

falling,” says Alice Gast, vice president for research and assistant provost at the Massachusetts Institute of Technology, where the number of international applications to its six graduate programs has returned to 2000 levels after a 16% drop in the past 2 years. “I’ve been looking at MIT figures historically, and you can see how political events over the years have impacted the numbers.”

Alan Goldman, chair of the physics department at the University of Minnesota,

says that “we were bracing for a tremendous attrition rate last year [in the number of applications], but it’s been less of a problem than we thought. I’m not saying that it’s not a problem—there are perceived and real barriers to entry. But we’re managing.”

As Zhu settles in at Johns Hopkins, he can still remember the bumpy road he traveled to get there. “First my Chinese adviser wanted me to apply to graduate school at CAS,” he says. Then Zhu got rejected by all but one

U.S. graduate program—“and they didn’t offer any money, so I didn’t go.” Finally came the opportunity to travel to America and “find someone who would sponsor me.”

A tighter immigration policy is probably no match for someone with such perseverance. But for U.S. academics, the question remains: Are there still enough people like Zhu out there?

—JEFFREY MERVIS

With reporting by Ding Yimin in Beijing and Pallava Bagla in New Delhi.

NEWS

Settling In on Campus

Immigrant scientists say that it can take a while to warm up to the U.S. academic climate—but there are big benefits for both sides

Zhong Lin Wang is a materials scientist, not an actor. But as he sat in his Atlanta hotel room in June 1994, rehearsing the graduate lecture he was to give the next day at Georgia Institute of Technology, he knew that his chances of getting a faculty position rested on his performance in the classroom. “The department was already impressed with my research credentials,” says Wang, who at the time was working at the National Institute of Standards and Technology in Gaithersburg, Maryland. “What they wanted to know was: ‘Can this guy speak English? Will he be able to teach?’”

Growing up in Pucheng, China, Wang had always wanted to be a professor. But after earning his Ph.D. in 1987 from Arizona State

University in Tempe, Wang had been turned down for numerous academic posts. Although he couldn’t prove it, he was convinced that his ethnicity had played a signif-

icant role in those rejections. “The perception of a language barrier was a bigger obstacle than language itself,” he says.

A decade later, as a tenured full professor at Georgia Tech, Wang has long since shattered that barrier. And the 10 students he has helped earn graduate degrees are testimony to his ability to function in a U.S. academic setting. But like thousands of other immigrant scientists, Wang has had to walk the extra mile to gain the acceptance of his U.S. colleagues.

In return, U.S.-born scientists have benefited from the cultural influences of their immigrant colleagues and expanded their research horizons. Immigrant scientists often gravitate to scientific problems of pressing interest back home, and links they forge with researchers in the United States and their country of origin have paved the way for increased global collaboration (see below).

At the same time, the strength



Scientific engine. Immigrants such as (from left) Uzi Landman, Mark Borodovsky, Abdul-Hamid Zureick, and Zhong Lin Wang make up 40% of Georgia Tech’s faculty.

A Clearer Look at Asian Pollution

Veerabhadran Ramanathan, an Indian-born atmospheric scientist at the Scripps Institution of Oceanography in La Jolla, California, has helped bring to the fore a research area that wasn’t on the U.S. radar screen. Literally.

Last year Ramanathan launched a project to study the composition, regional patterns, and impact of aerosol clouds over southern and southeastern Asia. The idea grew out of a 1999 experiment that revealed a thick, brownish haze of air pollution covering an area from the Himalayas to the northern Indian Ocean. “I could have studied brown clouds anywhere in the world, but I chose a region that includes India,” he says. “That’s probably not accidental.”

Seeing the cloud over the Bay of Bengal and imagining how the aerosols might disrupt monsoonal rainfall patterns for India and other

south Asian countries so haunted Ramanathan, now a U.S. citizen, that he drew up a proposal to set up more than a dozen climate-monitoring stations across Asia. The Atmospheric Brown Clouds project, funded by the U.S. National Oceanic and Atmospheric Administration and five Asian nations, is already spawning collaborations between U.S. scientists and researchers in India, China, Japan, and South Korea.

Russell Dickerson, an American-born meteorologist at the University of Maryland, College Park, says his participation in the 1999 experiment led him to shift his research focus from the developed to the developing world. “It made me realize that studying air pollution in south and east Asia was critical to understanding global climate change,” he says. Dickerson is now participating in a NASA-funded project being led by his Chinese-born departmental colleague, Zhanqing Li, that aims to investigate the effect of aerosol clouds above the China region.

