

Department of Mathematics, North Carolina State University

In how many different ways can a mathematics department succeed? Count the successes of the Mathematics Department at North Carolina State University and you will have a good approximation. The recipient of last year's AMS Award for an Exemplary Program or Achievement in a Mathematics Department, NC State has excelled in just about everything mathematics departments do. This time, the department was chosen for the Programs that Make a Difference distinction for one particular achievement: its extraordinary record in serving students who have traditionally been underrepresented in mathematics, especially African-Americans.

The numbers speak for themselves. According to the Annual Survey of mathematics departments that the AMS and collaborating organizations prepare each year, Group I and II mathematics departments produced seventy-three African-American Ph.D.s during the academic years 1999–2000 to 2008–2009 (this counts U.S. citizens only). Nine of these seventy-three, or 12.3 percent, graduated from the NC State mathematics department. And NC State is not an enormous producer of mathematics Ph.D.s overall; in that period, it



Photo courtesy of the NCSU Mathematics Department.

accounted for just 2 percent of the total number of Ph.D.s produced by Group I and II departments. NC State's impressive record has continued, with a total of four additional African-Americans receiving their Ph.D.s in the department in the 2009–2010 and 2010–2011 academic years. When it comes to female African-American Ph.D.s in mathematics, NC State might very well be the top producer in the nation: In the same nine-year time period as above, twenty-six mathematics doctorates were awarded to female African-Americans by Group I and II departments, and six, or nearly a quarter, earned their degrees at NC State.

What accounts for this achievement? One factor is the department's commitment, starting more than a decade ago, to recruiting domestic students into its graduate program. Today 96 percent of its graduate students are U.S. citizens or permanent residents (and 49 percent are women). One of the strategies the department uses is an annual recruiting weekend, in which students are invited to the campus to learn about the graduate program. Through its long-standing contacts with historically black colleges and universities, the department identifies strong African-American applicants, encourages them to apply, and invites them to the recruiting weekend.

Another factor is the substantial support the department offers to students. An S-STEM grant from the National Science Foundation provides financial support for all of the department's African-American students during the first two years in graduate school. For students whose backgrounds need additional shoring up, extra mentoring is available. In addition, the department has a Research Experience for Early Graduate

Students (REG) program, which provides stipends for first- and second-year graduate students to work with faculty on summer research projects. Unlike other graduate students, S-STEM students are eligible for two summers of REG participation.

A third factor in the department's success lies in the broad and flexible nature of its graduate program. Students have a wide variety of research areas to choose from, and many opportunities are available to work on interdisciplinary problems with researchers in other university departments, in industry, and in government laboratories. The mathematics department wanted the structure of its qualifying examinations to reflect the increasingly interdisciplinary nature of mathematical research, so it created a set of fifteen examinations, and each student must complete three of them.

The final, and perhaps most important, factor is the faculty's commitment to students. The department's success with students from underrepresented groups is not due to outsized efforts by a small number of faculty members. Indeed, the thirteen African-Americans who received their Ph.D.s in the department during the academic years 1999–2000 to 2010–2011 were spread among twelve different advisors.

The department's commitment to underrepresented students does not stop with the graduate program. The department stands out nationally as a predominantly white institution in which a large number of African-Americans earn bachelor's degrees in mathematics. Alongside its Research Experiences for Undergraduates program, the department has started REU+, which is geared toward students from historically black colleges and universities. At the postdoctoral level, the department has spearheaded a new national program called the Alliance for Building Faculty Diversity in the Mathematical Sciences, which offers postdoctoral fellowships to new Ph.D.s from traditionally underrepresented groups. Fellows will typically spend two years in one of the alliance institutions and one year in an NSF-funded mathematics institute. After NC State was chosen for the AMS Exemplary Program Award, department head Loek Helminck was interviewed for an article in the *Notices*. Asked how the department managed to achieve so much, he replied: "You have to create a culture in which people believe this is the right direction for the department so that there is broad faculty participation. You start with a few people and you show that a program is successful, then one by one you have faculty start to participate...They can totally change their minds."

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