



## A WORD FROM...

Freeman A. Hrabowski III, President of the University of Maryland, Baltimore County

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Photo is courtesy of Freeman A. Hrabowski III.

At this critical moment, America continues to struggle with structural racism exposed over the past year by police violence and the most lethal pandemic in a century. Many have been searching for ways to address the consequences of racial discrimination, asking “What can I do?” As my colleagues and I have recently argued, “Channeling the growing public and private support for meaningful change into action requires Americans, in every sector, to engage in difficult conversations, and to be honest about our problems and deliberate in developing solutions. We in higher education are no exception.”<sup>1</sup> And within higher education, each discipline—including mathematics—must also engage in these conversations and take action.

Mathematics has great international diversity, but its domestic diversity is sorely lacking. In 2018, about half (52%) of new recipients of doctorates in mathematics from US universities were non-US citizens. Meanwhile, of the 935 doctoral recipients in mathematics from US universities who were US citizens, just 79 (8%) were underrepresented minorities: As reported by the AMS, 754 were White, 81 Asian, 34 (3.6%) Hispanic or Latino, 27 (2.9%) Black or African American, and 8 American Indian, Alaska Native, Native Hawaiian, or

Other Pacific Islander. Another 31 were of unknown race/ethnicity.<sup>2</sup> According to the National Science Foundation, of 35,200 US-residing mathematicians and statisticians with doctorates, just 800 (2.3%) were Black and 1,250 (3.5%) were Hispanic or Latino.<sup>3</sup>

As a field, we have work to do.

When I was a graduate student at the University of Illinois in the 1970s, there were no Blacks among the doctoral students or faculty in the mathematics department, and only three others in the master’s program. I was inspired by the example of David Blackwell who earned his PhD in mathematics at Illinois in 1941 and eventually moved to the University of California, Berkeley, where he was the first Black to earn tenure and the first Black elected to the National Academy of Sciences.<sup>4</sup> There was only one woman on the faculty who, I could tell by the way she looked at me, understood my situation. But despite this, I found the experience lonely. While I did well in the work, no one encouraged me to continue on to a PhD. I learned the importance of preparing undergraduate Blacks so they would be ready when they would likely be “the only one” in a graduate program.

To ensure that African Americans, Latinos, and Native Americans succeed in graduate mathematics programs, we need to start by supporting undergraduates. At the University of Maryland, Baltimore County (UMBC), we have done just that through our Meyerhoff Scholars Program which successfully supports students of diverse backgrounds in science, mathematics, and engineering.<sup>5</sup>

As I have argued in a TED Talk, we can prepare underrepresented minority undergraduates for doctoral study by emphasizing four things.<sup>6</sup>

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<sup>1</sup><https://www.theatlantic.com/ideas/archive/2020/10/higher-education-structural-racism/616754/>

<sup>2</sup>[www.ams.org/profession/data/annual-survey/2018Survey-NewDoctorates-Report.pdf](http://www.ams.org/profession/data/annual-survey/2018Survey-NewDoctorates-Report.pdf)

<sup>3</sup>[https://ncesdata.nsf.gov/doctoratework/2017/html/sdr2017\\_dst\\_08.html](https://ncesdata.nsf.gov/doctoratework/2017/html/sdr2017_dst_08.html)

<sup>4</sup><https://math.illinois.edu/david-blackwell>

<sup>5</sup><https://meyerhoff.umbc.edu/>

<sup>6</sup>[https://www.ted.com/talks/freeman\\_hrabowski\\_4\\_pillars\\_of\\_college\\_success\\_in\\_science](https://www.ted.com/talks/freeman_hrabowski_4_pillars_of_college_success_in_science)

- First, we must instill high expectations in promising students. We do this by identifying students who have potential, helping them develop a vision of what is possible, providing financial support so they can focus on their studies, and urging a commitment to doctoral education. Along the way, we also discuss what is expected to succeed in a graduate program.
- Second, we help these students build community by bringing them in as a cohort, providing them with a summer bridge experience, and encouraging group study. Participants in our Meyerhoff program typically say it feels like “family,” and this sense of belonging is critical to learning, persistence, and success.
- Third, we engage the students in research. Our faculty play a key role by pulling students into their laboratories where they learn the science, identify with a field, and develop professional networks. As we regularly say, “it takes researchers to produce researchers.”
- Fourth, assessment is critically important. We included an evaluation component in the Meyerhoff Scholars Program from its inception to ensure its effectiveness and demonstrate its success to others.

