was useful for investigating behavior in forest edge and core zones, contextualized by what is already known about howler monkeys in pristine environments. It is my goal to someday apply Anthropocene-focused questions on a variety of under-studied species as well. In the scope of this investigation, I set out to compare both howler monkey behavior and structural com-

**While the monkeys quickly and gracefully travelled through the trees, to keep up with them I trekked through dense underbrush, scaled down muddy ravines and muscled my way out again, and crossed rivers and streams — all while hoping not to stop data collection for a moment, or worse, disturb wasp’s nests and animal dens.**
Navigating my future career in science began in the fall semester of 1976, when I entered the College of Natural Science and Mathematics (NSM) at the University of Houston as an incoming freshman. I attribute so much of my career success to the quality education and training that I received at the College of NSM at the University of Houston. With math skills, interest in science and innate curiosity, my goal was to obtain a college degree that would enable me to choose the work that I wanted to do.

At the University of Houston, I earned two degrees in Biochemistry, B.S. and PhD. My journey to this university started years before in my childhood home, just two miles away. My parents, my first mentors, did not have any opportunity for a college education but they were committed to their two daughters going to college. There were no scientists in my family, but my parents encouraged my curiosity. My sister had a critical role in my interest in science.

Patrice Oliver Undergraduate research in C. elegans lab August 1979 photo by Harold Taylor.
since just nine years earlier she was a trailblazer in chemical engineering at the University of Houston.

The summer before my senior year in high school I was one of a few minority students selected in the Westinghouse Talent Search for a summer science experience at the University of Houston. I was fascinated with this first experience of working in a university laboratory.

The following year, I graduated salutatorian of my high school class, earned a full academic scholarship and chose to stay at home in a familiar place and not incur college debt. I had the complete freedom to choose a career that I was passionate about and I declared a major in biochemistry. I graduated four years later with honors with a Bachelor in Biochemistry and immediately matriculated to the PhD program.

Shaping my career
My graduate advisor demanded much and helped me to shape my career into one that would be sustainable. He was aware of the increasing opportunities for women and minorities but knew that I would need to be well-trained for a career in the new biotechnology industry. Although he hoped that I would pursue a career in academia, he was supportive of my choice to have a career in private industry in translational research. He recommended, and I followed through with a traditional education and credentials that would allow me to transition between work environments. In 1985, I earned a Doctorate in Biochemistry with a dissertation on the developmental regulation of two isoenzymes in the microscopic nematode, C. elegans. I delayed entry into private industry and completed a NIH post-doctoral fellowship in molecular biology and yeast genetics at UT Southwestern Medical Center in Dallas, Texas. I was building a strong resume and developing fortitude in academia.
I was charting a path to the career I wanted in translational research.

In 1989, I was hired as a Scientist I at Genelabs Technologies in Redwood City, California. The five-year-old biotech company had about 100 staff with half having PhDs. I thrived in the virus discovery research program. As a part of the successful 3-way collaboration between a small biotech company, a large pharmaceutical company and government labs, the next nine years were the most productive research-intensive years of my career. As Senior Scientist and the HEV (hepatitis E viruses) Project Leader, the international HEV vaccine group developed a sub-unit vaccine with demonstrated efficacy in a non-human primate animal model. With more than 40 publications and book articles on HEV and co-inventor on eight U.S. patents for HEV, I received the COPEV Association Young Investigator Award for Prevention of Viral Hepatitis in 1996. I was seven months pregnant with my second child when I accepted this award in Rome. My science career was flourishing, and my marriage of 15 years was strong with a five-year old son and an infant daughter. I had life balance.

A few years later in 2000, my family and I wanted to relocate back to Texas. My NIH post-doctoral experience and my publication record equipped me to compete successfully for the few industry positions that were open in Houston. I accepted a research management position at Tanox Inc., a small biotech company and eventually moved to the clinical R&D side to evaluate a novel HIV drug candidate. A few years later in 2004, when the market changed, and the biotechnology industry weakened, these same credentials helped me to secure a science management position at UTMB, an academic medical center close to Houston. While at UTMB, I served as the institutional lead for space medicine research and partnership activities. No longer in the laboratory, I was now a voice for research alliances and strategic research planning until 2008. These years were challenging with each transition from basic research to clinical research & development to research partnerships.

**Broadening my career at NASA**

In late 2008, I joined the NASA Human Research Program (HRP) at Johnson Space Center in Houston. As the International Space Station Medical Program (ISSMP) scientist for flight analogs, I interface with subjects, attending physicians, principal investigators and study coordinators to monitor study compliance and the safety of study subjects.

So, what does my current position as a senior scientist contracted to manage the human subject studies have to do with translational research? In my opinion, the NASA HRP analogs programs are some of the best examples of translational research. As NASA prepares for missions to Mars and places far away in our galaxy, researchers are using ground-based...
analogs to study the impact of living in space on people. Analogs are used as a “proving ground” before studies or countermeasures are implemented in space. Everything we learn during the conduct of short-duration and long-duration bed rest studies allow us to study the impact of living in space on humans. The six-degree head-down tilt bed rest platform is used to simulate physiological changes that occur in response to weightlessness. The Human Exploration Research Analog (HERA) platform is used to understand how humans behave in confinement and isolation, away from friends and family for extended periods of time. Our ultimate goal is to develop the best technologies for long-duration human space exploration.

Reflecting on my career
My sister refers to me as a science warrior to have sustained a 30-year long career in scientific research. Over the years as the type of research changed and the work environments changed, I learned to embrace the challenges, how to transition and sustain the joy of work. I continued to stay true to my career goals in translational research: to build on basic scientific research to create new therapies or diagnostics or medical procedures.

I’ve been a member of AWIS since joining the Gulf Coast Houston (GCH) chapter in 1984 as a graduate student at the University of Houston. I renewed my membership annually and joined the local chapter wherever I was during my career moves. In 2007, I joined the AWIS Diversity Task Force (DTF) and then was Chair of the DTF from 2007-2010. Minority women are a very small percentage of scientists, and I have a passion to see that change. It is so important that AWIS National remains dedicated to helping all women become more visible in the STEM fields. There is a continuing crisis in the shortage of women entering the sciences and staying long enough to secure positions of sustainability. Currently I serve on the Advisory Board for the AWIS Gulf Coast Houston Chapter.

My path has been one of traditional training for a non-traditional career path in biotech, to research alliances in private industry, academic institutions, and government agencies. The common factor has been my love of applied science and translational research.

A native Houstonian, my volunteer work includes serving as President of the Ashley Jadine Foundation, a charity that seeks to prevent suicide in youth. In 2017, the College of Natural Science and Mathematics at the University of Houston selected me as one of 12 honorees in the inaugural class of distinguished alumni. I now serve on the Dean’s Advisory Board and chair the Student Engagement Mentoring Committee. Since graduating from college, I have continuously mentored science students. I am passionate about making STEM more accessible to all students.

It has been 42 years since I embarked on the journey to my science career. I had nine years of undergraduate and graduate education in biochemistry and three years of post-doctoral training in molecular biology and yeast genetics. I entered the private industry workforce at a young biotech start-up in northern California. I thrived in a virus discovery laboratory for 11 years, had two children with my husband, and earned a young investigator international award. When I wanted to return to Texas to be closer to my parents with failing health, I joined another biotech company and transitioned to science management, then to clinical research for four years. When the Texas biotech industry was weak in the early 2000s, I took employment at a large academic medical center in the Office of Strategic Research Collaborations. This five-year academic experience primed me for the position I currently hold. I joined the government space agency 10 years ago as a NASA contractor, first on the science team for the bed rest analog studies and now as a principal investigator for the confined-isolation analog studies, both high-impact translational research studies.

My path has been one of traditional training for a non-traditional career path in biotech, to research alliances in private industry, academic institutions, and government agencies. The common factor has been my love of applied science and translational research. My children are now young adults, both having earned their college degrees of choice and embarking on their journey for the career that they have prepared for. Early in my science career, I knew that I wanted to balance a family and a career. My husband for 37 years and my involvement with AWIS for 34 years have both had a significant role in sustaining my career in science.

