

# Facing the Big Chill in Science

**A hostile economic and political climate threatens women and minorities in science, but new strategies for survival are emerging**

While Sue Rosser was head of women's programs at the National Science Foundation (NSF) last year, she got a series of concerned telephone calls. "Are you still in business?" worried voices asked. "Have your programs been cut?" Rosser reassured them that the programs were alive and well, but the calls are a sign of growing nervousness in the academic community over the vulnerability of programs for women and minorities in science. And Rosser worries that the very perception that these programs are in trouble may stunt their effectiveness. "There is a good bit of fear about federal budget cuts. There's been this chilling effect even though there have been no cuts yet," she says.

Like Rosser, many educators and policy-makers worry that efforts to foster women and minorities in science are endangered in today's economic and political climate. A backlash against affirmative action has sent a strong message that minorities and women may no longer get a helping hand from government and academia. Many programs to encourage greater diversity in science are under review; some may be in jeopardy, and others

are likely to be recast to be sex- and race-blind. At the same time, Congress is slicing federal science budgets, and in many fields research jobs are scarcer than ever before. Meanwhile, women and minorities are still seriously underrepresented in many areas, and in an era of belt-tightening, "men will be more likely to do better compared to women and minorities," says NSF Deputy Director Anne C. Petersen. "There's a lot of smoke, and if our alarms are not going off, then there's something

wrong with our detectors," says Georgia Institute of Technology sociologist Mary Frank Fox, who recently surveyed 3800 doctoral students about their career prospects in science and engineering.

Students, among the first to spot smoke signals, are already avoiding what they consider unfriendly territory. Applications from underrepresented minorities to the University of California (UC) dropped last fall in the wake of a resolution by the Board of Regents to end preferences based on race and sex. Although solid national figures are scarce, the National Action Council for Minorities in Engineering reports a 7% drop in minority freshmen enrolling in engineering in 1994, with the largest losses among African Americans. Those numbers are particularly disturbing because they come on the heels of a tremendous increase—60%—in minority enrollment from 1986 to 1993.

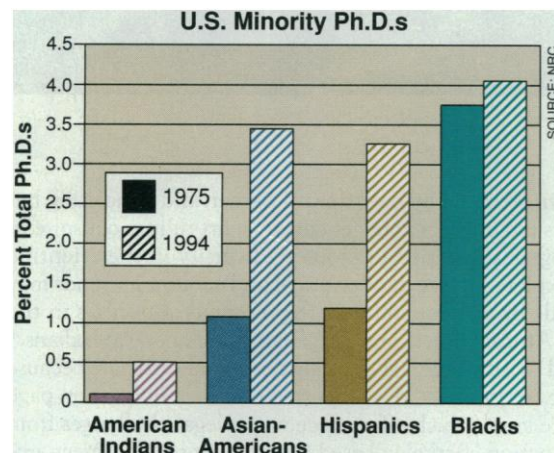
In this climate, educators say they must work harder than ever to convince minorities that it's still worthwhile to pursue careers in science. "There has been a chilling effect," says Freeman Hrawbowski, president of

the University of Maryland, Baltimore County (UMBC), and founder of the highly successful Meyerhoff Scholars program to increase the number of black scientists. "Many minorities believe that most universities don't want them there."

The tough environment presents a major challenge to educators, who predict that only programs with a proven track record and strong institutional support will survive. But the veterans of 2 decades of efforts to improve diversity in science are already employing new strategies for braving the political and economic chill. They are focusing on systemic reform of kindergarten through grade 12 (K-12) science and math education, and opening their programs to students of all colors, while making sure that those who need help most—minorities and women—reap the greatest gains. "We are seeing a backlash against affirmative action, but I do feel that we are closer than we have ever been to achieving equity in mathematics and science education in schools [at the K-12 level]," says Beatriz Chu Clewell, principal research associate at the Urban Institute.

