



## Baccalaureate Origins of U.S.-trained S&E Doctorate Recipients

by Mark K. Fiegener and Steven L. Proudfoot<sup>1</sup>

Foreign institutions and U.S. research universities play large roles in the baccalaureate education of U.S.-trained science and engineering (S&E) doctorate recipients.<sup>2</sup> In 2011, about one-third (35%) of individuals earning S&E doctorates from U.S. universities held bachelor's degrees from foreign institutions, and 29% earned bachelor's degrees from U.S. doctorate-granting institutions with very high research activity<sup>3</sup> (table 1). Other doctorate-granting universities, master's colleges and universities, and baccalaureate colleges combined to

account for another 28%. Among U.S. S&E doctorate recipients, the proportion with a foreign bachelor's degree increased 4 percentage points from 2002 to 2011, while the proportion with a bachelor's degree from a U.S. institution declined slightly over this period for each type of institution.

Public universities with very high research activity are prominent in the baccalaureate training of U.S. S&E doctorate recipients, as reflected in the ranked list of U.S. baccalaureate-origin institutions (table 2). Of the top 20 U.S.

baccalaureate-origin institutions for 2002–11 S&E doctorate recipients, 19 are research universities with very high research activity, including 15 public institutions. Of the top 50 U.S. baccalaureate-origin institutions for 2002–11 S&E doctorate recipients, approximately two-thirds are public institutions, and only 1, Brigham Young University, is not a research university with very high research activity.

Table 3 reports the top 10 U.S. baccalaureate-origin institutions for 2002–11 doctorate recipients in each of the four

TABLE 1. S&E doctorate recipients, by 2010 Carnegie classification of baccalaureate institution: 2002–11

| Year | All institutions | Very high research activity universities | Other doctorate-granting universities <sup>a</sup> | Master's colleges and universities | Baccalaureate colleges | Other or unclassified Carnegie group <sup>b</sup> | Foreign institutions | Unknown baccalaureate-origin institutions |
|------|------------------|--|--|------------------------------------|------------------------|---|----------------------|---|
| 2002 | 26,265           | 7,961                                    | 2,737  | 2,666                              | 2,460                  | 139   | 8,069                | 2,233                                     |
| 2003 | 26,917           | 8,027                                    | 2,723  | 2,629                              | 2,520                  | 145   | 8,753                | 2,120                                     |
| 2004 | 27,993           | 7,989                                    | 2,650  | 2,768                              | 2,585                  | 143   | 9,423                | 2,435                                     |
| 2005 | 29,770           | 8,116                                    | 2,849  | 2,816                              | 2,560                  | 167   | 10,960               | 2,302                                     |
| 2006 | 31,778           | 8,470                                    | 2,918  | 2,873                              | 2,716                  | 169   | 12,233               | 2,399                                     |
| 2007 | 33,977           | 8,693                                    | 2,983  | 3,024                              | 2,892                  | 174   | 13,082               | 3,129                                     |
| 2008 | 34,927           | 9,457                                    | 3,185  | 3,048                              | 2,863                  | 198   | 13,054               | 3,122                                     |
| 2009 | 35,560           | 10,027                                   | 3,384  | 3,261                              | 3,098                  | 175   | 12,790               | 2,825                                     |
| 2010 | 35,234           | 10,245                                   | 3,320  | 3,314                              | 3,061                  | 163   | 12,096               | 3,035                                     |
| 2011 | 36,654           | 10,555                                   | 3,606  | 3,437                              | 3,229                  | 178   | 12,721               | 2,928                                     |

S&E = science and engineering; includes health fields.

<sup>a</sup> Includes high research activity and doctoral/research universities.

<sup>b</sup> Includes associate's colleges, special focus institutions, and tribal colleges.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Earned Doctorates.

TABLE 2. Top 50 U.S. baccalaureate-origin institutions of 2002–11 S&E doctorate recipients, by institutional control and 2010 Carnegie classification

| Rank | Academic institution                        | Institutional control | 2010 Carnegie classification | S&E doctorate recipients |
|------|---|-----------------------|------------------------------|--------------------------|
| na   | All baccalaureate-origin institutions       | na                    | na                           | 319,075                  |
| na   | Foreign institutions                        | na                    | na                           | 113,181                  |
| na   | Unknown institutions                        | na                    | na                           | 26,528                   |
| 1    | U. CA, Berkeley                             | Public                | Research-very high           | 3,406                    |
| 2    | Cornell U., all campuses                    | Private               | Research-very high           | 2,646                    |
| 3    | U. MI, Ann Arbor                            | Public                | Research-very high           | 2,205                    |
| 4    | U. IL, Urbana-Champaign                     | Public                | Research-very high           | 1,976                    |
| 5    | PA State U., main campus                    | Public                | Research-very high           | 1,934                    |
| 6    | U. WI, Madison                              | Public                | Research-very high           | 1,881                    |
| 7    | MA Institute of Technology                  | Private               | Research-very high           | 1,880                    |
| 8    | U. CA, Los Angeles                          | Public                | Research-very high           | 1,873                    |
| 9    | Harvard U.                                  | Private               | Research-very high           | 1,794                    |
| 10   | U. TX, Austin                               | Public                | Research-very high           | 1,787                    |
| 11   | U. FL                                       | Public                | Research-very high           | 1,730                    |
| 12   | Brigham Young U., main campus               | Private               | Research-high                | 1,688                    |
| 13   | U. CA, San Diego                            | Public                | Research-very high           | 1,546                    |
| 14   | U. CA, Davis                                | Public                | Research-very high           | 1,542                    |
| 15   | Stanford U.                                 | Private               | Research-very high           | 1,359                    |
| 16   | TX A&M U., main campus                      | Public                | Research-very high           | 1,299                    |
| 17   | U. VA, main campus                          | Public                | Research-very high           | 1,260                    |
| 18   | Rutgers, State U. NJ, New Brunswick         | Public                | Research-very high           | 1,256                    |
| 18   | U. WA, Seattle                              | Public                | Research-very high           | 1,256                    |
| 20   | U. MD, College Park                         | Public                | Research-very high           | 1,216                    |
| 21   | Virginia Polytechnic Institute and State U. | Public                | Research-very high           | 1,193                    |
| 22   | Brown U.                                    | Private               | Research-very high           | 1,188                    |
| 23   | OH State U., main campus                    | Public                | Research-very high           | 1,178                    |
| 24   | U. MN, Twin Cities                          | Public                | Research-very high           | 1,161                    |
| 25   | Princeton U.                                | Private               | Research-very high           | 1,131                    |
| 26   | Duke U.                                     | Private               | Research-very high           | 1,103                    |
| 27   | Purdue U., main campus                      | Public                | Research-very high           | 1,097                    |
| 28   | MI State U.                                 | Public                | Research-very high           | 1,092                    |
| 28   | U. AZ                                       | Public                | Research-very high           | 1,092                    |
| 30   | U. PA                                       | Private               | Research-very high           | 1,081                    |
| 31   | Yale U.                                     | Private               | Research-very high           | 1,020                    |
| 32   | U. NC, Chapel Hill                          | Public                | Research-very high           | 991                      |
| 33   | U. CO, Boulder                              | Public                | Research-very high           | 987                      |
| 34   | U. CA, Santa Barbara                        | Public                | Research-very high           | 959                      |
| 35   | U. CA, Santa Cruz                           | Public                | Research-very high           | 952                      |
| 36   | Northwestern U.                             | Private               | Research-very high           | 949                      |
| 37   | U. of Chicago                               | Private               | Research-very high           | 940                      |
| 38   | NC State U., Raleigh                        | Public                | Research-very high           | 938                      |
| 39   | Boston U.                                   | Private               | Research-very high           | 913                      |
| 40   | GA Institute of Technology, main campus     | Public                | Research-very high           | 911                      |
| 41   | IA State U.                                 | Public                | Research-very high           | 863                      |
| 42   | Columbia U. in the City of New York         | Private               | Research-very high           | 829                      |
| 43   | Carnegie Mellon U.                          | Private               | Research-very high           | 812                      |
| 44   | Johns Hopkins U.                            | Private               | Research-very high           | 797                      |
| 45   | U. CA, Irvine                               | Public                | Research-very high           | 787                      |
| 46   | IN U., Bloomington                          | Public                | Research-very high           | 785                      |
| 47   | U. of Rochester                             | Private               | Research-very high           | 771                      |
| 48   | AZ State U.                                 | Public                | Research-very high           | 744                      |
| 49   | CA Institute of Technology                  | Private               | Research-very high           | 739                      |
| 50   | U. DE                                       | Public                | Research-very high           | 734                      |

