ARRI EISEN

A New Model for Increasing Diversity in STEM Faculty

In 2018, I became the first woman of African descent to receive tenure and promotion to Associate Professor in the Department of Chemistry at Georgia State University.… My two former PhD students—both women of color—are now assistant professors in their own independent careers—teaching and mentoring undergraduates. The legacy of FIRST continues.

—Suazette Mooring, PhD, FIRST alumna

To celebrate the twentieth anniversary of Emory University's FIRST program—Fellowships in Research and Science Teaching—we recently gathered a dozen alumni to organize a public symposium. They were professors, deans, and experts from around the nation. One, Andrea Morris, who gave the keynote address, is at Rockefeller University, another is at Emory, another at Morehouse College, one at Spelman College, one at New York University. Every one of them is black.

We wanted the symposium, "Becoming a Scientist in the 21st Century: 20 years of FIRST as a Model for Success," to capture the spirit of their experiences in the largest and longest continuously running biomedical postdoctoral training program in the country. The symposium was targeted at young people—undergraduates, graduate students, postdocs—who dream of careers in science or medicine, and also to administrators and educators who want to educate and support complete scholar-scientists.

Postdocs: the critical transition

FIRST was the brainchild of Clifton Poodry at the National Institutes of Health in the late 1990s. The idea was to provide a new model for preparing future academic scientists that would give them rigorous training in research *and* teaching, and, ultimately, to increase the numbers of talented underrepresented minority students pursuing biomedical careers. FIRST is open to anyone, but attracts many women and people from other underrepresented groups. Since FIRST's inception, 20 programs like it have been developed around the country.

Postdoctoral fellowships, essentially a required step on the way to a faculty position in the sciences, exist in a complicated social and administrative space; postdocs are no longer students, are not yet faculty, and are not staff. They tend to be isolated and poorly paid. Most fellows are in their late twenties or early thirties, often with young families, and the financial burden is disproportionately challenging for underrepresented minorities and women, especially those starting families. Between 1980 and 2013, the older, traditional career pathway in science, technology, engineering, and mathematics (the STEM fields) produced a ninefold increase in underrepresented minorities earning PhDs in biomedical fields; however, it failed to produce *any* increase in professors in this demographic over the same period. No increase was seen, then, in the number of mentors and role models from underrepresented groups who could diversify and enrich the experiences and opportunities of majority and minority students in STEM fields. The situation is similar

PAMELA PHATSIMO SUNSTRUM *Spear*, 2017; gouache and pencil on wood panel; 15 3/4 x 11 3/4 inches

for women. Although they now represent over half of all undergraduates earning degrees in the biomedical sciences, and the number of women STEM faculty has increased this century, women still represent only 33% of STEM professors in the United States.

Social science research identifies some potential explanations for this gap: structural issues persist in recruiting, hiring, and retention, and many scientists who are underrepresented minorities or are women choose to give back to their communities in ways other than through traditional faculty jobs. But the nation needs more diversity among the faculty who influence students, and postdoctoral programs can help close this gap. Traditional STEM postdocs are trained exclusively in research, thus focusing on only one aspect of future faculty members' responsibilities, even though they will likely spend a third or more of their time teaching. Why not create postdoctoral experiences that integrate training in both research and teaching, while simultaneously developing strong community, to more effectively model the life of the professors that postdocs hope to become?

Our alternative model features partnerships between universities that engage in the highest levels of research activity (known as Research I universities) and minority-serving institutions. FIRST is a collaboration between Emory University and several historically black institutions: Morehouse College, Spelman College, Clark Atlanta University, and the Morehouse School of Medicine. Our model interweaves a traditional, rigorous research postdoctoral experience at Emory with a structured teaching experience at our partner schools.