These changes come at a time when some politicians and educators question whether women and minorities still deserve favored treatment in science and engineering. The answer is yes if you look at the numbers, says Catherine Gaddy, executive director of the nonprofit Commission on Professionals in Science and Technology, which analyzes human resource data on scientists. Although more women are earning science degrees, the percentage of degrees earned by underrepresented minorities has changed little, especially in the natural sciences and engineering (see chart). "My biggest concern is that the percentage of minorities earning degrees in science and engineering isn't going anywhere—and for African Americans it's just hovering," says Gaddy. Minorities earned just 10.7% of all science bachelor's degrees in 1992—compared to 10.2% of such degrees in 1981. And although women are closing the gender gap, they are still relatively scarce in many natural sciences, and they are rare at the top, in the ranks of full professors.

**Backlash blues.** Closing those gaps is likely to get even tougher if Congress outlaws federal affirmative action programs, as proposed by Senator Bob Dole (R-KS) in a bill introduced last summer. And a recent Supreme Court ruling sets narrow limits on any programs that make distinctions based on race or sex (see p. 1908) and is forcing a review of all such programs in the federal government. It is still unclear what all this will mean to programs at NSF and the National Institutes of Health. But if these and other government programs are reduced or eliminated, the impact could be devastating because the government is by far the biggest sponsor of efforts to increase diversity in science. "A small change in government spending will make a big difference," says Ted Greenwood, program officer at the Alfred P. Sloan Foundation, which spends about \$3 million a year on minority programs. Foundations do sponsor scholarships and academic programs, but "the government is the 600-pound gorilla here,"



**Minor movement.** U.S. minorities, especially blacks, still earn a tiny fraction of all science and engineering Ph.D.s.



## Gender, Race, and Class

Women and minorities are often lumped together in discussions of diversity, as both are underrepresented in science. But an emerging body of research suggests that these groups have different career patterns, and that socioeconomic class may be as important as race or sex to success in science. "In many situations, the main thing women and minorities have in common is that they are not white men," says Barbara Lazarus, associate provost at Carnegie Mellon University in Pittsburgh.

Students' family backgrounds—their parents' affluence, education, and encouragement—are often critical in determining whether they will earn a degree in science, an achievement which on average takes more time and effort than earning a degree in the humanities, researchers say. An affluent white woman with educated parents, for example, has better prospects for staying in science than does a poor black woman from the inner city, even though both may face discrimination, particularly in the physical sciences or as faculty members. Elaine Seymour, a sociologist at the University of Colorado, Boulder, and co-author of a new 3-year study on why undergrads drop out of science, minces no words: "The word 'class' is taboo in this country. But it's clear—this is a social class issue."

Although enrollment of women and minorities in freshman science classes has gone up dramatically in the past decade, a disproportionate number drop out of science. It's here that class

factors play a big role. Many students are finding it hard to afford college, researchers say, because budget cuts have made scholarships and financial aid scarce. Minorities feel the pinch disproportionately because many come from poor or working-class backgrounds and cannot afford to pay tuition for the extra time needed for a science degree. "Financial aid is the number one reason for attrition for minority students," says George Campbell Jr., president of the National Action Council for Minorities in Engineering. Students can work, but this leaves less time for study. "Faculty don't have a clue about how many hours students are working," says Seymour.

In addition to trying to pay for their education, lower income students are more likely to have family responsibilities that require them to work. And poor students often attend poor schools that don't prepare them well for college science and math, researchers say. Working-class women, particularly those of color, face an additional challenge—their families may be less supportive of their plans to become scientists, especially during the long hours of graduate school, says University of Georgia sociologist Linda Grant. In fact, in a study of 600 academic scientists, Grant found that many senior women were spouses, ex-spouses, daughters, or sisters of eminent scientists—underscoring the notion that family encouragement and connections to the world of science give students a major advantage.

—A.G.

says Greenwood. Indeed, even the \$350 million spent since 1988 on science education and diversity programs by the largest philanthropic organization, the Howard Hughes Medical Institute (HHMI), is minimal compared to the more than \$2 billion spent by the government over the past 20 years. "It's unrealistic to think the private sector can be a replacement for cuts in the federal budget," says HHMI President Purnell W. Choppin.

Few such cuts have actually been made yet, given the long-drawn-out funding cycle and the wrangling over the federal budget. Yet shifting priorities are already taking their toll. For example, NSF pulled the plug on one of its programs, Research Careers for Minority Scholars (RCMS), which provided \$6 million a year for research by minority undergrads. One of the programs left out in the cold is at the City University of New York (CUNY), which in September will lose \$200,000 a year, money that program director Neville Parker says he used to "nurture students and keep them in the pipeline."

