

Making More Minority Scientists

When 24 minority 12-year-old girls on a field trip from the WaveHill Summer Science Camp in The Bronx, New York, visited the Mount Sinai Medical Center Division of Environmental and Occupational Medicine, they were asked by a researcher to describe a real-life scientist. Unanimously, they described what can be summarized as an Einstein look-alike with glasses and a pocket protector.

In some ways, the girls' perceptions are correct. According to a 1992 National Science Foundation (NSF) study, entitled *Women and Minorities in Science and Engineering: An Update*, underrepresented minorities comprised 18% of the total labor force, but only 5% of scientists and engineers. Underrepresented minorities included African-Americans, Native Americans, and Hispanics; because Asians comprised 3% of the total labor force and 6% of scientists and engineers, they were not considered to be underrepresented in science. Of all scientists, only 26% were women. Unfortunately, those statistics have not changed much in the last four years.

When asked what a scientist does, the girls said that "he looks into a microscope," and used words like boring, hard, and difficult to describe what it is like to do science. Needless to say, none of the girls expressed aspirations of becoming a scientist.

The Need for Diversity

Through its executive order, *Federal Actions to Address Environmental Justice in Minority Populations*, the federal government has recognized that people of color suffer disproportionately from the burdens of environmental pollution. This inequity

underlines the need to increase the number of minorities in the environmental health sciences because it appears that minority scientists tend to perform studies of minority populations. In the early 1980s, the Robert Wood Johnson Foundation showed that minority physicians were more likely than their Caucasian colleagues to practice in underserved minority communities. This also appears to be the case for minority scientists, who tend to research diseases that particularly affect minority populations. As Clifton Poodry, director of the Division of Minority Opportunities in Research at the National Institute of General Medicine, points out, "There are communities that are not getting the same benefits from science [as] others, and NIH needs to serve all communities because this situation, in the long run, costs everybody."

This conclusion "shouldn't mean that only women do breast cancer research, or only blacks do studies of sickle cell anemia," says George Friedman-Jiménez, director of the occupational and environmental medicine clinic at Bellevue Hospital in New York City. However, personal experience and cultural background may motivate a person to pursue a particular area of research. For example, Native Americans are more likely than whites to become environmental scientists. According to the NSF study, 47% of Native American scientists were environmental and life scientists while only 23% of white scientists pursued those areas of research. Still, "the best qualified researchers should be doing the best research, regardless of their ethnicity," says Friedman-Jiménez.

Another argument for a more diverse pool of environmental health scientists is that minority researchers have varied perspectives and experiences that increase the potential

for understanding sociocultural variables that are important in the assessment of health and disease patterns in the population. In addition to conducting quality research, whether on minority-related or other diseases, minority scientists can help push the national agenda toward promoting resources in those areas that particularly concern them. For example, Kenneth Olden, director of the NIEHS and himself a minority scientist, has promoted new efforts in environmental equity and community outreach.

Increasing the Numbers

The NIH has recognized the need to increase the number of minority scientists and, over the last two decades, has spent over \$1.5 billion to address this issue. However, the number of minorities in science has barely risen since the 1970s, when minorities made up 2% of the scientists in the United States. Reasons for the failure of these governmental programs include inconsistency in funding, unrealistic goals, low expectations, failure to reach students early enough to have an impact on their careers, and a lack of follow-up on the progress of the programs. According to Poodry, the NIH intends to address these difficulties by holding institutions accountable for reaching specific goals and by facilitating the continued support of programs that show quantifiable success.

The NIEHS is working within existing NIH programs that aim to increase the number of minorities in the biomedical sciences. These programs consist of institutional National Research Service Awards (NRSAs), individual NRSAs, and career programs. There are also a variety of programs focused on attracting minorities to careers in environmental health sciences, such as the Short-term Training Program for Minority Students, the National Predoctoral Fellowship Award for Minority Students, and the Summers of Discovery Program. In particular, the Research Supplements for Underrepresented Minorities program uses funding supplements to attract underrepresented minorities into biomedical and behavioral research. The goal of the program is to provide support for research experiences at NIH grantee institutions for minorities throughout the continuum from high school to the faculty level. Information on these and other programs can be found on the NIEHS World Wide Web page at www.niehs.nih.gov. In addition, the NIEHS is designing innovative programs to address this issue.

Together with the American Association for Cancer Research (AACR), the NIEHS convened a task force in 1994 composed of academics and members of industry, govern-



From the classroom to the community. (left to right) Minority students Alicia Hurtado, Naida Montes, and Evelyn Roman take water samples from the Hudson River in New York to test for contamination.

ment, and community organizations. The goal was to establish a model national program to increase the number of minorities who earn doctorates and excel in the biomedical sciences to levels that reflect their percentage by age group in the general population. The task force was coordinated by Marian Johnson-Thompson, director of the Office of Institutional Diversity at the NIEHS.