By all traditional measures of what it means to be a successful academic scientist, FIRST works. Compared with a control group of traditional "research-only" postdocs funded by the National Institutes of Health, FIRST fellows publish in the peer-reviewed literature at similar rates and with similar quality and impact. Like the alumni involved in planning the symposium, they get similar kinds of jobs and obtain funding at similar rates in similar time frames after getting those jobs—although, unsurprisingly, a greater percentage of those jobs are at liberal arts and minority-serving institutions. As important, of FIRST's nearly 200 alumni, almost half are black and about 70% are women. Virtually all our alumni are *still in science*, representing a retention rate 25 times the national average for blacks and twice that for women.

It's about the community

But why does FIRST work? How can a program that asks *more* of its postdocs be working—and working *better*—for retaining underrepresented groups and women in science?

The FIRST fellows' overwhelming response to this question, reported in numerous surveys and focus groups

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PAMELA PHATSIMO SUNSTRUM *Time, Place, & Identity*

Born in Mochudi, Botswana, artist Pamela Phatsimo Sunstrum's work merges ideas of ancient mythologies with scientific theories. Sunstrum is interested in topics such as the origins of time, geological concepts, and ideas about the universe. Her works on paper, large-scale installations, and stop-motion films are rooted in autobiography. They address the development of transnational identities, human connections, and cross-border rituals. Having lived in Africa, Southeast Asia, and the United States, Sunstrum developed an alter-ego, Asme, to convey her unfixed, evolving sense of identity. The image of Asme is often superimposed with overlapping gestures as a means of suggesting compounded time, illustrating her universal, temporal existence. Sunstrum's landscapes also expand on themes of timelessness; she reconstructs sites both real and imagined to reveal the small scale of individuals within the vast universe, a concept that's reminiscent of eighteenth century notions of the sublime.

Sunstrum came to the United States in 1998 and received degrees from the University of North Carolina at Chapel Hill and the Mount Royal School of Art at the Maryland Institute College of Art. She lived in Baltimore, Maryland, as an artist-in-residence at the Baltimore Creative Alliance while also teaching at the Maryland Institute College of Art. She is currently based out of Johannesburg, South Africa, and is showcased in both individual and group exhibitions around the world. Sunstrum was appointed assistant professor in the Department of Visual Art & Art History of York University in 2017.

PAMELA PHATSIMO SUNSTRUM
Monsters, 2018; gouache and pencil on wood panel; 19 3/4 x 15 3/4 inches

over the years and across their careers, cites the program's intentional community. Half of the fellows, when asked at any point in their career trajectory—from their initial year in FIRST to the time they earn tenure and beyond—say that *they wouldn't have remained in science at all* if there wasn't a program such as FIRST.

Community is layered formally and informally throughout the FIRST experience. Fellows are recruited as a cohort from a competitive pool gathered by word of mouth and by presentations describing the program at professional meetings. From their arrival at Emory, fellows are encouraged to have meals together. Their first year they take a course with me on teaching; they have monthly research and teaching seminars with all the FIRST cohorts currently in the program; they select teaching mentors together; and together they attend the national meetings of the other programs like FIRST. Sarah Stabenfeldt, now an associate professor in the Arizona State University School of Biological and Health Systems Engineering, encapsulates the thoughts of many FIRST alumni when she says, "maybe most important [was] a supportive community where I could learn from others … asking the same questions, working through problems together. This community is why I had the confidence to apply to faculty positions, felt confident in leading a classroom of 100 students from the start of my faculty career, and put my research ideas out there…. I still lean on my contacts and network established during my time in FIRST."

Teach your fellows well

The second most common reason that fellows cite for FIRST's success is the training and practice in teaching. Fellows' mentored teaching experience comes in the context and structure of a supportive community that includes their peers, their teaching mentors, more senior fellows in FIRST, and the program directors. The teaching mentors are often FIRST alumni or other faculty who have worked with fellows over the years. As compared with research, teaching is more of a communal enterprise, its scholarship more interactive and social by nature. This FIRST fellow comment is telling: "As a scientist, I know the importance of going to weekly lab meetings or international meetings to develop a network of individuals to bounce ideas off of and present my research. The FIRST cohort of fellows provided that same setting, but instead of being focused on my specific field of research, it allowed me to discuss student mentoring, teaching, and how to bridge research into teaching. And the proximity of the cohort was essential to my experience in the fellowship. The opportunity to gather fellows quickly for a practice interview or to discuss topics for a course was only possible with the large cohort of fellows."

