what's needed. "We need an environment which really rewards research," says Hill of Meharry. And although black universities are creating new positions like vice president for research, many aren't trimming teaching loads or opening new labs fast enough for some research-oriented faculty members.

Warren W. Buck, who helped create the new Ph.D. program in physics at Hampton University, was drawn there because the school is near both the Department of Energy's new electron beam accelerator, CEBAF, and NASA's Langley Research Center. But when he first arrived 9 years ago, he felt he was swimming upstream by trying to do research. Things have improved—teaching loads in his department are down from four courses per term to one or two—but he still feels his research efforts aren't fully appreciated.

Julius Jackson, a microbiologist at Michigan State University, took a leave of absence to help build Clark Atlanta University into a world-class research institution. But now Jackson is disillusioned with the university's commitment to research and points out that teaching loads for many faculty are still three courses per term. Officials like Kofi Bota, who holds the new title of vice president for research and sponsored programs at Clark Atlanta, counter that the university's commitment is strong but there simply aren't resources to do everything at once.

Even at Howard, the only black school considered a comprehensive research university, faculty members say they have to be aggressive to win administrative support for their research. "When I first came there was a lack of understanding of what things had to be done to support big science research. But I think understanding is increasing," says Michael Spencer, professor of electrical engineering and director of the Materials Science Research Center at Howard. "The problem at many schools is that people who have never done research don't understand what it takes," says Spencer. "At major universities there's an appreciation for the mentoring of graduate students. Unless you've done it yourself or been in an environment where it's been done, you don't appreciate the effort."

Granting agencies are sensitive to this issue. When Hill moved from Colorado State University to Meharry 10 years ago, his NIH grant on tropical diseases (a mainstream, competitive award) was recommended for renewal for 3 years instead of 5: Reviewers wanted Hill to prove that his productivity could stay high in the new environment.

Today, Hill's grant has been renewed twice — and that's a good sign for Meharry. In the end, it may be the ability to get and keep competitive grants that determines whether black campuses are able to extend their undergraduate successes into the realm of graduate school.

–Elizabeth Culotta

RESEARCH AWARDS TO SELECTED BLACK UNIVERSITIES

Institution	Mainstream Grants	Minority Grants (in millions)	Total Research
Clark Atlanta University	$8	$16	$24
Hampton University	$4.8	$6.7	$11.5
Florida A&M University	$11.8	$17.6	*$29.5
Jackson State University	$2.7	$6.2	$8.9
Meharry Medical College	$4.8	$7.2	$12
North Carolina A&T State University	$3.1	$13.1	$16.2

*Numbers may not add up due to rounding.

RACIAL MODIFIERS III

Asian-Americans Bump Against Glass Ceilings

They're flooding the pipeline but say that they're still blocked at the top.

Alice Huang came to this country on a boat from mainland China at the age of 10. The year was 1949, she was a refugee without a penny to her name, and she was accompanied only by two siblings, but that didn't stop her from becoming a virologist and an American success story. It would be hard to imagine a more impressive curriculum vitae in science: Wellesley, a doctorate from Johns Hopkins, full professorship at Harvard. By 1989, she had become the first Asian-American to become president of the American Society of Microbiologists, and one of the first Asian-Americans to head any national scientific society. A year ago, in another first, she was named Dean for Science at New York University. On the surface, it appears that Huang has risen swiftly through the ranks, unimpeded. And yet she describes the very real barriers she has encountered. Says Huang: "There is no question that a glass ceiling exists for Asian-American scientists. I've experienced it. And the elite institutions are the worst."

Even after all her successes, she still remembers one committee that was searching for a woman to fill a "very top level job" at a prestigious college. "I realized early on in the interview that although I was qualified on paper, it was highly unlikely that they would appoint an Asian-American to the position," she recalls, "considering they had been so WASP for their whole history. They were pushing me on what I would be willing to give up for this job." In the end, Huang confronted them: "I told them that I doubted whether they were going to offer this job, at this time in the history of the institution, to an Asian-American woman." As she recalls, two of the committee members actually nodded, confirming her suspicions.