The NSF canceled RCMS and used the money to refocus its efforts on K-12 education and to support another undergrad program called the Alliance for Minority Participation (AMP), which spends \$25 million a year on alliances of colleges that offer research opportunities for minority undergrads, says Luther Williams, assistant director for education and human resources at the NSF. But Williams doesn't want institutions to get too dependent on that funding either: "My intent was that AMP would catalyze these programs ... that the institutions would take them over, and the NSF would not fund them in perpetuity."

Meanwhile, at Kenyon College in Ohio, economist Susan Palmer is struggling to find funding for COSEN, an 8-year-old consortium of eight colleges in Ohio and the Carolinas (including Duke University) that has a strong track record of helping minorities and women

earn degrees in science. But it is losing its funding from the Pew Science Program in Undergraduate Education, which has given it \$1.3 million. Like NSF, Pew is shifting resources to K-12 education and prodding such consortiums to become self-sufficient after almost a decade of funding. But the cuts come at a time when new money is hard to find. "There's no way [our] institution can contribute that kind of money," sighs Palmer. "I've been looking for money, but I've been discouraged by the general climate against affirmative action."

These two are just warning signs that the once-abundant programs for women and minorities may be shrinking. "I think for sure there will be a reduction of targeted programs," predicts NSF Deputy Director Petersen. As the NSF reviews its efforts, it is trying to see how to get the same results without targeting women and minorities. But, Petersen adds, "the worry is if you lower the profile of these programs—if you never talk about women and minorities—will they have the same kind of potency?"

**Poor prospects.** These potential cuts in agency funding for diversity programs coincide with major economic trends that make it harder to land a traditional research job (*Science*, 6 October 1995, p. 123). A new study by Fox and Georgia State University economist Paula Stephan identified three major factors that may hamper students' career prospects: government deficits, which may prompt cuts in federal research funding; the end of the Cold War, which



**Cold reality.** Neville Parker and students at CUNY lost NSF funding.

ANDRÉ N. BECKLES/CUNY





EL PASO COLLABORATIVE

**Great expectations.** All students in El Paso, Texas, public schools are expected to do science and math.

curtains defense spending; and the lifting of the mandatory age for retirement, which slows turnover at universities.

The result of those changes is that many of the 3800 science and engineering doctoral students surveyed for Fox's study were glum about their prospects for finding university research positions, particularly in physics and chemistry. And women and minorities, who already drop out of science in greater numbers than men do, are the most easily discouraged, because they start out with uncertainty about whether they "belong," says sociologist Elaine Seymour of the University of Colorado, Boulder. The result, says Fox, is that the economic and political changes are "a closing of the door, so minorities and women don't have access to careers in science."

Even before the jobs are gone, the perception of a tough market may deter students, says Rosser, who now directs a women's studies center at the University of Florida, Gainesville. Already, the number of fresh-

men who enrolled in engineering last fall is "way down" for both men and women, says Linda Sax, associate director of the Higher Education Research Institution at UC Los Angeles, which surveyed 240,000 freshmen at 473 colleges. Ironically, there are still jobs in engineering.

**Strategic planning.** Given the economic uncertainty, policy-makers are changing their tactics even before the ax falls on their programs. Heeding Williams's warning, Parker is seeking funds from the CUNY administration and other new sources. "Every time you get money from the government, you better figure out how not to depend on it," he says. Commitment from institutions themselves is critical. "I didn't agree to do this job unless there was institutional commitment behind it," says Parker.

But even where the highest echelon of an institution turns its back on affirmative action, administrators can still take steps to increase diversity, as shown by Berkeley Chancellor Chang-Lin Tien. In the face of the regents' order to end preferential treatment in admissions, Tien has begun a program called the Berkeley

## ADVICE TOP from the

### Learning the Trade Secrets

The first time Anne C. Petersen submitted a grant proposal to the National Institutes of Health, she was turned down. Like many first-timers, she didn't know the usual routine—revise and resubmit—and she fired off an angry rebuttal to reviewers, an act not likely to improve her chances in the next round. Fortunately, the program officer clued her in. "She phoned me to say that she was tossing [my letter] in the trash and suggested the effective way to respond," says Petersen. Without an insider's help, Petersen would have made a costly mistake.