na = not applicable.

S&E = science and engineering; includes health fields.

NOTE: Institutions with the same number of doctorate recipients are listed alphabetically.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Earned Doctorates.

broad subfields of S&E: life sciences, physical sciences, social sciences, and engineering. The public research universities dominate these lists. Of the 18 institutions listed in the table, 12 appear on the top 10 list for multiple broad subfields, and 4 institutions—the University of California, Berkeley; Cornell University; Pennsylvania State University; and the University of Michigan at Ann Arbor—appear on each list. The University of California, Berkeley is the top-ranking institution in all three of the science subfields and ranks second in engineering.

### Institutional-Yield Ratio Based on All S&E Doctorate Recipients

Although U.S. research universities are few in number (108 universities are classified as research universities with very high research activity, according to the 2010 Carnegie basic classification), collectively they award a large proportion of U.S. bachelor's degrees each year. In contrast, the several hundred baccalaureate colleges in the United States, as a group, award a smaller proportion of the total number of U.S. bachelor's degrees.<sup>4</sup> Because the number of bachelor's degrees awarded per institution—and, thus, the pool of potential doctorate recipients—is smaller for baccalaureate colleges than for research universities with very high research activity, rankings of baccalaureate-origin institutions based on the absolute numbers of S&E doctorate recipients understate the contributions of the baccalaureate colleges in the training of U.S. S&E doctorate recipients. To account for this disparity, a second measure of institutional contribution is used to establish rankings. The “institutional-yield ratio” for a baccalaureate-origin institution for a given year is expressed as the number

TABLE 3. Top 10 U.S. baccalaureate-origin institutions of 2002–11 S&E doctorate recipients, by doctoral field of degree, institutional control, and 2010 Carnegie classification

| Rank                         | Doctoral field of degree and academic institution | Institutional control | 2010 Carnegie classification | S&E doctorate recipients |
|------------------------------|---|-----------------------|------------------------------|--------------------------|
| Life sciences <sup>a</sup>   |   |                       |                              |                          |
| 1                            | U. CA, Berkeley                                   | Public                | Research-very high           | 1,132                    |
| 2                            | Cornell U., all campuses                          | Private               | Research-very high           | 1,085                    |
| 3                            | U. WI, Madison                                    | Public                | Research-very high           | 854                      |
| 4                            | U. CA, Davis                                      | Public                | Research-very high           | 817                      |
| 5                            | PA State U., main campus                          | Public                | Research-very high           | 754                      |
| 6                            | U. IL, Urbana-Champaign                           | Public                | Research-very high           | 745                      |
| 7                            | U. CA, Los Angeles                                | Public                | Research-very high           | 686                      |
| 8                            | U. CA, San Diego                                  | Public                | Research-very high           | 673                      |
| 9                            | U. MI, Ann Arbor                                  | Public                | Research-very high           | 655                      |
| 10                           | U. FL   | Public                | Research-very high           | 641                      |
| Physical sciences            |   |                       |                              |                          |
| 1                            | U. CA, Berkeley                                   | Public                | Research-very high           | 740                      |
| 2                            | MA Institute of Technology                        | Private               | Research-very high           | 637                      |
| 3                            | Harvard U.  | Private               | Research-very high           | 548                      |
| 4                            | Cornell U., all campuses                          | Private               | Research-very high           | 505                      |
| 5                            | CA Institute of Technology                        | Public                | Research-very high           | 404                      |
| 6                            | U. MI, Ann Arbor                                  | Public                | Research-very high           | 368                      |
| 7                            | Brigham Young U., main campus                     | Private               | Research-high                | 335                      |
| 8                            | PA State U., main campus                          | Public                | Research-very high           | 331                      |
| 9                            | U. TX, Austin                                     | Public                | Research-very high           | 328                      |
| 10                           | U. IL, Urbana-Champaign                           | Public                | Research-very high           | 324                      |
| Social sciences <sup>b</sup> |   |                       |                              |                          |
| 1                            | U. CA, Berkeley                                   | Public                | Research-very high           | 888                      |
| 2                            | U. MI, Ann Arbor                                  | Public                | Research-very high           | 724                      |
| 3                            | U. CA, Los Angeles                                | Public                | Research-very high           | 645                      |
| 4                            | Harvard U.  | Private               | Research-very high           | 629                      |
| 5                            | Cornell U., all campuses                          | Private               | Research-very high           | 597                      |
| 6                            | U. TX, Austin                                     | Public                | Research-very high           | 586                      |
| 7                            | Brigham Young U., main campus                     | Private               | Research-high                | 516                      |
| 8                            | U. FL   | Public                | Research-very high           | 468                      |
| 9                            | U. WI, Madison                                    | Public                | Research-very high           | 445                      |
| 10                           | PA State U., main campus                          | Public                | Research-very high           | 424                      |
| Engineering                  |   |                       |                              |                          |
| 1                            | MA Institute of Technology                        | Private               | Research-very high           | 671                      |
| 2                            | U. CA, Berkeley                                   | Public                | Research-very high           | 646                      |
| 3                            | GA Institute of Technology, main campus           | Public                | Research-very high           | 510                      |
| 4                            | U. IL, Urbana-Champaign                           | Public                | Research-very high           | 507                      |
| 5                            | U. MI, Ann Arbor                                  | Public                | Research-very high           | 458                      |
| 6                            | Cornell U., all campuses                          | Private               | Research-very high           | 457                      |
| 7                            | PA State U., main campus                          | Public                | Research-very high           | 425                      |
| 8                            | U. FL   | Public                | Research-very high           | 387                      |
| 9                            | Purdue U., main campus                            | Public                | Research-very high           | 382                      |
| 10                           | VA Polytechnic Institute and State U.             | Public                | Research-very high           | 365                      |

