

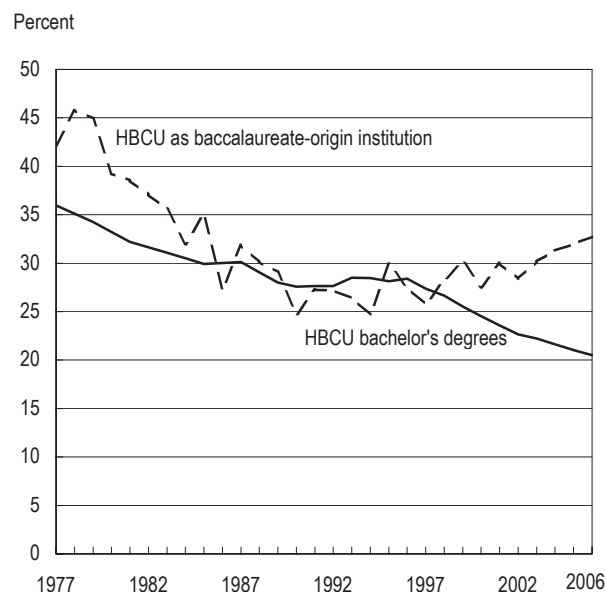
## ROLE OF HBCUs AS BACCALAUREATE-ORIGIN INSTITUTIONS OF BLACK S&E DOCTORATE RECIPIENTS

by Joan Burrelli and Alan Rapoport<sup>1</sup>

In a February 2008 article in the *Washington Post*, the presidents of four Maryland historically black institutions raised the issue of the role and relevance of historically black institutions in enhancing educational opportunities for African Americans (Avery et al 2008). This InfoBrief partially addresses this issue by examining the role of historically black colleges and universities (HBCUs) as baccalaureate-origin institutions of black science and engineering (S&E)<sup>2</sup> doctorate recipients. It examines trends primarily during the past two decades and compares HBCUs to non-HBCU institutions, to different Carnegie types of institutions,<sup>3</sup> and to a select group of baccalaureate colleges—the Oberlin 50 (minus Hampton University which is an HBCU).<sup>4</sup> The InfoBrief also examines differences between public and private institutions. The analysis focuses on two types of output variables: the absolute number of doctorates and the institutional yield—the number of S&E doctorates in a given year per thousand bachelor's degrees awarded in all fields 9 years (the median time from bachelor's-to-doctorate receipt for S&E doctorates) prior to that year.

In the late 1970s over 40% of black S&E doctorate recipients received their baccalaureate degrees from HBCUs.<sup>5</sup> This percentage fell to 25% in the first part of the 1990s before increasing to about 33% in 2006. During the same period (1977–2006), the share of blacks receiving bachelor's degrees from HBCUs fell from 36% to 21% (figure 1).

FIGURE 1. Black S&E doctorate recipients with HBCU baccalaureate degrees and black bachelor's degrees conferred by HBCU institutions: 1977–2006



HBCU = historically black college or university.

NOTES: Includes only U.S. citizens and permanent residents. Bachelor's degree data by race are not available for 1978, 1980, 1982–84, 1986, 1988, and 1999.

SOURCES: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates, 1977–2006 and National Center for Education Statistics, IPEDs Completions Survey, 1977–2006.



### Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients

Black S&E doctorate recipients from U.S. universities complete their undergraduate education at a wide variety of types of institutions in the United States. A small proportion of blacks earning S&E doctorates from U.S. universities had undergraduate degrees from foreign institutions, 8% in 2006 (table 1). An additional 2% did not provide information about their baccalaureate institutions in 2006. Of those with known U.S. baccalaureate institutions, in 2006 a third earned their bachelor's degrees from an HBCU institution and the remainder

earned their bachelor's degrees from non-HBCU institutions. The percentage of S&E doctorate recipients earning their bachelor's degrees from HBCUs ranged between 24% and 33% from 1986 to 2006. Among those earning their baccalaureate degrees at known U.S. institutions in 2006 slightly less than one-third (31%) earned their bachelor's degrees from a non-HBCU research university. The remainder earned their bachelor's degrees from non-HBCU other doctorate-granting institutions (15%), master's-granting institutions (12%), or baccalaureate colleges (8%). The baccalaureate origin of 4% was an Oberlin 49 institution.