I lead the semester-long weekly seminar on teaching for the new cohort, explicitly integrating teaching as a practice that builds community and skill. Over the course of the semester, we explore the diversity of our backgrounds and our research, which runs from chemistry to genetics to public health, and become familiar with cutting-edge pedagogy. Fellows begin developing teaching portfolios, design their own course, practice teaching it to the seminar group using the pedagogies discussed, and receive detailed feedback from me and their peers.

Between 1980 and 2013, the older, traditional STEM career pathway produced a ninefold increase in underrepresented minorities earning PhDs in biomedical fields; however, it failed to produce any increase in professors in this demographic in the same period.

Toward the end of their first year, fellows meet a group of potential teaching mentors at our partner schools, where the layers of community are powerfully exemplified. Of the dozens of these potential mentors, as many as half are former FIRST fellows (18 of our faculty at minority-serving partner institutions are FIRST alumni), and several mentors also have *their* mentors in the room. Once teaching mentors are identified, we lead a workshop with mentors and mentees to plan the teaching experiences, which develop from an observational role to leading a full-semester class.

Empowering the critical masses

As fellows apply for jobs, give practice seminars for job interviews, and then get those jobs and move through promotion and tenure, they continue to share experiences and resources both within FIRST and across the network of similar programs nationally.

Institutions hiring new professors consult our website to identify promising candidates, suggesting that FIRST and programs like it are beginning to create a critical mass of postdocs in the workforce attuned to issues important in the retention of talented people from underrepresented groups. Indeed, this community of support is especially important for people such as Suazette Mooring—the chemistry trailblazer at Georgia State, a woman, and an underrepresented minority—who are often the only, or one of the few, faculty of their demographic in their department or college.

The next step is a critical mass of underrepresented faculty at schools and departments across the country and of

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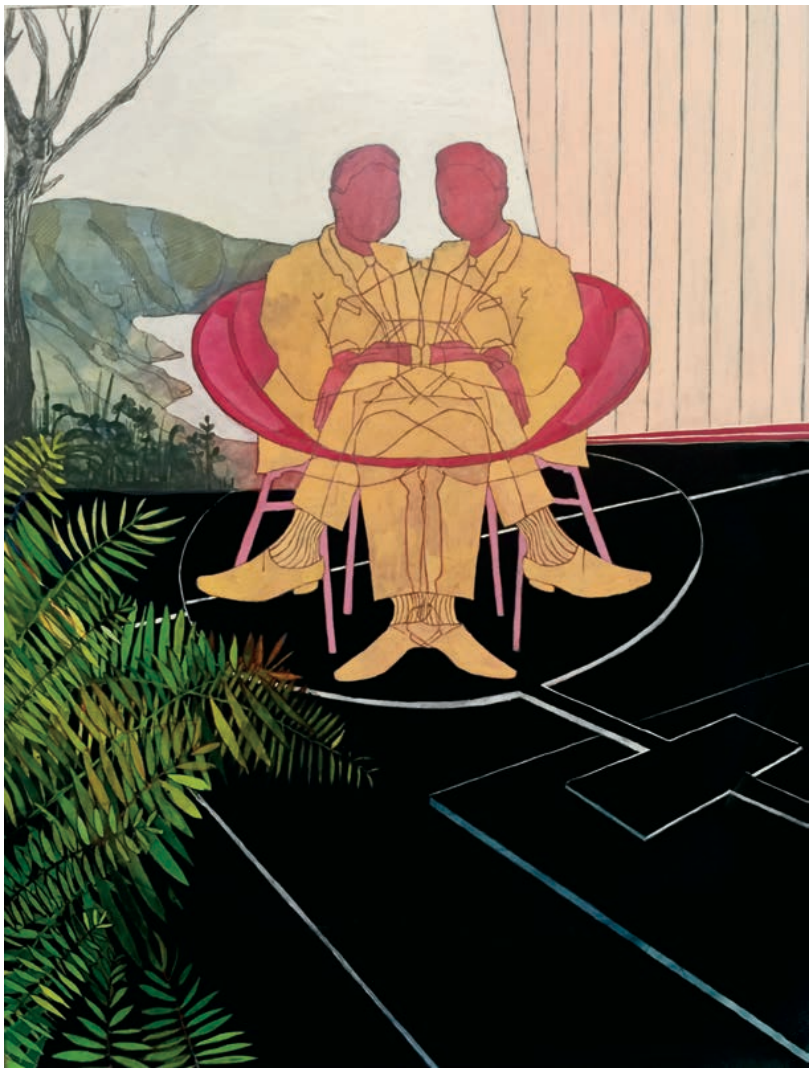
PAMELA PHATSIMO SUNSTRUM, *Choice Assorted*, 2017; pencil and gouache on wood panel; 15 3/4 x 11 3/4 inches