The advice I give to women in the early stages of their career is to figure out what you are good at, what you enjoy, and what your goals are. Embrace the challenges and have a buddy on the journey with you.

Patrice O. Yarbough, PhD, is a senior scientist at NASA Johnson Space Center and a contractor to NASA’s Human Research Program. She is principal investigator for the confined isolation human subject studies performed in the Human Exploration Research Analog (HERA) habitat.
Percent of women around the world that had cesarean births, even though only 15% were medically required.

A series of articles published in The Lancet medical journal show a dangerous new trend: Global rates of cesarean section use almost doubled between 2000 and 2015, with many surgeries being performed without any significant maternal or birth-related benefits.

Estimated annual cost of Medicare beneficiaries requiring treatment for at least one type of chronic wound or infection. A new smart bandage designed by Tufts University researchers to actively monitor the condition of chronic wounds and deliver appropriate drug treatments to improve the chances of healing has been recently developed. Tuft University researchers designed the bandages with heating elements and thermoresponsive drug carriers that can deliver tailored treatments in response to embedded pH and temperature sensors that track infection and inflammation.

American workers who are covered by workplace wellness programs. Employers offer participation incentives worth up to 30% of the total cost of health insurance to employees who enroll in the workplace wellness program. A new University of Illinois at Urbana-Champaign study of one large program finds little evidence that it paid off in lower medical expenditures or greater workforce productivity. The researchers also caution that their findings are based on only a single year of experience with the wellness program, and that ongoing follow-up in coming years will lead to a more complete understanding of its effects.

When it comes to money, nice people really are more likely to finish last, a new study suggests. A 2018 Journal of Personality and Social Psychology article analyzed data from more than 3 million people and found that those who were nice were at increased risk for bankruptcy and other financial problems.

The active ingredient in psychedelic magic mushrooms psilocybin has a low risk of harm and a high potential as a therapeutic drug. Johns Hopkins University scientists argue its potential benefits of treating mental illnesses, including anxiety, depression, drug addiction, and PTSD, outweigh its possible harms.

So many people have had their DNA sequenced that they’ve put other people's privacy in jeopardy. A Science journal study argues that more than half of Americans could be identified by name if all the search had to start with was a sample of their DNA and a few basic facts, such as where they live and how old they might be.
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The ARC Network is funded by the National Science Foundation under award number HRD-1740860
Without Role Models, Girls Miss Out on STEM Careers

Role models can inspire and improve female retention in STEM fields

By FabFems

As a child, Shivani Desai knew she wanted to pursue a career in science. Originally she wanted to be the first scientist to study “everything in the universe.” Then she decided she wanted to be a surgeon. Finally, she landed on engineer, but she was unsure what that entailed. As she neared high school, Shivani decided to reach out to some potential mentors to get a better sense of her career options. She found the FabFems.org website, a database of online female role models working in science, technology, engineering and math (STEM), and reached out to engineers in her area. She began emailing with Stephanie Gillespie, a PhD candidate at Georgia Institute of Technology who had a background in electrical engineering. Shivani was
fascinated. She and Gillespie met at a coffee shop and Shivani was able to ask her about her work and how she got to her current job. Shivani quickly became passionate about electrical engineering and started high school with a clear goal that electrical engineering would become her career.

Stories like Shivani’s illustrate the remarkable power that a role model can have on young women interested in STEM careers. Research shows female students enroll in advanced science courses at similar rates to their male peers and achieve just as well on those subjects. However, women are underrepresented in the science workforce, making up only 29 percent of the science and engineering workforce even though they account for half of the country’s total college-educated workforce.

The number of girls who are interested in STEM doubles on average when female students have a mentor or role model. Access to a role model has been proven to help female students do well in STEM courses and increases the chances of them pursuing STEM careers.

“Without Role Models, Girls Miss Out” continues on page 62
Karen O. Yee
Research Lab Manager/ Medical Specialist II, MIT
AWIS Sustaining Member since 1994

AWIS: Where do you work?
KY: I currently work in the Koch Institute for Integrative Cancer Research at the Massachusetts Institute of Technology in Cambridge, Massachusetts.

AWIS: What do you consider to be your most important career achievement, milestone or accomplishment, and why?
KY: An important career accomplishment was spearheading the move of a large academic lab. I was very proud of this accomplishment since it involved the coordinated movement of equipment, reagents and mice. Everything was up and running in the new lab space within two days of the move.

Another important career achievement was helping to revive MASS AWIS in 2004 and to organize the MASS AWIS’s 10th anniversary celebration in 2014. I was part of the planning committee and helped to raise sponsorship for the event. Proceeds from the celebration established the MASS AWIS Member Scholarship Fund, which enables unemployed and underemployed women to join AWIS and tap into its network to further their careers. After the celebration, I co-chaired the MASS AWIS Sponsorship Committee for two years and helped to recruit sponsors to support MASS AWIS’s mission.

AWIS: What would you describe as an amazing opportunity in your STEM career?
KY: I would say that my current position at MIT has been an amazing opportunity for my STEM career. I have developed my leadership skills and administrative skills to a higher level. Being a MASS AWIS member has also been an amazing opportunity for my STEM career. Working with other women in STEM who want to make a difference has been empowering and being the point person in the organization has pushed me out of my comfort zone, which in the past has been the behind-the-scenes person. This in turn has made me more comfortable taking on more visible roles.

AWIS: What are some of the challenges you encounter in your STEM career, and how did you address them?
KY: One of the challenges I have encountered in my STEM career was the inability to say “no.” I always felt like I had to take on everything that was asked of me. I recently realized that this couldn’t be sustained anymore because of my added responsibilities at work, at MASS AWIS and at home so I used my MASS AWIS network to help me practice saying “no” in a professional manner. I also stopped volunteering to take on more work and kept quiet, allowing other people the opportunity to develop their leadership skills.

AWIS: How are you helping women in STEM achieve their full potential?
KY: I am helping women in STEM achieve their full potential indirectly and directly through MASS AWIS and through my job at MIT. I was president of MASS AWIS for two years and am now past president. I mentor the women who serve on the MASS AWIS board, especially the newer members. I try to lead by example and encourage board members to take a leadership role in the organization. At MIT, I also mentor undergraduates, technicians, graduate students and post-doctoral fellows in the lab. I offer

“Stereoisomer Showdown: Karen O. Yee” continues on page 56

“Working with other women in STEM who want to make a difference has been empowering and being the point person in the organization has pushed me out of my comfort zone, which in the past has been the behind-the-scenes person.”
Christina M. Dieli-Conwright
PhD, MPH, FACSM, CSCS
Assistant Professor, University of Southern California
AWIS Professional Member since 2017

AWIS: Where do you work?
CDC: I am an assistant professor in the Division of Biokinesiology and Physical Therapy at the University of Southern California. I hold a joint appointment in the Department of Medicine at the Keck School of Medicine. At USC, I direct the Integrative Center for Oncology Research in Exercise which houses my research laboratory and facilities and resources to conduct my research. My laboratory conducts research to examine the effects of post-diagnosis exercise on cancer prognosis with a specific focus on biomarkers related to poor body composition, inflammation and metabolic dysregulation.

AWIS: What do you consider to be your most important career achievement, milestone or accomplishment and why?
CDC: My most important career achievement is earning a PhD. I am a first-generation college graduate, I never imagined I would earn a PhD when I was an undergraduate student. In fact, my interest in research did not come until I was a master’s candidate where I gained experience conducting research for my thesis. With a PhD I can carry out research that is important to me and impactful to society. The faculty, staff, students, facilities and resources at USC make for an incredibly productive research environment that continues to open doors for the development of my career.