TABLE 1. Black S&E doctorate recipients, by selected classes of baccalaureate institutions: 1986–2006

Year	U.S. non-HBCU institutions										
	All institutions	HBCU	All non-HBCU	Research universities	Other doctorate granting	Master's colleges and universities	Baccalaureate colleges	Other/unclassified Carnegie group	Oberlin 49	Foreign institutions	Unknown baccalaureate institutions
1986	356	89	234	91	51	52	35	5	19	23	10
1987	350	99	221	93	47	48	32	1	18	28	2
1988	389	103	239	106	48	57	26	2	12	45	2
1989	396	104	257	114	42	56	42	3	22	32	3
1990	405	85	267	120	51	64	29	3	16	46	7
1991	503	119	325	139	79	69	34	4	17	45	14
1992	442	109	292	138	53	72	29	0	11	33	8
1993	526	121	340	140	75	77	42	6	20	54	11
1994	544	120	362	160	71	79	49	3	27	53	9
1995	610	165	390	176	72	83	53	6	26	40	15
1996	620	151	395	170	81	92	50	2	27	57	17
1997	668	145	420	189	102	76	52	1	25	50	53
1998	708	175	445	206	87	90	53	9	31	44	44
1999	773	207	475	218	95	104	52	6	19	57	34
2000	784	192	504	246	104	90	60	4	32	54	34
2001	767	204	480	234	105	85	47	9	27	60	23
2002	761	196	501	225	100	102	67	7	38	51	13
2003	742	195	454	215	84	86	55	14	32	58	35
2004	857	242	527	236	108	112	60	11	25	60	28
2005	828	239	512	230	122	96	56	8	23	51	26
2006	866	254	525	240	117	96	61	11	29	67	20

HBCU = historically black college or university.

NOTES: Includes only U.S. citizens and permanent residents. Research universities are the Carnegie group "doctorate-granting universities, very high research activity." Other doctorate-granting institutions include the two other Carnegie categories of doctorate-granting institutions—high research activity and doctoral/research universities. HBCUs are excluded from each of the Carnegie groups presented in the table. The Oberlin 49 schools are not excluded from the baccalaureate colleges category.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates, 1986–2006.

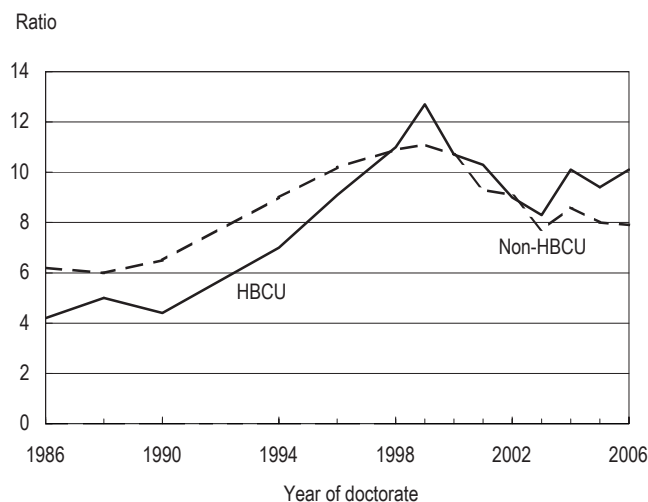
**Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients Normalized for Bachelor’s Degrees Awarded**

Although only one-quarter to one-third of black S&E doctorate recipients received their bachelor’s degrees from HBCUs from 1986 to 2006, when normalized by the number of bachelor’s degrees awarded, HBCUs as a group yielded about as many future S&E doctorates per thousand bachelor’s awarded as non-HBCU institutions during this period. The trends for both groups were similar (figure 2).

**Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients Normalized for Black Bachelor’s Degrees Awarded**

A recently released InfoBrief<sup>6</sup> showed that although baccalaureate colleges graduate relatively small

FIGURE 2. Black S&E doctorate recipients per thousand black bachelor’s degrees awarded in all fields 9 years earlier, by HBCU and non-HBCU institutions: Selected years, 1986–2006



HBCU = historically black college or university.

