

high school advisers had told them to avoid these subjects in order to keep their GPAs high. At that point, Somerton realized he had to leave his campus and go to the source of the problem: the high schools in the toughest parts of downtown Oakland. And that's where he met Mary Perry Smith, a science teacher at Oakland Technical High School. She told him: "If teachers spent as much extra time and energy on promising math and science students as the school coaches spend on promising athletes, the schools of Oakland would produce as many engineers as professional athletes."

Within a year, Somerton and Smith, backed by grants from Somerton's department, Smith's high school, and Bay Area industry, were testing out her idea by working intensively with 25 average high school students at Oakland Tech, whose students were mostly poor and black. They called the program MESA, for the Mathematics, Engineering, Science Achievement program. It was tough going in the early days: "We certainly dropped the ball sometimes," admits Somerton. But they learned from their experience, and from the start, they got good results: Most of the original 25 students went on to graduate from 4-year colleges. Today, MESA is reaching 14,000 students in grades three through college in California. At least 73% of the high school students who go through the program end up enrolling in 4-year colleges, with an average GPA of 3.25—compared with a 2.37 GPA and a 13% college enrollment rate for minorities statewide. At the university level, the MESA Minority

Engineering Program (MEP) is responsible for two-thirds of the bachelor's degrees awarded to blacks, Hispanics, and American Indians in California—producing a total of 600 engineers last June. Not everyone thought the program was perfect, of course (see story on page 1231, for one MESA student's opinion), but those strong statistics are partly why the NSF's director of education and human resources, Luther Williams, counts MESA among the few such efforts he believes have worked in the past 20 years.

High expectations. What makes MESA work? "It is simple, really," says Somerton. "You encourage students, you back them up, but you demand excellence." The first thing Smith and Somerton did was to take over advising these students from their counselors and to require them to take the advanced math, science, and English courses that are prerequisites for admission to top colleges. And "we recruited average students who had a little spark, who seemed a little interested in science and math," says Somerton.

Smith and Somerton tutored the students whenever they could—at lunch, after school, weekends (with the help of students from the University of California, Berkeley)—and they used the Socratic method, asking questions to make sure the students understood basic concepts. "All the while," says Somerton, "Mary was tough. She was a real stickler for excellence." They also required the students to work together in study groups, which not only set them up with better study habits for college but also created a peer group that reinforced the notion that it was OK to be a good

Puerto Rico Exports Hispanic Scientists



Puerto Rican gold. Science students are setting these high standards.

UPR-AP Mainstream colleges and universities in the United States haven't had much success in attracting Hispanic science students or keeping them in the pipeline once they're there. In 1988, for example, less than 2% of the U.S. science and engineering pipeline leading to the Ph.D. level was filled with Hispanics, who make up 9% of the population. But does that mean Hispanics aren't interested in science, or don't have an aptitude for it? Not at all—as illustrated by the results of a

remarkable program in Puerto Rico that supplies many of the Hispanic science doctorates in the United States.

Like many other successful efforts at attracting and keeping minority students, the program has been propelled by the passion of one person: physicist Manuel Gomez of the University of Puerto Rico (UPR). In 1980, with support from the Commonwealth government, the NSF, and local industry, Gomez launched an all-out offensive on scientific illiteracy that has since become the seed of a national effort.

Of course, a science program in Puerto Rico can't be compared directly to efforts to recruit minority students to programs in the United States. After all, one reason for Gomez' success is the social support students experience when they're part of a student body

that is 98% Hispanic. But social support alone can't account for the program's success. Another factor is that the UPR program is a total conception beginning from the bottom up. "Puerto Rico has really taken on the charge of looking at education in science and engineering from kindergarten through faculty development," says NSF's Joe Danek, director for Research Initiation and Improvement.

Coordinated throughout the Commonwealth by UPR's Resource Center for Science and Engineering, programs for grade-schoolers include Saturday academies for elementary school students, total-immersion summer camps for junior high students, and Math and Science Bowls and university research apprenticeships for high school students. The programs even send teachers back to school to learn better ways to teach science and to develop novel curricula.

At the college level, reforms shepherded by UPR attempt to increase undergraduate retention in the sciences. Undergraduates attend scientific meetings and lecture series, Gomez says; each year, more than 250 participate in research projects. Other major initiatives have strengthened the research infrastructure at the island's universities.

The proof that this top-to-bottom effort succeeds is in the numbers: In 1990, 74 of the 356 science and engineering doctorates granted to underrepresented U.S. minorities went to Puerto Ricans, with UPR baccalaureates leading the pack. "In the '40s we exported sugar cane," says Rafael Torrech, director of the development office at UPR's Rio Piedras campus. "In the '90s we will export technologically competent people." If the recent efforts are any indication, the new export program is already well under way.

—Dawn Levy