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DIVERSITY

Structural approach

The field of materials science is working to broaden the range of people it attracts.

BY LEIGH KRIETSCH BOERNER

A report on diversity says that by far the most PhDs in materials science in the United States go to white men. This group also receives more and better mentoring than do female doctoral students or those from other ethnic groups. The report recommends that universities and federal agencies work to boost enrolment of graduate students from minority groups and improve their mentoring, and initiatives and programmes have already popped up around the country that aim to equalize the playing field in the discipline.

The report, *Ethnic Diversity in Materials Science and Engineering*, released in September by the US National Science Foundation (NSF), is an outgrowth of a symposium in 2012 on the state of diversity in the field. Sponsored by the NSF and the US Department of Energy, among others, the symposium found

that gender and racial bias continue to affect education and workplace practices. The report was released almost two years after the workshop because it included contributions that took time to collect and organize, says Justin Schwartz, who organized and chaired the 2012 symposium and is head of the materials-science and engineering department at North Carolina State University in Raleigh.

Yet efforts are under way to mitigate bias and its effects in the field. Olivia Graeve, a materials scientist at the University of California, San Diego (UCSD), launched a small-scale research-education venture in 2012 for Latino high-school students from San Diego and Mexican students from Tijuana. The programme, called REACH, aims to motivate these students to attend university, and is run between their third and final years of high school. Participants live in the UCSD dorms for seven weeks while doing research in Graeve's and other faculty members' labs.

The first class drew five students. The second attracted 20, and next summer she expects 40, even though the programme is advertised only on its website (go.nature.com/bv3qzp). "For many of the students, this summer of research had an impact in choice of major, and also in choice of university," she says, especially for Mexican students who hope to come to the United States. Funding for her venture comes from the NSF, the UCSD chancellor's office and from her own start-up package.

Graeve says that she was fortunate to have received a great deal of support as an undergraduate, both in mentoring and in research opportunities, and was lucky to have a great mentor during her PhD at the University of California, Davis.

She has always felt that she and her research were sought after and respected wherever she has been studying or working, including San Jose State University in California; the ▶

► University of Nevada, Reno; Alfred University in New York; and the UCSD. She says that she had never personally encountered overt discrimination or felt disadvantaged in her field even though she is a woman and a Latin American. “I have always been very optimistic, and I tend to have blinders on about this type of thing. I don’t notice subtle things, and discrimination tends to be subtle,” she says.

Nonetheless, Graeve knew that bias existed, and came face to face with it once. “At one point in my career, somebody said I got hired because I was a Latina, and I said, ‘So what?’” So she started to think about ways to combat such opinions and had come up with the idea for her initiative before she attended the symposium in 2012. The symposium helped her to develop concrete ideas for implementing it, however.

STRONG APPROACH

More formally, the Partnership for Research and Education in Materials (PREM) programme is trying to boost diversity in materials-science research and education and close the mentoring gap. Launched in 2004 by the NSF and the worldwide Materials Research Society, PREM matches undergraduate and high-school students with graduate programmes throughout the United States for a variety of activities, including summer research projects, poster sessions, lectures and networking opportunities.

Yves Chabal and Magaly Spector of the University of Texas at Dallas have brought undergraduates who have gone through PREM into the university’s materials-science graduate programme. They launched an outreach initiative this year with Xavier University of Louisiana in New Orleans, a historically African American university that does not have graduate programmes in the sciences, to bring its students to Dallas. As a result, the initiative has already drawn two more graduate students.

Spector, assistant to the president of strategic initiatives and a professor in practice at the University of Texas at Dallas, is the chair of the Materials Research Society diversity subcommittee, for which she sets up mentoring programmes that bring students together with graduate institutions. She and Chabal, who heads the university’s materials-science and engineering department, have also created the Young Women in Science and Engineering Investigators Program, another initiative that resulted from the diversity workshop. The venture targets girls from the Dallas area, where many students struggle to find the funds to attend university, who are in their third or fourth year of high school. “These are

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Magaly Spector (second from left) was involved in setting up a programme for young women in science.

very motivated students,” Chabal says, “with no exposure to research. Some of them haven’t even thought of going to college.”

Teams of girls choose research projects and are paired up with graduate students and postdocs. They then work on these projects over the academic year and finish with a poster presentation. The three teams who perform best receive partial scholarships to the university. This is the programme’s third year, although so far none of the winners have gone on to the university — they were seniors at the time, and had already made college plans. This year, 51 girls, mostly in their third year, are participating; of these, 9 will win scholarships.

The NSF report incorporates results from a survey conducted at the symposium that aimed to find out what is blocking students from minority groups from starting careers in materials science. The results reveal a striking difference in the type and amount of mentoring that students from minority groups receive compared with white men. For example, students from minority groups are less likely to be introduced to other researchers in the field by their advisers at conferences; they also receive less encouragement from advisers, faculty members, lab heads or department chairs, for example, to submit their research — in short, the sorts of practices that help to smooth a student’s path into professional development, which can help to lead into a successful academic or industrial career.

The report found that in 2011, white people, and in particular white men, overwhelmingly earned the highest proportion of materials-science PhDs in the field, at 60% and 76%, respectively. Asians, the most successful minority group, earned around 14% of the PhDs. Degrees were rarely awarded to African American or Hispanic students, at around 3% each. Women get about 24% of the PhDs.

Schwartz helped to organize the symposium as a way to identify diversity issues at the graduate level. “There really hasn’t been that

much progress made at the higher levels [of education],” he says. “I thought there was a need to come at it from a different perspective.”

Although the report incorporates input from materials-science researchers and students from minority groups, it does not provide suggestions for responding to or countering any bias or discrimination that they might encounter during training or in the workplace.

SELF-AWARENESS

Materials scientists at all levels need to try to become more aware of their biases, especially unconscious ones, the report recommends. “This is easy to say, not easy to do,” says Eve Fine, a researcher and workshop developer at the Women in Science and Engineering Leadership Institute at the University of Wisconsin–Madison. That awareness is the first step to overcoming biases, she says. A second step is to replace the bias with a counterpoint: for example, when someone hears someone say that women are not good at maths, that person should think of a woman who is very good at maths.

An online quiz (<https://implicit.harvard.edu/implicit>) can help people to learn to recognize their unconscious biases, and that is the first step to dissolving them. Even considering gender and race when hanging pictures on an office wall or posting on a department web page can help to combat implicit bias, Fine says.

Although these activities can boost awareness of biases, the road to equality in the sciences is a long one, Fine concedes. “If you’re at an institution that does not even believe that bias plays a role, it’s a giant step to develop awareness,” she says. But she believes that incremental improvement is taking place. “It’s not going to be two years and the problem goes away. But I think we are seeing progress.” ■

Leigh Krietsch Boerner is a freelance writer in Bloomington, Indiana.