NOTES: Includes only U.S. citizens and permanent residents. Bachelor’s degree data by race were not collected in 1978, 1980, 1982–84, 1986, and 1988.

SOURCES: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates, 1977–2006 and National Center for Education Statistics, IPEDs Completions Survey, 1977–1997.

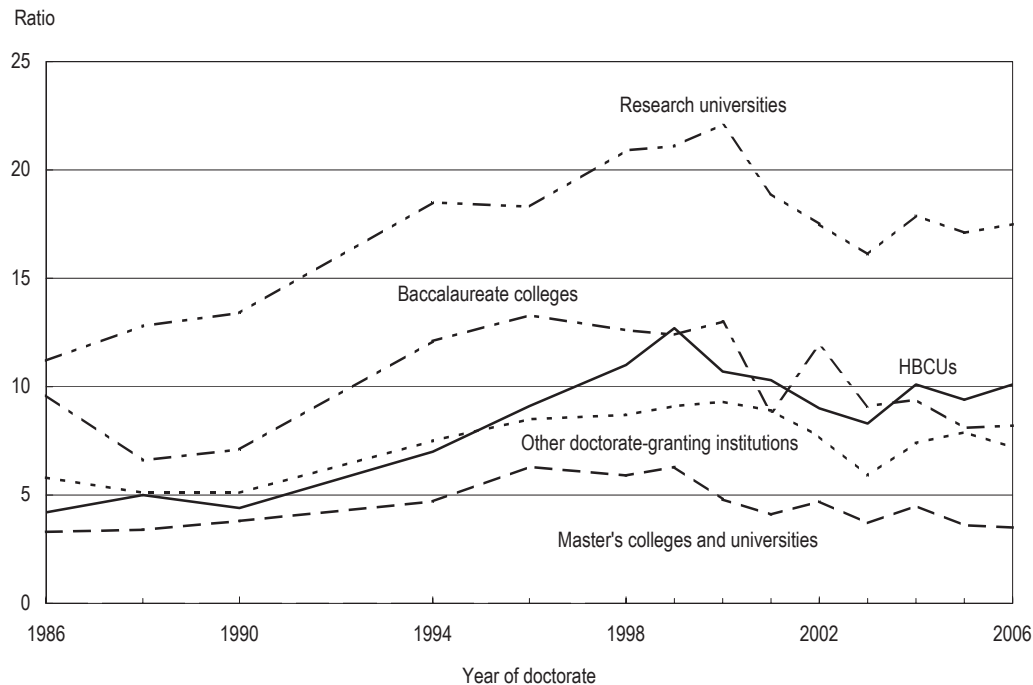
numbers of undergraduate degree holders compared to doctorate- and master’s-granting institutions, when normalized by the number of bachelor’s degrees awarded, the baccalaureate colleges as a group yield more future S&E doctorates than other types of institutions, except research universities. Figure 3 shows that for 9 of the 14 years shown, baccalaureate colleges also yielded more future black S&E doctorates than other types of institutions, except research universities. Between 1986 and 1998, both the non-HBCU research universities and the non-HBCU baccalaureate colleges yielded more future black S&E doctorates than the HBCUs. However, between 1999 and 2006, HBCUs and non-HBCU baccalaureate colleges yielded similar numbers of future black S&E doctorates. During this latter period the HBCUs yielded more black S&E doctorates than either non-HBCU other doctorate-granting or non-HBCU master’s institutions (figure 3). The yield ratios of all of these types of institutions generally increased between 1986 and the late 1990s, reaching their peak in 1999 or 2000, and have generally declined since then.

Comparing public and private institutions, private schools, whether non-HBCU research universities, non-HBCU baccalaureate colleges, or HBCUs, outperform comparable public schools in the proportion of their black bachelor’s degree recipients becoming future S&E doctorate recipients (figure 4). The number of 2006 black S&E doctorate recipients per thousand black bachelor’s degrees awarded in all fields 9 years earlier is highest among private non-HBCU research universities and the Oberlin 49 baccalaureate colleges. Private HBCUs as a group have a yield similar to all private non-HBCU baccalaureate colleges and public non-HBCU research universities (figure 4).

