Having a Life in Science

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If the barriers to women in science are crumbling, where are all the female professors?

Ariana Sutton-Grier, a wetlands ecologist, seems to be on track toward a successful career as an academic scientist. She earned her PhD from Duke University, has numerous publications to her credit, and has received several National Science Foundation (NSF) grants. She is an American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellow, hosted by the National Oceanic and Atmospheric Administration (NOAA).

But Sutton-Grier is not sure she’ll end up at a university. “I’m still considering academia,” she says, “but I’m enjoying my policy fellowship. The analytical and critical thinking skills I bring can add a lot of value to the questions and policy decisions that NOAA is thinking about.”

How to keep women scientists of Sutton-Grier’s generation in the academic fold is the subject of considerable study. Many women opt out because of both systemic barriers and individual choice. Some are turned off by the culture of research institutions, which they describe as overly competitive and demanding. Others see the tenure track being in conflict with their desire to have children. At the same time, good career options in business, government, and the nonprofit world beckon.

Women have always been a minority in the science, technology, engineering, and math (STEM) fields. It was long assumed that if women entered the graduate school pipeline, the parity problem in academia would be solved. If you educate them, they will come, the thinking went. For decades, NSF, AAAS, and universities around the country have been working to eradicate barriers that discourage women from pursuing degrees in science.

The goal was to ensure that the nation was not losing the contributions of half of its top talent. “More diverse groups of people bring more creativity to solving problems,” says Joan Steitz, professor of molecular biophysics and biochemistry at Yale University and a member of the National Academies of Sciences Committee on Maximizing the Potential of Women in Academic Science and Engineering.

Considerable progress has been made. A few short decades ago, many graduate science programs refused to accept women. Today, overt sexism is rare. “I actually can’t think of any instance where I felt discriminated against,” says marine ecologist April Blakeslee, a postdoctoral fellow at the Smithsonian Environmental Research Center, in Edgewater, Maryland.

Indeed, when women apply for tenure-track jobs in biology, they may even have an edge. According to a 2010 National Research Council report (see the further reading section), of PhD biologists applying for tenure-track positions from 1999 to 2003, 26% were women; 28% of those who were invited to interview were women, and 34% of first offers of jobs were to women.

The question is why only one in four applicants for tenure-track positions are women. Of all the STEM fields, biology should be the first for which women plant a flag of victory. Women now receive roughly half the doctoral degrees in the biological sciences, compared with 30% in the physical sciences and mathematics and 20% in computer sciences and engineering. Yet women hold just 22% of tenured professorships in the biological sciences and 42% of nontenured positions. “Most strikingly,” according to

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the NRC report, "women were most likely to be underrepresented [in the tenure track] in the fields in which they accounted for the largest share of the faculty—biology and chemistry."

The report also showed that although men and women in other STEM fields received roughly equal research funding, in biology, male faculty members had significantly more funding than did female faculty members. Further study is needed to understand why.

Of bias and babies
In February, the Proceedings of the National Academy of Sciences published a controversial study on women in science by Cornell University researchers Stephen J. Ceci and Wendy M. Williams (see the further reading section). After reviewing 20 years of research, they found no evidence of discrimination in grants, publishing, interviews, or hiring in academic STEM fields. They wrote, “The ongoing focus on sex discrimination in reviewing, interviewing, and hiring represents costly, misplaced effort. Women’s current underrepresentation in math-intensive fields is not caused by discrimination in these domains, but rather [by] sex differences in resources, abilities, and choices (whether free or constrained).”

Not surprisingly, many disagreed, contending that outright discrimination may be a thing of the past, but implicit gender bias is alive and well. “I agree with virtually all the new articles [Ceci and Williams] quote,” says Steitz. “However, when the same articles document that women get paid less, have less access to secretarial help, have less access to common facilities and less space, we still need training in implicit bias.”