The findings of the NIEHS/AACR task force, published in the 15 July 1996 issue of *Cancer Research*, showed that parental involvement, early intervention, high expectations, innovative teaching strategies, and competent, enthusiastic role models were key to achieving the goal of increasing minority interest and involvement in science careers. The task force developed a "pipeline strategy" in which education coalitions would be formed between academic institutions. One such coalition is the Bridging Education, Science, and Technology (BEST) program. BEST is a partnership between the NIEHS and the Durham, North Carolina, public school system in which a state-of-the-art molecular biology laboratory was opened at the Hillside Model High School, a predominantly minority school. (See related article in this issue, p. 176).

According to Michael Galvin, program administrator at the Division of Extramural Research and Training at the NIEHS, this strategy seeks to "develop new minority scientists who can be competitive in the research grants process." To this end, the NIEHS emphasizes intervention at the early career stages coupled with strong mentoring programs that encourage productive senior researchers of any ethnic background to participate as mentors for junior minority scientists.

Under Galvin's direction, the NIEHS conducted a workshop, called Opening the Door, in which 12 minority junior scientists were invited to the NIEHS campus to participate in a grant-writing exercise. The objectives of the workshop were to increase knowledge about professional opportunities, to improve knowledge about the NIH grant process, to improve grant-writing skills, and to introduce participants to NIH staff. Participants also worked on specific grant ideas alongside accomplished senior scientists.

Mark Nelson, a researcher in the Department of Pharmacology and Toxicology at the Arizona Cancer Center, was one of the participants at the NIEHS workshop. According to Nelson, the workshop improved his grant-writing skills and helped him better present his data. These skills helped Nelson obtain a First Award grant from the NIH.

A Need Justified

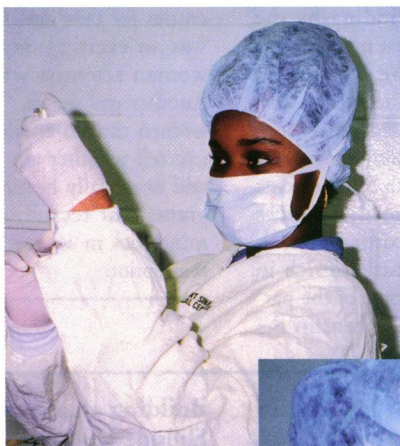
Programs targeted to minorities have been accused of giving minorities an unfair advantage. Poodry counters, however, that although the NIGMS has approximately 6,000 slots for graduate student training, the minority fellowship programs only support a few outstanding minority students. For the past few years, the number funded has hovered around 36. In addition, says Poodry, there are a variety of reasons, including financial ones, why innovations and interventions in science education are not being done or why they are currently missing the minority students. Minority programs are designed to remedy specific situations. Their small size and specific objectives can allow a program to try new strategies or to improve on others. Says Poodry, minority programs that are found to be particularly effective in attracting and

retaining students in science could be opened to nonminority students, who face many of the same issues as minority students, such as peer pressure, lack of preparation, and a preference for more lucrative careers than those in the environmental health sciences.

To encourage environmental education for everyone, Congress passed the National Environmental Education Act of 1990. The EPA is the lead federal agency for environmental education, with a program that includes grants for environmental education projects, teacher training, the President's Environmental Youth Awards, and resources and information about the environment for teachers, students, and citizens. The agency provides annual funding to the National Environmental Education and Training Foundation (NEETF) to match private contributions.

The programs supported by the NEETF are geared toward improving public understanding of environmental issues by focusing on various aspects of environmental education, including research on public attitudes, campaigns for science-based environmental education, environmental health education and training, and safe drinking water education, among others.

According to a 1994 study by the NEETF, 50% of all American schoolchildren in grades 4–12 say that environmental pollution is a problem that they want to help make better. According to Michelle Harvey, vice-president of programs at the NEETF, "disadvantaged children have fewer opportu-



Students from the spectrum. High school student Kerryann Bryant (top) participates with (left to right) researcher Luz Claudio, college student Sue Kuen Lee, and high school student Vilma Perusina in NIEHS-sponsored minority training programs.

nities to participate in environmental education programs, but when they are given the opportunity, 1 out of every 2 children is eager to participate.”

Finding Minority Students

One difficulty in establishing research programs for underrepresented minorities is finding qualified individuals. Although the gap is narrowing, minority students still fall behind in proficiency test scores for math and science as compared to white students at ages 9–17, according to the National Center for Education Statistics. This gap also occurs in students who pursue science majors in college. The NSF cites a 1994 survey, entitled *Women, Minorities, and Persons with Disabilities in Science and Engineering*, that determined the relative importance of perceived factors that contributed to attrition from science majors in college. It showed that most minority students felt they had made an inappropriate choice in choosing a science major, had difficulty understanding concepts, or had inadequate high school preparation. These responses may result from the fact that many minority students attend primary and secondary schools located in poor districts with more limited science resources. In contrast, white students noted poor teaching and curriculum overload as the main reasons for switching from science majors.

