

REACHING GENDER EQUITY IN SCIENCE:

THE IMPORTANCE OF ROLE MODELS AND MENTORS

The number of women embarking on science careers has been increasing steadily during the past several decades. Although women scientists continue to be underrepresented at the faculty level, many women have established rewarding and successful careers in science—thanks in part to having had role models and mentors whose paths they could follow. **By Laura Bonetta**

Judith Weis knows about the value of role models. Last spring, the biology professor received a heartwarming e-mail from a woman who had been inspired to pursue a career in science by a television commercial—one that Weis had starred in.

In the 1970s the makers of a popular orange beverage called Tang shot a series of television commercials featuring women scientists with their children. Weis, who had recently joined the faculty at Rutgers University in New Jersey, took part in one of them. The e-mail writer saw the commercial as a child and went on to obtain a Ph.D. in pathology in 1987. “I vividly remember the commercials and thinking—I can do that!” she wrote. “So, thank you—for deciding to make the commercial and become a positive role model, not only for me but hopefully many other women.”

When Weis started her research career in marine biology, there were few women scientists, particularly at the faculty level. “The department I joined was exceptional because it had three tenure-track female faculty,” she says. “It was very unusual for back then.” The situation has changed dramatically in the past three decades. “Up until the 1970s women were not even allowed to go out on oceanographic vessels. In the 1980s things changed a lot. I remember one of the first signs was going to a conference and there was a line for the women’s bathroom,” recalls Weis laughing. “Since then women have been flocking to marine biology.”

Weis’s experience parallels national trends in the United States. According to the latest figures from the NSF (National Science Foundation)—Women, Minorities and Persons with Disabilities in Science and Engineering, 2009—in 2006 women accounted for more than half of all graduate students in some science fields—76 percent of graduate students in psychology, 56 percent in biological sciences, and 54 percent in social sciences. (But women made up only 23 percent of graduate students in engineering and 25 percent in computer science.) Women also accounted for a rising share of postdocs in all fields except computer sciences; in 2006, 53 percent of psychology postdocs, 46 percent of social sciences postdocs, and 41 percent of biological sciences postdocs were women.

At the faculty level, however, change has been slower. According to the report released in June 2009 by the National Research Council, National Academy of Sciences (NRC), Gender Differences at Critical Transitions in the Careers of Science, Engineering and



Marcie McClure

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Mathematics Faculty, women are not applying for tenure-track jobs at research-intensive universities at the same rate that they are earning Ph.D.s. For example, while women received 45 percent of the Ph.D.s in biology from 1999 to 2003, they accounted for 26 percent of applicants to tenure-track positions.

European figures are similar. Preliminary findings of the She Figures 2009: Women in Science Across Europe report, produced by the European Commission, reveal that in 2006, 45 percent of students graduating in the European Union at Ph.D./Doctorate level were women—an improvement over the 2002 figure of 42 percent. (There were, however, significant differences between disciplines, with women being noticeably less represented in the physical sciences and engineering, compared to life and social sciences.)

But as in the United States, career retention is an issue for European female researchers. The EU average of women in Grade A research positions—the single highest post at which research is conducted—in 2007 was only 20 percent. This is an improvement from 2002, when this figure was 17 percent.

Having Role Models

One of the factors that has inspired more women to pursue scientific careers has been having examples of successful women who have done the same. “When you are 24 or 26 and are looking at different career options—industry, academia, or government labs—men see three clear paths and will know several people who **continued** »

UPCOMING FEATURES

Postdoc 1: Life Beyond the Bench—March 5

Faculty 1: Lab Management—March 12

Careers in Bioinformatics/Systems Biology—April 9

DIVERSITY: WOMEN IN SCIENCE



“For those of us with many years of experience in this scientific endeavor, it is critically important that we serve as mentors.”

— Geraldine Richmond

traversed each one. They can see other men 20 years down the line,” says **Geraldine Richmond**, a professor of chemistry at the University of Oregon. “But for women it is more of a fog. They may not know anyone who has gone that road, or at least no other women. So they cannot visualize where they are going to go. If you plan to have children, but don’t see any women who have gone that path, you may not be sure it’s possible.”

