

Recruiting Minorities to the Biological Sciences

Biologists are trying a range of approaches to diversify their field

BETH BAKER

On a sunny day last June, a group of 15 students set out on the *Aquarius*, the research vessel of the Chesapeake Biological Laboratory (CBL). Throughout the day, the students kept busy measuring water salinity and light intensity and examining samples of sea squirts, mussels, and jellyfish. As part of Maryland Sea Grant's summer internship program, each student would have the opportunity to spend the next 2 months working alongside a research scientist.

Two of the students on board were African American—not bad, some would say, given the relatively small numbers of black, Hispanic, and Native American students majoring in the organismal biological sciences. “This kind of experience is a tremendous opportunity for students,” says ecology professor and intern selection committee member Livingston Marshall, of Morgan State University, a historically black institution in Baltimore. “It creates contacts for them and really gives them an idea of what it's like to be a scientist. As professors we lecture all year, but when you bring students in the field and give them hands-on experience, it raises teaching to a new level.”

Through a formal agreement with CBL, Marshall hopes to provide such opportunities to more of his students—and he hopes that eventually many of them will choose careers in environmental and marine sciences. He is among a growing number of sci-

entists around the country seeking ways to expand the ranks of biological science to include far greater numbers of underrepresented racial and ethnic minorities.

According to the most recent edition of *Women, Minorities, and Persons with Disabilities in Science and Engineering: 1998*, published by the National Science Foundation, minorities are poorly represented in graduate science and engineering programs. Within the biological sciences specifically, the number of underrepresented minorities earning PhDs has grown since 1985 but remains woefully small. The number of African American doctoral recipients in the biological sciences grew from 53 in 1985 to 105 in 1995, out of a total of 4321 US citizens and permanent residents who received PhDs in biology; for Hispanics, the increase was comparable—from 59 to 126; and for Native Americans the gain was only two individuals—from 13 to 15. The numbers of minority students focusing on organismal biology are even lower because the NSF figures also include other areas of biology.

The challenge of diversifying the field is thus enormous. “Nationally, I believe we have only one or two PhD students in entomology who are African American or Hispanic. Now you see what we're up against!” says Christian Oseto, a professor of entomology at Purdue University and recent past president of the Entomological Society of America.

“I'm literally the only African American I see at my society [American Society of Plant Taxonomists] meet-

ings, and I got my degree in 1979,” says Muriel Poston, associate professor of biology at Howard University and chair of the AIBS Committee on Minority Recruitment. “It gets lonely after a while.”

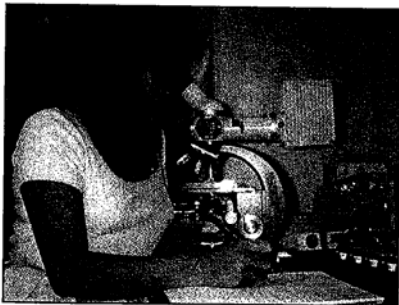
Barriers to minority representation

Research and data on why minority representation in the field of organismal biology is so low are skimpy, but many factors have been identified. Perhaps the most frequently cited observation is that African American students who excel in biology typically choose careers in medicine, pharmacology, or microbiology. “That's based on a sound economic analysis [by the students] that those are areas for a high potential of very good jobs,” says Nora Bynum, Academic Director of the Organization for Tropical Studies (OTS), which is based at Duke University.

Not only financial reward, but also public service expectations propel black students toward medicine, Poston says. “For many generations it was perceived that if you were going to get a graduate degree, it would be in something that would directly impact your community in terms of health sciences,” she says.

Indeed, many African American students interested in biology do not even consider academic research as a career choice, says University of Kentucky graduate student K. Nicole Sudler, a Howard graduate and aspiring plant ecology researcher. To many of her African American peers, she says, “teaching is for weird people who won't

Features



Maria Rocio-Hernandez, a former undergraduate at Wiley College, in Marshall, Texas, was a participant in the SEEDS program (Strategies for Ecology Education, Development and Sustainability). She is now a graduate student in environmental sciences at Stephen F. Austin State University, in Nacogdoches, Texas. The program's goal is to pique minority undergraduate

students' interest in ecology and to collaborate with historically black colleges and universities to improve their ecology curricula. Photo: Courtesy of SEEDS program.



Students Jessica Lucas, of Southern Illinois University; Myesha Mooney, of Hampton University; and Brock Bourassa, of the University of Maryland (left to right), studying hummingbirds for their final project at La Selva Biological Station in Costa Rica in June 1999. The students were participants in a summer course in tropical biology run by the Organization for Tropical Studies. Photo: Courtesy of OTS.

make any money."