AWIS: What would you describe as an amazing opportunity in your STEM career?
CDC: My STEM career provides many opportunities – too many to name them all. However, travelling around the world is definitely among the top of the list. I have the opportunity to share my research nationally and internationally and my career has taken me all over the United States including the National Institutes of Health, as well as abroad to Italy, Germany, France, and Canada.

AWIS: What are some of the challenges you encounter in your STEM career and how did you address them?
CDC: The main challenge I encounter in my STEM career is the preconceived notion about my career since I chose to have a family. I believe this is less of a challenge now than it would have been many years ago. However, there is still some remaining notion that you must choose to have a family or a career. I chose both. It is not easy, but it is not hard. I overcome this challenge by putting my efforts where they should be and not on worrying about how others perceive my professional and personal choices.

AWIS: How are you helping women in STEM achieve their full potential?
CDC: I am very passionate about mentoring women in science. This passion extends from elementary school girls to junior women faculty. I enjoy discussing my experience in STEM with others and sharing my successes and failures for the advancement of women. I have had the opportunity to speak at and participate in local and national events about STEM careers for women and co-host mentoring events for STEM women at USC. I have some amazing mentors that have helped shape my career thus far which aids in my ability to mentor others.

“This passion extends from elementary school girls to junior women faculty. I enjoy discussing my experience in STEM with others and sharing my successes and failures for the advancement of women.”

“Stereoisomer Showdown: Christina M. Dieli-Conwright” continues on page 57 >
Connecting the Dots with Science and Publishing

By Amy Kullas, PhD, Publishing Ethics Manager
American Society for Microbiology
AWIS Junior Member since 2013

In the era of “fake news” and “alternative facts,” my work at the American Society for Microbiology (ASM) involves maintaining the integrity of the scientific record. As the Publishing Ethics Manager for ASM’s 13 journals, I investigate allegations of misconduct and manage the communications and decision process for such allegations. Additionally, I design and implement policies and educational modules to help authors (and potential authors) conform to best practices in publishing ethics. I hope to educate scientists on issues of scientific misconduct, and in doing so I have been invited to give presentations to different stakeholders.

Recently, I was invited to the Rocky Mountain Laboratories (RML) in Hamilton, Montana. Not only was I able to describe ASM’s approach to scientific publishing ethics, but I also talked with post-baccalaureates and postdoctoral fellows about my career path, transitioning from doing bench research to my current position at ASM. While at RML, I had the opportunity to tour their BSL-4 training facility, where I suited up in one of the positive-pressure protective suits (informally known as “space suits”), navigated through the laboratory, and even attempted to do some pipetting in the hood. These suits are airtight and designed for positive pressure to prevent contamination to the wearer, even in the unlikely event that the suit becomes damaged.

I appreciate that I can remain connected to the science through publishing, attending meetings, and of course conversing with other scientists. Though I no longer work at the bench, I know
that my job makes a difference to the scientific community. When scientists engage with the community, this partnership helps prevent misinformation. As scientists, it is important for us to ensure that accurate, reliable information is disseminated into society so that there continues to be trust of and transparency in science, because when this trust begins to falter, everyone can suffer.

Amy L. Kullas, PhD, is the Publishing Ethics Manager for the American Society for Microbiology (ASM). She came to ASM after conducting a postdoctoral fellowship at the National Institutes of Health, where she was awarded a Postdoctoral Research Associate (PRAT) fellowship from the National Institute of General Medical Sciences. Kullas obtained a Doctorate in Molecular Genetics and Microbiology from Stony Brook University in New York. She spent her research career focused on understanding the dichotomy of the host-pathogen interaction. Growing up in a Wisconsin farming community, she never fathomed she would live in the nation’s capital. Some of her other interests include science policy, global health, and STEM education.
AWIS led a session entitled “Leading Intentional Cultural Change” at Anita Borg’s Grace Hopper Celebration, the world’s largest gathering of women technologists held last September in Houston, Texas. More than 22,000 women and allies attended the 2018 conference. AWIS Director of Research and Analysis Dr. Heather Metcalf and Research Assistant Aspen Russell led the session and were joined by Dr. Tanya Crenshaw, Senior Software Engineer, New Relic; Dr. Erin Wolf-Chambers, Professor, St. Louis University; and Dr. Cinda Heeren, Senior Instructor, University of British Columbia.

The session, attended by more than 250 conference participants, covered the panelists’ collaborative, 12-year research project on academic computing culture, the lessons they have learned in evidence-based advocacy across sectors, and the importance of systemic change.

Addressing the necessity and power of organizational transformation, the five computer scientists also offered concrete actions and key strategies for cultivating cultural change. View the full presentation, session outline and related research publications at https://www.awis.org/leadingchange.

Pictured from left to right: Jodie Draper, Fariba Khan, Erin Wolf Chambers, Heather Metcalf, Tanya Crenshaw and Aspen Russell.

The “Minds of Tomorrow” activity.
Can higher education create systems that support excellent and equitable faculty service and engagement? This was the overarching question for the November 6-8, 2018 summit convened by Lehigh University. A keynote address by Dr. Freeman Hrabowski, President of University of Maryland, Baltimore County, challenged 80 participants from the arts and humanities, business, education and STEM representing 37 different higher education institutions to think about how service and engagement fit into an organization’s overall culture. Emphasis was placed on aligning service and engagement with the institutional mission.

The balance of speakers, workshops, and break-out sessions (visit facultyservice.lehigh.edu), permitted participants to explore the existing service-engagement landscape and brainstorm ways to foster excellent and sustainable mutual benefits of this type of work within academe and across professional societies, museums, and other partners.

From AWIS, Dr. Rochelle L. Williams, project director for the ADVANCE Resource Coordination (ARC) Network and Cynthia Simpson, chief business development officer, were among the guest speakers. “Lehigh’s commitment to identify workable solutions to improve equitable engagement opportunities in academia align with our mission at AWIS. At AWIS we challenge institutions and other professional societies to think about the role they play in supporting systems that impede the full participation and equitable advancement of all faculty at institutions,” said Dr. Williams who spoke about Equitable Solutions for All Faculty: Beyond Best Practices. AWIS is a collaborating partner of the summit.

Through a review of current research, attendees learned about causes and consequences of gender and racial inequities in typical service assignments. The summit considered both formal and informal types of service and difficult-to-measure impacts of faculty service and engagement. The workshops inspired attendees to rethink service-engagement by implementing specific tools for investigating their local faculty work-load practices. Discussions highlighted the subjective perceptions of equity, and the need to make service workloads transparent. Participants also examined how faculty evaluation criteria related to engagement as well as resources to foster successful scholars of engagement might be reframed. Attendees shared where their institution might be on the continuum of equitable, transparent and robust service and engagement-related policies and how their individual roles at their institutions may be leveraged to create changes.

“Summit on Transforming the Culture” continues on page 63
Inaugural Cohorts of STEM to Market: The AWIS Accelerator Celebrate Graduation

By Aspen Russell
AWIS Research Assistant

Contrary to what investors often say to excuse the lack of founder diversity in their portfolios, a diversity of STEM women entrepreneurs exists. In fact, STEM women entrepreneurs are creating amazing innovations. Those women were part of the inaugural cohorts of AWIS’ pilot program STEM to Market: The AWIS Accelerator (S2M). As the program begins to wrap up, it is important to celebrate the graduation of the 33 S2M entrepreneurs who participated in the Washington, DC, Bay Area, and Chicago cohorts of S2M.

These S2M entrepreneurs hold degrees in 26 different STEM disciplines and have raised nearly $6.6 million through a combination of funding mechanisms. Over a third of them hold patents for their innovations. With a focus on intentional inclusivity, we expanded participation of women of color in S2M to 64%.

The S2M program aimed to provide holistic support, an awareness of bias both in the accelerator materials and in entrepreneurship spaces, and a knowledge of the unique, yet myriad experiences and pathways of STEM women. Other accelerators, for example, implement a bootcamp approach that excludes those who are unable to travel, leave their place of employment, and/or have availability outside work hours. In addition, when entrepreneurs experience life-related challenges, these boot camps often remove resources and support during a time when they’re most needed for entrepreneurs who often carry the heaviest load when it comes to managing caregiving responsibilities. These approaches punish those without privilege, despite the high marketability of their ideas.