**Top Schools From Which Black S&E Doctorate Recipients Received Bachelor’s Degrees**

Among known U.S. baccalaureate-origin institutions of 1997–2006 black S&E doctorate recipients, the top 8 and 20 of the top 50 were HBCUs. Another 26 were non-HBCU research universities (table 2). The top 5 baccalaureate-origin institutions of 1997–2006 black S&E doctorate recipients were: Howard University, Spelman College, Hampton University, Florida A&M University, and Morehouse College.

FIGURE 3. Black S&E doctorate recipients per thousand black bachelor's degrees awarded in all fields 9 years earlier, by selected Carnegie group and HBCU status: Selected years, 1986–2006



HBCU = historically black college or university.

NOTES: Includes only U.S. citizens and permanent residents. Research universities are the Carnegie group "doctorate granting universities-very high research activity." Other doctorate-granting institutions include doctorate granting institutions, high research activity and doctoral/research universities. Bachelor's degree data by race were not collected in 1978, 1980, 1982–84, 1986, and 1988.

SOURCES: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates, 1986–2006 and National Center for Education Statistics, IPEDs Completions Survey, 1977–1997.

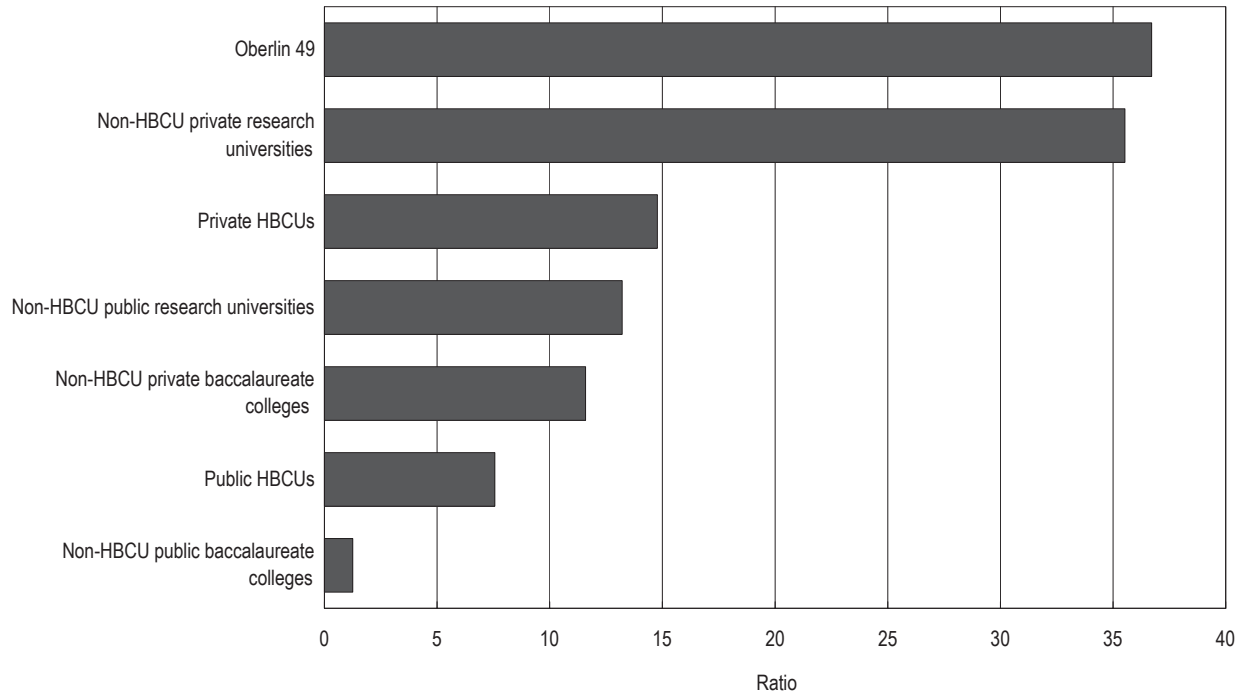
However, after normalizing for the number of bachelor's degrees awarded 9 years earlier, only 5 of the top 50 baccalaureate origin institutions of 1997–2006 black S&E doctorate recipients were HBCUs, with only Spelman College in the top 25.<sup>7</sup> Thirty-two were research universities and 8 were Oberlin 49 colleges (table 3). The top 5 baccalaureate origin institutions in terms of number of black S&E doctorates per thousand bachelor's degrees awarded in all fields 9 years earlier were: Massachusetts Institute of Technology, Swarthmore College, Princeton University, Harvard University, and Amherst College.