In its 2010 report on women in STEM, Why So Few?, the American Association of University Women (AAUW; see the Further reading section) cites studies that suggest that unconscious bias remains a barrier. For example, the implicit association tests, designed by researchers at Harvard University (https://implicit.harvard.edu), uncover unconscious bias in many areas, including gender–science bias. Since 1998, more than half a million people have taken the gender–science bias test, and 70% (including this writer, alas) more readily associated male with science and female with the humanities. Such unconscious bias may influence employment decisions by both men and women.

Because of their numbers, women in biology are less likely to encounter bias than women in engineering or physics, says Christianne Corbett, AAUW senior researcher. “But as you go higher up the ranks, you’re more likely to run into it,” she says.

Even more than its effect on individual women, implicit bias undergirds an unwelcoming academic climate, says Phoebe Leboy, professor emeritus of biochemistry at University of Pennsylvania and past president of the Association for Women in Science. “The workplace—in academia at least—is still constructed for men with stay-at-home wives, and even a lot of American men are rebelling about that,” she says. “To succeed, the expectations are that you’re working more than 60 hours a week in the lab, that you’ve got several grants on which you are the principal investigator by the time you come up for promotion, and [that] you have already built a research empire. Why is it harder for a woman to do that? This is occurring during their prime child-bearing years. Even if they don’t have children, it is occurring in an environment where the deck is stacked against them.”

Although experts disagree on the role of bias, no one disputes that the lack of work–life balance is a major obstacle facing women. A 2010 study conducted by Mary Ann Mason and colleagues at the University of California, Berkeley, showed that “research-intensive universities were considered the least friendly of a range of possible career choices” by science scholars nationally (see the further reading section).

Many senior faculty members in academia have an outmoded image of what it takes to be a scientist—one that works against parents, says Shirley Malcolm, head of the Directorate for Education and Human Resources Programs at AAAS. “Not being physically present all the time or not being there late at night may go against their idea of what it takes to do good science,” she says.

Further reading


Understanding current causes of women’s underrepresentation in science. Proceedings of the National Academy of Sciences. www.pnas.org/content/early/2011/02/02/1014871108.full.pdf+html


Even small things, such as requiring faculty to attend meetings after 5:00 p.m., speak volumes about institutional awareness of family demands. Indeed, it’s not women so much as mothers who are not choosing—or not being chosen for—academic science careers. A 2009 study by researchers with University of California, Berkeley, and the Center for American Progress showed that married women with children were 35% less likely to have a tenure-track position in a STEM field than married men with children, a disparity that did not exist for single women (www.americanprogress.org/issues/2009/11/pdf/women_and_sciences.pdf). A 2008 study of STEM faculty in Research in Higher Education showed that married men and women had parity in tenure and promotion decisions—unless the women had children.

But the solution is not just a matter of adding maternity benefits for graduate students or an on-site day-care center, as important as these measures are. Many women reject academic science because of the elusive question of “fit.” According to surveys conducted of tenure-track faculty at 130 schools, the Collaborative on Academic Careers in Higher Education at Harvard University found that women STEM professors were less satisfied than their male counterparts with how well they fit in, with opportunities to work with senior faculty, and with institutional support for family life.

Sutton-Grier says that only when she got to graduate school did she begin to feel “different.” “I was in the lab where I was the only female graduate student for the majority of time,” she says. “There were very few women professors in my department.”

As she worked on her postdoctoral research (postdoc), she found the nature of the work to be isolating. “I was doing my research in the lab, by myself. That really wasn’t the way I preferred to spend my time,” she says. “Teaching was the highlight of my postdoc.” If she pursues an academic career, she adds, she wants to focus on teaching and not research as “an end-all and be-all.”

Blakeslee agrees. “The institutions that are really focused on research and have a lot of pressure are not as interesting to me,” she says. “I do want to have an outside life as well as a career.”

