InfoBrief
NCSES National Center for Science and Engineering Statistics

April 2015 ■ NSF 15-318

Full-Time Graduate Enrollment in Science and Engineering Rose in 2013, Fueled by a Large Increase in Foreign Graduate Enrollment

by Kelly Kang[1]

The number of full-time graduate students enrolled in science and engineering (S&E) programs rose by 2.4% in 2013 after remaining relatively flat for the past 2 years. This increase was largely due to a 7.9% increase in full-time enrollment of foreign students on temporary visas. In 2013, full-time S&E foreign graduate enrollment reached an all-time high of 168,297 students, and they now represent 39.6% of all full-time S&E graduate students, up from 35.9% in 2008. In contrast, full-time S&E graduate enrollment of U.S. citizens and permanent residents declined for the third year in a row.

These and other findings in this report are from the 2013 Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS), cosponsored by the National Science Foundation (NSF) and the National Institutes of Health (NIH).

Graduate Enrollment in S&E

Graduate Student Profile

In 2013, there were 570,300 students enrolled in S&E graduate programs in the United States, with about three-quarters enrolled as full-time students. More than half of those enrolled in S&E graduate programs were men, and more than two-thirds were U.S. citizens or permanent residents. Overall, full-time enrollment increased by 2.4% in 2013 to nearly 425,000 students. These increases were largely due to the foreign S&E graduate students, whose enrollment grew 7.9% from 2012 (table 1).

Although the S&E graduate enrollment of U.S. citizens and permanent residents declined since 2011, the number of Hispanic or Latino S&E graduate students has climbed steadily every year between 2008 and 2013, resulting in 25.8% growth over the five year period. The number of S&E graduate students reported to be in more than one race also grew every year since the new category was collected for the first time in 2008, from 1,319 students to 8,015 students in 2013.[2]

Among U.S. citizens and permanent residents, graduate enrollment in S&E continued to become more diverse in 2013, with Asians and Native Hawaiians or Other Pacific Islanders (8.9%), Hispanics or Latinos (8.6%), blacks or African Americans (8.1%), more than one race (2.1%), and American Indian or Alaska Native (0.6%) making up over 28% of total enrollments. In 2008, these groups combined made up less than a quarter of the U.S. citizen and permanent resident S&E graduate students.

The proportion of S&E graduate students who are women has fallen slightly (to around 43% since 2008), although this past year showed a 1.2% increase in women's overall enrollment (table 1).

Graduate Enrollment, by Field

In 2013, 73.2% of the 570,300 S&E graduate students were enrolled in science fields, and the remainder were enrolled in engineering. Graduate enrollment in the various science fields remained fairly flat from 2012 to 2013, except for computer sciences, which jumped by 8.8% and contributed to 1% growth of overall graduate enrollment in science from 2012 (table 2).

The growth in graduate enrollment of computer science fields was fueled by

TABLE 1. Graduate enrollment in science and engineering fields, by enrollment status, sex, citizenship, ethnicity, and race: 2008–13