S&E = science and engineering; includes health fields.

<sup>a</sup> Includes agricultural, biological, biomedical, and health sciences.

<sup>b</sup> Includes psychology.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Earned Doctorates.

of S&E doctorate recipients per 100 bachelor's degrees awarded in all fields 9 years earlier.<sup>5</sup>

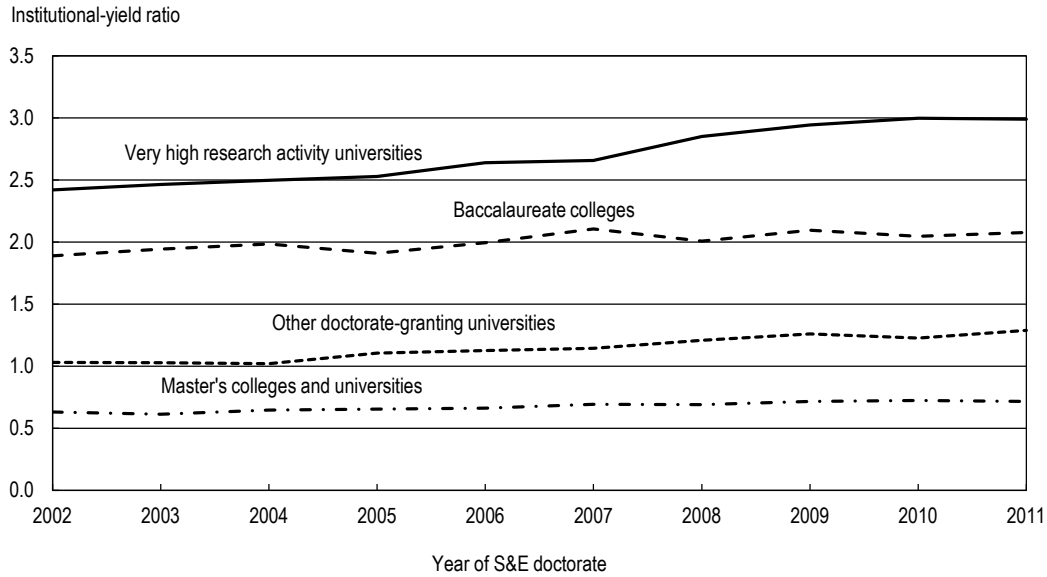
Research universities with very high research activity had the highest institutional-yield ratio each year from 2002 to 2011, followed by baccalaureate colleges, other doctorate-granting universities, and master's colleges and universities (figure 1). The institutional-yield ratios increased for all four types of institutions over this period, and research universities with very high research activity and other doctorate-granting universities showed the largest increases.

When institutional rankings are determined according to the institutional-yield ratio based on S&E doctorate recipients rather than the absolute counts of S&E doctorate recipients, the list of top U.S. baccalaureate-origin institutions changes dramatically (table 4). Nine of the top 20 U.S. baccalaureate-origin institutions of 2002–11 S&E doctorate recipients are baccalaureate colleges, 10 are research universities with very high research activity, and only 1 of the top 20 (New Mexico Institute of Mining and Technology) is a public institution. Of the top 50 U.S. baccalaureate-origin institutions ranked by the institutional-yield ratio, 27 are baccalaureate colleges and 21 are research universities with very high research activity). Only 3 of the institutions appearing on the top 20 list of table 2 also appear in the top 20 of table 4: Massachusetts Institute of Technology, Harvard University, and Stanford University.

## Historically Black Colleges and Universities

In 2011, 24% of black S&E doctorate recipients<sup>6</sup> received their bachelor's degree from historically black colleges and universities (HBCUs), the second

FIGURE 1. Institutional-yield ratios based on S&E doctorate recipients, by 2010 Carnegie classification of U.S. baccalaureate institution: 2002–11



S&E = science and engineering; includes health fields.

NOTES: Institutional-yield ratio is the number of S&E doctorate recipients per 100 bachelor's degrees awarded in all fields 9 years earlier. Other doctorate-granting universities include the two other Carnegie categories of doctorate-granting institutions: high research activity and doctoral/research universities.

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Earned Doctorates; U.S. Department of Education National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey.

most common type of baccalaureate-origin institution next to research universities with very high research activity (29%) for these doctorate recipients (table 5). The proportion of black S&E doctorate recipients with bachelor's degrees from HBCUs has declined from 2006 to 2011, while the proportion with bachelor's degrees from research universities with very high research activity remained near 30% for all but one year of the 2002–11 period. Foreign institutions provided the baccalaureate training for a small but growing proportion of black S&E doctorate recipients, accounting for 7% of the doctorate recipients in 2002 and 11% in 2011.

The importance of HBCUs and research universities with very high research activity in the training of black S&E doctorate recipients is evident from the rankings of baccalaureate-

origin institutions of black S&E doctorate recipients (table 6). Ten of the top 11 baccalaureate-origin institutions of black S&E doctorate recipients from 2002–11 are HBCUs, and 19 of the top 20 are either HBCUs or research universities with very high research activity. The University of Maryland, Baltimore County is the only institution in the top 20 that is neither an HBCU nor a research university with very high research activity. Thirteen of the top 20 institutions are public institutions. Of the top 50 baccalaureate-origin institutions of black S&E doctorate recipients, 21 are HBCUs and 27 are research universities with very high research activity.