—Y.B.

of ethnic ties can sometimes create what are known as “nationality labs,” in which the majority of students and scientists are from the same country as the principal investigator. Such labs can stifle the free flow of ideas and information and create an environment in which lab members feel undue pressure to conform to traditional norms, including hierarchical structures and long hours.

Learning the ropes

As Wang discovered, language can be a significant barrier to landing an academic job. But the problem doesn't end when an immigrant scientist is hired. Although Wang believes he showed from day one that “teaching is not about language but about delivering ideas,” no native-born graduate students joined his lab in his first 3 years at Georgia Tech. “They just didn't know how well they'd be able to communicate with me in a work environment where we'd be interacting frequently,” he says.

Only after Wang had taught a few graduate classes and interacted with several nonimmigrant students did the barriers begin to fall. And even though language wasn't a problem, it took a special effort by Wang and his native-born lab members to establish a comfortable working relationship. One of his graduate students, Daniel Moore, recalls a difficult moment 2 years ago when he asked for a week off during Passover to be with his family in New York. Wang wanted him to stick around to present a poster at a local conference. “I explained to him that I was Jewish, and that this was a very important holiday for me,” Moore says, adding that Wang was willing to listen and finally granted the leave.

Limited language skills and unfamiliarity with American culture can be a significant disadvantage for immigrant researchers at scientific meetings. Beyond the challenge of simply being understood, many Asian-born scientists play down the importance of communicating what they have discovered, says Da-Lin Zhang, a Chinese-born meteorologist at the University of Maryland, College Park. “We apply ourselves entirely to the research and don't think about how to present it,” he says. As a result, exciting work presented by an Asian-born researcher can sometimes generate a lot less interest than it deserves. In turn, says Zhang, Chinese- and Korean-born scientists are less likely to be asked to be keynote speakers at scientific meetings.

Cultural and language differences can also hinder networking, says Mei-Yin Chou, a Tai-



Country
RUSSIA
Surname
PROPOPOVA
Given Name
MARINA

Field
CHEMISTRY
Workplace
SEQUELLA INC.

U.S. IMMIGRATION
ADMITTED

CLASS
UNTIL

Fourteen years ago, organic chemist Marina Protopopova left her Moscow laboratory for a brief sabbatical in the United States—and never returned. “I was having such a good experience, and I kept saying: ‘I’ll stay just a little bit longer.’” Three years into her extended absence, the Russian Academy of Sciences’ Zelinskii Institute cut her loose. “My mom was more upset that I was fired than I was,” she says. “I’ve had an awesome experience here.”

Born in Siberia and trained at Moscow State University, 44-year-old Protopopova now lives in suburban Maryland. Her journey began with an invitation from an American collaborator in San Antonio, Texas. “I came with \$30 in my pocket, but everyone was incredibly supportive,” she says. Still, “the first 3 months were exhausting” due to language barriers. “I didn’t even get a telephone because it was too tiring to understand [callers].”

What sold her was the scientific culture. “In Russia, we had these brilliant academicians, but they never gave open lectures like they do here,” she says. That openness outweighed the provincialism of some of the students. “They didn’t even know there was an ocean between [the U.S.] and Russia,” she says in amazement.

After teaching and corporate chemistry stints in Illinois, Protopopova followed her husband—an American academic—to Maryland. In 1999 she joined Sequella, a Rockville, Maryland-based biotech company that is developing tuberculosis drugs. Now the firm’s director of chemistry, she heads a multinational team that includes several Russians. There’s “absolutely no way” she could do similar work at home, she says.

The mother of two young children, Protopopova has applied for U.S. citizenship. Her only regret is the distance from her parents and relatives. “Siberia really is on the other side of the world.”

—D.M.