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## Notes

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2. In this report, science and engineering includes health fields.
3. The 2005 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

FIGURE 4. Black S&E doctorate recipients in 2006 per thousand black bachelor's awarded in all fields in 1997, by selected Carnegie group, HBCU status, and institutional control



HBCU = historically black college or university.

NOTES: Includes only U.S. citizens and permanent residents. Research universities are the Carnegie group "doctorate-granting universities, very high research activity."

SOURCES: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates, 2006 and National Center for Education Statistics, IPEDs Completions Survey, 1997.

conferred, level of degree production, and research activity. Doctorate-granting universities are institutions that award at least 20 doctoral degrees per year. These institutions have three subgroups: very high research activity, high research activity, and doctoral/research universities, based on level of research activity. 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://www.carnegiefoundation.org/classifications/> for more information on the Carnegie classification scheme.

4. The Oberlin 50 is a group of 50 small, private baccalaureate schools that was studied in the mid-1980s and was found at that time to contribute greatly to the production of future S&E doctorates. Hampton University is also an HBCU and is therefore eliminated from the group to obtain the Oberlin 49. The Oberlin 50 institutions are: Albion College, Alma College, Amherst College, Antioch University, Barnard College,

TABLE 2. Top 50 baccalaureate origin institutions of 1997–2006 black S&amp;E doctorate recipients, by institutional control, 2005 Carnegie classification, and HBCU status

Rank	Academic institution	Institutional control	2005 Carnegie classification	HBCU	1997–2006 black S&E doctorate recipients
na	All baccalaureate-origin institutions	na	na	na	7,754
na	Foreign institutions	na	na	na	552
na	Unknown institutions	na	na	na	310
1	Howard University	Private	Other doctorate granting	Yes	224
2	Spelman College	Private	Baccalaureate colleges	Yes	150
3	Hampton University	Private	Master's colleges and universities	Yes	135
4	Florida Agricultural and Mechanical University	Public	Other doctorate granting	Yes	100
5	Morehouse College	Private	Baccalaureate colleges	Yes	99
6	North Carolina A&T State University	Public	Other doctorate granting	Yes	89
7	Southern University A&M College at Baton Rouge	Public	Master's colleges and universities	Yes	88
8	Xavier University of Louisiana	Private	Master's colleges and universities	Yes	79
9	Harvard University	Private	Research universities	No	73
10	University of Maryland at College Park	Public	Research universities	No	72
11	Tuskegee University	Private	Baccalaureate colleges	Yes	71
12	Morgan State University	Public	Other doctorate granting	Yes	64
13	University of California Berkeley	Public	Research universities	No	64
14	Jackson State University	Public	Other doctorate granting	Yes	63
15	University of Virginia, main campus	Public	Research universities	No	63
16	University of Michigan at Ann Arbor	Public	Research universities	No	62
17	Massachusetts Institute of Technology	Private	Research universities	No	58
18	University of North Carolina at Chapel Hill	Public	Research universities	No	54
19	North Carolina State University at Raleigh	Public	Research universities	No	51
20	Brown University	Private	Research universities	No	50
21	Stanford University	Private	Research universities	No	50
22	Yale University	Private	Research universities	No	48
23	Princeton University	Private	Research universities	No	47
24	Cornell University, all campuses	Public/private	Research universities	No	46
25	University of Illinois at Urbana-Champaign	Public	Research universities	No	45
26	Clark Atlanta University	Private	Other doctorate granting	Yes	43
27	Prairie View A&M University	Public	Master's colleges and universities	Yes	43
28	University of California Los Angeles	Public	Research universities	No	43
29	University of Pennsylvania	Private	Research universities	No	43
30	Alabama Agricultural and Mechanical University	Public	Master's colleges and universities	Yes	41
31	Rutgers University New Brunswick	Public	Research universities	No	41
32	Tougaloo College	Private	Baccalaureate colleges	Yes	41
33	University of South Carolina at Columbia	Public	Research universities	No	41
34	CUNY City College	Public	Master's colleges and universities	No	40
35	Norfolk State University	Public	Master's colleges and universities	Yes	40
36	North Carolina Central University	Public	Master's colleges and universities	Yes	40
37	Wayne State University	Public	Research universities	No	38
38	Fisk University	Private	Baccalaureate colleges	Yes	37
39	Temple University	Public	Other doctorate granting	No	37
40	Florida State University	Public	Research universities	No	36
41	Michigan State University	Public	Research universities	No	35
42	Tennessee State University	Public	Other doctorate granting	Yes	35
43	Duke University	Private	Research universities	No	34
44	Grambling State University	Public	Master's colleges and universities	Yes	34
45	University of Texas at Austin	Public	Research universities	No	34
46	CUNY Hunter College	Public	Master's colleges and universities	No	33
47	Columbia University in the City of New York	Private	Research universities	No	32
48	Georgia Institute of Technology, main campus	Public	Research universities	No	32
49	Pennsylvania State University, main campus	Public	Research universities	No	32
50	University of Maryland Baltimore County	Public	Other doctorate granting	No	32