To help provide role models for young women scientists, Richmond co-founded the Committee on the Advancement of Women in Chemistry (COACH)—a program that provides dozens of professional development workshops and networking events each year for women scientists and engineers around the country. So far the COACH workshops have impacted the careers of over 4,000 women. “In addition to the training, women have the opportunity to share their challenges and successes, helping to make those paths less foggy,” says Richmond.

Richmond is herself a mentor and role model to many students and postdocs in her department and around the country. “For those of us with many years of experience in this scientific endeavor, it is critically important that we serve as mentors to others that are following in our footsteps, helping them to identify the career path that best fits their values and aspirations, and to help them to succeed,” she says.

Having role models may be particularly critical in fields where there are fewer women. **Aoife Moloney**, a lecturer at the School of Electronic and Communications Engineering at Dublin Institute of Technology in Ireland, has always been in the minority. “It’s something you have to get used to,” she says. “I have been used to it for the most part of my life. Few women do math and physics.”

To help get more women into the field, she takes part in Role Model Day at her institute. “That has been very successful. We invite women engineers working in industry mainly. They talk to second level students about doing engineering,” explains Moloney. “We always inspire a few students.” And although being the sole woman in a department can be off-putting to some, Moloney does not think that prospect should keep women away from engineering. “The field is welcoming to women,” she says. “Men like to have female colleagues. They enjoy working in a more mixed environment.”

Marcie McClure, a professor in the Department of Microbiology at Montana State University, Bozeman, came up with a different strategy to introduce young students to role models in her field. “Four years ago I was attending a conference in Brazil. I was in the swimming pool with some students who were saying that there was no place for women in bioinformatics. They thought the field was too

cutthroat and male dominated,” recalls McClure. She realized that those students did not know that many of the pioneers in the field of bioinformatics had been women.

As a result, she decided to make a documentary of interviews with prominent women scientists. “We filmed these women as we asked them about their youth, their being mentored, why they became fascinated in science,” says McClure. “I wanted young women to know that there is a place for them in science.”

The videos are now available online through SciVee TV (<http://www.scivee.tv/user/womeninbioinformatics>).

The Importance of Mentors

The NRC’s committee in charge of the Gender Differences report determined that women who had a mentor did better than women without one.

They reached this conclusion by analyzing the results of two national surveys, taken in 2004 and 2005, of tenure-track and tenured faculty in six disciplines (biology, chemistry, mathematics, civil engineering, electrical engineering, and physics) at 89 institutions. They found that in chemistry, for example, female assistant professors with mentors had a 95 percent probability of having grant funding versus 77 percent for those women without mentors. Across the six fields surveyed, female assistant professors with no mentors had 68 percent probability of having grant funding versus 93 percent of women with mentors.

Stem cell researcher **Amy Wagers** realized early in her career the importance of “having the perspective of people you can trust.” Part of the reason she accepted a faculty position at Harvard Medical School was that she thought she would have good mentors there. “Even as I was going through the interviewing process I was thinking, Who would be a good mentor?” she says. “I was looking for people who seemed genuinely interested in my work and also in mentorship.” She now has several mentors in her department, as well as outside her institution.

Wagers herself has since become a mentor to numerous graduate students and postdocs, many of whom are looking for examples of successful scientists who have achieved a healthy work-life balance. “Some graduate students will ask me, Is it more of a challenge for a woman to do science?” she says. “But it’s the same for everyone. You really have to love what you are doing. Then it’s not a challenge but an opportunity.”

To increase the chances that scientists will benefit from mentoring, a number of universities and national organizations have created programs to formalize the process. For example, the Association of Women in Science has many chapters around the country that bring women scientists together to network. For scientists who cannot meet in person, MentorNet is an online service that virtually connects established scientists with undergraduates and graduate students, postdocs, and beginning faculty (www.mentornet.com). In Europe the Max Planck Institute of Biophysics in Frankfurt, Germany, set up “Minerva-FemmeNet,” a network for female scientists at www.mpibp-frankfurt.mpg.de/misc.

