

BEATING THE ODDS IN CLEVELAND

How to close the achievement gap for minorities? Enlist your funded graduate researchers as mentors.

In 2004, faculty members in the Department of Macromolecular Science and Engineering (Macro) at Case Western Reserve University (CWRU) noticed that there were stark racial and ethnic differences between the Cleveland students going to and from high school in the neighborhoods around CWRU, and the makeup of the undergraduate STEM classes at the university. This disparity is repeated across the country, as reflected in government data showing that while minorities earn 18.6 percent of undergraduate degrees from four-year colleges, they account for only 16.4 percent of the degrees in science fields and less than 13 percent of degrees in physical sciences and engineering.

The literature is full of examples of how admissions policies and the availability of role models affect minorities' entry into STEM fields. These are valid considerations, but a far more simple fact became apparent to the Macro faculty members: *If you don't take physics in high school, you are not going to become an engineer.*

The Macro faculty decided to attempt to find a solution to this problem in developing a new Center for Layered Polymeric Systems (CLiPS STC), a National Science Foundation-funded Science and Technology Center. Reaching into the challenged public schools of Cleveland Ohio, where taking physics is not always an option, they recruited talented high school students to work in the laboratories at CWRU, a research-intensive institution located in an urban environment.

In the decade preceding the launch of what is called the Polymer Envoys Program, many young people from suburban schools had worked in the Macro Department at CWRU, but not a single student from the local neighborhood schools had been seen

in the laboratories, much less enrolled as an undergraduate. Eight years into the Envoys program, 52 inner-city students have participated in the program (16 are currently enrolled). Of the 25 who have finished the program to date, all (100 percent) have gone on to college, with 20 (80 percent) majoring in STEM fields. Forty-eight are minority students (92 percent), and half are women. By contrast, students in the Envoys' home high schools graduate at a rate of approximately 30

chemistry, mathematics, polymer science, English, computer science, and presentation skills delivered by CLiPS staff, the graduate student mentors also provide personalized teaching in math and science, adapting instruction to match student needs.

"If I ever thought about quitting or turning away from my career goals, the Envoys Program would be there to push me back on the right path" commented one graduate of the program. An Envoy parent spoke to how this program had helped her child: "The leadership, personal, and professional assistance that my son received through the Envoys program has provided him with an educational future exceeding anything we could ask or think."

Among the greatest Envoy success stories to date is the first high school student recruited by CLiPS for the program, a student who completed her B.S. in polymer science and engineering at CWRU, and who is now a third-year Ph.D. student, supported as a research assistant in CLiPS.

This student is in turn mentoring a current Envoy student as she progresses toward her degree.

Of great importance to CLiPS is the translation of methods and lessons learned to other institutions, especially to inner-city, research intensive universities interested in changing the world of students in their own backyards. Inadequate high school math and science instruction too often closes off educational and career paths to minorities. CWRU's Envoys program demonstrates that engineering schools can open up opportunities instead.

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OF THE 25 HIGH SCHOOL STUDENTS WHO HAVE FINISHED THE ENVOYS PROGRAM TO DATE, ALL HAVE GONE ON TO COLLEGE, WITH 20 (80 PERCENT) MAJORING IN STEM FIELDS.

percent, with 5 percent attending college, few in engineering and the sciences.

What is different about this program? There is great continuity of interaction between the Envoys and the university during the three academic years and three summers that make up the program. High school students enter during the summer preceding their sophomore year, working full time for six weeks, followed by two afternoons per week during the academic year. This pattern is repeated in their junior and senior years.

The high schoolers' key points of contact are Ph.D. students, supported as research assistants within CLiPS, who forge three-year, one-on-one relationships with them. In addition to organized classes in