HBCU = historically black college or university; na = not applicable.

NOTES: Includes only U.S. citizens and permanent residents. Research universities are the Carnegie group "doctorate-granting universities, very high research activity." Other doctorate-granting institutions include the two other Carnegie categories of doctorate-granting institutions--high research activity and doctoral/research universities. Institutions with the same number of doctorate recipients are listed alphabetically.

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

TABLE 3. Top 50 baccalaureate origin institutions of 1997–2006 black S&E doctorate recipients, by black S&E doctorate recipients per thousand black bachelor's degrees awarded in all fields 9 years earlier, institutional control, 2005 Carnegie classification, HBCU status, and Oberlin 49 status

Rank	Academic institution	Institutional control	2005 Carnegie classification	HBCU	Oberlin	1997–2006 S&E doctorate recipients	1997–2006 black S&E doctorate recipients per 1,000 bachelor's awarded 9 years earlier
1	Massachusetts Institute of Technology	Private	Research universities	No	No	58	112.6
2	Swarthmore College	Private	Baccalaureate colleges	No	Yes	17	85.9
3	Princeton University	Private	Research universities	No	No	47	70.7
4	Harvard University	Private	Research universities	No	No	73	64.2
5	Amherst College	Private	Baccalaureate colleges	No	Yes	15	55.6
6	Brown University	Private	Research universities	No	No	50	54.0
7	Yale University	Private	Research universities	No	No	48	52.9
8	Wellesley College	Private	Baccalaureate colleges	No	Yes	18	52.3
9	Carnegie Mellon University	Private	Research universities	No	No	14	50.4
10	University of Chicago	Private	Research universities	No	No	14	49.8
11	Oberlin College	Private	Baccalaureate colleges	No	Yes	22	48.7
12	Vanderbilt University	Private	Research universities	No	No	21	47.3
13	University of California Santa Cruz	Public	Research universities	No	No	19	45.6
14	Colgate University	Private	Baccalaureate colleges	No	Yes	11	44.4
15	Spelman College	Private	Baccalaureate colleges	Yes	No	150	41.8
16	Stanford University	Private	Research universities	No	No	50	41.2
17	Vassar College	Private	Baccalaureate colleges	No	Yes	16	41.0
18	Columbia University in the City of New York	Private	Research universities	No	No	32	39.5
19	Case Western Reserve University	Private	Research universities	No	No	13	39.4
20	Wesleyan University	Private	Baccalaureate colleges	No	Yes	20	38.9
21	Rice University	Private	Research universities	No	No	11	38.3
22	University of Pennsylvania	Private	Research universities	No	No	43	38.1
23	Johns Hopkins University	Private	Research universities	No	No	15	37.5
24	Duke University	Private	Research universities	No	No	34	36.8
25	Williams College	Private	Baccalaureate colleges	No	Yes	12	35.9
26	Tougaloo College	Private	Baccalaureate colleges	Yes	No	41	35.9
27	Wake Forest University	Private	Other doctorate granting	No	No	15	35.8
28	Cornell University, all campuses	Public/private	Research universities	No	No	46	34.4
29	University of California Irvine	Public	Research universities	No	No	21	33.8
30	Tulane University	Private	Research universities	No	No	25	33.7
31	George Washington University	Private	Other doctorate granting	No	No	19	30.8
32	College of William and Mary	Public	Research universities	No	No	19	30.5
33	Fisk University	Private	Baccalaureate colleges	Yes	No	37	30.0
34	Dartmouth College	Private	Research universities	No	No	17	29.7
35	Washington University	Private	Research universities	No	No	19	28.4
36	Emory University	Private	Research universities	No	No	25	27.1