Characteristic	2008	2009	2010	2011	2012	2013	% change 2012–13	% change 2008–13
All graduate students in surveyed fields	529,275	545,685	556,532	560,941	561,418	570,300	1.6	7.8
Full-time enrollment	383,560	398,498	409,107	411,168	414,384	424,508	2.4	10.7
First time	108,819	115,755	118,492	120,135	121,856	127,725	4.8	17.4
Part-time enrollment	145,715	147,187	147,425	149,773	147,034	145,792	-0.8	0.1
Male	297,278	307,936	316,051	318,209	318,870	324,913	1.9	9.3
Female	231,997	237,749	240,481	242,732	242,548	245,387	1.2	5.8
U.S. citizens and permanent residents[a]	369,781	382,342	390,403	392,160	385,343	381,225	-1.1	3.1
Full-time enrollment	245,691	256,503	263,871	262,043	258,477	256,211	-0.9	4.3
First time	68,093	75,321	77,242	75,394	73,704	72,731	-1.3	6.8
Part-time enrollment	124,090	125,839	126,532	130,117	126,866	125,014	-1.5	0.7
Hispanic or Latino	26,098	27,265	28,609	30,808	31,406	32,819	4.5	25.8
Not Hispanic or Latino								
American Indian or Alaska Native	2,618	2,549	2,500	2,392	2,188	2,198	0.5	-16.0
Asian[b]	30,356	31,754	32,185	33,147	32,700	32,917	0.7	8.4
Black or African American	28,680	29,973	31,094	32,197	31,338	30,911	-1.4	7.8
Native Hawaiian or Other Pacific Islander[b]	1,121	1,125	1,088	1,008	920	882	-4.1	-21.3
White	242,623	250,443	255,256	256,096	250,783	246,518	-1.7	1.6
More than one race[b]	1,319	2,300	4,989	6,103	7,578	8,015	5.8	507.7
Unknown ethnicity and race	36,966	36,933	34,682	30,409	28,430	26,965	-5.2	-27.1
Temporary visa holders	159,494	163,343	166,129	168,781	176,075	189,075	7.4	18.5
Full-time enrollment	137,869	141,995	145,236	149,125	155,907	168,297	7.9	22.1
First time	40,726	40,434	41,250	44,741	48,152	54,994	14.2	35.0
Part-time enrollment	21,625	21,348	20,893	19,656	20,168	20,778	3.0	-3.9

[a] Ethnicity and race data are available for U.S. citizens and permanent residents only.

[b] Reporting of ethnicity and race in 2008–13 has been affected by changes in the reporting of ethnicity and race in the Integrated Postsecondary Education Data System (IPEDS). Starting in 2008, IPEDS respondents were asked to use a new classification that included a category for two or more races and separate reporting of Native Hawaiians and Other Pacific Islanders from Asians. The new classification was optional in 2008 and 2009 IPEDS but mandatory beginning in 2010 and may have contributed to a significant increase in the reporting of Not Hispanic or Latino, More than one race.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering.

a 19.8% increase in computer science foreign graduate students between 2012 and 2013 (figure 1).

In contrast, graduate enrollment in engineering fields grew by 3.1% from 2012 to 2013, bringing the total number of students to 153,049 and surpassing the previous high of 149,241 students in 2010. This growth is led by the increases in the number of graduate students in electrical engineering (7.6%), chemical engineering (5.2%), and mechanical engineering (4.3%) from 2012 to 2013. Aerospace engineering and metallurgical or materials engineering each also grew by more than 2% from 2012 to 2013.

As in computer science, foreign students contributed to the overall growth in electrical engineering graduate enrollment as their number grew 13.4% between 2012 and 2013. The foreign students represented 57.1% of computer science and 67.3% of electrical engineering graduate enrollments in 2013 compared to their respective shares of 47.3% and 60.5% in 2007 (figure 1).

Postdoctoral Appointees in S&E

Postdoc Profile

In 2013, a total of 43,395 postdoctoral appointees (postdocs) were conducting research in S&E fields at U.S. academic institutions and their affiliated research centers and hospitals. The total number of S&E postdocs declined slightly by 1.0% from 2012. This was mainly due to a decrease in the number of foreign postdocs (-2.1%), who constitute a majority (53.3%) of the S&E postdocs, although their share has decreased from a decade ago (59.8% in 2003).

The number of U.S. citizen and permanent resident postdocs remained around 20,200 in 2012 and 2013. Although the number of S&E postdocs dropped slightly for both men (-1.1%) and women (-0.8%) from 2012 to 2013, the share of female S&E postdocs has remained steady over the years, hovering near 36% (table 3).