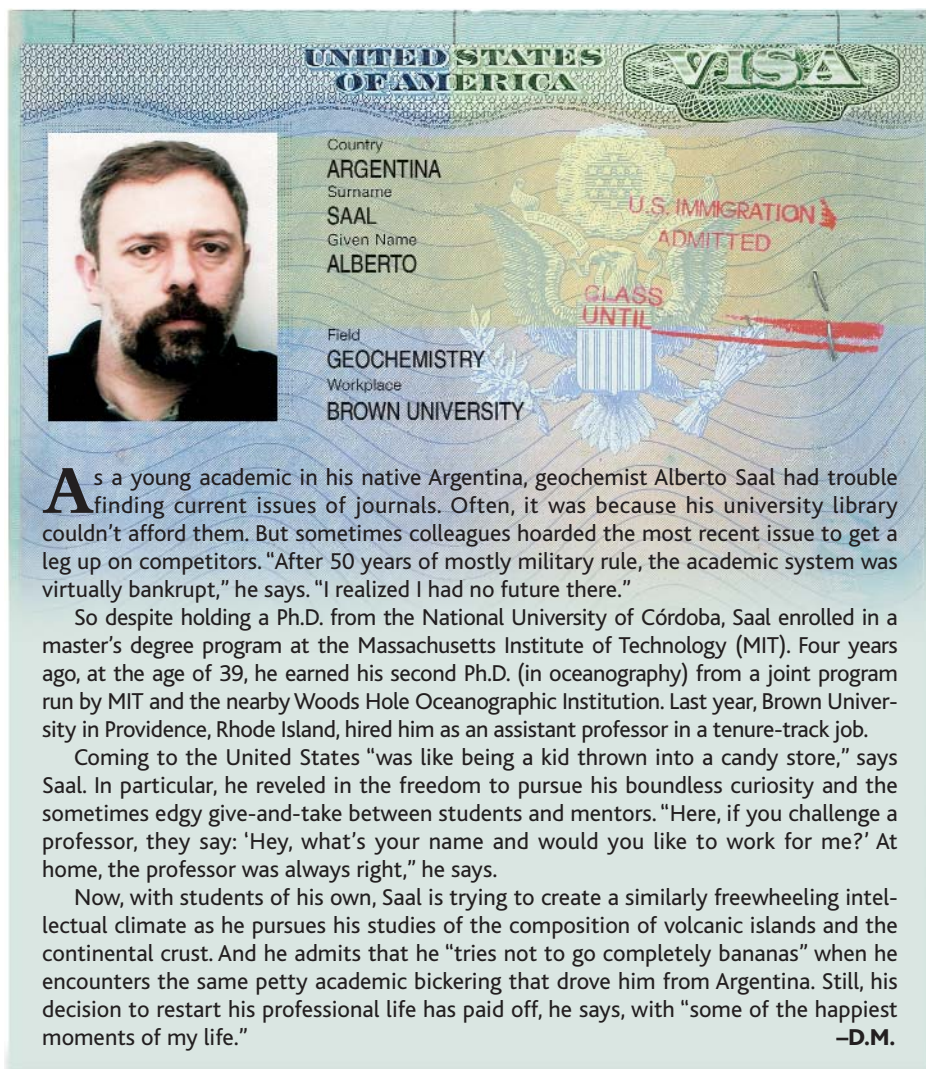
wanese-born physicist at Georgia Tech. Chou, who came to the University of California, Berkeley, in 1980 to get her Ph.D., says it took her a few years to learn the importance

of marketing her work. “You can’t be shy about going up to people at conferences,” she advises her doctoral students—of whom three are Chinese, one is Indian, and one is African. “And then you can’t start telling them about your research right away. You must find the right moment.”

Although the barriers of culture and language can make assimilation a challenge, they ultimately have little impact on the research activities of immigrant scientists, says Maryland’s Sergei Sukharev, a Russian-born biophysicist who came to the United States in 1987 as a postdoc. The diversity of U.S. academia, he says,

Right at home. Maryland’s Sergei Sukharev says scientists speak a universal language.





As a young academic in his native Argentina, geochemist Alberto Saal had trouble finding current issues of journals. Often, it was because his university library couldn't afford them. But sometimes colleagues hoarded the most recent issue to get a leg up on competitors. "After 50 years of mostly military rule, the academic system was virtually bankrupt," he says. "I realized I had no future there."

So despite holding a Ph.D. from the National University of Córdoba, Saal enrolled in a master's degree program at the Massachusetts Institute of Technology (MIT). Four years ago, at the age of 39, he earned his second Ph.D. (in oceanography) from a joint program run by MIT and the nearby Woods Hole Oceanographic Institution. Last year, Brown University in Providence, Rhode Island, hired him as an assistant professor in a tenure-track job.

