

EMIGRATION OF U.S.-BORN S&E DOCTORATE RECIPIENTS

by Joan S. Burrelli

Participation in international S&E research can provide opportunities for younger scientists and engineers to learn more about other cultures and to improve their S&E skills and knowledge (NSB 2001). Despite efforts of science and technology groups in the United States and abroad to encourage American scientists to work overseas (NSB 2003, Agrawal 2001), relatively few U.S.-born S&E doctorate recipients from U.S. universities plan to work or study abroad at the time of receiving their doctorates. In contrast, a large number of students come to the United States to earn S&E doctorate degrees, and many foreign-born U.S.-trained S&E doctorate recipients remain in the United States.

In 2002, 24,558 people earned S&E research doctorates from U.S. universities. Two-thirds (66 percent) of them had definite plans¹ for work or study, and of those, 10 percent had definite plans for work or study abroad. Among U.S.-born S&E doctorate recipients with definite plans, 289, or 3 percent, “intended” or “planned” to work or study abroad in 2002 (table 1).

More non-U.S. citizens than U.S.-born citizens plan to go abroad after graduation. Among non-U.S. citizens in 2002 with definite plans, 5 percent of S&E doctorate recipients with permanent residency visas and 25 percent of S&E doctorate recipients on temporary

TABLE 1. Doctorate recipients with definite plans, by location of plans, broad field, and citizenship: 2002

| Broad field and citizenship | All with definite plans | | Definite plans in United States | | Definite plans abroad | |
|------------------------------|-------------------------|---------|---------------------------------|---------|-----------------------|---------|
| | Number | Percent | Number | Percent | Number | Percent |
| S&E doctorate | 16,239 | 100.0 | 14,481 | 89.2 | 1,668 | 10.3 |
| U.S. native born | 9,338 | 100.0 | 9,007 | 96.5 | 289 | 3.1 |
| U.S. naturalized | 875 | 100.0 | 827 | 94.5 | 41 | 4.7 |
| Non-U.S., permanent resident | 744 | 100.0 | 706 | 94.9 | 34 | 4.6 |
| Non-U.S., temporary visa | 5,234 | 100.0 | 3,910 | 74.7 | 1,294 | 24.7 |
| Visa status unknown | 48 | 100.0 | 31 | 64.6 | 10 | 20.8 |
| Non-S&E doctorate | 9,745 | 100.0 | 8,965 | 92.0 | 742 | 7.6 |
| U.S. native born | 7,805 | 100.0 | 7,645 | 98.0 | 135 | 1.7 |
| U.S. naturalized | 396 | 100.0 | 373 | 94.2 | 20 | 5.1 |
| Non-U.S., permanent resident | 286 | 100.0 | 263 | 92.0 | 23 | 8.0 |
| Non-U.S., temporary visa | 1,233 | 100.0 | 674 | 54.7 | 551 | 44.7 |
| Visa status unknown | 25 | 100.0 | 10 | 40.0 | 13 | 52.0 |

NOTE: Detail does not add to total because all with definite plans includes missing or unknown location.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates, 2002.

¹Those who have definite plans are those who reported they are “returning to, or continuing in, predoctoral employment” or who “have signed contract or made definite commitment for other work or study.”



visas had definite plans for work or study abroad (table 1). Non-U.S. citizens with non-S&E doctorates and definite plans were more likely than those with S&E doctorates to plan work or study abroad—8 percent of non-S&E doctorate recipients with permanent residency and 45 percent of those on temporary visas had definite plans for work or study abroad.

Trends in Plans to Work or Study Abroad

Except for two brief upturns, the number of U.S.-born S&E doctorate recipients with definite plans to work or study abroad has been about 300–400 each year since the mid-1960's (figure 1). The two brief exceptions were the Vietnam era of the early 1970s, in which the numbers going to Canada increased dramatically, and another upturn in the early 1990s. The percentage of those planning work or study abroad ranged between 2 percent and 4 percent from 1958 through 2002.

Destinations

The top postdoctoral study or employment destinations of U.S.-born S&E doctorate recipients from 1998 to 2002 who had definite plans abroad were Canada, the United Kingdom, Germany, France, Japan, Switzerland, and Australia (figure 2). These seven countries accounted for 61 percent of the 1,624 U.S. born S&E doctorate

recipients in that 5-year period who reported that they planned to work or study abroad. The three top countries, Canada, the United Kingdom, and Germany, accounted for 38 percent.

