

On Issues of Immigration and Employment For Mathematicians

Cora Sadosky

The major political and economic changes that shook the world during the last decade led to population displacements. The simultaneous globalization of the economy produced complex effects on unemployment resulting in confusion, exasperation, and despair. Such a reaction is being felt in the U.S. mathematical community, which has faced an unexpected and sustained scarcity of jobs. Issues pertaining to immigration have come before the Society a number of times in the past few years. In view of this I accepted an invitation from the editors of the *Notices* to write on this subject.

Mathematics (Universal Science) in the U.S. (an Immigrant Nation)

Mathematics is the universal science *par excellence*, with no language or national barriers. This constitutes one of its great traditions. The validity of the same theorems in Chicago, Jerusalem, Beijing, Cape Town, Paris, Rio, Cairo, or Tokyo is one of the few things still beyond doubt—ours is an international enterprise.

“Throughout its history, the United States has been a nation of immigrants” reads the first sentence of “The New Americans”, the monumental new report produced by the National Research Council on “Economic, Demographic and Fiscal Effects of Immigration” [9]. It concludes that “immigration produces substantial eco-

nomic benefits to the U.S. as a whole,” yet recalls that “the current debate over... immigration is not new; it stretches back even to colonial times. There are concerns about the effects of immigration on the economic prospects of native-born residents.” On scientific immigration there is little, and all is praise.

In fact, there is not one significant aspect of American life that has not gained through immigration, from music to modern art and architecture, to sports, to medicine, and—paramount to all—to science. “The emergence of American research mathematics coincides with the founding of Johns Hopkins University and the hiring of the British Algebraist J. J. Sylvester in 1876” [5], while modern medicine began when the new Johns Hopkins School of Medicine brought Sir William Osler from Oxford.

Many of the immigrant scientists arrived already famous, as did Albert Einstein and Emmy Noether, and became the teachers to many of the more senior AMS members. But many others—refugees from Nazism also among them—developed brilliant careers here, building in the process renowned schools in U.S. institutions. The contribution of immigrants to the formation and consolidation of the American mathematical community is well known (see, e.g., [2] and [5]).

In the mathematics departments of many U.S. universities a substantial percentage of professors—in particular, of mathematicians—are foreign born. This would be unthinkable in Europe! It is a sign of how more socially open this country is with respect to the rest of the world. We should be collectively proud of the U.S. openness, which underlines an extraordinary social dynamism. The enlightened acceptance foreigners receive at our universities ought to be promoted as an example to follow.

Shortage of Professional Employment for Mathematicians

All this being widely acknowledged, there is a shortage of mathematical jobs in the United States of unprecedented proportions. Although

Cora Sadosky is professor of mathematics at Howard University. Her e-mail address is cs@scs.howard.edu

many causes coalesce to produce this problem, some voices are turning to a not-so-new approach: curtail immigration to protect jobs for U.S. nationals.

The problem of finding employment for graduating and recently graduated mathematicians is real and severe. Much has been said about how responsible institutions (like the National Science Foundation or the National Academy of Sciences) have made wrong predictions on the issue in the recent past (see, e.g., [1]).

This appalling situation is not unique to mathematics, but widespread in all academia, worse in the humanities than in the sciences. Many of its causes are common to the problems created by an increasingly global economy, but some are peculiar to the academic environment. Among the latter are declining overall federal funding for basic research, declining states' funding for higher education, and university administrations applying corporate methods to handle the educational boom, which has made colleges and universities into a \$180 billion industry, nearly 3 percent of the total U.S. economy (*New York Times*, August 31, 1997).

Under this plight, and finding it plausible that immigration has played a part in the high unemployment figures, a few mathematicians have gone to the public (see, e.g., articles in the *Wall Street Journal*, September 4, 1996, and in the *Boston Globe*, March 17, 1997) and to Congress, urging that the immigration of research scientists and university professors be restricted.

Traditional Scapegoat: The Alien

"2,000,000 chomeurs = 2,000,000 arabes" was Le Pen's slogan for the French National Party last fall. ("Chomeurs" translates as unemployed.) The FNP had to do away with this one xenophobic slogan when it was pointed out in the press as a carbon copy of the anti-Semitic slogan of the Vichy Government during WWII: "200,000 chomeurs = 200,000 juifs". ("Juifs" translates to Jews.) The public found it a bit too much to swallow, even with the high rates of unemployment that exist in France.

But if this happens in France, the cradle of rationalism and once a traditional refuge from persecution, what can one expect from the rest of the world? Elsewhere immigrants are often held responsible for social ills such as epidemics, housing shortages, lower economic standards, and unemployment.

Study after study has failed to substantiate these perceptions, but they still are used to create a scapegoat to explain every evil people suffer from. No need to look for real causes then, much less for solutions.

In the early 1990s at the start of the current job shortage in mathematics the easy explana-

tion was "women are getting all the jobs". Although AMS data provided the basis for an effective early refutation [3, 7], it helped spread stereotypes while diverting attention from the search for solutions.

