Job Market Does Number On Ph.D.s in Math, Science

Joblessness is especially severe in mathematics

by John Yemma

Let "x" equal the shrinking number of job openings for high-level mathematicians, physicists, and other scientists in the United States each year.

Let "y" equal the number of new American- and foreign-born Ph.D. scientists fighting for those jobs.

As many young scientists see it, "x minus y" equals dismal hopes of ever landing a prestigious academic post.

"My situation probably won't elicit much sympathy," said Stephen Sawin, an assistant professor of mathematics at Fairfield University in Connecticut. "I have a nice job now, but I am unhappy with how things progressed for me."

At a time when overall unemployment has fallen to around 5 percent, high-level scientists have been experiencing double-digit unemployment. This does not put them in unemployment lines or soup kitchens, but it does lead to jobs for which they are overqualified.

Take Sawin, 33. He has an undergraduate degree from Princeton, a Ph.D. from Berkeley, and he spent five years doing post-doctoral work at MIT. He won a prestigious National Science Foundation fellowship, was given letters of recommendation from some of the most notable mathematicians in the field, and has a strong research and publication record.

Sawin applied for positions at research universities three years in a row, beginning in 1994 — "casually the first year, seriously the second, and really, really seriously the third." In response to about 90 applications he received only two job offers before settling on Fairfield, a liberal arts college with a few small graduate programs, where very little research goes on.

The job market Sawin thought was there when he decided to pursue pure math back in the 1980s collapsed by the 1990s. Throughout the sciences and humanities, new Ph.D.s are complaining about how difficult it is to land one of the prestigious academic posts they spent years training for.

But in science and math, the job shortage is exacerbated by the steady stream of foreign-born scientists entering the U.S.

Unlike any other employment category — where the number of foreign workers who may enter the job market each year has a strict ceiling — U.S. law allows in a virtually endless stream of foreign-born scientists and academics under what is known as the Einstein exemption.

Like American doctors, who are urging cuts in the influx of foreign medical students, many young American scientists want fewer foreign-born scientists competing with them for jobs.

"Scientists, engineers, and computer people are getting pretty mashed around" by U.S. immigration law, said former Senator Alan K. Simpson, co-author of 1990 immigration reform legislation and now a lecturer at Harvard's John F. Kennedy School of Government.

Critics of current policy say it not only discriminates against one class of Americans — scien-tists — but discourages young Americans from entering the sciences and may ultimately hamper the country's innovativeness.

As Sawin puts it: "The established generation of scientists hasn't grasped the effect yet — people do not want to go into a field where they scramble to find any job, with little security."

Joblessness is especially severe in mathematics, a discipline that has seen major academic cutbacks in recent

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years, an influx of talented mathe-maticians from Eastern Europe and the former Soviet Union, and a continuing increase of foreign-born talent from Asia, led by Chinese, Taiwanese, Indians and Koreans.

"I've seen what's happened with colleagues in mathematics, and it's horrible," said Goeff Davis, an assistant professor of mathematics at Dartmouth. "They are constantly having to uproot and move from one postdoctoral position to another with no prospect of permanent employment. It is very demoralizing."

Only about 1,100 new mathematics Ph.D.s are produced each year in the United States, but through much of this decade mathematicians have experienced unemployment of more than 14 percent — more than twice the rate of the overall economy.

The good news, according to the Providence-based American Mathematical Society, is that preliminary figures show math unemployment may have dipped below 10 percent by late last year. But some mathematicians suspect the numbers understate the problem, since they track only new Ph.D.s, not those who have been in the job market for a few years and have given up hope of finding a position in their chosen discipline.

The world's biggest employer of mathematicians is the National Security Agency, the super-secret encryption and code-breaking operation based at Fort Meade, Md. It has 400 to 500 mathematicians on staff, and last year it hired 50 fresh math Ph.D.s, accounting for a large part of the year's decrease in unemployment.

Some scientists trace the problem back to the mid-1970s, when the National Science Foundation warned of an impending shortage of scientists and mathematicians and urged that the United States open its borders to the best brains from around the world. That warning was reissued as recently as 1990.

"The shortage [of mathematicians and scientists] never materialized, but in the process university teachers and research scientists were classified for 'special handling' under immigration laws."

The shortage never materialized, but in the process university teachers and research scientists were classified for "special handling" under immigration laws. This meant an employer could hire a foreign scientist or teacher if it could be shown that he or she was more qualified than native workers. In other fields, (except, oddly, sheepherding, where a shortage was also believed to exist), a foreigner cannot be hired if even a minimally qualified native is available.

While the "Einstein exemption" has brought some of the brightest lights in the sciences to the United States, it has also flooded the job market.

Among scientists, the surge in foreign-born labor is of growing concern, but fear of being branded a xenophobe, or a sore loser in the job market, has made many reluctant to speak out on the subject.

"You see evidence of immigration everywhere — people from the former Soviet Union and Eastern Europe," said Donald McClure, a professor of math at Brown University.

In almost all the hard sciences — physics, math, astronomy — and even in applied sciences like engineering, 40 percent of new Ph.D.s are foreign-born, according to the National Science Foundation. More than two-thirds of these graduates stay in the United States, most already armed with permanent resident status by the time they receive their doctorates.

To some observers that isn't a bad thing.

"I'm sure a lot of other countries would like to have the problem of attracting too many brilliant people to their country," said Stuart Anderson, an immigration policy specialist at the Cato Institute, a free-market think tank in Washington, D.C.