37	Andrews University	Private	Other doctorate granting	No	No	14	26.5
38	Iowa State University	Public	Research universities	No	No	17	25.2
39	University of California Riverside	Public	Research universities	No	No	12	25.1
40	Georgia Institute of Technology, main campus	Public	Research universities	No	No	32	24.7
41	Miami University, all campuses	Public	Other doctorate granting	No	No	14	24.4
42	Morehouse College	Private	Baccalaureate colleges	Yes	No	99	24.4
43	University of Michigan at Ann Arbor	Public	Research universities	No	No	62	24.3
44	Xavier University of Louisiana	Private	Other doctorate granting	Yes	No	79	24.1
45	University of California Berkeley	Public	Research universities	No	No	64	24.0
46	University of California Davis	Public	Research universities	No	No	26	24.0
47	University of Virginia, main campus	Public	Research universities	No	No	63	23.9
48	University of Wisconsin Madison	Public	Research universities	No	No	17	22.6
49	University of Miami	Private	Research universities	No	No	24	22.1
50	University of Maryland Baltimore County	Public	Other doctorate granting	No	No	32	21.6

HBCU = historically black college or university.

NOTES: Includes only U.S. citizens and permanent residents. Research universities are the Carnegie group "doctorate-granting universities, very high research activity." Other doctorate-granting institutions include the two other Carnegie categories of doctorate-granting institutions—high research activity and doctoral/research universities. 1987 bachelor's degree recipients substituted for 1988 since no data reported for 1988. Only institutions from which more than 10 baccalaureate recipients received S&E doctorate degrees between 1997 and 2006 were included in the analysis. Institutions are ranked on unrounded ratios.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates and National Center for Education Statistics, IPEDs Completions Survey, 1977–2006.

Bates College, Beloit College, Bowdoin College, Bryn Mawr College, Bucknell University, Carleton College, Colgate University, Colorado College, Davidson College, Denison University, DePauw University, Earlham College, Franklin and Marshall College, Grinnell College, Hamilton College, Hampton University, Harvey Mudd College, Haverford College, College of the Holy Cross, Hope College, Kalamazoo College, Kenyon College, Lafayette College, Macalester College, Manhattan College, Middlebury College, Mount Holyoke College, Oberlin College, Occidental College, Ohio Wesleyan University, Pomona College, Reed College, Smith College, St. Olaf College, Swarthmore College, Trinity College (CT), Union College (NY), Vassar College, Wabash College, Wellesley College, Wesleyan University, Wheaton College (IL), Whitman College, Williams College, and College of Wooster. Two of these institutions (Hampton University and Manhattan College) are now Carnegie master's-granting institutions.

5. The analysis is limited to U.S. citizens and permanent residents since data on bachelor degree

conferrals by race/ethnicity are not provided for temporary residents.

6. "Baccalaureate Origins of S&E Doctorate Recipients" (NSF 08-311 available at <http://www.nsf.gov/statistics/infbrief/nsf08311/>) addressed the role of various types of colleges and universities as baccalaureate-origin institutions of S&E doctorate recipients.

7. Only institutions from which more than 10 baccalaureate recipients received S&E doctorate degrees between 1997 and 2006 were included in the analysis.

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