Now some would make foreigners rather than women the scapegoats. *It is imperative that the xenophobic "foreigners are getting all the jobs" does not become a rallying cry for inaction on the real causes of the problem.*

"Do Baptist Preachers Cause Public Drunkenness?"

"I raise this unlikely inquiry because an old and famous tabulation clearly shows a strong positive correlation between the number of preachers and the frequency of arrests for inebriation during the second half of the nineteenth century in America.

"You don't need a Ph.D. in logic to spot the fallacy in my first sentence. Correlation is not causality. The undeniable association of preachers and drunks might mean that hellfire inspires imbibing, but the same correlation could also (and more reasonably) suggest the opposite causal hypothesis that the rise in public drinking promotes the hiring of more preachers. But yet another possibility—almost surely correct in this particular case—holds that preaching and drinking may have no causal relationship, while their simultaneous increase only records a common link to a third, truly determining factor. The steady rise of the American population during the late nineteenth century promoted an increase in thousands of phenomena linked to total numbers, but otherwise unrelated—arrests for drinking and hiring of clergy among them. This tale has long served as the standard textbook example for illustrating the difference between correlation and causality" [4, p. 296].

Surely mathematicians know better than to mistake correlation with causality in their efforts to deal with the current job crisis.

Enrollments Decline and Part-Timers Are the Cheap Solution

Recent data suggest that we ought to be paying more attention to other factors in mathematical unemployment in addition to those stemming from the global economy and from changes in government funding. From 1990 to 1995 enrollment in calculus decreased by over 100,000 students at all four-year institutions according to [6, Table 1]. During the same time period calculus enrollment at two-year community colleges increased by 5,000. Both the net enrollment decrease and the shift between institutions represent a significant number of positions [8]. Assuming full-time faculty normally teach 100 students of calculus per semester, this can add up

to a loss of 1,000 full-time faculty positions. Not a figure to disregard.

Worse, as new enrollments increase again the positions lost will probably not be replaced in kind, but by part-time, low-paying, no-benefits, heavy-teaching, nonpermanent jobs.

The Size of Graduate Programs and Chinese Students Who Stayed

Under the (debatable) assumption that “we are producing too many Ph.D.s,” there is talk of the need to downsize graduate output. It is easy to err with such a policy—we have seen how predictions made twelve years ago were flawed. It is also hard to implement, since it is usually somebody else’s graduate program that we would agree to cut. Professors need the graduate programs to justify their research as part of their thesis advising, and chairmen need graduate students as teaching assistants to sustain their undergraduate programs.

When the number of graduate students began to decrease in the 1980s, the Chinese were welcomed. But the influx of Chinese students was not purely spontaneous. The visits of prestigious mathematicians to Beijing were followed by the appearance in their institutions of talented and extremely hard-working students, without whom entire programs would have disappeared. And after graduation they went home. Everybody was happy. Then came the massacre at Tienanmen Square, the Chinese students started to remain in the U.S., and they needed jobs. Even now the U.S. graduates from China face an employment problem far worse than any other group of mathematicians in the U.S., so grave that it has created a racist atmosphere damaging even U.S.-born citizens bearing a Chinese name.

A steady flow of foreign students has come to this country since the 1960s when it became clear that the U.S. had the best graduate education in the world. After a postdoctoral period, most foreign graduates yearn to go home. But it is not always easy or possible to do so. The worst-case scenario is when returning may mean the loss of freedom or life. This is but one more reason why the American mathematical community should care about the human rights situation in China and elsewhere.

Perceptions, Competition, and the American Way

This is not the first time that historical events led to an influx of foreign scientists, as did racist persecution and war in the 1930s and 1940s. Yet it has been repeatedly claimed in the press and in [1] that the current increase in scientific immigration transcends the historical events of the last decade, such as the mas-

sacre at Tienanmen Square and the demise of the Soviet Union.

However, a recent NSF study shows that this perception is false. In 1993 the number of people in all fields of science and engineering admitted to the U.S. on permanent visas peaked at 23,534. But in 1994 the number of these immigrants admitted had dropped to 17,403, or a decline of 26 percent. “The number of immigrant scientists and engineers entering the United States each year was stable throughout the 1980s, rose in the early 1990s, and then declined dramatically in 1994 back toward 1980s levels. The latest data indicates that what observers thought was a major, long-term rise in skilled immigrants was only a temporary surge”[10].

The increased influx of mathematicians associated with the dissolution of the Soviet Union coincided with the onset of employment problems. Many of the incoming mathematicians were already very accomplished, while most of the rest had training both broad and deep. Some decried this as unfair competition. Why unfair?

Is it the American Way to give preference to less-qualified U.S. citizens? While the true American Way would be to improve the U.S. educational system to train our graduates so as to ensure their competitiveness, is barring competitive foreigners a New American Way of Affirmative Action?

This would be a perverse caricature—one all too common and responsible for much current backlash. Affirmative action is not about *closing* doors for those who are able and well trained in favor of those who are not. It is about *opening* opportunities to *all* those who are able to become well trained and to compete as such.