Having mentors who model work–life balance is critical, says Steitz and other experts. Too often, scientists like Sutton-Grier and Blakeslee get the message that it’s nearly impossible to be successful and have a family, especially in academia.

Even women who don’t want children say they find the academic environment unappealing. One woman completing her PhD in biology at the University of California, Berkeley, says that she wants a different work culture than she found there. “I really like working on teams. You have the same goal and evaluate options and priorities together,” she says. “There are a lot of groups and very few teams in academia. Teams are exciting. Groups are committee work.”

Related to this is an “alpha-male” ethos, she and others say. Another woman biologist who chose to work in a Washington, DC–area nonprofit rather than in academia says, “I had a lot of very confrontational men in my [doctoral] program. It didn’t seem that much fun to fight with them the rest of my life.”

Women outside the academy

Although much of the research on women in science has been focused on universities, most PhD biologists are not academics. According to 2006 NSF data, of the 116,000 doctoral life scientists, 29,000 were postsecondary teachers. Less than one-third of doctoral life scientists and of higher education teachers were women.

Understanding what draws women to other careers may help inform academic science. Take Angela Bednarek, an officer with the Pew Environmental Group’s ocean science division in Washington, DC. Bednarek always knew she wanted to be a scientist. At 10 years old, she was an avid insect collector. “The babysitter would go to get fish sticks out of the freezer, and there would be my bugs,” she says.

Bednarek was never told that she could not study science, but as a bug-loving female in the 1970s, she was an anomaly. “I got a lot of attention because I was a girl,” she recalls. “My parents were really supportive. I got scholarships and opportunities to do field work as a high school student.”
She received her PhD in ecology in 2002 and landed a postdoc at Columbia University. Rather than pursue an academic career, though, she chose a different path. She did not want to narrowly concentrate on her topic of the impact of dams on rivers. “I was interested in a broader suite of issues,” she says. Bednarek decided to have children; meanwhile, her friends in university settings were putting off having theirs.

She chose to work as a scientist who could influence policy. The position fits with her goal of using science to effect change, she says, and her four-day-a-week schedule gives her time to be with her children. Bednarek finds it “annoying” to read articles bemoaning the loss of women scientists from the academic pipeline. Women who choose fulfilling careers in government and nonprofits, she suggests, should not be viewed as somehow “lost.”

Other women scientists find a home in the world of business. Debra Bowes’s company, Chevy Chase Biopartners, in Chevy Chase, Maryland, advises startup biotech firms on licensing and strategic planning. She believes that the biotech industry is a good fit for women. “If you have an interest in applying your scientific knowledge to something that’s going to benefit humanity, the rubber meets the road in this industry,” she says. “Academics create good ideas and patents, but the patents sit there unless there are women—and men—in the life sciences industry to actually move them forward and take the risk. And in my opinion, that’s where the fun starts.”

Scientist and entrepreneur Pamela Contag always assumed that she would be in academia, but while she was completing her postdoc in microbiology at Stanford University, she says, “I had several ideas where technology could be turned into an application, and a business could be started around it, and that’s the road I chose.” She mastered setting up a facility, raising venture capital, and selling a product and went on to found several successful biotech companies in northern California. Fortune magazine named her one of the top 25 women in small business. Throughout, she retained her focus as a scientist.

Academia expects scientists to fit into a “template,” she says, but “in industry, they were more tolerant. If you can raise money and come up with good projects, the investors are there for you.” She also found motherhood less of an obstacle. “I have three children,” she says. “That was a huge issue in academics. In industry, they’re more used to scientists having flexible time and being extremely directed toward a certain problem. In academics, your presence at 10 p.m. in the lab is more highly noted.”

Not that everything is rosy for women scientists outside academia. Contag encountered prejudice and discrimination in both worlds. Recently, a male investor told her, “everybody believes there’s a glass ceiling in business for women. Don’t you owe it to your investors to turn your business over to a man?”