Still, many minority students do beat the odds to excel academically and obtain science degrees at high-ranking universities. Most Hispanic science majors graduate from state universities located in regions of the

country where they form a high percentage of the population, such as California, Texas, Florida, and Puerto Rico. The University of Puerto Rico is particularly prolific in granting bachelors and masters degrees in the sciences because of a strong pharmaceutical industry that is the economic base for the island. Many qualified minority students also attend historically black colleges and universities, which graduate approximately 30% of all black science bachelors degree recipients. These universities offer a wealth of potential scientists who could be encouraged to consider the environmental health sciences as a viable career choice.

Minority students can also be found through scientific societies that hold special activities for minority students and faculty. For example, the Society of Toxicology sponsors a summer internship program that provides information on training opportunities for toxicology students throughout the United States.

Leading by Example

A particularly compelling finding by the NIEHS/AACR task force is that mentoring is a key tool in increasing the number of minorities in the sciences. The NIH offers several programs that are based on pairing faculty mentors with students or junior scientists. For example, the Research Supplements for Underrepresented Minorities places junior minority scientists on existing research teams, and funds such scientists' research in an area closely related to the topic of the parent grant. This arrangement also benefits the

scientists under the parent grant by providing the research team with an additional member who may contribute distinct perspectives and ideas to an ongoing research project.

As obtaining grants becomes more competitive and faculty members' time is consumed by conducting research and writing papers and grant proposals, available time for mentoring individual students is cut. One solution to this problem is other programs that allow junior faculty to be mentors. For example, Nelson, who is a junior faculty member, directs a short-term training program for minority college students in his laboratory. It can be difficult for junior faculty to attract students to their laboratories, and mentorship programs like these can facilitate the process.

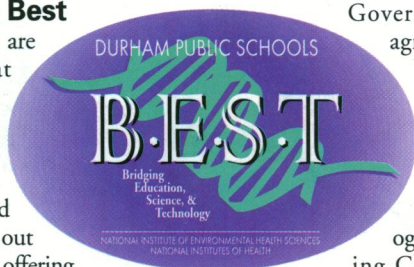
The benefits of mentoring and fostering minority scientists can be measured at many levels and by more indicators than advancement in academic rank. For example, weeks after the presentation to the WaveHill summer campers, the researcher received a letter including excerpts from the girls' journal entries for that day. One girl wrote, "Today was an exciting day. We went to meet a woman scientist who studies the brain." Another girl wrote, "Now I know Hispanic women can do anything." Although no one can tell whether any of these young people will eventually become scientists, with programs that recruit, educate, and promote minorities in science, at least they will have that option.

Luz Claudio

Striving To Be the Best

Adopt-a-school programs are nothing new. Not that they're something to yawn about—every effort to help children learn should be celebrated—but for years businesses and institutions have reached out to public schools, usually offering speakers and tutors, or occasionally books or supplies. Federal government agencies, constrained by law, can rarely offer more than the time of employee volunteers. A new program, the Bridging Education, Science, and Technology, or BEST, Program is changing all that. Originally conceived as a traditional adopt-a-school effort, the BEST Program is now envisioned by its leaders as a new model for precollege science education and outreach programs.

The BEST Program is a partnership between the NIEHS and the Durham, North Carolina, public school system, which was recently proclaimed by North Carolina



Governor James Hunt as an agreement through which "all students can have an opportunity to achieve in science related disciplines." At the center of the program is the NIEHS Molecular Biology Laboratory and Training Center at Hillside High

School. The partnership surrounding and supporting the laboratory includes a mentoring program led by the Research Triangle Park, North Carolina, chapter of Blacks in Government, a speaker series, a site on the World Wide Web linked to both the NIEHS and Hillside High School, and an active network of parents, educators, scientists, and local business and political leaders. With the laboratory as its focus, the program aims to increase students' enthusiasm for science, provide opportunities for motivated students to pursue science careers, and ensure a flow of scientifically trained workers into the future workforce.

Building a Laboratory

Hillside High School is just a few miles down the road from the NIEHS campus in Research Triangle Park. Known historically as the high school for African-American students before segregation ended in the late 1960s, Hillside is now Durham's model high school.

On the second floor of its new, spacious building is the molecular biology laboratory, which looks like almost any other high school science classroom—desks fill the middle of the room while countertops and sinks containing six laboratory stations line two walls, and an island station stands in the front of the room. Behind the locked door to a former storage closet, however, are the guts of the molecular biology laboratory—about \$60,000 worth of brand-new equipment, including a thermocycler for performing polymerase chain reactions, an autoclave, two centrifuges, six gel electrophoresis units, pipettes, and other items on loan from the NIEHS.

Carolyn Harris, head of Hillside's science department and one of the driving