Table 7 reports the top 10 baccalaureate-origin institutions for 2002–11 black doctorate recipients by broad subfield of S&E. All of the top-ranking baccalaureate-origin institutions in

physical sciences and all but one of the top-ranking institutions in life sciences are HBCUs. Research universities with very high research activity are among the top 10 baccalaureate-origin institutions of black doctorate recipients in two S&E subfields: social sciences and engineering. Twelve of the 22 institutions listed in the table appear on the top 10 list for multiple broad subfields, and Howard University and Florida A&M University appear on each list.

### Institutional-Yield Ratio Based on Black S&E Doctorate Recipients

As noted earlier in this report, institutional rankings based on absolute numbers of S&E doctorate recipients may not fully reflect the relative contributions of particular types of institutions in the training of S&E doctorate recipients. Figure 2 shows the institutional-yield ratio based on black

TABLE 4. Top 50 U.S. baccalaureate-origin institutions of 2002–11 S&E doctorate recipients, by institutional-yield ratio, institutional control, and 2010 Carnegie classification

| Rank | Academic institution                                | Institutional control | 2010 Carnegie classification | S&E doctorate recipients |                           |
|------|---|-----------------------|------------------------------|--------------------------|---------------------------|
|      |   |                       |                              | Number                   | Institutional-yield ratio |
| 1    | CA Institute of Technology                          | Private               | Research-very high           | 739                      | 34.9                      |
| 2    | Harvey Mudd C.                                      | Private               | Baccalaureate                | 359                      | 24.4                      |
| 3    | MA Institute of Technology                          | Private               | Research-very high           | 1,880                    | 16.0                      |
| 4    | Reed C.   | Private               | Baccalaureate                | 374                      | 14.2                      |
| 5    | Swarthmore C.                                       | Private               | Baccalaureate                | 472                      | 13.1                      |
| 6    | Carleton C.   | Private               | Baccalaureate                | 555                      | 12.3                      |
| 7    | Grinnell C.   | Private               | Baccalaureate                | 366                      | 11.1                      |
| 8    | Rice U.   | Private               | Research-very high           | 728                      | 10.8                      |
| 9    | U. of Chicago                                       | Private               | Research-very high           | 940                      | 10.7                      |
| 10   | Princeton U.  | Private               | Research-very high           | 1,131                    | 10.1                      |
| 11   | Harvard U.  | Private               | Research-very high           | 1,794                    | 10.0                      |
| 12   | Pomona C.   | Private               | Baccalaureate                | 345                      | 9.5                       |
| 13   | Haverford C.  | Private               | Baccalaureate                | 269                      | 9.5                       |
| 14   | NM Institute of Mining and Technology               | Public                | Master's granting            | 142                      | 9.1                       |
| 15   | Williams C.   | Private               | Baccalaureate                | 451                      | 8.7                       |
| 16   | Case Western Reserve U.                             | Private               | Research-very high           | 608                      | 8.4                       |
| 17   | Bryn Mawr C.  | Private               | Baccalaureate                | 245                      | 8.3                       |
| 18   | Stanford U.   | Private               | Research-very high           | 1,359                    | 8.0                       |
| 19   | Brown U.  | Private               | Research-very high           | 1,188                    | 8.0                       |
| 20   | Yale U.   | Private               | Research-very high           | 1,020                    | 7.8                       |
| 21   | Macalester C.                                       | Private               | Baccalaureate                | 311                      | 7.8                       |
| 22   | Carnegie Mellon U.                                  | Private               | Research-very high           | 812                      | 7.7                       |
| 23   | Cornell U., all campuses                            | Private               | Research-very high           | 2,646                    | 7.7                       |
| 24   | Hillsdale C.  | Private               | Baccalaureate                | 65                       | 7.7                       |
| 25   | Oberlin C.  | Private               | Baccalaureate                | 523                      | 7.6                       |
| 26   | Amherst C.  | Private               | Baccalaureate                | 309                      | 7.4                       |
| 27   | Johns Hopkins U.                                    | Private               | Research-very high           | 797                      | 7.2                       |
| 28   | Lawrence U.   | Private               | Baccalaureate                | 178                      | 7.1                       |
| 29   | Duke U.   | Private               | Research-very high           | 1,103                    | 7.1                       |
| 30   | Kalamazoo C.  | Private               | Baccalaureate                | 182                      | 6.8                       |
| 31   | U. of Rochester                                     | Private               | Research-very high           | 771                      | 6.6                       |
| 32   | Wesleyan U.   | Private               | Baccalaureate                | 471                      | 6.6                       |
| 33   | Cooper Union for the Advancement of Science and Art | Private               | Baccalaureate                | 125                      | 6.5                       |
| 34   | Wellesley C.  | Private               | Baccalaureate                | 386                      | 6.5                       |
| 35   | Hendrix C.  | Private               | Baccalaureate                | 129                      | 6.3                       |
| 36   | Whitman C.  | Private               | Baccalaureate                | 193                      | 6.3                       |
| 37   | Brandeis U.   | Private               | Research-very high           | 451                      | 6.3                       |
| 38   | Allegheny C.  | Private               | Baccalaureate                | 233                      | 6.1                       |
| 39   | Vassar C.   | Private               | Baccalaureate                | 348                      | 6.1                       |
| 40   | Bowdoin C.  | Private               | Baccalaureate                | 240                      | 6.1                       |
| 41   | Dartmouth C.  | Private               | Research-very high           | 654                      | 6.0                       |
| 42   | Earlham C.  | Private               | Baccalaureate                | 138                      | 6.0                       |
| 43   | U. CA, Berkeley                                     | Public                | Research-very high           | 3,406                    | 5.9                       |
| 44   | Rensselaer Polytechnic Institute                    | Private               | Research-very high           | 590                      | 5.9                       |
| 45   | Mount Holyoke C.                                    | Private               | Baccalaureate                | 278                      | 5.8                       |
| 46   | Columbia U. in the City of New York                 | Private               | Research-very high           | 829                      | 5.7                       |
| 47   | CO School of Mines                                  | Public                | Research-very high           | 237                      | 5.7                       |
| 48   | Occidental C.                                       | Private               | Baccalaureate                | 206                      | 5.7                       |
| 49   | Franklin and Marshall C.                            | Private               | Baccalaureate                | 231                      | 5.5                       |
| 50   | C. of William and Mary                              | Public                | Research-high                | 718                      | 5.5                       |

S&E = science and engineering; includes health fields.

NOTES: Institutional-yield ratio is the number of S&E doctorate recipients per 100 bachelor's degrees awarded in all fields 9 years earlier. Only institutions from which 50 or more baccalaureate recipients received S&E doctorate degrees between 2002 and 2011 were included in the analysis. Institutions are ranked on unrounded ratios.

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Earned Doctorates; U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey.