But other minorities would love to have Huang's problems. Compared to blacks and Hispanics, Asian-Americans have achieved tremendous success: They are "overrepresented" in the ranks of science, comprising 7% of all doctoral scientists working in the United

States in 1989 (even though they make up only 2.9% of the total population), according to the National Science Foundation. And they've won a disproportionate number of Nobel prizes. Perhaps because many Asians arrive in this country with excellent high school or undergraduate educations in math and science, they do not have the same difficulties as other minorities in excelling in scientific research. The barriers they face are more subtle, and perhaps more parallel to those faced by women in science than to those faced by other American minorities.

Ultimately, all their obvious accomplishments are scant comfort to Asian-Americans who find themselves bumping up against these invisible barriers in their efforts to become leaders in industry, academia, and in the government science and technology enterprise. According to the National Science Foundation, Asian-Americans are not reaching the upper echelons of science and technology in numbers proportional to their presence as scientists: They lag behind whites, blacks, and Hispanics in tenure status and academic rank in the United States. In 1989, only 43% of Asian-American scientists and engineers with doctorates had tenure, compared with 56% of whites, and only 35% of those doctorates were full professors, compared with 42% of whites. And Asian-Americans have been noticeably absent, at least until very recently, from leadership positions as deans, institute heads, and advisory board members.

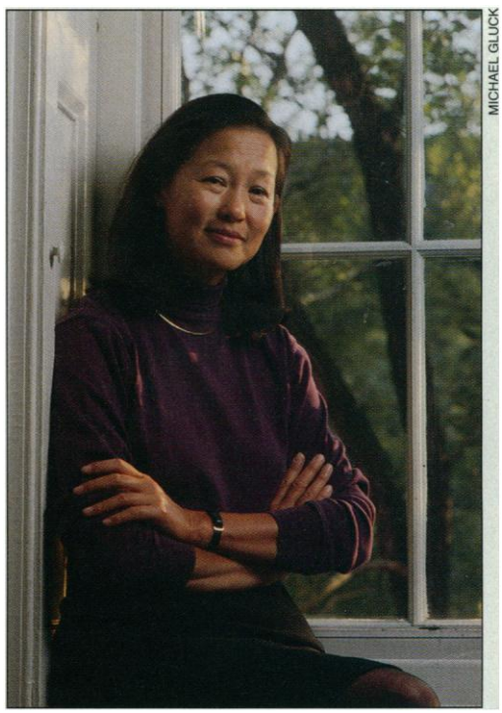
Of course there are notable exceptions. Just last year, Chang-Lin Tien was appointed chancellor of the University of California, Berkeley. And University of Pennsylvania astrophysicist Benjamin Shen was finally named to be the first Asian-American on the National Science Board. But these exceptions are recent and few, raising the question: Why haven't Asian-Americans gained more power in the scientific establishment? Most Asian-American scientists are reluctant to blame blatant discrimination and will say only that cultural differences and the language barrier may be hurting them. Of course, many Asians return to their native countries before they have a chance to climb to the top: Only about 70% of Asian scientists working here are U.S. citizens, and of those that come to the United States for doctoral or postdoctoral studies, many return home—particularly the Japanese. "These days there are many more opportunities in Japan," says Nobel laureate Susumu Tonegawa, a Massachusetts Institute of Technology biologist who first came here in 1963.

But what is holding down the Asian scientists who do remain in this country? For despite their image as naturally gifted scientists, the bulk of them remain in the rank and file of bench scientists.

Language barrier. The most obvious barrier to career advancement for many Asian-American scientists is language. "Communication skills are definitely a problem for the zero generation," says Yung-Chi Cheng, the Henry Bronson professor of pharmacology at Yale University, who emigrated from Taiwan in 1968. "My English is very poor. But I have been lucky so far. One way or another people accommodate me."

