

Creating Career Paths for African-American Students in Geosciences

By Robert Liebermann, Lars Ehm, and Gabriel Gwanmesia



On the morning of 6 February 2015, Melissa Sims walked the short path to the podium in the lecture hall of the newly constructed National Synchrotron Light Source II facility, a building of Brookhaven National Laboratory. This was no ordinary lecture. At age 28, Sims was a graduate student studying how feldspar minerals compress during meteorite impacts. In the audience sat Secretary of Energy Ernest Moniz, whom she was tasked with introducing at the new facility's dedication.

It's not every day that a graduate student gets to open for a cabinet member. Rarer still is Sims, an African-American woman geoscientist in a field dominated by white men. As she sat on stage, Sims



Brookhaven National Laboratory

Melissa Sims from Stony Brook University (right) introducing Secretary of Energy Ernest Moniz (left) at the dedication of the National Synchrotron Light Source (NSLS) II facility in February 2015 with NSLS director Steve Dierker (far right) looking on.

remembers thinking, “How did I end up here, on a stage with someone appointed by the president?”

Sims is the product of a new initiative at Stony Brook University called “A Career Path for African-American Students from Historically Black Colleges and Universities to National Laboratories.” The initiative teaches marketable skills, places students in internships, and fosters the professional career tracks of underrepresented minorities. We offer this initiative as a proof of concept example of how and what institutions can do to address the shortage of African-Americans in the geosciences.

The Scope of Underrepresentation

The geosciences have the lowest African-American representation of all the science, technology, engineering, and mathematics disciplines [Huntoon *et al.*, 2015].

A report from the American Institute of Physics entitled “Untapped Talent: The African American Presence in Physics and the Geosciences” [Czujko *et al.*, 2008] gives some background on the root causes of this underrepresentation.

The report emphasizes that although many African-American students have the necessary high school backgrounds to succeed in physics, “these prepared students are more likely to choose math or sciences other than physics and geosciences.” In fact, “compared to other scientific disciplines, physics and the geosciences consistently come out near the bottom in terms of their ability to attract and retain African Americans,” the report notes [Czujko *et al.*, 2008]. For example, in 2004, 4% of African-American undergraduates earned a bachelor’s degree in physics and only 2% in the geosciences (compared with 9% for all sciences, which is still below the 13% of African-Americans in the U.S. population).

Czujko *et al.* [2008] also examine the state of African-Americans within the larger context of the U.S. educational system and social structure, including geography and economics. Most African-American students go to college near their homes, and more than 70% of U.S. universities and colleges awarded no bachelor’s degrees in the geosci-

ences to African-Americans in the 5-year period of 2000–2004.

The dearth of degrees awarded to African-Americans is even more pronounced at the master’s level, despite the fact that more than 500,000 such degrees are awarded each year in the United States. As the report notes, “The geosciences have the unenviable distinction of having the poorest representation of African Americans (1%) among master’s degree recipients” [Czujko *et al.*, 2008].

Framework for Training and Employment

To address this poor record, the National Science Foundation (NSF) Directorate for Geosciences established in 2006 a program called Opportunities for Enhancing Diversity in the Geosciences (OEDG). Stony Brook’s new initiative is a product of OEDG.

The initiative has a few key steps. First, project leaders seek to recruit undergraduate science and engineering students from underrepresented groups into the graduate program in the Department of Geosciences at Stony Brook University. For expediency, efforts are focused on historically black colleges and universities, such as Delaware State University.

Next, the recruited students take courses and develop research projects toward an M.S. in geosciences instrumentation—a degree provided by Stony Brook. Thus far, project leaders have chosen to focus on instrumentation so that students could develop marketable skill sets in an emerging field between science and technology.

Finally, students receive training that prepares them for employment as science associates in national user facilities of the U.S. Department of Energy. All graduates of the program have conducted their research projects at the National Synchrotron Light Source (NSLS) of the Brookhaven National Laboratory (BNL).

Building on Existing Foundations

The new program has taken advantage of the long-standing relationship between professors from historically black colleges and universities and BNL. An important element of this relationship is the Interdisciplinary Consortium for Research and Educational Access in Science and Engineering (INCREASE), an organization that supports access to research facilities not typically available to faculty at historically black colleges and universities (see <http://www.increaseonline.org/>). To enhance its ability to attract African-American undergraduates, Stony Brook University has capitalized on its connection with colleagues in INCREASE institutions to help identify and recruit students.

In addition to INCREASE and NSLS at BNL, partners in this new initiative include the Center for Inclusive Education and the Graduate School of Stony Brook University (see <http://bit.ly/1Zc41hJ>). All of these organizations have provided matching funds to complement the National Science Foundation support.

The M.S. in geosciences instrumentation program includes both formal courses and hands-on research proj-



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(left to right) Melissa Sims, Adairé Heady, and Ashley Thompson examining one of NSLS's beamlines. Beamlines are paths for accelerated particles, used in this case to study properties of crystal structures.

ects at the NSLS. The projects typically involve the study of the physical and chemical properties of minerals under high-pressure conditions, which is the major focus of the Consortium for Materials Properties for Research in Earth Sciences, which operates synchrotron beamlines for high-pressure research in the United States.

Program Successes

To date, the initiative has graduated three M.S. students: Ashley Thompson from Delaware State University, Melissa Sims from the University of South Carolina, and Adairé Heady from Delaware State University. All graduated from Stony Brook within a 2-year period.

Thompson is now in a Ph.D. program in mechanical engineering at Stony Brook; Sims, who was awarded a prestigious graduate fellowship from Stony Brook, is studying for her doctorate in geosciences at the university; and Heady is seeking employment at a national laboratory such as BNL.

In September 2014, Brandon Rhymer from the University of the Virgin Islands enrolled in Stony Brook's initiative. He graduated with his M.S. degree in May 2016 and is

returning to his home institution to teach for a year before deciding whether to pursue further graduate study.

Stony Brook's program shows how science-minded students, through mentoring and research opportunities, can change their expectations to embrace geoscience research. For example, Sims was an undergraduate in exploration geophysics and headed toward a career in the oil industry. But when she learned about Stony Brook's program, she shifted her ambitions to a more academic direction. Similarly, Rhymer initially was considering opportunities in engineering but changed his focus to study geophysics after spending two summers at BNL in the Science Undergraduate Laboratory Internship program (see <http://1.usa.gov/1X0leiB>).

The Future

The NSF Directorate for Geosciences has approved a no-cost extension of Stony Brook's grant, which allows the program's time period to run to 2016. Unfortunately, NSF has temporarily suspended funding for the OEDG program, so Stony Brook is seeking new funding to extend the program beyond 2016. However, both Brookhaven National Laboratory and the Graduate School at Stony Brook have extended their funding for another 2 years.

For tips on how to implement such a program in your institution, contact Robert Liebermann.

References

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Brandon Rhymer with the 2000-ton uniaxial split sphere apparatus in the Stony Brook High Pressure Laboratory. The apparatus helps scientists simulate the high pressures of Earth's deep interior.