TABLE 5. Black S&E doctorate recipients, by selected classes of baccalaureate-origin institutions: 2002–11

| Year | All institutions | HBCUs | U.S. non-HBCU institutions               |  |                                    |                        |   |     | Foreign institutions | Unknown baccalaureate institutions |
|------|------------------|-------|--|--|------------------------------------|------------------------|---|-----|----------------------|------------------------------------|
|      |                  |       | Very high research activity universities | Other doctorate-granting universities <sup>a</sup> | Master's colleges and universities | Baccalaureate colleges | Other or unclassified Carnegie group <sup>b</sup> |     |                      |                                    |
| 2002 | 763              | 198   | 243                                      | 78   | 106                                | 67                     | 6   | 51  | 14                   |                                    |
| 2003 | 742              | 196   | 222                                      | 80   | 82                                 | 56                     | 11  | 59  | 36                   |                                    |
| 2004 | 863              | 241   | 253                                      | 92   | 117                                | 58                     | 9   | 60  | 33                   |                                    |
| 2005 | 829              | 236   | 245                                      | 108  | 95                                 | 55                     | 8   | 51  | 31                   |                                    |
| 2006 | 876              | 260   | 251                                      | 114  | 93                                 | 59                     | 7   | 70  | 22                   |                                    |
| 2007 | 908              | 256   | 231                                      | 107  | 121                                | 57                     | 11  | 83  | 42                   |                                    |
| 2008 | 928              | 227   | 291                                      | 124  | 102                                | 53                     | 11  | 85  | 35                   |                                    |
| 2009 | 1,093            | 269   | 333                                      | 106  | 139                                | 81                     | 5   | 108 | 52                   |                                    |
| 2010 | 1,053            | 276   | 331                                      | 108  | 114                                | 79                     | 8   | 101 | 36                   |                                    |
| 2011 | 1,147            | 276   | 336                                      | 134  | 156                                | 71                     | 12  | 130 | 32                   |                                    |

HBCU = historically black college or university. S&E = science and engineering; includes health fields.

<sup>a</sup> Includes high research activity and doctoral/research universities.

<sup>b</sup> Includes associate's colleges, special focus institutions, and tribal colleges.

NOTE: HBCUs are excluded from each of the 2010 Carnegie classification groups presented in the table.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Earned Doctorates.

S&E doctorate recipients (counts of black S&E doctorates in each category of baccalaureate-origin institution are normalized by the number of bachelor's degrees awarded to blacks 9 years earlier by universities in the same Carnegie class). In every year from 2002 to 2011, research universities with very high research activity had the highest institutional-yield ratio based on blacks with S&E doctorates. The institutional-yield ratio of HBCUs has been equal to or greater than that of baccalaureate colleges every year since 2005. Over the years 2002 to 2011, HBCUs are the only type of baccalaureate-origin institution that has shown an upward trend (albeit slight) in institutional-yield ratio based on blacks with S&E doctorates.

Determining the institutional rankings on the institutional-yield ratio based on blacks with S&E doctorates, rather than on the absolute counts of black S&E doctorate recipients, generates a very different list of top producing baccalaureate-origin institutions (table 8). Of the top 20 baccalaureate-origin

institutions for black S&E doctorate recipients over the 2002–11 period, 16 are research universities with very high research activity and 3 are HBCUs (all baccalaureate colleges). Only 2 of the top 20 are public institutions. Expanding the list to include the top 50 baccalaureate-origin institutions of black S&E doctorate recipient reveals 36 very high research universities, 12 HBCUs (of which 8 are baccalaureate colleges), and 22 public institutions. Only 4 of the institutions appearing on the top 20 list of table 6 also appear in the top 20 of table 8: Harvard University; University of Maryland, Baltimore County; Spelman College; and Xavier University of Louisiana.

### Notes

1. Mark K. Fiegener (mfiegene@nsf.gov; 703-292-4622), Steven L. Proudfoot (sproudfo@nsf.gov; 703-292-4434), Human Resources Statistics Program, National Center for Science and Engineering Statistics, National Science Foundation, 4201 Wilson Boulevard, Suite 965, Arlington, VA 22230.

2. In this InfoBrief, science and engineering includes health fields. This InfoBrief updates the analysis reported in two earlier InfoBriefs: *Baccalaureate Origins of S&E Doctorate Recipients* (NSF 08-311) and *Role of HBCUs as Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients* (NSF 08-319). Data collected by the National Science Foundation's (NSF's) Survey of Earned Doctorates are used to report the numbers of S&E doctorate recipients between 2002 and 2011. Data from the Department of Education's Completions Survey provide the numbers of bachelor's degrees awarded between 1993 and 2002, 9 years prior to each year of doctoral degree data.

3. The 2010 version of the Carnegie Foundation for the Advancement of Teaching's Basic Classification scheme for colleges and universities categorizes academic institutions on the basis of highest degree conferred, level of degree production, and research activity. Institutions that award at least 20 doctoral degrees per year are called doctorate-granting universities, and are

TABLE 6. Top 50 U.S. baccalaureate-origin institutions of 2002–11 black S&E doctorate recipients, by institutional control, 2010 Carnegie classification, and HBCU status