TABLE 2. Graduate enrollment in science and engineering, by field: 2008–13

Characteristic	2008	2009	2010	2011	2012	2013	% change 2012–13	% change 2008–13
Science and engineering	529,275	545,685	556,532	560,941	561,418	570,300	1.6	7.8
Science	391,419	401,008	407,291	414,440	413,033	417,251	1.0	6.6
Agricultural sciences	14,153	15,200	15,656	16,129	16,234	16,429	1.2	16.1
Biological sciences	72,666	73,304	74,928	75,423	76,447	76,649	0.3	5.5
Computer sciences	49,553	51,161	51,546	51,234	51,789	56,339	8.8	13.7
Earth, atmospheric, and ocean sciences	14,389	14,839	15,655	15,820	16,069	15,816	-1.6	9.9
Mathematical sciences	21,400	22,226	23,136	23,801	24,575	24,804	0.9	15.9
Physical sciences	37,319	38,149	38,973	39,694	39,928	40,019	0.2	7.2
Psychology	58,991	56,184	53,419	54,486	54,117	54,102	0.0	-8.3
Social sciences	103,384	107,820	109,220	111,661	108,169	107,278	-0.8	3.8
Other sciences[a]	19,564	22,125	24,758	26,192	25,705	25,815	0.4	32.0
Engineering	137,856	144,677	149,241	146,501	148,385	153,049	3.1	11.0
Aerospace engineering	4,902	5,266	5,540	5,691	5,069	5,181	2.2	5.7
Biomedical engineering	7,339	7,904	8,497	9,175	9,157	9,198	0.4	25.3
Chemical engineering	7,892	8,188	8,668	8,828	9,222	9,698	5.2	22.9
Civil engineering	16,931	18,638	19,559	19,596	19,922	20,110	0.9	18.8
Electrical engineering	41,164	41,218	41,336	41,580	42,347	45,562	7.6	10.7
Industrial engineering	15,692	15,825	15,205	14,494	14,469	14,363	-0.7	-8.5
Mechanical engineering	19,585	21,243	22,509	21,883	23,088	24,087	4.3	23.0
Metallurgical and materials engineering	5,539	5,863	6,274	6,649	6,985	7,144	2.3	29.0
Other engineering	18,812	20,532	21,653	18,605	18,126	17,706	-2.3	19.3

[a] Includes communication, family and consumer sciences and human sciences, neuroscience, and multidisciplinary and interdisciplinary studies.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering.

Between 2010 and 2013, the number of S&E postdocs who were underrepresented minorities (American Indian or Alaska Native, black or African American, Hispanic or Latino, Native Hawaiian or Other Pacific Islander, or more than one race) increased by 21.7%, from 1,573 to 1,914. However, these underrepresented minorities still account for less than 10% of the U.S. citizen and permanent resident postdocs in S&E.

Postdocs, by Field

Although most S&E postdocs in 2013 were conducting research in science fields (83.6%), this proportion has steadily declined over the past decade from 88.7% in 2003. Between 2010 and 2013, the number of postdocs in science fields declined by 2.8%, with the largest drops occurring in the two largest science fields: biological sciences (-11.0%) and physical sciences (-5.1%). The number of postdocs in engineering fields has grown steadily over time; as of 2013, 16.4% of all S&E postdocs were in engineering, up from 11.3% in 2003. Between 2010 and 2013, the number of engineering postdocs increased by 2.0%, with the largest increases in chemical engineering (14.2%), biomedical engineering (7.8%), and electrical engineering (7.8%).

