So you want to be a scientist

FOR CENTURIES IN THE WESTERN WORLD, the study of science has been dominated by a specific demographic – those with economic and cultural advantages necessary to advance in academics and research careers. Likely white, likely male.

In 2018, a National Institutes of Health study found that, over the previous seven years, only 1% of NIH grants for experienced investigators went to underrepresented minorities. The percentages for early stage and new investigator funding were only slightly higher.

Diversifying research is crucial, not only for the benefit of the young scholars entering various fields, but for the disciplines themselves, says Dr. Lee Phillips, director of UNC Greensboro’s Undergraduate Research, Scholarship, and Creativity Office.

“A diverse set of researchers can more effectively identify and address problems, particularly in a country like America where our professional workforce doesn’t reflect our diverse demographics.”

But to shake up the scientific workforce, Phillips and his colleagues say, you have to start at the beginning.

Most students enter college unprepared for research careers. They don’t know how to ask questions, conduct projects, or present their results.

What takes undergraduates to the next level? What gets them to the point where they may consider graduate school and a scientific career?

Phillips says mentorship from a faculty member is proven to help students succeed in college and then advance to graduate school. Students also thrive with exposure to the professional research world.

But a student needs economic freedom to spend time doing that. They need peers, mentors, or educational experiences to introduce the idea of conducting research – both the reasons and the processes.

Much of this depends on socioeconomic circumstances. And that undeniably keeps students and universities, as well as fields of study and industry, locked within systematic racism.

Two years ago, nanoscience professor Dan Herr, Phillips, and their colleagues won NIH funding to launch a MARC U-STAR program. Through the two-year program, promising underrepresented students receive financial support, targeted mentoring, hands-on experience, and exposure to the professional world of research.
Anaheim, California.

One week out from their departure to the program, with an impetus to present attend the conference for both years of Phillips calls “a rock show for biology and Conference for Minority Students, which attend is the Annual Biomedical Research DEVELOPING SCHOLARS

One of their progress, advises them, and plans coordinator Traci Miller, who tracks team. Another critical student relationship, project launched, and recently joined the PI Petersen mentored MARC fellows when the Associate Professor of Chemistry Kim Graves has worked with MARC U-STAR programs and similar initiatives since 1985. As the first African American to have earned a Ph.D. in evolutionary biology, he believes the most effective mentorship for minority students comes from minority scientists. Throughout his career he has made a point of seeking out these students to mentor them. Gradual and postdoctoral researchers in his lab are encouraged to provide similar mentorship to the next generation of researchers.

“Nothing drives me like finding ways to increase his lab time considerably. During his on-campus research experience this past summer, he learned to work through many different phases of research, with the ultimate goal of identifying anticancer drug leads from different fungi. He began by mastering the extraction of fungal cultures and quickly advanced to techniques, such as high-performance liquid chromatography, for purifying drug leads. Once compounds are isolated, he analyzes their structures via nuclear magnetic spectroscopy and mass spectrometry, gaining valuable skills on UNCg’s highly precise research instruments.

Roberts knew he could succeed in the classroom, but he says he couldn’t have done so without hands-on research experience – and his mentor agrees.

“The most meaningful inspiration comes from the students I work with,” says Petersen. “He has become a great example not only me but the whole lab,” says Knowles. “He works with me is thrilling.”

The work Mo’nay is participating and, therefore, the resulting work with Oberlies, is also the recipient of an NSF STAMPS – Science, Technology and Math Preparation – scholarship. The STAMPS program and MARC U-STAR are just two of a host of initiatives at UNCg targeting underrepresented students.

in every university her work is highly coveted, Oberlies says Roberts is much more likely to be able to find one as a MARC fellow. As a funded student who already has experience in the lab, he is an asset.

**STAND–OUT GROWTH**

Senior biology major Mo’nay Rodgers applied to become a MARC fellow in 2018. In her cell biology course during her junior year, she realized, for the first time, that she had potential to excel as a scholar.

“Cancer cell cycling was interesting to me,” she recalls. “I wasn’t a class where I had to study, but I wanted to.”

She was accepted into MARC, and though she could have graduated in 2019, she decided to stay an extra year to fully make use of the research opportunities and mentorship she would receive. Now in her second year of the program, she has assisted in Dr. Graves’ genomics laboratory for two different projects and also worked at the Purdue University Center for Cancer Research.

Rodgers is especially pleased about the opportunity to attend and present her work at academic conferences – not only ABRCMS and UNCG’s Thomas Undergraduate Research Expo but also the Biocomputational Evolution in Action Conference, an NSF-funded event in Lansing, Michigan.

At the most recent ABRCMS, Rodgers presented her work on iron magnetite resistance in E. coli, and the resulting genetic adaptations that can produce more dangerous strains of the bacteria.