According to a 2008 white paper on women in bioscience, academic medicine, and nursing, conducted by Catalyst, a New York City–based nonprofit devoted to expanding opportunities for women in business, women’s pay was significantly lower than men’s in nonacademic bioscience. Male chief executives earned $161,000 per year, compared with $109,000 for women; among lab scientists, men earned $56,000 per year and women $44,000. Women were also more likely to be stuck in middle management.

Closing the gender gap
In March, a study by the Massachusetts Institute of Technology (see the further reading section) showed that its full-court press to woo women faculty is paying off. Although problems remain, the number of women faculty in the school of science has doubled since 1999, with many more women in senior positions. As the report explains, MIT brought “women faculty with a deep knowledge of the problems into a partnership with powerful administrators (the president, provost, and deans) so that, together, they could devise and rapidly execute solutions pertaining to equity, hiring, family–work conflict, and inclusion in the administration.” MIT’s success will no doubt be emulated by other institutions.

Hundreds of other projects have been designed to increase the numbers of successful women scientists, many funded through NSF’s ADVANCE (Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers) grants (see the box, next page).
Feature

A Sample of Successful Projects

Work–life balance
Faculty Family Friendly Edge at the University of California, Berkeley, is a comprehensive effort to create a culture supportive of families that includes stopping the tenure clock to allow time for infant care, a flexible part-time option or leave given to family caregivers, on-site child care, and a job search program for partners and spouses. The university conducted surveys in 2002 and 2003 and found “impressive gains in awareness and use of core family responsive policies.” Women assistant professors also have children significantly more often than in the past.

Enhancing women’s confidence and skills
CareerWISE (www.asu.edu/careerwise), at Arizona State University, provides free online professional coaching and support to women STEM graduate students. CareerWISE trains women to better handle key issues, including their relationship with advisers, work–life balance, unwelcoming climates in academic departments, and unexpected hurdles to completing their degree. A randomized clinical trial showed that women who used the training tool gained confidence and resilience and increased their self-assessed competencies.

Transforming organizational cultures
The Center for Research on Learning and Teaching at University of Michigan created a novel way to nurture a more supportive environment. Through skits, professional actors depict scenes from faculty meetings aimed at demonstrating real-life situations, such as a male senior professor interrupting a junior female faculty member. The project has spread to other campuses. “The best evidence we have of the power of the theater program is the fact that our faculty—and indeed faculty all over the country—report that it makes them think about everyday interactions they normally take for granted,” says Abigail Stewart, professor of psychology and women’s studies and director of the university’s ADVANCE Program. The project is one of many ADVANCE-supported initiatives, she says, that have led to more women faculty members in STEM disciplines at the university.

Women supporting women
Women Evolving Biological Sciences (WEBS; www.engr.washington.edu/advance/webs) is a collaboration of researchers at University of Washington and University of California, Santa Cruz. WEBS holds occasional three-day symposia, bringing together women scientists in academia and research settings to network, share practical advice, hear success stories, and learn about a range of career options.

“Qualitative data from longitudinal studies of participants paint WEBS as a transformative early career experience,” says Claire Horner-Divine, assistant professor at the University of Washington’s College of the Environment, and WEBS’s principal investigator. Participants say they increased their professional skills, heightened their awareness of the intricacies of academia, and gained confidence and courage to advance in their field.

Other organizations support women in industry, as well. Women in Bio, established in 2001 in the greater Baltimore–Washington, DC, area, promotes leadership and entrepreneurship of women in the life sciences. Nationally, there are 600 members and a handful of chapters. Members network, connect with mentors, and get advice on finding investors. Although the organization does not collect data, Debra Bowes, president, says, “Our sense is that women’s leadership in bioscience is growing.”

The renewed attention on women in science leaves Sutton-Grier feeling hopeful about her future as a scientist. “There are so many more opportunities out there than I ever realized,” she says. “It’s incredibly liberating and exciting to me.”

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