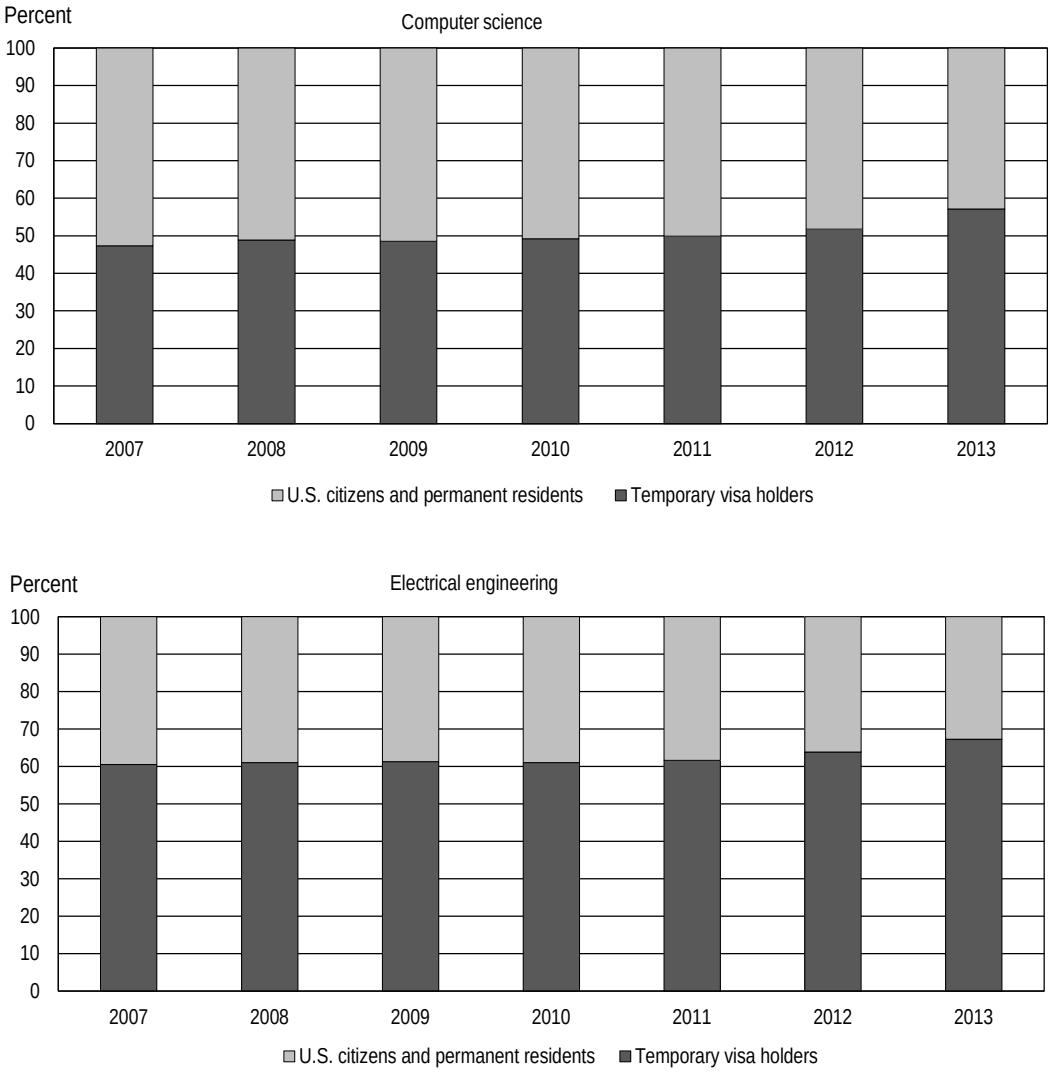
Data Sources and Limitations

Conducted since 1966, the GSS is an annual survey of all academic institutions in the United States granting research-based master's or doctoral degrees in science, engineering, or selected health fields. The 2013 GSS collected data from 15,942 organizational units (departments, programs, affiliated research centers, and health care facilities) at 564 institutions of higher education and their affiliates in the United States, Puerto Rico, and Guam. The institutional response rate was 99.7%. An overview of the survey is available at http://www.nsf.gov/statistics/srvygradpostdoc/.

GSS health fields are collected under the advisement of NIH. These GSS fields make up about one-third of all health fields in the U.S. Department of Education's Classification of Instructional Programs (CIP) taxonomy.[3] NIH information on trends seen within these selected health fields can be found at http://www.report.nih.gov/nihdatabook/.