“The work Mo’nay is participating in helps us better understand how bacteria may evolve resistance to novel nanomaterials,” explains Graves. “We want to slow down the spread of multidrug-resistant bacteria.”
DEFINE THE DIRECTION

Senior kinesiology major Lauren Dorn began her first foray into research as a technician for a High Point University neuroscience professor, studying neuralglial cells and binge drinking. In 2017 she was selected to join UNCG’s first MARC cohort and began conducting research with Safrit-Ennis Distinguished Professor of Kinesiology Laurie Wideman. They are studying psychosocial factors in children’s lives that impact health and psychological wellness over time.

“The outcome of my first project at UNCG suggested that neighborhood characteristics – park or green space access, crime levels, and public transportation – as well as parenting behaviors impact insulin levels, BMI, and ultimately cardiometabolic risk,” says Dorn. “We looked at a composite protein, which is indicative of inflammation and stress in the body. We found a relationship there, so that was really interesting.”

Dorn presented the work at ABRCMS. “I wanted to research and study medicine, and the MARC program has made it more of a possible reality for me,” she says. “It has allowed me to put myself out there in ways I wouldn’t have been able to.”

For her external summer research experience, Dorn worked at the Mayo Clinic, looking at the effect of Vitamin D on myocarditis, an inflammatory condition that can progress to heart disease.

“I actually have a personal connection with that,” she explains. “Some of my family members have had Vitamin D deficiencies that negatively impacted their health.”

Although Dorn has already completed her second year as a MARC fellow, she is continuing her research with Dr. Wideman, now analyzing Vitamin D as a hormone working in tandem with estrogen in the body.

Their latest work examines a larger cohort of adolescents and more variables – such as seasonal vitamin D level variations and subject demographics. Dorn will also study neighborhood environments, especially factors influencing physical activity and birth control intake. She will present her results at UNCG’s 2020 Thomas Undergraduate Research Expo.

“The goal is to get a manuscript out by the time she leaves campus,” says Wideman.

Dorn, who next plans to pursue a graduate program, knows she will be an asset to the research community, particularly after completing MARC.

“There’s so much information out there that is untouched or understood. Diversity ensures we have a variety of perspectives and motivations to continue. I like that I’m able to use my own personal experiences in the research and affect my community,” she says. “And we may have the next discovery that helps somebody drastically improve their health.”

MOVING FORWARD

Former student-athlete Alexis Rice is in the first year of her master’s program in applied sports psychology at UNCG. As an undergraduate, she was in the first cohort of UNCG’s MARC program.

Her mentor is Assistant Professor of Kinesiology Erin Reifsteck, whose research focuses on promoting physical activity and health through sport and life transitions. The Moving On! program, which aids college athletes in planning for a healthy lifestyle after college, was developed by Rice in collaboration with Reifsteck with funding from the NCAAA.

“I like being able to actually apply what you find,” says Rice. “A lot of my family have been athletes or played a sport. So, when I talk to them, I can explain it through the lens of their experience, and they understand.”

Rice’s first research project found a significant difference in exercise identity between ethnic minority college students and white, non-Hispanic students, particularly among women. Reifsteck says Rice’s findings could inform tailored physical activity interventions for college students.

“Her understanding of how research works improved a lot during that first year,” says Reifsteck, recalling how they worked on Rice’s writing and her process – including a literature review and developing and analyzing questions.

Rice pursued her external research project at the Physical Activity Research and Community Implementation Laboratory at Virginia Tech, examining physical activity among community-based health educators and the degree to which they met recommendations.

“It was different, but enlightening,” she says, recalling the adjustment period. “I took what Dr. Reifsteck taught me and applied it in a different way. She required me to be at a certain level, and she pushed me a little bit, so when I got to a different institution, I could push myself.”

Upon her return to UNCG, Rice participated in a number of trainings and workshops for professional development, graduate school preparation, and even how to battle feelings of impostor syndrome.

“It was a good balance,” she says. “We had courses with Dr. Graves and other mentors where we really had an opportunity to learn how to analyze at a higher level.”

At the beginning of her graduate career, Rice is already an accomplished young researcher and taking part in the greater conversations in her field. This spring, UNCG will host the Diversity in Sport Conference, supported by the Association for Applied Sport Psychology, and Rice is part of the planning committee.

Her mentor notes that kinesiology is one of UNCG’s biggest majors and increasingly diverse, but at the student level. Diversifying faculty is the next step, and Reifsteck sees MARC as an important tool in the process.

“One way we can improve diversity and representation in our field and in our communities is through the graduate student pipeline. These programs give us opportunities to work with students and prepare them to be professionals and academics. I think that’s really critical for our field and other disciplines this program targets.”

By Susan Kirby-Smith
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