Today, as deputy director of the National Science Foundation and one of the most visible scientists in the nation, Petersen remains keenly aware that to succeed in science, the unwritten rules are at least as important as the official ones. And she considers it part of her job to help women and minorities—the newcomers to science—learn the "trade secrets" of the scientific world. Knowing the ropes is more important now than ever, she says, as those who lack street smarts may be trampled into the mud by the ambitious herd when times are tough.

Petersen, 51, entered science without understanding exactly what she was getting into. She chose to earn a Ph.D. in statistics and measurement, in part because she was planning a family and she thought academic life would give her time to be a traditional mom. "I had this fantasy that being a Ph.D. meant you had your summers off," she says. But she quickly learned differently. After getting her degree (from the University of Chicago) and a new daughter in one year, she worked such a hectic schedule as a researcher at Chicago that she and her husband arranged a tag-team system of child care, meeting daily at the train station and handing the baby across the turnstile to one another.

A native of Little Falls, Minnesota, Petersen has a natural, open quality, but she also has the mind of a politician: She's quick to understand the power structure. That helped her avoid a possible career dead end at Chicago. As an associate professor in the Department of Psychiatry, she won her own grants as a psychometrist and did research on adolescent psychology. But the depart-



Anne C. Petersen

ment wasn't expanding, and she realized that without an M.D., she would never get tenure. So in 1982, Petersen jumped ship to be a department chair at Pennsylvania State University, where she later became a dean. In 1992, she moved to the University of Minnesota as dean of the graduate school.

In every job, she made sure that those who worked for her understood the tricks of the trade. Often, Petersen says, minorities and women are sought after for teaching, advising, and committee work—and somehow miss the message that in many schools what really counts for promotion is re-

search. As department chair, she made sure all junior faculty "knew what they needed to know." For example, at Penn, a black sociologist was in such demand that her academic future was in danger. Instead of letting her sink or swim, Petersen stepped in, moving the woman's office to a more out-of-the-way place and fending off researchers seeking only a minority name on their grants.

In another instance, Petersen was asked by a university department to consult on why none of the women made tenure despite their strong credentials. She talked to the faculty and discovered that professors often took newly hired men out for a beer or a squash game, all the while passing along valuable information such as the idiosyncrasies of the department chair. But this didn't happen with women. "It was clear the women had no informal socialization, so they really weren't learning the ropes," she says.

Sometimes, not knowing the ropes can have a measurable effect on careers—and salaries, says Petersen. In her first year at Penn, she was amazed at how differently men and women responded to their salary increases. "Several men came in after to complain, but no women did. ... Two women told me that I had given them more than they deserved! [They] felt that they were appropriately expressing their gratitude. ... They did not realize that their manifest message was that they could have been given less." Whether the goal is to win grants or a bigger paycheck, says Petersen, women who understand the informal rules of the game are more likely to succeed.

—Constance Holden

Pledge, which sends recruiters to high schools to find minorities who qualify for admission, especially in science and math.

At other institutions, the answer is to broaden the pool. At UMBC, for example, Hrawbowski launched the Meyerhoff Scholars program in 1989, which has helped 48 African Americans earn B.S. degrees. But now the highly successful program is reconfiguring to ensure its survival. This fall it will open its doors to students of all colors—if they can demonstrate that they are committed to helping underrepresented groups in the sciences, such as by working with inner-city kids. “Our most important goal is to increase the number of successful minorities in science, and it’s not just minorities who can help,” says Hrawbowski.

The same tactic is being used in programs that assist women. New NSF-sponsored programs now enlist both male and female faculty members in sessions on how to be more effective in teaching and working with women, says Rosser.

And no matter what the government does, nothing is stopping institutions from taking matters into their own hands. At Tulane University, President Eamon Kelly is dangling a juicy carrot in front of departments that hire minorities—\$750,000 from its general fund to hire and support qualified new minority faculty members. This is not a new approach, but it’s unusual in these times.