| Rank | Academic institution                    | Institutional control | 2010 Carnegie classification | HBCU | Black S&E doctorate recipients |
|------|---|-----------------------|------------------------------|------|--------------------------------|
| na   | All baccalaureate-origin institutions   | na                    | na                           | na   | 9,202                          |
| na   | Foreign institutions                    | na                    | na                           | na   | 798                            |
| na   | Unknown institutions                    | na                    | na                           | na   | 345                            |
| 1    | Howard U.                               | Private               | Research-high                | Yes  | 220                            |
| 2    | Spelman C.                              | Private               | Baccalaureate                | Yes  | 175                            |
| 3    | FL A&M U.                               | Public                | Doctoral/Research            | Yes  | 154                            |
| 4    | Hampton U.                              | Private               | Master's granting            | Yes  | 150                            |
| 5    | Xavier U. LA                            | Private               | Baccalaureate                | Yes  | 126                            |
| 6    | Morehouse C.                            | Private               | Baccalaureate                | Yes  | 106                            |
| 7    | Morgan State U.                         | Public                | Doctoral/Research            | Yes  | 102                            |
| 7    | NC A&T State U.                         | Public                | Doctoral/Research            | Yes  | 102                            |
| 9    | Southern U. and A&M C.                  | Public                | Master's granting            | Yes  | 100                            |
| 10   | Tuskegee U.                             | Private               | Baccalaureate                | Yes  | 80                             |
| 10   | U. MD, Baltimore County                 | Public                | Research-high                | No   | 80                             |
| 12   | U. MD, College Park                     | Public                | Research-very high           | No   | 76                             |
| 13   | U. MI, Ann Arbor                        | Public                | Research-very high           | No   | 73                             |
| 14   | U. VA, main campus                      | Public                | Research-very high           | No   | 72                             |
| 15   | Harvard U.                              | Private               | Research-very high           | No   | 71                             |
| 16   | Jackson State U.                        | Public                | Research-high                | Yes  | 69                             |
| 17   | U. CA, Berkeley                         | Public                | Research-very high           | No   | 64                             |
| 18   | U. IL, Urbana-Champaign                 | Public                | Research-very high           | No   | 62                             |
| 18   | U. NC, Chapel Hill                      | Public                | Research-very high           | No   | 62                             |
| 20   | TN State U.                             | Public                | Doctoral/Research            | Yes  | 61                             |
| 21   | Yale U.                                 | Private               | Research-very high           | No   | 60                             |
| 22   | Brown U.                                | Private               | Research-very high           | No   | 55                             |
| 22   | MA Institute of Technology              | Private               | Research-very high           | No   | 55                             |
| 24   | U. FL                                   | Public                | Research-very high           | No   | 54                             |
| 25   | Cornell U., all campuses                | Private               | Research-very high           | No   | 51                             |
| 26   | AL A&M U.                               | Public                | Master's granting            | Yes  | 50                             |
| 26   | NC State U., Raleigh                    | Public                | Research-very high           | No   | 50                             |
| 28   | Duke U.                                 | Private               | Research-very high           | No   | 49                             |
| 29   | Princeton U.                            | Private               | Research-very high           | No   | 47                             |
| 29   | Rutgers, State U. NJ, New Brunswick     | Public                | Research-very high           | No   | 47                             |
| 31   | CUNY City C.                            | Public                | Master's granting            | No   | 46                             |
| 31   | GA Institute of Technology, main campus | Public                | Research-very high           | No   | 46                             |
| 31   | MI State U.                             | Public                | Research-very high           | No   | 46                             |
| 34   | Clark Atlanta U.                        | Private               | Doctoral/Research            | Yes  | 45                             |
| 34   | FL State U.                             | Public                | Research-very high           | No   | 45                             |
| 34   | Prairie View A&M U.                     | Public                | Master's granting            | Yes  | 45                             |
| 37   | Tougaloo C.                             | Private               | Baccalaureate                | Yes  | 44                             |
| 38   | U. PA                                   | Private               | Research-very high           | No   | 43                             |
| 39   | CUNY, Hunter C.                         | Public                | Master's granting            | No   | 42                             |
| 39   | PA State U., main campus                | Public                | Research-very high           | No   | 42                             |
| 41   | Norfolk State U.                        | Public                | Master's granting            | Yes  | 41                             |
| 42   | LA State U. and A&M C.                  | Public                | Research-very high           | No   | 40                             |
| 42   | NC Central U.                           | Public                | Master's granting            | Yes  | 40                             |
| 42   | U. CA, Los Angeles                      | Public                | Research-very high           | No   | 40                             |
| 45   | Grambling State U.                      | Public                | Master's granting            | Yes  | 39                             |
| 45   | U. SC, Columbia                         | Public                | Research-very high           | No   | 39                             |
| 47   | Stanford U.                             | Private               | Research-very high           | No   | 36                             |
| 47   | TX A&M U., main campus                  | Public                | Research-very high           | No   | 36                             |
| 47   | U. GA                                   | Public                | Research-very high           | No   | 36                             |
| 50   | Dillard U.                              | Private               | Baccalaureate                | Yes  | 35                             |
| 50   | Fisk U.                                 | Private               | Baccalaureate                | Yes  | 35                             |
| 50   | Temple U.                               | Public                | Research-high                | No   | 35                             |

na = not applicable.

HBCU = historically black college or university. S&E = science and engineering; includes health fields.

NOTES: Includes only U.S. citizens and permanent residents. Institutions with the same number of doctorate recipients are listed alphabetically.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Earned Doctorates.

TABLE 7. Top 10 U.S. baccalaureate-origin institutions of 2002–11 black S&E doctorate recipients, by field of doctoral degree, institutional control, 2010 Carnegie classification, and HBCU status

| Rank                         | Academic institution                    | Institutional control | 2010 Carnegie classification | HBCU | Black S&E doctorate recipients |
|------------------------------|---|-----------------------|------------------------------|------|--------------------------------|
| Life sciences <sup>a</sup>   |   |                       |                              |      |                                |
| 1                            | Xavier U. LA                            | Private               | Baccalaureate                | Yes  | 74                             |
| 2                            | Howard U.                               | Private               | Research-high                | Yes  | 61                             |
| 3                            | Hampton U.                              | Private               | Master's granting            | Yes  | 57                             |
| 4                            | Spelman C.                              | Private               | Baccalaureate                | Yes  | 55                             |
| 5                            | U. MD, Baltimore County                 | Public                | Research-high                | No   | 50                             |
| 6                            | FL A&M U.                               | Public                | Doctoral/Research            | Yes  | 46                             |
| 7                            | NC A&T State U.                         | Public                | Doctoral/Research            | Yes  | 35                             |
| 8                            | Southern U. and A&M C.                  | Public                | Master's granting            | Yes  | 34                             |
| 9                            | Tuskegee U.                             | Private               | Baccalaureate                | Yes  | 32                             |
| 10                           | Morehouse C.                            | Private               | Baccalaureate                | Yes  | 31                             |
| 10                           | Morgan State U.                         | Public                | Doctoral/Research            | Yes  | 31                             |
| Physical sciences            |   |                       |                              |      |                                |
| 1                            | Howard U.                               | Private               | Research-high                | Yes  | 28                             |
| 2                            | Hampton U.                              | Private               | Master's granting            | Yes  | 24                             |
| 2                            | Morehouse C.                            | Private               | Baccalaureate                | Yes  | 24                             |
| 4                            | Spelman C.                              | Private               | Baccalaureate                | Yes  | 23                             |
| 5                            | Southern U. and A&M C.                  | Public                | Master's granting            | Yes  | 22                             |
| 6                            | FL Agricultural and Mechanical U.       | Public                | Doctoral/Research            | Yes  | 19                             |
| 7                            | Xavier U. LA                            | Private               | Baccalaureate                | Yes  | 16                             |
| 8                            | Jackson State U.                        | Public                | Research-high                | Yes  | 13                             |
| 8                            | Norfolk State U.                        | Public                | Master's granting            | Yes  | 13                             |
| 10                           | AL A&M U.                               | Public                | Master's granting            | Yes  | 12                             |
| 10                           | NC A&T State U.                         | Public                | Doctoral/Research            | Yes  | 12                             |
| Social sciences <sup>b</sup> |   |                       |                              |      |                                |
| 1                            | Howard U.                               | Private               | Research-high                | Yes  | 109                            |
| 2                            | Spelman C.                              | Private               | Baccalaureate                | Yes  | 84                             |
| 3                            | Hampton U.                              | Private               | Master's granting            | Yes  | 61                             |
| 4                            | FL A&M U.                               | Public                | Doctoral/Research            | Yes  | 52                             |
| 5                            | Harvard U.                              | Private               | Research-very high           | No   | 44                             |
| 6                            | U. CA, Berkeley                         | Public                | Research-very high           | No   | 42                             |
| 7                            | Morehouse C.                            | Private               | Baccalaureate                | Yes  | 39                             |
| 8                            | U. MD, College Park                     | Public                | Research-very high           | No   | 37                             |
| 8                            | U. VA, main campus                      | Public                | Research-very high           | No   | 37                             |
| 10                           | Yale U.                                 | Private               | Research-very high           | No   | 36                             |
| Engineering                  |   |                       |                              |      |                                |
| 1                            | NC A&T State U.                         | Public                | Doctoral/Research            | Yes  | 48                             |
| 2                            | FL A&M U.                               | Public                | Doctoral/Research            | Yes  | 37                             |
| 3                            | Morgan State U.                         | Public                | Doctoral/Research            | Yes  | 32                             |
| 4                            | Brown U.                                | Private               | Research-very high           | No   | 28                             |
| 5                            | GA Institute of Technology, main campus | Public                | Research-very high           | No   | 25                             |
| 6                            | Howard U.                               | Private               | Research high                | Yes  | 22                             |
| 7                            | Tuskegee U.                             | Private               | Baccalaureate                | Yes  | 20                             |
| 8                            | U. MI, Ann Arbor                        | Public                | Research-very high           | No   | 18                             |
| 9                            | U. MD, College Park                     | Public                | Research-very high           | No   | 16                             |
| 9                            | U. MD, Baltimore County                 | Public                | Research-high                | No   | 16                             |