Fifty-four percent of our S2M cohort members participated in entrepreneurship support programs prior to entering S2M. Of those entrepreneurs, a full 100% of them reported negative and exclusionary experiences that left them seeking support elsewhere. All of these excluded entrepreneurs cited S2M’s holistic support as a primary reason for continuation and completion of the program, leading to a program ending 94.2% retention rate.

By addressing these issues with the entrepreneurs, AWIS has been able to support their retention in STEM entrepreneurship and see their growth individually and commercially. For example, Kelsey Kennedy, a DC cohort member

S2M Accelerator Cohorts
participant explained, “S2M exposed me to so many diverse examples of how the path of entrepreneurship and commercializing a product or idea ‘looks’ for other women in STEM. Borrowing ideas from other participants’ triumphs and struggles has made the process more efficient for me.”

“The program has always helped me work through obstacles and challenges and given me a space to share my struggles with other women going through the same experiences. The program has been key to helping me build my self-confidence and has motivated me not to give up on being a STEM entrepreneur,” said Chinmayee Subban of the Bay Area cohort.

Carol Hirschmugl of the Chicago cohort shared, “I now understand a lot more about the entrepreneur space and importantly the potential hurdles and obstacles for female founders in obtaining funding. I have ideas about how to develop a strategy for moving forward.”

S2M entrepreneurs have spent nearly a year in the accelerator program and have begun to successfully implement their new knowledge, making breakthroughs across entrepreneurship spaces, academia, and industry. During the latter half of the program, the entrepreneurs applied for and received new SBIR/STTR (Small Business Innovation Research/Small Business Technology Transfer) awards, won pitch competitions, received admittance to later-stage accelerator programs (e.g. Y-Combinator), awarded competitive fellowships (e.g. Fulbright Program), and secured new funding for their companies and innovations.

AWIS research identifies best practices for how entrepreneurship support organizations can incorporate inclusion into their outreach efforts and how investors can help fix the funding gap to help women in STEM achieve their full potential.

“It is the responsibility of every venture capitalist and investor to reach out to a wider network of entrepreneurs beyond the one they already have convenient access to. Our inherent trap of reaching out to networks one degree away can cause us to exclude opportunities that have a broader impact on society,” said Dr. Vas Bailey, a partner at ARTIS Ventures and S2M Advisory Board member.

S2M entrepreneurs have licensed and patented their technologies; incorporated their companies; and spun off and started second or third companies. They have also been highly engaged in the broader entrepreneurship community. They have served as advocates for diversity in STEM entrepreneurship, winning speaker awards, starting entrepreneurship programs for young women in STEM, and engaging with policymakers on Capitol Hill.

The achievements of the S2M entrepreneurs are plenty. Their accomplishments show that entrepreneurial success knows no bounds when combined with holistic support from a community of STEM women entrepreneurs and the necessary tools.

“The impact of S2M on my life has been far more than I expected,” explains Subban. “I have never been a member of any women-only associations, STEM or otherwise. Going through S2M introduced me to AWIS and the support that women can offer one another – both as they face challenges and find success. I found a new group of friends and a supportive network through S2M.”

The results for DC Cohort entrepreneur Felicia McClary was also impactful. “S2M has connected me to the steps for developing a clear business model, and structure for pitching my business. In addition, connecting with the network of entrepreneurs empowered me to step up and pursue my venture, without fear of failure,” said McClary.

The S2M entrepreneurs grew in all aspects of their lives and are now empowered to pursue paths that are not a one-size-fits-all. It is exciting to see what their futures will bring. Learn more about AWIS S2M at https://www.stemtomarket.org.

Aspen Russell is a Research Assistant at the Association for Women in Science (AWIS) where he studies STEM equity in the workplace and academia. He has an undergraduate degree in computer science and a minor in women’s, gender, and sexuality studies from American University. He has worked in tech industry in advanced equipment manufacturing software creation, co-founded a nonprofit dedicated to researching and engineering solar-powered vehicles, and presented on bias in language and media communications. As a first-generation, genderqueer sociologist focused in gender studies, Aspen is dedicated to intentional and inclusive research methods with a focus on engaging allies. Aspen currently co-leads research for STEM to Market: The AWIS Accelerator, a program created specifically for the needs of STEM women, and AWIS Intentional Investing, a program focused on eliminating investor bias.
Decades of AWIS Advocating for Women in STEM

1970s

- AWIS is founded and incorporated as a not-for-profit organization.
- AWIS files suit against the NIH for underrepresentation of women. *AWIS et al. v Richardson and Marston.*
- Estelle Ramey, AWIS President, establishes the first national office of AWIS at 1717 R Street, NW, in Washington, DC.
- NAACP and AWIS win a lawsuit against the Office of Civil Rights (OCR) for discrimination in higher education on the basis of sex and race.
- AWIS wins lawsuit against the National Institutes of Health.

1980s

- AWIS annual meeting convenes in Toronto, Canada, to discuss the theme of building gender parity in mathematics education.
- President Jimmy Carter proclaims the first “National Women’s History Week,” incorporating International Women’s Day on March 8th.
- Symposium on Women in Science meets in Washington, DC, with the theme of improving the status of women in science and promoting equal pay.
1990s


• Accredited as a United Nations NGO, AWIS attends the “UN Fourth World Conference on Women” held in China, creating the first science and technology caucus for a UN Women’s Conference.

• AWIS wins the Presidential Mentoring Award for Creating Tomorrow’s Scientists: Models of Community Mentoring.

• AWIS staff testify in Congress on “The Advancement of Women in Science, Engineering, and Technology Development Act” (H.R. 3007).

2000s

• AWIS Magazine receives APEX Award for publication excellence and journal design and layout.

• Carol Greider, PhD the first AWIS member to receive the Nobel Prize in Medicine, is recognized for her work on telomeres.

• AWIS celebrates its 40th anniversary.

• AWIS awarded prestigious $420,000 Inclusion Challenge grant from the Ewing Marion Kauffman Foundation to provide entrepreneurial awareness, skills and support to a diversity of STEM women.

• AWIS members around the county joins millions for the Women’s March.

• AWIS endorses bipartisan Senate bill to recognize African American female mathematicians that contributed to the United States’ victory in the Space Race and award the ‘Hidden Figures’ Congressional Gold Medal Act, Katherine Johnson, Dorothy Vaughan, Mary Jackson, and Dr. Christine Darden, the highest award the United States can bestow to a civilian, the Congressional Gold Medal.

• AWIS endorses the Combating Sexual Harassment in Sciences Act of 2018, which was introduced by Science, Space and Technology House Committee Ranking Member Eddie Bernice Johnson. Through research and action, the House bill helps understand the prevalence of and addresses sexual harassment in the sciences. The Senate passed the bipartisan bill in November 2018.
Federal and Congressional Leaders Establish Much-Needed Regulations to Combat Sexual Harassment in STEM Fields

By Jossie Flor Sapunar, AWIS Communications Manager

Two meaningful changes in policy and legislation were introduced this fall to help reduce sexual harassment and discrimination in STEM fields. The progress comes after years of advocacy by key groups like AWIS, the leading advocate for women in STEM.

**Reporting sexual offender principal investigators to NSF**

According to a National Science Foundation (NSF) statement, effective October 21, 2018, awardee organizations must report if an NSF-funded principal investigator (PI) or co-principal investigator (co-PI) has committed harassment, including sexual harassment or sexual assault and the placement of the PI or co-PI on administrative leave or of the imposition of any administrative action relating to a harassment or sexual harassment finding or investigation.

