

# Shortage of Scientists Here Likely as Science Abroad Improves

The United States remains the world's leading producer of and a net exporter of high-technology products and ranks among the global leaders in research and development (R&D) spending. That's the good news. The bad news is that ongoing economic and workforce changes make the outlook for the future uncertain.

So says Science and Engineering (S&E) Indicators 2004, a biennial report of the National Science Board to the President. The National Science Board oversees the activities of the National Science Foundation.

"The United States is in a long-distance race to retain its essential global advantage in S&E human resources and sustain our world leadership in science and technology said NSB Chair Warren M. Washington. For many years we have benefited from minimal competition in the global S&E labor market, but attractive and competitive alternatives are now expanding around the world. We must develop more fully our native talent."

Among the most disturbing findings of the report is that the United States is producing too few American scientists and engineers to fill its ever-increasing need for such specialists.

A May 5 story in the New York Times noted that the NSB report said that the recruitment problem "grows out of the nation's economic success and the rising demand for employees trained in science and engineering. For decades, such jobs have grown faster than over-all employment. They went to 3.8 percent of civilian jobs from 2.6 percent between 1983 and 2002. Unchecked, the trends in technical employment will leave a dearth of scientists to meet the rising demand . . . the number of United States citizens

qualified for science and engineering jobs could remain level."

The shortage of U.S.-born scientists and engineers is not new; this concern has been raised repeatedly since at least the 1980s. However, for the past 20 years our country has been able to make up for shortages of American scientists and engineers by encouraging the immigration of thousands of foreign-born scientists and engineers to make up the shortfall. Unfortunately, the report notes, the nation may soon be unable to rely on foreign citizens to fill the gap, either because of limits to their entry or because of intense foreign competition for those skills.

Record levels of foreign-born scientists and engineers have helped make possible rising U.S. employment in science and engineering in the past several decades. The report highlights U.S. Census data from 2000 showing about 17 percent of those with bachelor's degrees, 29 percent with master's degrees, and 38 percent with doctorates employed in science and engineering are foreign-born.

On the other hand, the number of high-skill-related visas issued to students, exchange visitors and others has declined significantly since 2001. These numbers reflect both a drop in applications and higher U.S. State Department refusal rates. Visas granted to students, exchange visitors, and highly skilled foreigners dropped from 787,000 in 2001 to 625,000 last year. Visa applications have dropped as well.

In addition, a number of countries, particularly in Asia and Europe, are becoming more prominent in technology development because of their large, ongoing investments in S&E education and R&D. This trend is also revealed by a

growing number of journal articles from East Asia, which suggests an accompanying increase in basic R&D in these nations. While NSB data show that U.S.-based authors continue to produce the largest share of scientific journal articles, article output has flattened since 1992.

Inevitably, this trend has attracted the attention of our nation's politicians. Senate Democratic Leader Tom Daschle (D-SD) noted at the recent American Association of Advancement of Science meeting in Washington, DC:

"According to a recent study; America's rate of scientific discovery is lagging behind that of European countries. The number of scientific papers published by American researchers declined last year, and has been flat for the past several years. In contrast, every country in Europe has increased its rate of discovery. In the last two decades of the 20th century, France, Germany, and the United Kingdom doubled their production of doctorates in science and engineering. Japan doubled its production of science and engineering doctorates in just one of those decades. If this stagnation is allowed to continue, it will have profound implications for every aspect of American society. If we are to remain the land of the future, we must reaffirm the partnership that created America's dominant position within the world of science."

Daschle characterized this trend as "disturbing," and perhaps it is. But let's take a look at the implications. First, these trends are the logical outcome of a major aspect of American policy in recent decades. While we have been able to fill our needs for scientists and engineers through recruiting foreign talent, tens of thousands of students have been trained here and have returned to their homelands. These scientists, who have benefited by some of the world's best training, return home and begin to

practice science there instead of the U.S., and thus inevitably begin to improve the science infrastructure in their own countries. What we are seeing is therefore perfectly natural and a logical outcome of U.S. policy in this area.

Like most Complex occurrences on the global level, there are a number of implications to consider. First, it is obvious that the U.S. position as the world's science colossus would begin to slip as other countries' science infrastructure improves. Second, this will probably cause some dislocations in the short term as world-class work begins to occur overseas with increasing frequency. Third, this is not necessarily bad. Improved science infrastructure around the globe will inevitably (if over the long-haul) improve the economies of other nations around the world, reducing the economic gap between the world's rich and poor nations, with the accompanying benefit of greater global stability.

Still, American students continued lack of interest in science and engineering is a disturbing trend that, if allowed to continue, will inevitably affect our own economy. The trend toward fewer students in scientific and engineering fields can only be exacerbated by the recent analysis of the American Association for the Advancement of Science, which noted that in 2004, 21 of 22 federal science agency budgets declined in real terms. Thus, improved science funding, easing of visa restrictions for foreign students, and more attention to basic science education in our schools, would seem to be in order.

The NSB report can be read on the National Science Foundation website at: <http://www.nsf.gov/sbe/srs/seind04/>