HBCU = historically black college or university. S&E = science and engineering; includes health fields.

<sup>a</sup> Includes agricultural, biological, biomedical, and health sciences.

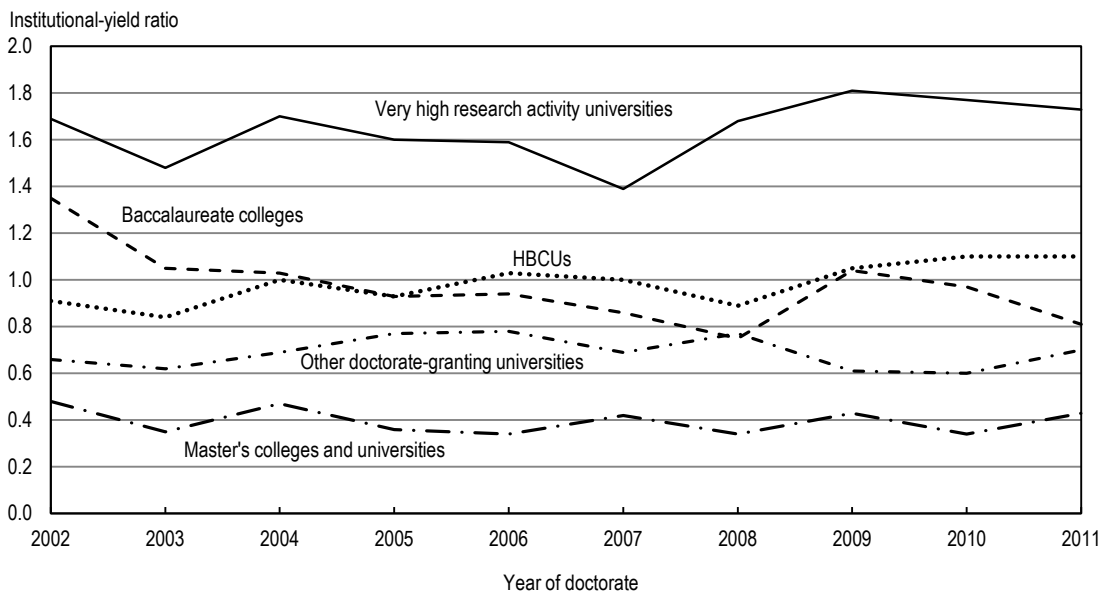
<sup>b</sup> Includes psychology.

NOTES: Includes only U.S. citizens and permanent residents. Institutions with the same number of doctorate recipients are listed alphabetically.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Earned Doctorates.



FIGURE 2. Institutional-yield ratios based on black S&E doctorate recipients, by selected classes of U.S. baccalaureate-origin institutions: 2002–11



HBCU = historically black college or university. S&E = science and engineering; includes health fields.

NOTES: Institutional-yield ratio based on black S&E doctorate recipients is the number of black S&E doctorate recipients per 100 bachelor's degrees awarded in all fields to blacks 9 years earlier. Other doctorate-granting universities include the two other Carnegie categories of doctorate-granting institutions: high research activity and doctoral/research universities. Figure includes only U.S. citizens and permanent residents. HBCUs are excluded from each of the 2010 Carnegie classification groups presented.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics Survey of Earned Doctorates; Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey.

distributed among three subgroups based on the level of research activity: research universities with very high research activity, research universities with high research activity, and doctoral/research universities (for the purposes of this InfoBrief, the latter two subgroups are combined into a single category, called “other doctorate-granting universities”). Master's colleges and universities are institutions that award at least 50 master's degrees and fewer than 20 doctoral degrees per year. Baccalaureate colleges are institutions that award fewer than 50 master's degrees or 20 doctoral degrees per year and at which baccalaureate degrees are at least 10% of all undergraduate

degrees. See <http://classifications.carnegiefoundation.org/> for more information on the Carnegie classification scheme.

4. Research universities with very high research activity were responsible for 25.6% of all bachelor's degrees awarded by U.S. academic institutions in 2011, and baccalaureate colleges were responsible for 11.5% of all bachelor's degrees (U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey; special tabulation from NSF's WebCASPAR system [<https://webcaspar.nsf.gov/>], March 2013).

5. Nine years was the median time from receipt of bachelor's degree to doctorate award for S&E doctorate recipients between 2002 and 2011. Time to degree was shorter in physical sciences (7.7 years) and in engineering (8.0 years) than in life sciences (8.6 years) and social sciences (9.9 years). Explorations of the data with 8- and 10-year lags produced similar results.