The assumption that talented minorities would be interested only in medical careers has become a self-fulfilling prophecy. Until recently, few professors made an effort to reach out to minority students and explain the world of research in a compelling way. New career opportunities, such as those in the environmental sciences, have also been poorly conveyed.

Urbanization may also be a factor in minority underrepresentation. Marshall notes that growing up in the Bahamas, he lived near the sea and was

of the biology department at Eastern Connecticut State University.

Moreover, in a typical chicken-and-egg phenomenon, as long as the profession is virtually all white, there will be a dearth of role models to inspire and attract young people from different backgrounds. Cid, a Cuban American, says her own interest in biology was fostered not by role models but by her father, a businessman. "There really aren't Hispanic ecologists in this country," she says.

Cultural differences between minority students and majority students and



Christy Bellamy, of Hampton University (top left), and Clark Smith, of Duke University (top right), at work in the laboratory at La Selva Biological Station in Costa Rica in June 1999 as part of a summer course organized by the Organization for Tropical Studies, which is based at Duke University.

Photo: Courtesy of OTS.

professors can also be a stumbling block to retaining students in the field. A 1996 study by cultural anthropologist Roberta A. Ibarra, of the University of Wisconsin, found that many Hispanic graduate students had difficulty adjusting to an academic culture that thrives on competition rather than the cooperative approach to which they were accustomed from their own cultural experience.

"Cultural differences can have a big effect on interactions between students and mentors," agrees Joann Roskoski, acting director of NSF's Division of Environmental Biology. "For example, the Native American view is that you don't manage nature, you work with it, whereas the Caucasian American view is, 'we're in charge.' That kind of philosophical difference is very interesting when you think about designing experiments."

Alan Berkowitz, vice president for education and human resources for the Ecological Society of America (ESA), argues that for the profession to succeed at attracting minorities, science itself must change and expand to

Algernon Prioleau (left) and DeVry Nichols (right), two undergraduate biology majors from Morgan State University, in Baltimore, Maryland, conduct water-quality analysis at a field research site near Fort McHenry in Baltimore. The students are gaining research experience while supporting a collaborative research program between Morgan State and the National Aquarium in Baltimore. Photo: Photography staff, National Aquarium in Baltimore.

include issues it has ignored, such as urban ecosystems. He notes that ESA will, for the first time, have a symposium at its annual meeting in 2000 to examine how ecological science can contribute to environmental justice, a movement that seeks to curb polluting industries in low-income and minority communities.

Christine Moffitt, president of the American Fisheries Society, agrees that science itself needs to change. Historically, she says, those drawn to fisheries management were white men who loved hunting and fishing—and the profession has tended to reflect the interests of this constituency. Today, fisheries managers must address many new issues, such as urban fisheries, the relationship between fish health and human health, and Native American fishing rights. Through two new special interest sections, Equal Opportunities and Native Peoples Fisheries, the Fisheries Society is actively seeking to increase its female and minority membership. In the long run, the involvement of a more diverse membership will help raise awareness of fisheries issues among the general public and political leaders, Moffitt says.

Whether racial discrimination within the profession is another barrier to diversity is a sensitive subject. Many deny that racism plays a role. But Gwen White, an aquatic biologist with the Indiana Department of Natural Resources, who leads the Equal Opportunities section of the Fisheries Society, says that opening her field beyond its traditional “white male constituency” makes for “a very difficult transition.”

“While much of the discrimination is indirect and based on a lack of understanding or false assumptions about ethnic groups, vestiges of more entrenched institutional discrimination remain,” she says. The Fisheries Society, through



Undergraduates who participate in the SEEDS program (Strategies for Ecology Education, Development and Sustainability) attend the annual Ecological Society of America meeting, where they are paired up with ESA members who serve as mentors. Keshica Butler (above), an undergraduate at Paine College, in Augusta, Georgia, and a participant in the SEEDS program, presented a poster at the 1998 ESA meeting. Photo: Courtesy of SEEDS program.

its Equal Opportunities section, hopes to understand and address the complexities of this problem.

Although challenges to recruiting underrepresented minorities to biology and ecology careers clearly exist, Berkowitz believes that the field of ecology will be enriched and energized by opening the doors to the profession. And education is the key to opening those doors, he believes. “The way we teach our undergraduates can have the biggest effect on diversity—the quality of our teaching and the scope of what we teach,” he says. “If we do a better job, more diverse students will get interested and stay interested in ecology. We’ll not just achieve social justice—we’ll improve the field.”

To that end, professional societies (including many AIBS member societies), institutions, and universities are trying a number of strategies to recruit and retain underrepresented minorities in the field of biology. Efforts span



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Keshica Butler (above), an undergraduate at Paine College, in Augusta, Georgia, and a participant in the SEEDS program, presented a poster at the 1998 ESA meeting. Photo: Courtesy of SEEDS program.

the age spectrum, from kindergarten through graduate school.