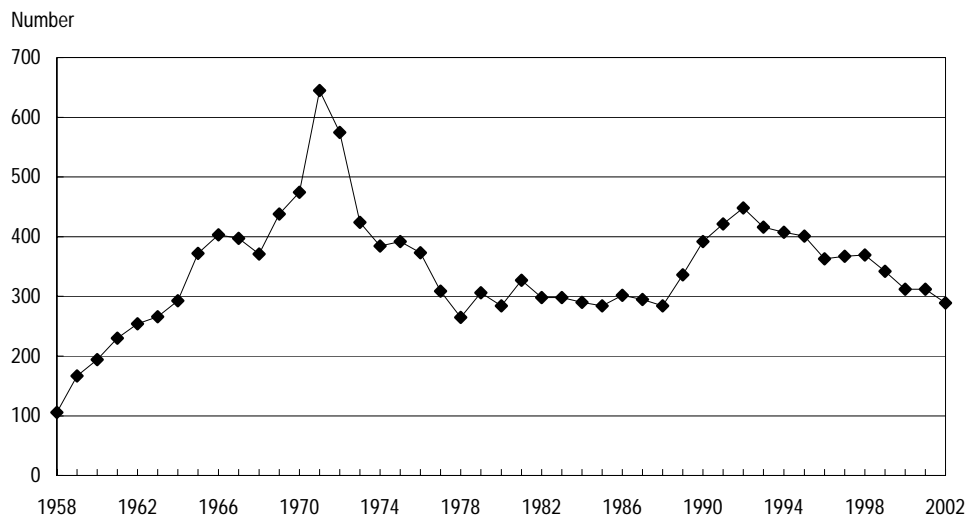
Field of Doctorate

The three largest fields of the 1998–2002 U.S.-born S&E doctorate recipients who reported that they planned to work or study abroad were biological sciences (27 percent), physical sciences (25 percent), and social sciences (22 percent) (table 2). A much larger percentage of those with definite plans abroad than of those who planned to stay in the United States had doctorates in the physical and social sciences and a much smaller percentage had doctorates in psychology. Those destined for Australia and the United Kingdom were more likely than other U.S.-born S&E doctorate recipients to have doctorates in the biological sciences (about 40 percent), and those destined for Germany or Switzerland were more likely than other U.S.-born S&E doctorate recipients to have doctorates in the physical sciences (37 and 39 percent, respectively).

Type of Plan

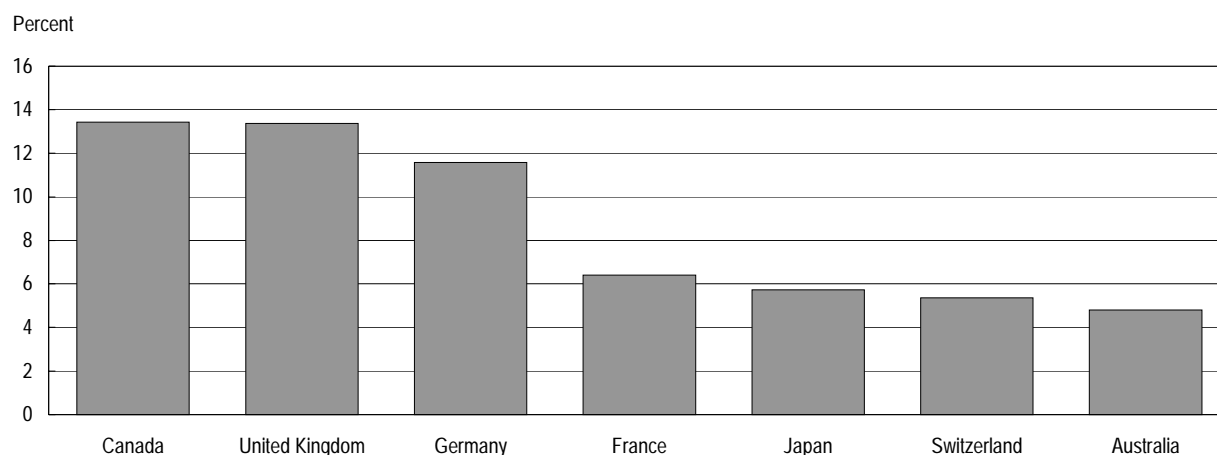
The majority (71 percent) of U.S.-born S&E doctorates in 2002 who had definite plans for work or study abroad

FIGURE 1. U.S.-born S&E doctorate recipients with definite plans to work or study abroad: 1958–2002



SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates.

FIGURE 2. Postdoctoral location of U.S.-born 1998–2002 S&E doctorate recipients with definite plans abroad



SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates.