“The National Science Foundation is sending the message that sexual harassment must no longer be tolerated by penalizing institutional cultures that allow sexual predators to thrive,” said Dr. Susan Windham-Bannister. “Every year women in STEM leave workplace environments that tolerate gender discrimination and sexual harassment. As a result, the STEM community loses creative, energetic, highly educated women who could potentially develop better vaccines, discover smarter technologies, start new companies and make the world a better place.”

The bill expands research efforts to better understand the causes and consequences of sexual harassment affecting individuals in the STEM workforce, including students and trainees, and to examine policies to reduce the prevalence and negative impact of such harassment.

“Equitable access to education and research experiences cannot be ensured for women in the sciences until gender discrimination, implicit bias, and sexual harassment are no longer potential barriers to their success,” stated Ranking Member Johnson in a statement issued by her office. “We cannot afford – morally, scientifically, or economically – to continue to lose these skilled scientists and engineers, particularly from groups that are already underrepresented in STEM.”

These two much-needed policy changes are the first of many steps that need to be taken against these dangerous norms, which tragically abandon women, hinder their careers, and stifle the contributions that women in STEM make to innovation.

As communications manager at AWIS, Jossie Flor Sapunar implements an integrated communications strategy by developing and managing targeted efforts to promote the association’s key objectives, brand and mission. A bilingual communications professional, she comes to AWIS from the non-profit and public sector, where she has advocated on behalf of the Latino community at LULAC, international human rights at Catholic Relief Services and the American people at the U.S. House of Representatives.

**Research Well Overdue**

There are notable concerns in STEM fields which perpetuate a climate of fear and violence that sometimes governs the lives of women scientists in the workplace.

Almost six out of 10 (58%) of individuals in the academic workplace experience sexual harassment, the second highest rate when compared to the military, private sector and government, according to a 2018 National Academies of Sciences, Engineering, and Medicine report.
In November 2018, the ADVANCE Resource and Coordination (ARC) Network’s Executive Team released a report gathering ideas and results generated from its inaugural stakeholder convening. The Executive Team leading the program consists of Principal Investigator (PI) Heather Metcalf, PhD, and Co-PIs Gail Gasparich, PhD, Joan Herbers, PhD, and Rochelle L. Williams, PhD. Held last September, 32 researchers and practitioners from higher education institutions and professional organizations convened with a goal of positioning the ARC Network as the driver of STEM equity.

Funded by the National Science Foundation (NSF), the ARC Network seeks to achieve gender equity for faculty in higher education STEM disciplines. As the STEM equity brain trust, the ARC Network promotes systemic change by drawing on decades of research and practice while producing perspectives, methods, and interventions with an intersectional, intentional and inclusive lens.

First, the report describes agenda development and emerging themes from one-on-one stakeholder interviews. The ARC Network Executive Team interviewed nine ARC Network stakeholders representing ARC Network Research Board, External Advisory Committee and Communities of Practice. Interviewees provided insight on key components of the ARC Network which, in turn, informed the content and structure for the convening.

Second, the report explains the presentations and activities identified from the interviews. The community can position the ARC Network as the driver of STEM equity by pursuing three themes:

**Theme 1: Crafting a common understanding of intersectionality and STEM equity**

While the NSF ADVANCE program emphasized systemic change toward gender equity among STEM faculty, over time researchers and practitioners in the space began to understand that barriers to gender equity are influenced by and intertwined with many demographic factors. To position the ARC Network for success, coming to a common understanding of intersectionality and STEM equity are priority. Key elements on intersectionality and STEM equity were presented throughout the meeting, and then grouped those elements into the following categories:

**Intersectionality:** A social science concept and framework originating in feminist and legal theory that considers the interconnected nature of social categorizations, such as gender, race, disability, class, and more, and their relationship to overlapping and inseparable systems of privilege and marginalization.

**STEM equity:** STEM spaces in which each participant gets what they need to succeed (e.g. access to opportunity, networks, resources, support, and more) based on the individual context of where they are and where they want to go.

**Theme 2: Creating community and envisioning success**

The ARC Network must be broad and diverse to creatively resolve difficult problems and ensure different perspectives are considered. Participants developed a list of potential key collaborators, identifying expertise, willingness to engage and level of influence of each. Collaborators were then organized by function and prioritized according to outreach in a diagram available in the full report.

*From left to right: (standing) Jevin D. West, PhD; Shari E. Miles Cohen, PhD; (seated) Peggy Layne; Eliza Lo Chin, PhD; and Felica Ahasteen-Bryant.*
be open about something as personal as our LGBTQ identity, and no scientist should feel pressure to do so. But without visibility, other scientists will not benefit from a sense of belonging and inclusion.

Now that I have tenure, I feel more comfortable. Yet I struggle to strike a balance between openness and professionalism. A casual reference to ‘my husband’ would suffice, at least in regions where it is safe to do so, but I’m single. Displaying a rainbow symbol in my office could work, but I worry that some will think I’m calling for attention or being ‘political’. And I don’t want my sexual orientation to be my defining characteristic, either; I want it to be incidental. These days, I’ll usually invoke a pop-culture reference that lets others infer that I’m gay. Most scientists — LGBTQ or otherwise — can take the hint.

I’m heartened by Twitter and other social media platforms that allow LGBTQ scientists to find each other. It’s inspiring to see those promoting visibility by submitting their bios and stories to sites such as 500 Queer Scientists. However, I worry that this visibility might give those early in their careers a misleading picture. Science can be slow to change. In many STEM departments, all tenured faculty members vote on each tenure-track recruit, someone they expect to be a colleague for the rest of their working lives. In a market that has far too few opportunities as it is, LGBTQ scientists suffer even more when job-search committees and voting faculty members assume that LGBTQ scientists won’t ‘mesh’ with their department or settle outside urban areas in the long-term.

LGBTQ trainees should not have to worry about making the mistake of their career because of lazy heteronormative logic. As a job candidate, each of the 13 times a faculty member asked me whether I had a wife — technically in violation of university policy — I had to make a choice. I could politely correct their assumption, probably embarrassing them and damaging our rapport. Or I could answer ‘no,’ deflect any other personal questions, feel dishonest and forgo a stronger personal connection with someone who might be hiring me into a position that could last into my retirement. Either way, there is the potential for negative impact.

**Call to Action**
Advocacy groups such as Out in STEM and the US National Organization of Gay and Lesbian Scientists and Technical Professionals are doing important work to connect LGBTQ scientists. However, the most natural points of intersection occur in specific fields — where physicists meet other physicists and biologists meet other biologists. Scientific societies and conferences need to take on this role more proactively, as do research institutions and funding agencies.

Diversity programs to develop the scientific workforce at both the US

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Karen O. Yee, PhD, is the research lab manager/medical specialist II at Massachusetts Institute of Technology (MIT) and oversees the operations and administration of a large, academic research laboratory. Previously, she was the research lab manager at Harvard University and instructor and post-doctoral fellow at Beth Israel Deaconess Medical Center and Harvard Medical School. Karen obtained a Bachelor’s in Biological Science with honors from Dartmouth College and a Doctorate in Molecular and Cellular Biology from University of Washington. Karen was involved in the Seattle Chapter of AWIS while at the University of Washington and chaired the scholarship committee for two years as well as held many different positions on the AWIS-Seattle Chapter Board including treasurer. She helped revive the Massachusetts Chapter of AWIS in 2004 when she came to Boston to complete her post-doctoral fellowship. Since then she has participated in the chapter in various capacities including being the chair of the leadership workshop committee, member of the mentoring committee, member of the events committee and chair of the membership committee. Karen was also treasurer in 2012-2013, member of the 10th anniversary planning committee in 2014 and co-chair of the Sponsorship Committee in 2015-2016. From 2017-2018, she served two terms as president of MASS AWIS, and this year she is past president. When Karen is not in the lab, she enjoys spending time with her husband, Lewis, and her two daughters, Sofia and Athena.
National Science Foundation (NSF) and the US National Institutes of Health (NIH) consistently leave out LGBTQ people. Although the NSF’s review criteria for trainee fellowships include the “development of a diverse, globally competitive STEM workforce” and the NIH’s diversity definition is predicated on evidence of under-representation, neither agency makes specific mention of LGBTQ people. The NIH explicitly accounts for minority ethnic groups, people with disabilities, women and people from low-income families but not LGBTQ people. In fact, the NSF’s analyses of STEM participation, widely used by funding agencies and universities, do not even track LGBTQ people. Thus, the data that could inform policy are not being collected.