Outreach to K–12

“Too often, recruitment starts towards the end of high school or in college,” grad student Sudler says. “We need to encourage and nurture interests in science starting in grade school.”

Steven Clemants, director of science at the Brooklyn Botanic Garden, has established a program for local public high school students, most of whom are Hispanic or African American. Clemants was motivated by some historical research he’d done on New York botanists of the late 1700s. “Every one of them got interested in plants as a teenager,” he says. “But all the literature I’d seen was geared at getting [minority] undergrads and graduates into biology.”

Each semester, six to eight high school students come to the Brooklyn Botanic Garden after school and work on a research project, often of their

own design, under the tutelage of working scientists. For example, students study the effects of homemade acid rain on lichens, look for pollinators in the field, and analyze the thickness of leaf cuticles as an indicator of roadside pollution. The Garden publishes abstracts of the students' research on its Web site (www.bbg.org).

Although it is too soon for the program's effectiveness to be evaluated, Clemants knows of at least one success story: A recent immigrant from the Dominican Republic went on to get a full scholarship to Carleton College after her internship.

In addition to the program for high school students, the Garden brings in high school teachers and gives them ideas and resources for enhancing their biology curriculum, including maps, field guides of New York, and software to create identification keys so that students can learn about plants in their neighborhood. The teachers are even given a computer to keep for their classrooms.

Perhaps the most imaginative vehicle for attracting youngsters of all ethnic groups to biology is Purdue University's "Bug Bowl." The popular event, featuring cockroach races, a cooking demonstration (with insects as ingredients, not chefs), an insect petting zoo, a room full of microscopes—even a cricket-spitting contest that made its way into the *Guinness Book of World Records*—draws up to 20,000 elementary school students from the region each year.

The Entomological Society of America now holds a smaller-scale "Insect Expo" for children from local minority communities at the end of its annual meetings in various locales. "Whether or not this has any impact in getting minorities to become entomologists remains to be seen," Oseto says. "But we want to change the mindset and show that science can be fun and provide a career."

The SEEDS program

While a handful of programs are focused on getting K-12 minority students interested in biology, many more

are targeting undergraduate college students. One of the most promising is the SEEDS program, initiated by the Ecological Society of America.

In 1993, ESA held a strategic planning workshop that resulted in a ground-breaking report, "Mechanisms to Increase Recruitment and Retention of Women and Underrepresented Groups in Ecology." In 1996, as an outgrowth of that report, an unusual partnership was formed among the United Negro College Fund, ESA, and the Institute of Ecosystem Studies, in Millbrook, New York, whose education program Berkowitz heads. Called SEEDS (Strategies for Ecology Education, Development and Sustainability), the program developed by the partnership seeks to pique students' interest in ecology and to collaborate with historically black colleges and universities to improve their ecology curricula.

"There are lots of research opportunities around the country for undergraduates," Berkowitz says. "But we realized that many of the minority students who were applying for internships were not well-trained. They often came from small schools that didn't have ecology courses. We wanted to work with these small schools to improve their early exposure and training of students so they'd be in a better position to pursue these opportunities."

To date, SEEDS gives funding and curriculum support to 10 participating schools. The goal is for each school to organize a team of faculty members and junior- and senior-level ecology students who together develop an ecology curriculum and recruit freshmen and sophomores to the field. Students become involved in research, summer internships, and ecology clubs on campus. At Hampton University, in Hampton, Virginia, for example, a new biology track is being developed that will include organismal diversity, ecology, and evolution. At Bethune-Cookman College, in Daytona Beach, Florida, a research unit of four students from various disciplines will be trained to analyze local fishing spots for levels of toxic pollutants. "It was clear to the

faculty that for ecology to be meaningful to their students, they have to incorporate environmental justice," Berkowitz says. SEEDS teams also come to ESA annual meetings, where the students are paired with ESA members who act as mentors.

"ESA is an outstanding example of a professional society that has made [minority recruitment] a part of their strategic plan," Poston says. "They have backed up their initiatives with concrete funding. The SEEDS program has begun to make a substantive difference in how ecological and environmental sciences are taught at historically black colleges and universities." Moreover, she says, Howard University students have been energized by meeting their peers from other SEEDS programs.