PAMELA PHATSIMO SUNSTRUM

Left: *Atelier,* 2017; pencil and gouache on aquabord; 10 1/8 x 8 1/8 inches

Right: *Pop,* 2017; pencil and gouache on cradled wood panel; 14 3/4 x 1/8 x 1 5/8 inches



underrepresented students who see themselves in STEM careers. As Derrick Morton, one of the African-American FIRST postdocs puts it, "As a Kentucky native, growing up in the '80s and early '90s, I rarely, if at all, saw anyone who looked like me—in my classrooms, at the doctor's office, or even on television.… As an undergraduate biology major, I was still faced with not seeing myself amongst my peers or the faculty, which led me to continue to question whether I belonged in science." The more diverse the faculty, the more role models to inspire the next generation.

The alternative postdoctoral training model that FIRST represents has been extremely effective in retaining women and underrepresented groups in science, yes, but *all* postdocs benefit from social and intellectual community and career development opportunities beyond the lab bench. If you want to be a professor in the twenty-first century, doesn't it make sense to learn how to do research as well as how to teach? When FIRST began, other Emory postdocs saw what we were doing and asked the administration for a structure to support them too. In response, Emory established one of the first offices of postdoctoral development in the country.

Good for everyone

Importantly, FIRST fellows who are not underrepresented minorities enter the professoriate with a much greater appreciation of issues of inclusive education. Laurie Krug, FIRST alumna and research faculty at the National Cancer Institute, noted that as a white woman from rural South Carolina, FIRST made her aware of the critical need for diversity in STEM and cognizant that mentoring and active engagement of underrepresented minorities are vital for their retention. This model is as transformative for the Laurie Krugs of the world as it is for the Suazette Moorings.

As we organized the celebration of our twentieth anniversary, which took place on February 29, 2020, I was struck by how the planning process itself was a dramatic indicator of FIRST's success. Sitting down with the moderators and panelists, I encountered young scientists, from postdocs to full professors, women, men, whites, blacks, LatinX, Asians, who were all almost immediately on the same page. They quickly decided the symposium would be for the next generation of aspiring scientists—catalyzing them to think and act to accelerate the momentum created by FIRST and programs like it.

How do we increase underrepresented groups and women in the STEM professoriate? We create and facilitate diverse and interconnected cohorts of socially and intellectually engaged PhD scientists—scientists who are educated within a structured postdoctoral fellowship community to be complete scholars, in research, teaching, and mentoring. Sounds like a good idea for all aspiring faculty, doesn't it?

Arri Eisen *is FIRST's Director of Teaching and the Nat C. Robertson Distinguished Teaching Professor in Science & Society in the Department of Biology, the Institute for the Liberal Arts, and the Center for Ethics at Emory University.*