Coming to the United States "was like being a kid thrown into a candy store," says Saal. In particular, he reveled in the freedom to pursue his boundless curiosity and the sometimes edgy give-and-take between students and mentors. "Here, if you challenge a professor, they say: 'Hey, what's your name and would you like to work for me?' At home, the professor was always right," he says.

Now, with students of his own, Saal is trying to create a similarly freewheeling intellectual climate as he pursues his studies of the composition of volcanic islands and the continental crust. And he admits that he "tries not to go completely bananas" when he encounters the same petty academic bickering that drove him from Argentina. Still, his decision to restart his professional life has paid off, he says, with "some of the happiest moments of my life." **-D.M.**

versations about working for a PI from the same country. "Before I came to graduate school here, my Indian friends warned me: 'If you work for an Indian or Chinese boss, you'll have to work 24 hours a day,'" says Dhume. She disregarded the advice and joined an Indian-born researcher's lab because "there was a higher comfort level in interacting with him."

Soon, however, she discovered that her mentor expected her to work longer hours than native-born members of the group. "His message was: 'How can you be like these American kids? You should be working through your weekends and vacations,'" she says. "It wasn't that I didn't want to work hard. But I didn't like being treated differently."

At the same time, some immigrant scientists have imported a culture that is even more freewheeling than the U.S. variety. Leonid Glazman of the Theoretical Physics Institute at the University of Minnesota, St. Paul, is one of six Russian-born scientists on the institute's current seven-member faculty who helped popularize a "Russian-style seminar" throughout the school of physics and astronomy. It encourages listeners to aggressively ask questions right from the start of a talk. At times the main speaker is pushed aside, and things can get downright abrasive.

"When the Russians started doing this kind of questioning at our departmental seminars, it was frowned upon," says Glazman. "But now I see many native-born Americans doing the same thing."

Although immigrant faculty members agree that importing the discipline and rigor of the educational culture in their native countries can be positive, many limit the number of individuals from any one country in their labs in order to encourage cross-cultural interaction. "I've made a deliberate decision to keep no more than two students from any one [foreign] nation in my lab," says Farokh Mistree, an Indian-born mechanical engineer at Georgia Tech, whose 11-member group includes two Indians, one Chinese, one Korean, and seven U.S.-born graduate students.

Wang is particularly sensitive about the tendency of lab members from the same country to stick together. He also wants to reduce the chances that his foreign-born students are subjected to the same doubts about their language skills that he faced. In his own lab of 10 graduate students—half U.S.-born and half from Asia—hangs a notice banning students from speaking to each other in Chinese or surfing Chinese sites during lab hours. "I don't want any of my students to graduate with the feeling that being from a different culture is a disadvantage," he says.

-YUDHIJIT BHATTACHARJEE

fosters an environment in which national origin is almost irrelevant to scientific discourse. "The spirit is 'I don't care about your writing style, I don't care if you are a cocktail boy or a recluse. All I care about is what you are saying in your paper.'"

Nationality labs

Although foreign-born faculty members can facilitate the flow of international graduate students and postdoctoral researchers into the United States, the result can be ethnic enclaves within university departments—groups that consist predominantly of graduate students and postdoctoral fellows from the principal investigator's native country. It's not unusual to walk into one of these labs and find members having scientific exchanges in Chinese or Russian or one of India's regional languages, says Raymond Clark, a molecular biologist who witnessed such teams in action while a postdoc at the University of California, San Diego (UCSD). "Not only does this prevent the

speakers from improving their language skills—damaging their career prospects," says Clark, now a consultant at UCSD's Office of Government and Community Relations, "it also excludes other group members from the discussion."

Such labs can also reduce the quality of the research experience. If the PI happens to be from a culture that puts a premium on seniority and age, for example—as in India and China—a lab member from the same country may feel uncomfortable questioning the PI's research decisions and scientific judgment. "If I were working with a Chinese-born PI, I'd probably be more tactful about voicing criticism in the lab," says economist Chunling Lu, a Chinese-born research fellow at Harvard Medical School in Boston, Massachusetts, whose supervisor is a native-born American.

Ashwini Dhume, an Indian-born biomedical scientist at the National Institute of Arthritis and Musculoskeletal and Skin Diseases in Bethesda, Maryland, also has reser-