The brain drain is a problem for other countries, said Mario Molina, MIT professor of earth, atmosphere, and planetary sciences. Molina was born in Mexico, is now a U.S. citizen, and won a Nobel Prize in 1995.

"It is rather obvious that a significant number of MIT professors who have excelled were foreign born," said Molina. "For most research, it is very hard to think of circumstances where there appears to be no benefit" for the country that has liberal immigration.

Columbia University economist Jagdish Bhagwati, an Indian native, describes how the influx of foreign scientists pushes bright natives into jobs in second-tier schools and in other segments of the economy, improving overall quality. Natives, he said, have more options in the wider market than foreigners. Mathematicians, for instance, are in strong demand on Wall Street.

"I'm not saying there aren't temporary adjustment problems," Bhagwati said, but almost everybody in the nation "benefits when the super-brightest people in the world see America as the place to go."

Meanwhile, a number of talented natives have to find work — people like Charles Yeomans, who received a Ph.D. in math in 1990 from the University of Kentucky and now handles the accounting network for his wife's law firm.

"I'm fairly laissez-faire on most issues, but for me individually it has been very frustrating," Yeomans said.

"Now I do math on the side. You could say I've regained amateur status." TSC

High-tech Careers

The big draw for foreign students

by Jim Specht

The high-tech companies that hire hundreds of foreign workers each year usually don't have to travel any farther than the nearest college town to find them.

"We don't really go looking for foreign scientists, just the best young graduates available," said Coeta Chambers, hiring and recruitment attorney for computer chip maker Intel Corp., which hired 300 foreign workers in 1994. "But way over 50 percent of graduate students in these fields are foreign, so its not surprising that we will find some of them among the best."

For the past ten years, the number of foreign students in science and engineering doctoral programs has been growing steadily. In fact, foreigners have been awarded 54 percent of the science Ph.D.s in America since 1993.

And as more foreign students graduate from United States science programs, more of them are going to work at the universities as faculty and researchers.

A Gannett News Service computer analysis of more than one million government files found that universities are among the top recruiters for both permanent and temporary foreign workers. Three of the top five sponsors of permanent job-based immigrants over the past eight years were University of California, University of Texas and the State University of New York.

A System Out of Control

The ease with which foreign students can gain a temporary work visa and then a permanent one has federal regulators warning that the system may be out of control.

And critics worry that America will become dependent on foreigners to drive its technological edge — or worse yet, that those foreign students will take their expertise home.

In addition, many of these foreigners work in research almost entirely funded by state and federal grants and at state-funded universities.

"The American taxpayer is supporting extremely expensive research universities whose main educational purpose is to train students from abroad," David Goodstein, vice-provost of the California Institute of Technology wrote in *The American Scholar*.

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Goodstein wrote that although Congress and the public don't seem to have noticed, "while largely ignoring our own students, we are putting our money and best talent into training our competitors."

A Small Minority on Campus

But other university officials are quick to point out that foreign students, researchers and professors still make up a small minority of the total on campus.

"We're talking about universities that have thousands of people on the payroll, and usually the foreign faculty might be in the hundreds at most," said Mike Aitken, director of government relations for the College and University Personnel Association.

The news service's analysis of Labor Department and Immigration and Naturalization Service files found that universities have sponsored more than 15,000 professors and researchers for permanent immigration since 1988. They also received Labor Department approval for more than 70,000 temporary positions lasting six years or less.

That compares with an estimated 700,000 faculty positions and 2.3 million employees overall at state colleges and universities across the country, Aitken said.

Still, those foreigners are beginning to dominate the science and engineering fields, critics say.

"Professors love these foreign graduate students and research assistants because they aren't as focused on their own futures as U.S. students, and business loves the system because they have a bigger pool to pick from," said Kevin Aylesworth, a 1989 physics Ph.D. who now works for Sen. Tom Harkin, D-Iowa. "But you wonder what we are doing to the next generation of people looking to make science a career. They see that foreign competition and they'll head for medicine or law."

A Loss to Research Programs

But some science educators warn that U.S. research programs would suffer an irreplaceable loss if foreign students were restricted from moving on to become researchers and faculty.

"Education and research is pretty much a global activity these days, and you can't restrict yourself to national boundaries if you are going to find the best people," said George Carignan, associate dean of engineering at the University of Michigan. "It's not going to do us any good if the best students in the world begin to decide to go to the University of Taiwan instead."

A team of mostly Chinese students under mechanical engineering professor Sam Wu provided the research that helped Detroit close the gap with the Japanese on automobile body design, Carignan said. A group of mostly French researchers is working at the University of Michigan on laser technology that could allow surgeons to cut one cell at a time.

The students who come to the United States are the top graduates of the top universities in their home countries, said Gagan Agawal, 26, a native of India who just completed a Ph.D. at the University of Maryland and has been hired by the computer science department at the State University of Delaware.

"I wanted to do research on some of the newest high-end [computer] systems — and the only place to do that is in the United States."

Building a Multicultural Base

Federal officials who oversee science programs say the answer is not to limit access to foreign students and researchers, but to strengthen the ability of U.S. students to compete with them — here and abroad.

"If we're honest, we have to recognize that right now foreign students are harder working, hungrier and willing to train themselves in a multicultural way. They learn about how to succeed in the United States, not just how to succeed in science," said Rep. George Brown, D-CA, the senior Democrat on the House Science Committee.

"We haven't the vaguest idea about how to succeed in the Japanese culture or the Indian culture.

"For that reason, it's imperative that we encourage many of these foreign students to become American citizens, to give us that multicultural base," Brown said.

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