

## In praise of immigration

**The United States is a nation of immigrants — and nowhere more so than in the lab. Yet officials of the federal government don't seem to recognize that the country's scientific strength depends in large part on foreign talent.**

**A**fter the atrocities of 11 September 2001, it was inevitable that the US government would tighten up its procedures for letting foreign nationals into the country. For the Department of State and consulates abroad, security is now the watchword.

No one disputes the need to exclude potential terrorists, but the resulting controls on immigration have become an unwieldy mess, arbitrarily ensnaring individuals who would previously have been welcomed into the country with open arms. Visiting scientists, perhaps more than any other group, have experienced these policies first-hand — leading to missed conferences, lost lab time and delayed graduations for large numbers of scientists and students.

Some of the affected individuals have been through a nightmarish experience, their careers thrown seriously off track. But as *Nature's* investigation into the issue reveals, the greatest damage may ultimately be suffered by the US scientific enterprise (see page 190). If the world's brightest young scientists turn instead to other academic destinations, the quality of research in US labs will suffer.

You might expect to find science-oriented officials within the federal government speaking up to stress the important contribution made by foreign-born scientists, many of whom take up permanent residence in the United States. But in the most part, they have failed to do so. Even Elias Zerhouni, the Algerian-born director of the National Institutes of Health, has had little to say in public on the issue.

Some comments by senior officials have added to the impression that foreign scientists aren't valued. At a press conference in November on the status of the US scientific workforce, for instance, Rita Colwell, director of the National Science Foundation, told reporters: "We must end our addictive dependence on foreign workers." Her words were intended to bolster support for US science education, but they expose a widely held view that researchers from abroad are a stopgap that should be replaced by home-grown talent.

History teaches us a different lesson. The first scientific Nobel

prize won by the United States went in 1907 to Albert Michelson, a Prussian-born physicist whose measurement of the velocity of light inspired Einstein's theory of relativity. Since then, immigrant scientists have accounted for more than a quarter of the United States' Nobels in physics, chemistry and medicine. These scientists' journeys from their homelands to the United States were not simply about securing superior funding and laboratory equipment. Many fled discrimination, war and genocide. Others were politically active in countries where dissenters were imprisoned or executed. All saw the United States as a land of freedom and opportunity.

The experiences of foreign scientists currently attempting to enter the United States are eroding that perception. Visiting scientists are increasingly finding themselves in situations that are stressful or humiliating. Even more worrying are reports of hate crimes committed against Iranian and Arab students.

In contrast, over the past decade, other Western nations have worked to make their societies more receptive to talented foreigners by loosening immigration laws for technical workers and trying to combat prejudice in their societies. In the twenty-first century, the United States is just one of many destinations.

The US scientific leaders who recognize the important contribution made by foreign scientists are split into two camps. The optimists point out that about 40% of the world's research dollars are spent inside US laboratories. A few visa delays will do little to change that scientific hegemony, they argue. But the pessimists fear that the world's rising scientific stars are already starting to turn their backs on the United States. Even a superpower can't afford to be complacent, they warn.

Whoever is right, federal government officials must not seem indifferent to the plight of foreign scientists. They need to take measures to ensure that these valuable assets are treated with dignity and made to feel welcome. ■

## Don't fear the Robot Scientist

**Contrary to first impressions, an automated system that designs its own experiments will benefit young molecular geneticists.**

**A**t first glance, it seems to render obsolete the armies of postgrads and postdocs employed in the world's molecular-genetics laboratories. In this week's issue (see page 247), a British team unveils an automated system that "originates hypotheses to explain observations, devises experiments to test these hypotheses, physically runs the experiments using a laboratory robot, interprets the results to falsify hypotheses inconsistent with the data, and then repeats the cycle".

What's more, when set loose on experiments to investigate the genetic control of important metabolic pathways in yeast, it performs more cost effectively than scientifically educated human volunteers. The Robot Scientist seems to promise a future of successfully completed research projects, untouched by human mind.

Neo-luddites must be unsure whether to curse or celebrate. On one hand, they are obliged to condemn another technology that

seems to threaten established patterns of employment. But they may also be glad to see the scientific and technological elite seemingly hoist with its own petard.

The truth is rather different. The Robot Scientist does represent an important step forward, but does not spell the end for its human counterpart. The deductive steps required to design experiments for functional-genomic analyses are particularly amenable to solution by computer algorithms. And this is a field in which the deluge of data requiring explanation exceeds researchers' capacity to cope.

The team behind the Robot Scientist argues that such automation "frees scientists to make the high-level creative leaps at which they excel". Therein lies the challenge. Some lab heads still treat postgrads and postdocs as a cheap source of menial labour, rather than educating them to become tomorrow's creative research leaders. We can only hope that the Robot Scientist helps to change such attitudes. ■