Similarly, although most universities have non-discrimination policies for LGBTQ people, their diversity initiatives for recruiting faculty members and trainees typically omit us. Increasingly, faculty postings ask applicants for diversity statements, and trainees often wonder whether they should disclose their LGBTQ identity. The problem is that search committees might make assumptions that hurt LGBTQ applicants. And even if some members of search committees believe LGBTQ people provide a valuable form of diversity, that matters little if those candidates won’t receive benefits from the university’s initiatives.

Including those who identify as LGBTQ in mainstream diversity initiatives would encourage LGBTQ representation and send an official signal to the scientific community. Those appointing faculty members and lab personnel or reviewing graduate applications might be more willing to give us the benefit of the doubt (or, better, question the basis for their doubts). All of this, in turn, would lead to more peers and role models and ease challenges of invisibility.

I don’t think including LGBTQ people in diversity efforts lessens the importance of these initiatives for women and people from minority ethnic groups; these are real and urgent. Indeed, broadening diversity efforts could have synergistic impacts. For instance, LGBTQ people are more likely to be out in STEM fields that have greater representation of women.

In addition, improving LGBTQ representation could help scientific research itself. Many studies have shown that gender, racial, geographic and political diversity, as well as diverse personal experiences, all bring unique perspectives that improve group decision-making, company performance and the quality of scientific work.

If we are to eliminate the insidious ways in which bias, even in well-intentioned people, continues to hinder our career attainment, we must recognize and avoid it in our community and our policies. An LGBTQ graduate student I met recently relayed on Twitter his experience of asking a full room of scientists why there are so few out faculty members. They argued that there is no point in being out in science: acceptance is implicit and whether someone is LGBTQ is irrelevant. The data — and my experience — show otherwise.

Jon Freeman, PhD, is Associate Professor of Psychology and Neural Science at New York University and director of the Social Cognitive & Neural Sciences Lab. He received his PhD from Tufts University and was on the faculty at Dartmouth College before joining NYU in 2014.

Reprinted with permission from Jon Freeman.
How can robots be designed to simultaneously ensure high user uptake and to promote social equality? I see at least six options:

1. **Challenge current gender stereotypes**
2. **Design customizable robots, where users choose features**
3. **Design “genderless” robots**
4. **Design gender-fluid robots, prioritizing gender equality**
5. **Step out of human social relations**
6. **Design “robot-specific” identities that bypass social stereotypes**

We propose a Hippocratic oath for roboticists: to help or, at least, do no harm. The danger is that doing nothing, i.e., unconsciously designing robots toward current gender stereotypes, may reinforce those stereotypes in ways roboticists did not intend. Roboticists have an opportunity to intervene in the human world. With care, and through collaboration with humanists and social scientists, I do believe we can design socially-responsive robots.


**Londa Schiebinger, PhD, is the John L. Hinds Professor of History of Science at Stanford University. She directs Gendered Innovations in Science, Health & Medicine, Engineering, and Environment.** She is a leading international expert on gender in science and technology and has addressed the United Nations on the topic of “Gender, Science, and Technology.” She is an elected member of the American Academy of Arts and Sciences and the recipient of numerous prizes and awards, including the prestigious Alexander von Humboldt Research Prize and Guggenheim Fellowship. Her work on Gendered Innovations (genderedinnovations.stanford.edu) harnesses the creative power of sex and gender analysis to enhance excellence and reproducibility in science and technology.

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The test of any pipeline is in its structure, inclusivity, and alignment to support the career continuum, and, school cultures which not only expects civility, but also are free of bias and harassment. The integrity of our pipeline will enable departments to successfully recruit and retain women as well as men and women of color in STEM fields.

**Douglas M. Haynes, PhD, is vice provost for academic equity, diversity and inclusion and director of the ADVANCE program at UC Irvine.** In this role, he leads the campus aspiration to be a national leader and global model of inclusive excellence. A professor of history, his most recent book is titled Fit to Practice: Empire, Race, Gender, and the Making of British Medicine, 1850-1980 (Rochester Studies in Medical History, 2017) and examines the making of the modern British medical profession amide national and imperial interests.
components of their habitat quality in the 50-meter forest edge directly bordering intensive agricultural activities to forest farther away, hoping to broaden our understanding of how these and other organisms may be faring in close proximity to humans, and to inform conservation policy and practice.

**Life at the La Suerte Biological Field Station**

At the La Suerte Biological Field Station, the forest awakens with the dawn chorus of rumbling howls from the mantled howler monkeys, rain tings off the tin roofs of the researcher cabins, the morning mist caresses the golden-lit crowns of the forest canopy and the hairs on your arms, and the smell of both the earthy layer of rich decomposing leaves on the forest floor and your morning coffee awake your senses. Throughout the day, scarlet and green macaws hoarsely yell overhead, coatis patter along in single-file, and colorful poison dart frogs leap throughout the leaf litter. Stumbling through the brush may be the astoundingly large tapir or large ground-dwelling tinamou and curassow birds. At night, dink frogs let off the chimes of bell-like dink-dink-dink calls, red-eyed tree frogs meow like domestic felines, a great potoo bird hurls out its whoop call, and the insects some may mistake as leaves and twigs search for a meal. I know no privilege like working in a rainforest. At all times, the biodiversity is wondrous and enchanting and heightens your every sense.

Since I wanted to know about both monkey behavior and habitat structure, there were two “typical” kinds of days these past two field seasons. For typical “monkey days,” I would set out on an ordered pattern of forest transects, looking to find howler monkeys in edge and core zones. When I found them, I would stay with the group for as long as possible, sometimes many hours at a time, collecting information on their behavior, what they were eating, and GPS locations to determine how far we were from human agricultural activity. For typical “habitat days,” I would perform vegetation surveys in diverse geographic areas of the forest fragment in both edge and core zones. In these surveys, I would collect data on tree density, species richness, and canopy connectivity.

In some ways, both kinds of days are grueling. While the monkeys quickly and gracefully travelled through the trees, to keep up with them I trekked through dense underbrush, scaled down muddy ravines and muscled my way out again, and crossed rivers and streams — all while hoping not to stop data collection for a moment, or worse, disturb wasp’s nests and animal dens. Plant surveys were less physically strenuous in that the study subjects don’t run away, but carefully measuring tree characteristics had its challenges. Avoiding the world’s most painful insect bullet ants nesting in the bases of trees, carefully checking tree trunks for snakes before measuring them, and hurling tow-weight lines into the canopy to collect fruit and flower specimens for species identification proved mentally and physically exhausting in the hot, humid forest.

However, even with all of its discomforts, field work is the most thrilling and inspiring experience I know. Once assimilated to the overstimulation of the rainforest (if that is ever possible), the quiet(e) moments allow for intimate reflection. In moments where I am still and get to watch monkeys sleep, play, or feed together, and when I closely inspect the astoundingly small, sometimes nearly intangible differences in plant species – perhaps a slightly different color of already nearly invisible hairs on the underside of a leaf – I feel grounded in my goals to conserve biodiversity. Though just 50 meters away through a visibly impenetrable wall of rainforest lies a sea of pineapple fields, there is a profound hope that these organisms may persist if we act now. Policy and good conservation practice requires evidence on how we are changing rainforest environments. Today, I can contribute by collecting data on the ground and documenting how human activities are affecting biodiversity.