Good communication skills may be particularly vital for scientists employed in business. Jack Huang, a physicist at Honeywell Inc. who is Alice Huang's brother, speaks English fluently but admits that "sometimes in impromptu presentations I'm groping for words. You can express yourself in equations, but in this country verbal and written communications are key." Kenneth Fong, a molecular biologist who started his own biotechnology company, Clontech Laboratory Inc., in 1984, says, "Technically, I know that Asian-Americans are well trained. They have no problem going up the ladder in industry. But at the executive level where you encounter the old boy network, you need special skills."

Cultural differences. Beyond richness of vocabulary, these special skills include assertiveness. "Asian-Americans tend to be courteous and not make a big argument, even in scientific discussions," says Berkeley's chancellor Tien, a mechanical engineer and the first Asian-American named to head a major research university. "Even now, I sometimes have to remind myself that I have to adjust as I move between the two worlds." Alice Huang adds, "We need to be somewhat more aggressive, to exude self-confidence."


MICHAEL GLUCK

"There is no question that a glass ceiling exists for Asian-Americans. I've experienced it."
—Alice Huang

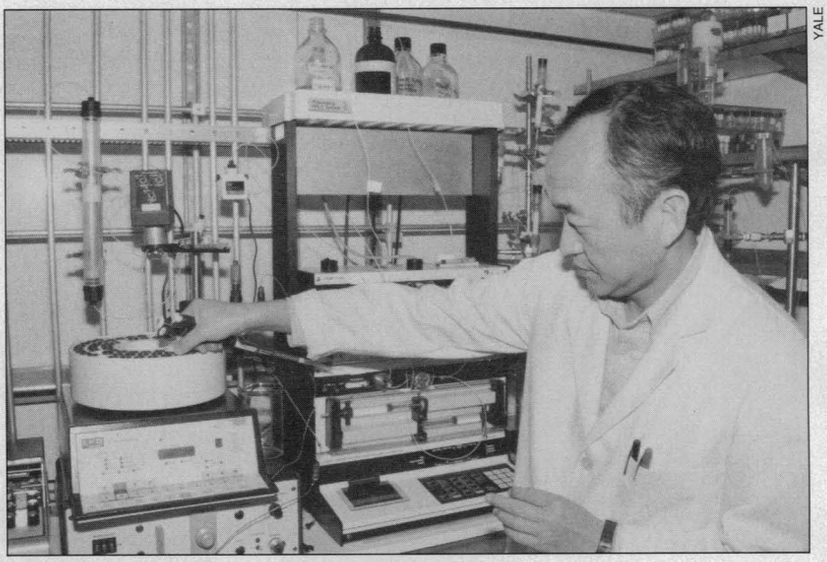
As a result of these differences in style, others may feel that Asian-Americans don't have the right "people skills" for leadership positions in science. "I don't think it's an intentional bias," says Tien. "People subconsciously feel that Asian-Americans can't do management." But the strength of Asian countries in science-related industry belies this stereotype. "If the Japanese can run their companies well, why shouldn't Asian-Americans be able to run them here?" asks Yale's Cheng.

Lab bound. Yet another reason Asian-American scientists aren't filling top-level jobs may be self-imposed: Many don't want to leave the lab behind. "In traditional Chinese culture, there is a strong tendency to think that scholarship is supreme," says Yang Chen Ning, Nobel laureate physicist at the State University of New York, Stony Brook. Less than 9% of Asian-American faculty at 4-year institutions listed administration as their primary activity, compared with 17% in administration in the faculty as a whole in 1985, according to a survey by the National Research Council. On the other hand, 41% of Asian-American faculty listed research as their primary activity in contrast to only 21% of all full-time faculty.

Some Asian-American scientists feel that fear is part of the reason for the tendency to cling to the bench. They don't want to risk running into bias or challenging the system. And part of the appeal of staying in the lab may be that lab scientists are evaluated impartially on their record of published papers, points out Tonegawa at MIT. But in the promotion process for administrative positions, evaluations become more subjective. "The people who are doing

the evaluating for these positions are mostly members of the majority, and so minorities don't get totally equal evaluation," Berkeley's Tien says. "So rather than fighting for equal judgment, they find that it is not worth it to fight."