TABLE 2. U.S.-born 1998–2002 S&E doctorate recipients with definite plans, by location of plans and field (Percent distribution)

| Location | All recipients | | Agricultural sciences | Biological sciences | Computer sciences | Engineering | Mathematics | Physical sciences | Psychology | Social sciences |
|----------------|----------------|---------|-----------------------|---------------------|-------------------|-------------|-------------|-------------------|------------|-----------------|
| | Number | Percent | | | | | | | | |
| Abroad | 1,624 | 100.0 | 3.4 | 26.9 | 1.5 | 11.8 | 3.5 | 25.2 | 6.2 | 21.5 |
| Australia | 78 | 100.0 | 0.0 | 38.5 | 0.0 | 11.5 | 2.6 | 21.8 | 2.6 | 23.1 |
| Canada | 218 | 100.0 | 2.8 | 24.3 | 2.8 | 7.8 | 7.3 | 28.4 | 11.0 | 15.6 |
| France | 104 | 100.0 | 5.8 | 27.9 | 1.9 | 21.2 | 2.9 | 31.7 | 1.9 | 6.7 |
| Germany | 188 | 100.0 | 0.0 | 26.6 | 1.6 | 14.9 | 5.3 | 36.7 | 6.9 | 8.0 |
| Japan | 93 | 100.0 | 1.1 | 23.7 | 1.1 | 17.2 | 0.0 | 23.7 | 9.7 | 23.7 |
| Switzerland | 87 | 100.0 | 0.0 | 34.5 | 3.4 | 14.9 | 1.1 | 39.1 | 0.0 | 6.9 |
| United Kingdom | 217 | 100.0 | 0.9 | 41.9 | 0.9 | 6.9 | 2.8 | 23.5 | 5.1 | 18.0 |
| Other | 639 | 100.0 | 6.4 | 20.7 | 1.1 | 11.3 | 3.0 | 18.9 | 6.1 | 32.6 |
| United States | 48,481 | 100.0 | 2.7 | 25.1 | 2.6 | 14.2 | 3.4 | 16.2 | 19.5 | 16.3 |

NOTE: Table does not include those with unknown location.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates, 1998-2002.

were planning postdoctoral fellowships, research associateships, traineeships, or other study (table 3). Another 26 percent had definite plans for employment abroad, with 60 percent of those planning employment in foreign academic institutions. The remaining 3 percent had definite plans for military service or other plans.

Of those who planned study abroad, most were funded by colleges or universities (39 percent) or “other” sources (24 percent). Only 12 percent were funded by the U.S. government. The remainder reported industry/business, private foundations, nonprofits or unknown sources as their main source of financial support for postdoctoral study or research.

Data presented in this InfoBrief are from the Survey of Earned Doctorates. These data are collected from all individual doctorate recipients via a questionnaire distributed by graduate deans to persons completing their doctorates. The survey has been conducted annually since 1957 for the National Science Foundation and five other Federal agencies. The data for a given academic year include all research doctorates awarded in the 12-month period ending June 30 of that year. For further information on the survey methodology or for detailed statistical tables, see <http://www.nsf.gov/sbe/srs/ssed/start.htm>.

TABLE 3. U.S.-born S&E doctorate recipients with definite plans for work or study abroad, by type of plan and source of postdoctoral study support: 2002

| Type of plan and source of support | Percent |
|--|---------|
| All plans | 100.0 |
| Employment | 26.3 |
| Military/other | 3.1 |
| Postdoctoral study | 70.6 |
| All sources of support | 100.0 |
| U.S. Government | 11.8 |
| Industry/business | 2.5 |
| College or university | 38.7 |
| Private foundation | 7.4 |
| Nonprofit, other than private foundation | 5.9 |
| Other | 24.0 |
| Unknown | 9.8 |

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates, 2002.

References

Agrawal, Alka. "American Postdocs Abroad" *Science's Next Wave*, October 2001. Washington, DC: American Association for the Advancement of Science. <http://nextwave.sciencemag.org/cgi/content/full/2001/10/04/5> accessed 3/29/04.

National Science Board (NSB), *Toward a More Effective Role for the U.S. Government in International Science and Engineering*. NSB 01-187. Arlington, VA.

National Science Board (NSB), *The Science and Engineering Workforce: Realizing America's Potential*. NSB 03-69. Arlington, VA.

For more information contact

Joan S. Burrelli
 Human Resources Statistics Program
 Division of Science Resources Statistics
 National Science Foundation
 4201 Wilson Boulevard, Suite 965
 Arlington, VA 22230
 703-292-7793
 jburrell@nsf.gov

NSF 04-327

NATIONAL SCIENCE FOUNDATION
 U.S. POSTAGE PAID
 PRESORTED STANDARD

RETURN THIS COVER SHEET TO ROOM P35 IF YOU DO NOT WISH TO RECEIVE THIS MATERIAL , OR IF CHANGE OF ADDRESS IS NEEDED , INDICATE CHANGE INCLUDING ZIP CODE ON THE LABEL (DO NOT REMOVE LABEL).

NATIONAL SCIENCE FOUNDATION
 ARLINGTON, VA 22230
 OFFICIAL BUSINESS