We have been successful at UMBC in securing funding for Meyerhoff Scholars, particularly in the life sciences, but we can also support students in other fields. The National Security Agency (NSA) has funded students majoring in computational science and mathematics.

We asked Meyerhoff Scholars who earned mathematics PhDs<sup>7</sup> to reflect on their experiences in graduate school and provide advice for students applying to graduate programs. Underrepresented minority undergraduates, they said, must first understand what any prospective graduate student should do to investigate their graduate options. They should talk with their faculty and peers about graduate programs, and gather information about program size, reputation, and faculty. They should consider the culture of the department, and the academic, social, and financial support that would be offered. They should identify faculty whose research interests align with theirs.

For underrepresented minority students that is just step one. The next step is to assess how a program would support them as an underrepresented minority. They should visit campuses and talk with faculty and students, especially underrepresented minority students. Questions become more nuanced. Would this program be welcoming? Does it regularly enroll other underrepresented minority students? What has been their experience? Will there be someone who will help me navigate the graduate experience? Are there faculty of color? Are there White faculty who are open-minded and willing to work with someone who looks like me? While students of color are inspired when they see and work with minority faculty, majority faculty who are allies are critical because the African American or Latino mentor is rare.

In graduate school, programs and their students have reciprocal obligations to ensure academic and professional success. Programs should provide adequate funding and build community for their students and faculty, encouraging study groups and social activities. They should also provide students with professional development opportunities, including support to attend conferences. Faculty should provide moral as well as academic support. Students should engage in these activities, building their knowledge and the professional networks they will need to succeed.

But, again, this is step one. Step two is making this experience work when others might dismiss you. Talithia Williams, associate professor of mathematics at Harvey Mudd College and formerly an ACE Fellow in my office, has related how she developed a strategy that allowed her to thrive in graduate school despite obstacles. She observed that many majority students dismiss their underrepresented minority peers, fearing they would either have little to offer or, worse, be a burden during group study. Talithia related to me:

I overcame this by inviting all my cohort out to lunch weekly, followed by homework sessions in a room that I had reserved. Setting up the group structure made everyone want to participate and our entire cohort really bonded. The first few weeks that we met, I would try to work out all of the problems prior to coming to our study session, because I knew most of my peers had not begun the homework sets. I would then share my solutions on the board as they struggled through the problems. As the only African American and female in our cohort, I needed them to see me as adding value so that they would continue wanting to work with me.<sup>8</sup>

<sup>7</sup>The Meyerhoff Scholars alumni who have earned PhDs in mathematics and corresponded with us were Erica Child, William Christian, Sean Colbert-Kelly, Delayne Johnson, Zachary Rayfield, and Danielle Robbins-Chukwumah.

<sup>8</sup>Email, Talithia Williams to Freeman Hrabowski, October 8, 2020.

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This was a creative and successful strategy. Yet, it is frustrating that underrepresented minority students have to be “twice as good” like this to thrive.

People are always surprised when I say I love math. I had a transformative experience as a child when I participated in a National Science Foundation funded program in mathematics at Tuskegee University for high-achieving high school students. We need more efforts like this that inspire students. More to the point, we need faculty to identify and work with promising underrepresented undergraduates, engaging them in research or summer programs, building their academic preparation, and exposing them to career opportunities. The National Institutes of Health have great programs that accomplish this in the life sciences. We need similar efforts in mathematics to build highly visible undergraduate programs that become partners with graduate schools in developing and caring for a cadre of diverse, future leaders in mathematics.

There is one last piece to the puzzle. When we launched the Meyerhoff program, I assumed that once underrepresented minorities had earned a doctorate, they would easily find academic jobs. This has turned out not to be the case. Many underrepresented students, more often than majority students, feel “on their own” at this stage. Having a champion who will “knock down doors” to open a career path is critical. This involves coaching students on how to demonstrate their knowledge and capability as they apply and interview for faculty positions and making connections between them and faculty on search committees. Learning more about careers outside academia would also help. The NSA, for example, provides internships to minority students and then hires them after they complete a doctorate.

We must all do more. I challenge our colleagues to identify and encourage underrepresented students to consider majoring in math, and to engage in departmental conversations about minority student performance and intervention strategies. Finally, we need even more support for research opportunities—such as the National Science Foundation’s Research Experiences for Undergraduates (REUs)—to inspire these students and expose them to the beauty of mathematics.