Even Asian-American scientists who say they have never personally suffered discrimination will often say that in a close race between an Asian-American and a white who are both qualified for a position, the white is apt to win. And Asian-Americans point out that they have not had the benefit of affirmative action or special federal protection in their efforts to overcome such bias. "As far as the federal government is concerned, Asian-Americans are overrepresented," says David Chu, a professor of medicine and chemistry at the University of Georgia who came from South Korea in 1968.



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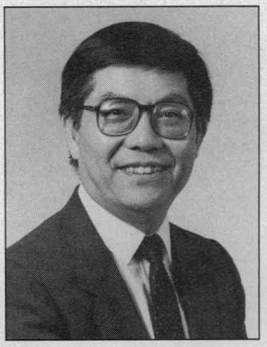

Rare birds. Yale professor Yung-Chi Cheng *(top)* and University of California, Berkeley, chancellor Chang-Lin Tien *(right)*, have flown to the top of science.

Such subtle forms of bias can contribute toward a feeling of insecurity in even the most accomplished Asian-American scientists. "I wouldn't call it discrimination in a strict sense, but there is a feeling of differences. We all live with it," says Tonegawa. Amiya Banerjee, vice chairman of the Research Institute of the Cleveland Clinic Foundation, learned excellent English in the schools of Calcutta before coming to this country in 1966 and mixes socially with his white colleagues. "I have not felt any overt discrimination. But I do feel that I have to be much better than my fellow colleagues in order to get recognition," says Banerjee.

Asian-American ascendancy. It is unclear whether this cycle of bias and insecurity will disappear entirely in subsequent generations. But there are signs on the horizon that Asian-Americans' star may soon be rising: In the international business world, Asian-Americans are beginning to prove they sometimes have a clear advantage. "In all fairness my ethnic background has helped me," says Frank Kung, a Taiwanese-born biologist who founded a biotech firm, Genelabs Technologies. "I have a global perspective."

A new generation of Asian-American scientists born in this country also should face fewer barriers created by language and cultural differences. The hope is that their experience will parallel that of the European immigrants earlier in the century and that it will take only one or two generations before the children of Asian immigrants also rise to the highest levels of academia and industry. At any rate, interviews with some first-generation Asian-Americans seem to point in a positive direction. For instance, Vishwanath Lingappa is the son of two microbiologists, both of whom emigrated from India. "My parents certainly experienced a glass ceiling," says Lingappa, a professor of physiology and medicine at the University of California, San Francisco. "But I'm not aware of any barrier in my own case." Lingappa, who holds degrees from Swarthmore, Cornell, and Rockefeller, believes that socioeconomic class and the "right schools" are much more important predictors of success than ethnicity in the United States.

As more Asian-Americans make it to the top, more will be in the position to help others. The formation and growth of societies like the Society of Chinese Bioscientists in America and the Korean Scientists and Engineers Association in America may be a sign that Asian-American scientists are getting more savvy politically, too.

In the end, power in the scientific establishment will come as an inevitable result of the growing number of Asian-Americans, many believe. "If you reach a critical mass, people have to pay attention to you, and things have to change," says Fong at Clontech. And there are signs that this critical mass may be fast approaching. One sign is Tien's appointment as chancellor at Berkeley. Another is the political activity of scientists like S.B. Woo, a physics professor at the University of Delaware who was elected Lieutenant Governor of Delaware, and was in the final stretch last week of a tight race for a congressional seat. Predicts Tien, "In the coming decade, you will see a lot of prominent Asian-American scientists in leadership positions, both inside science and outside it." Listen for the sound of shattering glass, as Asian-Americans break through what they hope are the final barriers. As Alice Huang says, "Whether we want them or not, we're going to have to take leadership roles."

–Susan Katz Miller

"If you reach a critical mass, people have to pay attention to you, and things have to change"
—Kenneth Fong

Susan Katz Miller is a U.S. correspondent for New Scientist.