6. The analysis in this section is limited to U.S. citizens and permanent residents as data on bachelor's degrees awarded by race or ethnicity are not provided for temporary residents. In this InfoBrief, “black” is used interchangeably with “black or African American.”

TABLE 8. Top 50 U.S. baccalaureate-origin institutions of 2002–11 black S&E doctorate recipients, by institutional-yield ratio for black S&E doctorate recipients, institutional control, 2010 Carnegie classification, and HBCU status

| Rank | Academic institution                    | Institutional control | 2010 Carnegie classification | HBCU | Black S&E doctorate recipients |                           |
|------|---|-----------------------|------------------------------|------|--------------------------------|---------------------------|
|      |   |                       |                              |      | Number                         | Institutional-yield ratio |
| 1    | MA Institute of Technology              | Private               | Research-very high           | No   | 55                             | 9.6                       |
| 2    | Rice U.                                 | Private               | Research-very high           | No   | 25                             | 7.0                       |
| 3    | Princeton U.                            | Private               | Research-very high           | No   | 47                             | 6.5                       |
| 4    | Brown U.                                | Private               | Research-very high           | No   | 55                             | 6.2                       |
| 5    | Yale U.                                 | Private               | Research-very high           | No   | 60                             | 6.2                       |
| 6    | Harvard U.                              | Private               | Research-very high           | No   | 71                             | 5.4                       |
| 7    | Vanderbilt U.                           | Private               | Research-very high           | No   | 25                             | 4.6                       |
| 8    | U. MD, Baltimore County                 | Public                | Research-high                | No   | 80                             | 4.4                       |
| 9    | Spelman C.                              | Private               | Baccalaureate                | Yes  | 175                            | 4.2                       |
| 10   | Duke U.                                 | Private               | Research-very high           | No   | 49                             | 4.1                       |
| 11   | Johns Hopkins U.                        | Private               | Research-very high           | No   | 25                             | 4.1                       |
| 12   | Cornell U., all campuses                | Private               | Research-very high           | No   | 51                             | 3.6                       |
| 13   | U. PA                                   | Private               | Research-very high           | No   | 43                             | 3.5                       |
| 14   | WA U., St. Louis                        | Private               | Research-very high           | No   | 28                             | 3.5                       |
| 15   | Columbia U. in the City of New York     | Private               | Research-very high           | No   | 32                             | 3.3                       |
| 16   | Tougaloo C.                             | Private               | Baccalaureate                | Yes  | 44                             | 3.2                       |
| 17   | Tulane U. LA                            | Private               | Research-very high           | No   | 26                             | 3.2                       |
| 18   | Xavier U. LA                            | Private               | Baccalaureate                | Yes  | 126                            | 3.0                       |
| 19   | Stanford U.                             | Private               | Research-very high           | No   | 36                             | 2.9                       |
| 20   | GA Institute of Technology, main campus | Public                | Research-very high           | No   | 46                             | 2.7                       |
| 21   | U. CA, Davis                            | Public                | Research-very high           | No   | 31                             | 2.5                       |
| 22   | U. VA, main campus                      | Public                | Research-very high           | No   | 72                             | 2.4                       |
| 23   | Fisk U.                                 | Private               | Baccalaureate                | Yes  | 35                             | 2.4                       |
| 24   | U. CA, Berkeley                         | Public                | Research-very high           | No   | 64                             | 2.3                       |
| 25   | Northwestern U.                         | Private               | Research-very high           | No   | 27                             | 2.3                       |
| 26   | Emory U.                                | Private               | Research-very high           | No   | 25                             | 2.2                       |
| 27   | Morehouse C.                            | Private               | Baccalaureate                | Yes  | 106                            | 2.2                       |
| 28   | U. MI, Ann Arbor                        | Public                | Research-very high           | No   | 73                             | 2.2                       |
| 29   | TX A&M U., main campus                  | Public                | Research-very high           | No   | 36                             | 2.1                       |
| 30   | U. of Miami                             | Private               | Research-very high           | No   | 31                             | 2.0                       |
| 31   | Howard U.                               | Private               | Research-high                | Yes  | 220                            | 2.0                       |
| 32   | U. NC, Chapel Hill                      | Public                | Research-very high           | No   | 62                             | 2.0                       |
| 33   | Hampton U.                              | Private               | Master's granting            | Yes  | 150                            | 1.9                       |
| 34   | U. IL, Urbana-Champaign                 | Public                | Research-very high           | No   | 62                             | 1.8                       |
| 35   | Tuskegee U.                             | Private               | Baccalaureate                | Yes  | 80                             | 1.8                       |
| 36   | Clemson U.                              | Public                | Research-high                | No   | 32                             | 1.8                       |
| 37   | U. DE                                   | Public                | Research-very high           | No   | 25                             | 1.8                       |
| 38   | PA State U., main campus                | Public                | Research-very high           | No   | 42                             | 1.8                       |
| 39   | NC State U., Raleigh                    | Public                | Research-very high           | No   | 50                             | 1.7                       |
| 40   | LA State U. and A&M C.                  | Public                | Research-very high           | No   | 40                             | 1.7                       |
| 41   | Oakwood U.                              | Private               | Baccalaureate                | Yes  | 29                             | 1.7                       |
| 42   | U. at Buffalo                           | Public                | Research-very high           | No   | 29                             | 1.7                       |
| 43   | Morgan State U.                         | Public                | Doctoral/Research            | Yes  | 102                            | 1.6                       |
| 44   | Lincoln U. PA                           | Public                | Master's granting            | Yes  | 34                             | 1.6                       |
| 45   | U. FL                                   | Public                | Research-very high           | No   | 54                             | 1.6                       |
| 46   | Dillard U.                              | Private               | Baccalaureate                | Yes  | 35                             | 1.5                       |
| 47   | U. TX, Austin                           | Public                | Research-very high           | No   | 34                             | 1.5                       |
| 48   | U. MD, College Park                     | Public                | Research-very high           | No   | 76                             | 1.5                       |
| 49   | Stony Brook U.                          | Public                | Research-very high           | No   | 28                             | 1.5                       |
| 50   | U. GA                                   | Public                | Research-very high           | No   | 36                             | 1.5                       |

HBCU = historically black college or university. S&E = science and engineering; includes health fields.

NOTES: Institutional-yield ratio for black S&E doctorate recipients is the number of black S&E doctorate recipients per 100 bachelor's degrees awarded in all fields to blacks 9 years earlier. Table includes only U.S. citizens and permanent residents. Only institutions from which 25 or more baccalaureate recipients received S&E doctorate degrees between 2002 and 2011 were included in the analysis. Institutions are ranked on unrounded ratios.

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Earned Doctorates; U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey.



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

NSF 13-323