**Future stock.** While Kelly works at the faculty level, many educators are looking to the future, which means today’s K-12 students. In El Paso, Texas, where 80% of public school students are Hispanic and 5% are black, a diverse group is working to boost the performance of students in grades K-12 and college. The El Paso Collaborative for Academic Excellence—led by the mayor, a county judge, a nun, and other educators—seeks to have all students master math and a deep understanding of science, rather than tracking only “gifted” kids into these courses. “There are just not enough kids making it through high school to get into science and math in college,” says Susana Navarro, an educational psychologist at the University of Texas, El Paso, and executive director of the collaboration.

The El Paso project is one of 25 urban areas to receive an Urban Systemic Initiative Grant from NSF. The bulk of the students in these cities, including New York City, Detroit, New Orleans, and Chicago, belong to minorities, but the initiatives are not affirmative action programs because they include every student in the system. So they should be immune to the anti-affirmative action backlash, yet fill the pipeline with better prepared minorities and girls.

So far, this systemic reform is getting high marks from people like Kati Haycock, who directs the education trust at the American Association for Higher Education. Colleges that join these initiatives tap into a pool of better prepared minorities and women, she says. “CUNY had the best prepared freshman class in decades,” says Haycock, referring to the College Preparatory Initiative, a project run by the New York City Public Schools and CUNY. “Pushing students—and schools—toward higher level classes is having a payoff in higher education as well.”

In fact, when institutions make structural changes



**Lydia Villa-Komaroff**

## ADVICE from the TOP

### Spinning Setbacks Into Success

In 1984, Lydia Villa-Komaroff was up for tenure at the University of Massachusetts, and it wasn’t at all clear that she would get it. She had been a rising young star in molecular genetics, but as an assistant professor she had fallen into a trap common to other young minority and women scientists: She had taken on a huge teaching and committee load, leaving little time to pile up publications. “I was a good citizen,” she says. Tenure committees, unfortunately, don’t give stars for citizenship.

In the end, Villa-Komaroff did win tenure, but the process was so painful that she left the university anyway. Hoping that the high-pressure atmosphere would boost her research productivity, she moved to a nontenured slot at Harvard Medical School’s neurology department and concentrated on publishing. She improved her research track record, spun off topnotch protégés—and in January 1996, her career took off, when she was tapped to be a high-level administrator at Northwestern University. She is now second in command overseeing the university’s \$170 million in research.

Villa-Komaroff, 48, says young scientists should be wary of the “mistake” she made—letting good citizenship take precedence over good scholarship—but that her own career shows that even after a misstep, it’s possible to move on and succeed. At a time when only one in 10 grant proposals receive funding, she says, it’s important not to fear failure, but to learn from it. “You have to turn it around,” she says. “If you consider ‘failure’ either rejection of a paper or rejection of a grant, then you’ve really had it, because it’s bound to happen.”

Villa-Komaroff herself isn’t afraid of failure, perhaps because she’s always blazed a trail, both as a researcher and as the third Mexican-American woman to earn a Ph.D. in science in the United States. She grew up in a middle-class family in Santa Fe, New Mexico, and studied molecular biology at the University of Washington and at Goucher College. She married and went on to the Massachusetts Institute of Technology, where she earned her doctorate under Harvey Lodish and Nobel laureate David Baltimore. Then came a “spectacular” postdoc at Harvard University, under another Nobel laureate, Walter Gilbert, conducting some of the first experiments to express a human gene (for insulin) in a bacterium.

When she returned to Harvard, Villa-Komaroff picked up on her old research strengths and made a name for herself working on insulin and insulin-related growth factors. Even as her research gathered steam, she managed to stay involved in advisory panels and groups such as the Society for the Advancement of Chicanos and Native Americans in Science, which she helped found as a graduate student. That made it easy for her to slide into a different track as a research administrator, as now her outside work and broad scientific interests are strengths. For Villa-Komaroff, working hard and learning from her mistakes were the keys to coming out ahead in the end.

—Jocelyn Kaiser

to improve the way they teach minorities and women, almost all students seem to benefit. In New York City, the number of minorities passing college-prep science courses more than doubled—and the number of whites passing these classes rose by 34%. A 2-year study at the University of Southern California found the same result: When faculty members changed their teaching methods and curricula to boost the retention of women in science, men’s grades also improved. All this suggests a key strategy to thaw the ice surrounding diversity programs, says Rosser: Get the message out that in many cases, what’s good for women and minorities is good for everyone in science.

—Ann Gibbons