**Looking ahead**

My preliminary findings offer both good news and bad news for biodiversity in rainforest fragments. So far, I’ve seen that howler monkeys are using both edge and core forest habitat, which has positive implications for their survival. I have seen no difference in the activities they’re engaging in edge and core, either. However, more research is ongoing, as it appears they may be using the edge for more seasonally-available foods (i.e. fruits and flowers) more than ubiquitously available foods (i.e. leaves) far more than expected. This leads me to wonder if they use the edge habitat year round, or if it is only worth venturing into when high quality, clumped food resources are available.

Also related to habitat quality, there are major differences in the forest structure in edge and core. I found that forest in the core is denser, has greater canopy connectivity, and a greater diversity of tree species. Even as I witnessed monkeys using edge and core zones, these vegetation differences are alarming as availability of diverse vegetation resources and a continuous canopy to travel through are important for howlers and many other arboreal species. As this study and others begin to quantify habitat differences in proximity to human activity, there is a great need to investigate how this will affect wildlife and their survival.

This research led to the completion of my master’s thesis in environmental science and is continuing with collaborations with multiple organizations. This year, I’m teaming up with other conservation scientists for a larger-scale analysis of behavior in edge and core zones for mantled howler monkeys as well as endangered Central American spider monkeys.

Dorian Russell is an environmental scientist with research interests in anthropogenic impacts on tropical forest diversity. She has a Master of Science in Environmental Science and an interdisciplinary bachelor’s degree in environmental science, policy, and communication from American University in Washington, D.C. Dorian is a former AWIS intern and proud first-generation queer woman in science.
industries. A closer look at the data, alongside the percentages of women and men in the workforce in each industry, shows that the percentage of sexual harassment charges filed by women in each industry is consistently higher than the percentage of women who work in the industry. Conversely, the percentage of men filing sexual harassment charges in each industry is consistently lower than the percentage of men who work in that industry. For example, although 41 percent of the sexual harassment charges filed in the mining industry during the time period were filed by men, that percentage is far less than the 86.9 percent of men in the overall mining workforce.

The data suggest even starker differences between women and men in their reporting of sexual harassment, when the rate of reporting is calculated to take into account the actual percentage of women and men working in that particular industry. For example, the data show that women—who constitute less than one-quarter of the transportation industry workforce—were 10 times more likely to report sexual harassment to the EEOC than men in the transportation industry.

**Across the Board, Women Report Sexual Harassment at Higher Rates Than Men**

The EEOC’s unpublished data show that, in every industry, women have higher rates of reporting sexual harassment than men. This result is consistent with other studies concluding that sexual harassment remains a problem that overwhelmingly confronts women throughout the entire workforce. The data does not establish how much more likely women are to experience sexual harassment in certain industries than men, it only indicates how much more likely women are to report sexual harassment to the EEOC than men.

The data also does not explain why there are higher reporting rates for women when compared to men in certain industries. The higher rate of reporting could reflect higher rates of discrimination for women, or it could reflect more familiarity among women with the available legal protections, or some other factor. Men might be more hesitant to come forward about sexual harassment in certain industries, perhaps because of gender-based assumptions about who experiences harassment and who does not.

**Women's Reporting Rates of Sexual Harassment are Higher in Male-Dominate Industries**

The data suggest that women may be more likely than men to report sexual harassment in industries that are predominantly male. In the construction industry, for example, 91 percent of the workers are male. Women in that industry are 27 times more likely to report sexual harassment to the EEOC than men. Meanwhile, in the healthcare and social assistance industry, where 21 percent of the workers are male, women are only 1.2 times more likely to report sexual harassment than men. This finding is consistent with other research suggesting that women are at a greater risk of sexual harassment in male-dominated industries.

In 2017, a Pew Research Center survey found that more women had experienced sexual harassment in male-dominated industries compared to female-dominated industries—at a difference of 28 percent versus 20 percent. Research examining the intersection of gender and power in the workplace concluded that women can be targets of harassment when they step out of perceived gender norms, such as by moving into positions of authority and/or historically male occupations. Strategies to reduce occupational segregation and gender imbalances in different industries could help challenge longstanding assumptions about women’s jobs and men’s jobs and drive much-needed workplace culture change. Additionally, a growing body research exploring the most effective strategies to combat sexual harassment has concluded that greater organizational diversity and increasing the number of women in the highest ranks of a company can help reduce workplace sexual harassment.

**The Full Picture of Sexual Harassment at Work Still Isn't Clear**

The existing EEOC research on sexual harassment in the workplace only scratches the surface. These data only compare the likelihood of reporting sexual harassment between men and women within an industry. Thus,
although women are 27 times more 
likely to report sexual harassment than 
men in construction, that does not 
mean women report sexual harass-
ment in the construction industry at a 
higher rate than women report sexual 
harassment in the health care and so-
cial assistance industry. More research 
could help shed light on the likelihood 
of women or men to report sexual 
harassment between industries.

More research is also needed about 
the different experiences of sexual ha-
rassment survivors. Research suggests 
that women of color can be targeted 
for sexual harassment because of 
factors such as the intersection of race 
and gender biases, demeaning sexual 
stereotypes, and a greater likelihood 
of women of color working in low-
wage jobs where the power imbal-
ances can be most stark. Furthermore, 
there is too little data on workplace 
sexual harassment experiences of 
LGBTQ and nonbinary individuals. Two 
existing studies suggest high rates 
of sexual harassment experienced by 
many of these workers: a study by the Williams Institute 
found that 35 percent of LGB-identified workers who were out in 
their workplace reported being harassed at work, and the National 
Transgender Discrimination survey found that 50 percent of 
transgender individuals reported being harassed at work.

This includes more federal and state 
dollars focused on improving the 
quality of data collected on sexual 
harassment and analyzing data bro-
den down by race, gender, ethnicity, 
LGBTQ status, and other characteris-
tics to better understand the experi-
ences of all survivors. Funding more 
academic research can add important 
evidence-based insights about best 
practices in combatting harassment. 
Furthermore, employers themselves 
can undertake and report on efforts to 
assess workplace climate, the diverse 
experiences of workers within their 
workplace, and the effectiveness of 
different strategies in rooting out 
discriminatory practices. It is critical to 
embrace these and other strategies to 
make meaningful strides in ridding the 
workplace of sexual harassment once 
and for all.

Permission to reprint from the Center for 
American Progress (CAP) Women’s Initiative. 
The Women’s Initiative is a comprehensive 
effort to marshal CAP’s broad expertise and 
promote public policies that enable women 
to participate fully in our economy and our 
society.
they will pursue STEM careers. Female students are more likely to have confidence in their own STEM skills when they see women in STEM fields, one report found. FabFems is one of several organizations trying to increase exposure to STEM fields by connecting girls to female role models. Through FabFems, role models can connect with students online or in-person, host field trips and site visits, and volunteer or serve as mentors for STEM clubs and events.

Experts say these opportunities can be life-changing for students. “If you can see it, you can be it,” said Karen Peterson, founder and CEO of the National Girls Collaborative Project (NGCP), a nonprofit that brings together organizations that support girls’ interests in STEM fields. “Role models provide an engaging way for girls to see themselves through the actions of women from similar backgrounds.”

Women who currently work in STEM fields say role models have been invaluable in guiding them to their current career. Nicole Osier, an assistant professor at the University of Texas at Austin, said she didn’t realize her career as a nurse scientist was “even an option” until she met a mentor who held that job. She says mentors continue to have an impact on her, even now that she has established her career. “Not only do my mentors provide me with constructive feedback but they help to build my confidence and self-efficacy by reminding me of my growth and nominating me for opportunities and awards, many of which I did not feel deserving of but ended up receiving,” Osier said. Osier now serves as a role model through FabFems.

Representing the Association for Women in Science (AWIS) on the NGCP Champions Board, Cynthia Simpson, AWIS Chief Business Development Officer, commented, “The Champions Board brings together individuals involved in education, policy, and gender equity. To remain competitive in an ever-increasing technological world, our country must educate the best minds in STEM to provide the needed talent and diversity in our workforce. I look forward to serving as a connection between AWIS and NGCP through my service on the Champions Board.”

