

Prize recipients in physics and chemistry since 1980, almost 40% were working in a foreign country; this year all six are.

Many scientists in the US and UK first came to the two countries as students or postdocs. In the aftermath of 9/11, the US tightened its borders, and students from some countries had much more difficulty going to the US. The onerous processes and anti-immigration rhetoric took their toll, and between 2001 and 2006, the number of international students dropped.

At the same time, other countries improved their environment for talented scientists. I worked during that time on a report for the Committee on Science, Engineering and Public Policy at the US National Academies; in it we made recommendations to improve the international student visa process. The numbers have increased since 2007, and according to the Institute of International Education, international students now make up 4.8% of the US student population. The number of international students in physical and life sciences in the US averages around 7–10%. The US is still a very attractive destination.

The flow of students should not be only in one direction. Studying in another country would be good for US students too, yet too few do so. A similar percentage, 7–8%, of US students abroad are in the physical and life sciences; however, in 2013–14 just over 300 000 studied abroad while the US attracted almost 900 000 foreign students.

International students can become great scientists, and they can become entrepreneurs too. One notable physicist-immigrant turned entrepreneur is Stephen Wolfram, whose innovations in computational algebra have influenced many of us. A study by AnnaLee Saxenian showed that in 1998 almost a quarter of Silicon Valley's technology companies were headed by Indian and Chinese computer scientists and engineers.¹ Saxenian, Vivek Wadhwa, Ben Rissing, and Gary Gereffi extended that study to show that from 1995 to 2005 more than half of the Silicon Valley technology and engineering companies had at least one immigrant founder.² A 2012 study from the Partnership for a New American Economy found that immigrants to the US were "more than twice as likely as the native-born to start a business."³ Further, according to Wadhwa, "immigrants started nearly half of America's 50 top venture-funded companies and are key

members of management or product development teams in more than 75% of those companies."⁴

Competition for talented people has grown. You see that in entrepreneurial activity. Wadhwa describes the slowing and reversing trend of new enterprises founded or partly run by immigrants.⁵ He and his research collaborator Alex Salkever ascribe the problem to the increasing competition from startup markets in India and China and to post-9/11 visa policies, which, while now mostly reversed, set a tone for foreigners. Despite improvements in visa policies, foreign students' desire to remain in the US declined. Only 6% of Indian and 10% of Chinese students in their 2008 survey wanted to stay in the US. The grass was starting to look greener in their home countries.

In his book, Wadhwa estimates that it takes approximately 13 years to start a successful company,⁴ and the US H-1B and green-card process makes that time span difficult for foreigners. Thus immigrant-founded companies in Silicon Valley decreased from more than 52% in 2005 to less than 44% in 2012. Perhaps more important than founders, the immigrant workforce fueling tech companies has shrunk dramatically, with 180 000 Chinese returning home in 2011 compared with the 330 000 students who left China that year. In 2008 only 50 000 Chinese graduates returned home. Those aptly named "sea turtles" (see PHYSICS TODAY, August 2010, page 12, and January 2011, page 9) are building the scientific capability and startup environment back home.

Of course, if we want to enable such mobility we need national and international policies that ensure movement across our countries' borders. We need to promote wise and reasoned immigration policies that allow talented people to move about. A conference here, a sabbatical there, a two-week holiday hiking in the mountains, all are ingredients in the recipe for insight, discovery, invention, and creativity.

In this period of populist retreat from globalization, we need to more broadly promote the benefits of freedom of movement. If we can do that, any town may soon be lucky enough to boast of a physicist or startup tech company.

References

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LETTERS

X-ray sterilization with accelerators is viable in US

David Kramer's piece on gamma irradiators (PHYSICS TODAY, August 2016, page 27) discusses the tricky position governments are in with respect to product sterilization facilities based on cobalt-60. Making current facilities safer and more secure directly addresses the threat of a radiological dispersion device based on ⁶⁰Co but might be seen as subsidizing the status quo. From the US industry perspective, however, practical steps taken today are not at odds with

the demonstrated long-term commitment by the Department of Energy to curtail the commercial use of materials suitable for a dirty bomb.

Our group at Niowave Inc is an example of a private-sector effort to develop an alternative technology to large ⁶⁰Co-based irradiators. We build superconducting electron linacs with high-power x-ray converters for applications such as high-throughput sterilization. Kramer correctly noted that electron

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linacs are already showing that they will be cheaper in the long run for large sterilization facilities. And as the cost of building and operating those accelerators goes down, smaller operations will find it beneficial to switch.

The article concludes that accelerators for sterilization are somehow excluded from the US, and it implies that they get no help from the government. Neither of those assessments is fair. Niowave is developing linacs with direct financial assistance through a Small Business Innovation Research grant from DOE. The company has also bene-

fit from participation in panel discussions like the Alternate Technology Working Group led by the Department of Homeland Security. Other groups are also receiving federal support and making progress in reducing radionuclide dependence—for example, in eliminating cesium-137 from blood irradiators and replacing americium-beryllium sources currently used for logging geologic formations when drilling wells.

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Israel's water story: Success or crisis?

When I received the June 2016 issue of *PHYSICS TODAY*, I was surprised to see that a piece featured on the cover was about Israel's water success story.

The item (page 24) blithely celebrates Israel's innovative technology for optimizing water usage and delivery to agricultural lands. It covers most of the technical strategy developed over the years, but it overlooks a key policy explaining the effectiveness of Israel's water management.

Since 1967 Israel has pursued a policy of monopolizing water in occupied Palestinian territories. Palestinians are denied the right to drill wells on their own land or to repair existing ones. The policy includes the destruction of wells, irrigation systems, and water lines in the West Bank and near the borders of the Gaza Strip.¹ As a result, the 4 million Palestinians living in those areas have less than the minimum quantity of water for domestic use established by the World Health Organization.

I understand the scientific vocation of the American Institute of Physics (AIP) and perhaps its desire to remain neutral on political issues. However, by failing to acknowledge the existence of a massive humanitarian crisis revolving around the very subject of the story, AIP is tacitly endorsing the brutal oppression of the Palestinian people.

As a member of the American Physical Society, I ask that you inform your readers of the ongoing water crisis in the Palestinian territories.

Reference

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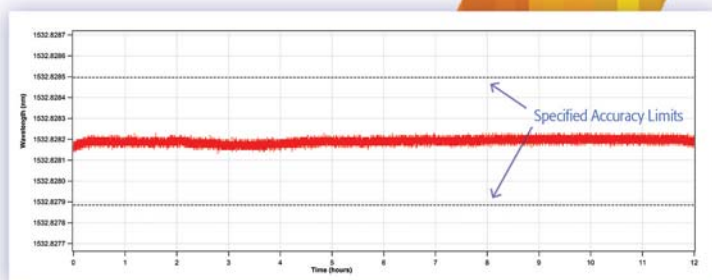
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