Let us work to eliminate the stereotype of foreigners as smart but unable to teach simply because they have accents. Both U.S. nationals and immigrants should be judged on their true mathematical and pedagogical talents when they seek opportunities to flourish.

Who Wants to Be a Mathematician? How to Remain One?

“There is considerable evidence that labor market considerations play a strong role in determining educational and career choices for young people” [1]. This seems to be so and is an important factor in the sharply declining number of U.S. nationals that pursue Ph.D.s in mathematics. “To our most talented students, the mere \$6,000 difference in starting salary over that for mathematics bachelor’s degree holders does not make a strong economic case for years of intensive postbaccalaureate training amidst deteriorating employment conditions” [1]. But

since when are mathematicians selected on their ambition to make money?

Mathematics is hard. The training requires a lifetime of work; it brings usually less money than corporate law, surgery, or really good computer wizardry; and job security is dependent on circumstances and economics. Those who opt out of mathematics on the basis of economics have made the right choice. There is no way we can attract them—much less keep them—with mere economic incentives. Nor should we want to.

If we are talking about how to attract and keep in the profession all those with strong inclination for the unique pleasures of mathematics, that is another question. At the very least they need to be able to make a decent living and to work under conditions conducive to doing mathematics.

Many young mathematicians are trying to develop research careers in difficult circumstances. Research mathematicians in nonresearch environments, including those at nondoctoral institutions, need support. For ages many women have faced these difficulties without help, and some have survived as mathematicians. Their experiences could help others, and their losses should not be repeated. Now some see promising young mathematicians take positions at non-research institutions, and they cry foul. Instead, we should help devise support systems to make small-college positions compatible with research.

Conclusion

The employment problem in mathematics exists and is very serious, warping the lives of many people. It is not clear what the future will bring, yet we have to oppose measures that carry a terrible social cost. It is morally imperative to seek rational and democratic solutions—nonexclusionary, embracing all ethnic groups—in keeping with America's tradition of openness.

Banning immigrant mathematicians would, at best, make a few positions available without going to the roots of the problem yet creating others.

The American Mathematical Society has gone on record deploring restrictions in the new immigration law¹, signaling that a significant seg-

ment of the community does not see foreign mathematicians as the problem.

Finding ways to support an active research population in the U.S. will become increasingly difficult in an era of globalization of the world economy, where the competition is fierce and international.

As an organized community we have to react positively to the challenge, not by asserting supposed birth rights of the U.S.-born in divisive chauvinist quests, or with anti-immigration innuendo, but with constructive proposals to improve the teaching of mathematics at all levels throughout America and to ensure the possibility of doing research outside the top institutions.

We can and must defend the profession and all of its members, and we will succeed only if we act in concert.

References

- [1] GEOFF DAVIS, *Mathematicians and the market*, Notices, November 1997. (Notices articles referenced here and below are available online at <http://www.ams.org/notices/>. Click on the appropriate month.)
- [2] PETER DUREN, ed., *A century of mathematics in America*, 3 volumes, Amer. Math. Soc., Providence, RI, 1988.
- [3] MARY E. FLAHIVE and MARIE VITULLI, *Are women getting all the jobs?*, Notices, March 1997.
- [4] STEPHEN JAY GOULD, *Dinosaur in a haystack: Reflections in natural history*, Harmony Books, New York, NY, 1995.
- [5] KAREN PARSHALL, *Historical contours of the American mathematical research community* (to appear).
- [6] RUNG, DONALD C., *A Survey of Four-Year and University Mathematics in Fall 1995: A Hiatus in Both Enrollment and Faculty Increases*, Notices, September 1997.
- [7] MARY BETH RUSKAI, *Time for advancement*, MAA Focus 14(6) (December 1994), 25–28.
- [8] MARY BETH RUSKAI, in *1997 AMS elections*, AWM Newsletter, September–October 1997.
- [9] JAMES P. SMITH and BARRY EDMONSTON, eds., *The new Americans: Economic demographic, and fiscal effects of immigration*, National Research Council, National Academy Press, Washington, DC, 1997. (Available online at <http://www.nap.edu/>).
- [10] *Immigrant scientists and engineers decline*, For Your Information, Notices, November 1997. (Available online at <http://www.nsf.gov/sbe/srs/stats.htm>.)
- [11] *The April 1996 Council Meeting*, From the AMS, Notices, July 1996.
- [12] *The January 1997 Council Meeting*, From the AMS, Notices, November 1997.
- [13] *The April 1997 Council Meeting*, From the AMS, Notices, November 1997.

¹At its meeting in April 1996, the AMS Council expressed alarm at then-pending federal legislation to restrict visits and immigration by academic scholars [11]. Despite the concerns voiced by the AMS and other groups, the bill was enacted into law in September 1996. At its meeting in January 1997, the AMS Council passed a resolution deploring provisions of the bill [12]. In April 1997 the Council approved, so as to speak in the name of the Society, the first four paragraphs of that resolution [13].