The NSF provides grants through ADVANCE (which stands for Increasing the Participation and Advancement **continued** »

FEATURED PARTICIPANTS

Association of Women in Science
www.awis.org

Committee on the Advancement of Women in Chemistry
coach.uoregon.edu

Dublin Institute of Technology
www.dit.ie

European Commission
ec.europa.eu

Harvard Medical School
hms.harvard.edu/hms

Max Planck Institute
www.mpg.de/english

Montana State University
www.montana.edu

National Research Council
sites.nationalacademies.org/NRC

National Science Foundation
www.nsf.gov

University of Michigan
www.umich.edu

University of Mississippi
www.olemiss.edu

University of Oregon
www.uoregon.edu

Yale University School of Medicine
medicine.yale.edu

of Women in Academic Science and Engineering Careers)—a program that supports the development of systemic approaches to increasing the representation and advancement of women in academic science, technology, engineering, and mathematics. Many such approaches, funded through ADVANCE, include a mentoring or advising program.

The University of Michigan received an ADVANCE grant for its Supporting Women Scientists and Engineers program, which includes career advising, networking opportunities, discussions, as well as grant opportunities. “We are trying to get women scientists to network more and encourage them to seek multiple mentors,” says **Laura Olsen**, associate chair of Molecular, Cellular, and Developmental Biology and one of the program’s career advisers.

Given the growing awareness of the importance of mentoring and the number of programs to support mentoring programs, it is perhaps surprising that many faculty members lack mentors. The NRC’s surveys asked tenure-track faculty and faculty tenured after 2001 whether they had or have a faculty mentor at their current institution. Among tenure-track faculty, 49 percent of the men and 57 percent of the women reported having a faculty mentor. Among recently tenured faculty 45 percent of men and 51 percent of women reported having a faculty mentor.

And although women were more likely than men to have mentors, they reported being less likely than men to engage in conversations with their colleagues on a wide range of professional topics including research, salary, and benefits. “This distance may prevent women from accessing important information and may make them feel less included and more marginalized in their lives,” says the report.

“Regardless of whether you are a man or a woman, you will need mentors at every level of your career,” says **Jane Reckelhoff**, a professor in the Department of Physiology at the University of Mississippi Medical Center in Jackson. “Even the chair of the department needs mentors.”

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Reckelhoff, who received a Ph.D. in biochemistry from the Medical College of Virginia at the Virginia Commonwealth University in 1985, says she was fortunate that her graduate adviser was a very good mentor and taught her what proper mentoring is about. “She taught me everything, from writing papers to how to conduct myself at a meeting,” recalls Reckelhoff. “She was very involved in what I was doing.”

Since then Reckelhoff has had many mentors, both men and women, and she is herself a mentor to several postdocs. “They come to me about anything having to do with research, to interactions with people in the departments, to interpersonal relationships. I have the same types of conversations with female and male graduate students,” she says.

Moving Forward

The data show that much progress has been made in advancing the careers of women scientists. The proportion of female graduate students and postdocs in most scientific fields is higher than it’s ever been. And although women scientists are in the minority at the faculty level, women faculty tend to be as successful as their male colleagues. According to findings reported in the NRC’s Gender Differences, although women are underrepresented in the applicant pool for faculty positions in many fields, those who do apply are hired at rates equal to or higher than those for men. Similarly, although fewer women are considered for tenure compared to men, those who are receive the promotion at rates equal to or higher than men.

Despite such progress, there are still challenges. As **Sally Shaywitz** of the Yale Center for Dyslexia and Creativity at Yale University School of Medicine said in a press release accompanying the NRC report, “There is a movement toward more gender equity than noted in previous reports or often publicly appreciated. At the same time, the findings show that we are not there yet. The gap between female graduates and the pool of female applicants is very real, and suggests that focus next be placed on examining challenges such as family and child responsibilities, which typically impact women more than men.”

While it may take some time to reach true gender equity in science—as well as other professional fields—role models and mentors will continue to play important roles for moving in the right direction.

Laura Bonetta is a scientist turned freelance writer based in the Washington, D.C., area.

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