Social support

SEEDS is just one of several programs that help students with a budding interest in biology feel less isolated. At Colorado College, senior John Novembre, who describes himself as half-Latino (his mother is Uruguayan), plans to be a researcher and professor in the field of population genetics. As a high school student, he participated in a two-part program at Colorado College aimed at minority students. "It had two missions—to get us excited about science in general and to get us ready for college," he says. The first part of the program, called Science as a Way of Knowing, is for high school juniors, who take a college science course that includes lab and fieldwork. "We build their confidence and let them see that college is a place where they can attend, succeed, and graduate," says Dick Storey, dean of Colorado College and chair of the diversity committee of the National Association of Biology Teachers.

The second part is for those students who have subsequently graduated from high school and been accepted at Colorado College. The incoming students spend 3 weeks on campus in the summer working on writing, library, and computer skills. They are given a computer to keep, on the condition that they pursue a science major

at Colorado College.

One of the biggest benefits, says Novembre, was the chance to get to know other minority students who excelled in high school. "When you got into your freshman year, you already had a set of friends that you could relate to and that have a similar background," he says. "That's really crucial because [social isolation] becomes one of the key things that can be hard for minority students in school."

According to Storey, students who have gone through the program have had a 92 percent graduation rate; the graduation rate for the college as a whole is approximately 80 percent, and for minority students who have not gone through the program, it is approximately 70 percent.

Internships

As Marshall of Morgan State observed, internships are a tried-and-true path to guide students toward a science career. As a college junior, Carla Peterman, an African American student who graduated from Howard and is now a Rhodes Scholar, participated in the Visiting Minority Undergraduate Summer Research Program at Rutgers University. "I did experiments with habitat selection for hermit crabs, as well as experiments with killifish from polluted and nonpolluted areas," she says. She conducted behavioral studies and analyzed the fish's nervous and fatty tissue to see what types of chemicals they had absorbed.

Science became more exciting to her as she began to understand the link between fish health and water quality. "Sometimes students can't find out how research will relate to their lives," she says. Students might not understand why, for example, a scientist would devote his or her career to studying a single species. "But when I talk to students and I explain how fish are indicators of environmental health, they get interested," Peterman says. "We need to provide more examples of different types of jobs available in biology and how research can relate to public policy issues."

It's not only minority students themselves who benefit from diversity in education. OTS has made a concerted effort to use NSF-funded scholarships to recruit minorities to its summer course in tropical biology in Costa Rica. Last summer, out of 22 students in the program, five were African American, two were Latino, and one was Native American. "Many [majority] students commented that they learned so much from interacting with students from different backgrounds," says Sandra Rodriguez, OTS Assistant Academic Director. "In the past, students have complained that everyone had similar backgrounds, and they would like more diversity." For their part, she says, minority students enjoyed not only the diversity but also having "a critical mass" of other minority students.

Mentoring and professional meetings

One of the most important tools for attracting minority undergraduates to biology careers is mentoring. Among many minority recruitment vehicles funded by NSF is the Undergraduate Mentoring in Environmental Biology program. The program aims to provide minority students with the opportunity to be actively involved with ongoing research projects. It awards \$50,000 grants to teams of at least three professors who offer students a comprehensive research experience. A 5-year pilot program, launched in 1993, awarded five grants.

"We were testing out the idea of providing long-term mentoring opportunities for underrepresented minorities to see if that would give them a richer exposure to ecology and environmental biology, and with that richer exposure if a higher percentage of students would elect to get PhDs and become professionals in those areas," Roskoski says. Students became active members of the research team and participated in weekly lab meetings, seminars, workshops, and national society meetings.

Midway through the pilot program, the researchers and students gathered

in Washington, DC, to compare notes and find out what was working and what wasn't. The professors were enthusiastic, although they acknowledged that the program required considerable time and effort on their part. "For the students, the overwhelming benefit was a strong sense of self-confidence that they were capable of doing PhD-level research, and that nothing that graduate school would throw at them would be beyond their ability," Roskoski says.

As of May 1998, 32 of the initial cohort of 66 students had graduated. Of these, 13 went on to graduate school in environmental biology and 10 obtained jobs in biology. Based on this success, NSF is continuing to fund the program.

Giving students the opportunity to attend professional meetings is viewed by many scientific societies as an important part of mentoring minority undergraduates. "You could sit at home and look at our Web site or read journals in the library, but when you're at a workshop or symposium with the ecologists who are doing research and passionately discussing issues, that's where you get the real flavor of the community aspect of science," says Susan Musante, ESA education and outreach program manager.

Strategies for recruiting minorities into biology careers are similar to those that are used with any students, says Poston. "Students need to be connected through research experiences. If they see individuals actively engaged in research, then they see this as a new opportunity," she says. "The exposure and the excitement are important. And it's got to be a sustained effort. You can't have one blip."

For diversification efforts to succeed, the profession must be deeply committed to broadening its ranks, Berkowitz adds. "These are societal-level problems," he says. "We've come to accept that progress is going to be really long term." □

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