January is National Mentoring Month which focuses attention on the need for mentors to guide our youth. Research shows girls benefit from relationships with role models and mentors who can provide valuable information about STEM careers. FabFems are enthusiastic about the science and technology work they do and want to inspire a future generation of FabFems. Search the Role Model Directory to find FabFems in your area. We benefit from role models at all stages of our lives.

Nhi Vu-Y Quach, a FabFems role model and graduate student at the University of California, Irvine, works in the field of nanotechnology research. Quach said as the first member of her family to attend college, she relied on mentors to help her navigate career fields. “I was able to meet great mentors along the way, who helped me get through the rough patches of college by guiding me and giving me their advice on which paths I could take,” Quach said. “They were the ones who inspired me to continue to get a PhD because they were PhD candidates themselves.”

For more information about the National Girls Collaborative Project visit https://ngcproject.org/ and FabFems at https://www.fabfems.org/
"STEM Equity Brain Trust" continued from page 55

Throughout the convening, the Executive Team used examples and circumstances that apply to both research and practice to bridge the gap between the two. The “Experience Mapping” structured activity engaged participants to reflect on value creation as a function of different phases of the ARC Network and distinguished between practitioners and researchers.

Over the next four years, the charts will help identify the ARC Network’s most important collaborators, like organizations and individuals as well as groups requiring additional incentives and engagement.

Theme 3: Curating access to research and resources

Participants engaged in a live demonstration of the Mendeley platform, which will host the ARC Network online community and resource library. Stakeholders compiled a list of desired features and tools for cultivating useful social networks and resources, like full accessibility, audience tailoring, wide scope of resources, and seamless incorporation with existing databases.

Stakeholder feedback will guide the ARC Network’s future objectives and will be incorporated into the online platform. In preparation of its 2019 launch, training materials specific to researchers and practitioners will be developed. Stakeholders produced a detailed list of additional individuals and organizations to invite into the ARC Network, not only as members but also as decision-makers and community leaders. Finally, based on stakeholder feedback, the ARC Network Ambassadors training modules have been developed to expand outreach with audiences who have not been a part of the traditional community.

Read the “Positioning the ARC Network as the Driver for STEM Equity” report at EquityInSTEM.org/report.

Rochelle L. Williams, PhD., is the Project Director for the ADVANCE Resource Coordination (ARC) Network for AWIS. The ARC Network has a primary focus on organizational and institutional systemic change from both the research and practical perspectives and aims to share and translate tools needed for change, remove barriers to resources, reduce duplication of equity and systemic change efforts, and curate, recover, and synthesize the body of knowledge on systemic change.

Before joining AWIS, Rochelle served as Research Scientist in the Office for Academic Affairs at Prairie View A&M University. Since 2012, Rochelle has worked as a subject-matter expert for the National Science Foundation on issues about cultures of inclusion, broadening participation, and university education programs. Rochelle received a Bachelor of Science in Physics from Spelman College and both a Master of Engineering in Mechanical Engineering and Doctorate in Science and Mathematics Education from Southern University and A&M College.

="Summit on Transforming the Culture" continued from page 49

By combining theory and practice, participants converged on a common understanding of the difficulty with fostering a shift in the culture of service and engagement. While service and engagement were seen as pathways to faculty retention, the existing difficulties with valuing service were noted as a metaphor for the challenges our society is having with the value of higher education overall. Despite these challenges, the summit culminated in some important recommendations:

Individual Actions:
• Share what was learned at the summit with five people on your campus, including senior academic officer.
• Participate in future activities related to transforming systems of service-engagement.

Systemic Actions:
• Establish locally relevant, operationalized definitions (taxonomy) of service and engagement with clear standards and criteria.
• Make service and engagement visible and aligned with organizational goals.
• Reduce unnecessary committees and committee memberships to the level necessary to complete the task.
• Implement credit systems (incentives) to support broader distribution of faculty service work tied to polices or practices to facilitate equity.
• Try pilot programs and audit practices (leveraging current research and summit resources) to create incremental change.
• Develop case studies of integrated scholarship/engagement and integrated teaching/scholarship for faculty development.
• Develop a service ‘impact factor’ for faculty reappointment/promotion similar to what is used in research and teaching evaluation.
• Harness professional societies to create disciplinary norms, guidelines, and expectations for valuing service and engagement.
• Broadly disseminate best practices and recommendations through publications and convenings of higher education leaders.
What is your favorite word?

OPPORTUNITIES

How do you define it?

Opportunities are not just something that comes knocking on your door – you must be active in finding them and working to make the opportunities come your way. I always tell students they must get off campus and meet people and to not always expect the university to bring professionals to them for networking. (Although grab the plum opportunities your university provides).

When opportunities come, make the most of them. Go with a positive spirit and great attitude to help others and not just have others help you. You never know when one opportunity leads to another one. And, always meet people with the mindset to learn and value them as a person, not just whether they can give you a job or a connection. Be present and memorable in your interactions and with people you casually or professionally meet.

Has your word influenced you during your career, or is it a word that you have chosen retrospectively?

Yes, both opportunity and the choices has always led to another step in my career. It is probably a word I choose now in reflection, rather than I would have chosen decades ago as I started out. I made choices that didn’t compromise my values and family or made the most money. However, I’m fulfilled in my career and doing work I would probably not be doing if it weren’t for the choices I made early on.

How has AWIS impacted your career journey?

As a postdoc, I took a chance and made a choice to spend time working with University of California, San Francisco’s Science and Health Education Partnership program to learn and volunteer for STEM education outreach. I was then introduced to AWIS by another new mom and AWIS colleague. Upon meeting the Palo Alto Chapter leaders, they expressed interest in helping their members do more STEM outreach activities. I chose to step up to help grow that effort. They embraced me and my growing family at the board meeting, program meetings, everything!

At one AWIS monthly program meeting I met someone who was leading biotechnology education efforts around the Bay Area. The choice to take her up on the new opportunity to make a difference in STEM education has led to learning about leadership and non-profits, K-12 education culture, developing a wide range of skills, and numerous teacher relationships that have grown over the decades. Despite the ups and downs and the challenge of learning about running an enterprise from scratch, I am happy where I am now and fulfilled in my job.

What are you currently reading?

As a mom who raised two fabulous now-adult women, I read what they tell me to read! Both are strong personalities and independent thinkers. Right now, I’m reading what one of them gave me from her college class, called “Men Without Women” by Haruki Murakami. They are translated short stories, each with a fascinating social commentary and a unique storytelling form.

Katy Korsmeyer works at SCU in the College of Arts and Sciences Deans Offices as the Director of Special Projects. Her career started at UCLA on pyruvate dehydrogenase. At the University of Texas at Austin, she studied structure-function of flavin-containing monoxygenase. Katy focused on post-translational modifications of cytochrome P-450s during her postdoctoral fellowship at UCSF. She volunteers on the AWIS National Chapters Committee, AWIS Northern CA Chapters Committee, volunteers on the board of the local Santa Clara Valley Science and Engineering Fair Association, and the board of Teach Biotech helping to run the non-profit for local educators to provide training and mobile biotech curricular labs to schools.
The AWIS Career Center is the best HR solution to attract and engage talented, diverse candidates. Feature your STEM career opportunity and recruit experienced, professional women in STEM.

awis.org/recruit
2019
Innovation & Inclusion
Annual Summit and Awards Dinner

Pinnacle Award Recipient
Carol Greider, PhD
2009 Nobel Laureate
Director of Molecular Biology and Genetics Johns Hopkins University

Leadership Award Recipient
Freda C. Lewis-Hall, MD, DFAPA
Chief Patient Officer
Pfizer

Next Generation Award Recipient
Mareena Robinson Snowden, PhD
Stanton Nuclear Security Fellow
Carnegie Endowment for International Peace

April 24, 2019 | Washington, DC
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