In 2011, the GSS field taxonomy was updated to conform to the 2010 CIP. The impact on overall GSS counts as a result of this change was minimal. See appendix A, "Technical Notes," in *Graduate Students and Postdoctorates in Science and Engineering:*

FIGURE 1. Graduate students enrolled in computer science and electrical engineering, by citizenship status: 2007–13



SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering.

Fall 2011 (NSF 13-331) for additional information about the 2011 GSS field taxonomy updates.

Data tables from the 2013 GSS will be available at http://www.nsf.gov/statistics/srvygradpostdoc/. For more information, contact the author.

Notes

1. Kelly H. Kang, Human Resources Statistics Program, National Center for Science and Engineering Statistics, National Science Foundation, 4201 Wilson Boulevard, Suite 965, Arlington, VA 22230 (kkang@nsf.gov; 703-292-7796).

2. Reporting of ethnicity and race in 2008–13 has been affected by changes in the reporting of ethnicity and race in the Integrated Postsecondary Education Data System (IPEDS). Starting in 2008, IPEDS respondents were asked to use a new classification that included a category

TABLE 3. Postdoctoral appointees in science, engineering, and health, by sex, citizenship, ethnicity, race, and field: 2010–13

Characteristic	2010[a]	2011[a]	2012	2013	% change 2012–13	% change 2010–13
All survey fields	63,439	62,639	62,851	61,942	-1.4	-2.4
Science and engineering	44,320	44,121	43,841	43,395	-1.0	-2.1
Male	28,531	28,314	28,176	27,858	-1.1	-2.4
Female	15,789	15,807	15,665	15,537	-0.8	-1.6
U.S. citizens and permanent residents[b]	19,617	19,439	20,214	20,257	0.2	3.3
Asian	3,592	3,502	3,330	3,526	5.9	-1.8
Underrepresented minorities	1,573	1,791	1,703	1,914	13.3	21.7
American Indian or Alaska Native	62	66	51	71	39.2	14.5
Black or African American	564	610	615	667	8.5	18.3
Hispanic or Latino	813	901	862	961	18.2	18.2
Native Hawaiian or Other Pacific Islander	53	53	63	50	-20.6	-5.7
More than one race	81	161	112	165	47.3	103.7
White	11,980	11,965	11,835	11,953	1.0	-0.2
Unknown ethnicity and race	3,285	3,082	3,346	2,864	-14.4	-12.8
Temporary visa holders	23,890	23,781	23,627	23,138	-2.1	-3.1
Science	37,351	37,335	36,738	36,289	-1.2	-2.8
Agricultural sciences	1,190	1,256	1,290	1,319	2.2	10.8
Biological sciences	21,726	21,107	20,086	19,330	-3.8	-11.0
Computer sciences	763	759	760	765	0.7	0.3
Earth, atmospheric, and ocean sciences	1,740	1,774	1,956	2,032	3.9	16.8
Mathematical sciences	791	830	902	932	3.3	17.8
Physical sciences	7,583	7,490	7,430	7,197	-3.1	-5.1
Psychology	1,132	1,124	1,132	1,023	-9.6	-9.6
Social sciences	711	774	799	938	17.4	31.9
Other sciences	1,715	2,221	2,383	2,753	15.5	60.5
Engineering	6,969	6,786	7,103	7,106	0.0	2.0
Biomedical engineering	1,023	1,069	1,161	1,103	-5.0	7.8
Chemical engineering	1,077	1,137	1,098	1,230	12.0	14.2
Civil engineering	571	551	590	587	-0.5	2.8
Electrical engineering	1,095	1,035	1,152	1,180	2.4	7.8
Mechanical engineering	1,021	889	985	1,034	5.0	1.3
Metallurgical and materials engineering	841	860	854	809	-5.3	-3.8
Other engineering	1,341	1,245	1,263	1,163	-11.7	-13.3
Health	19,119	18,518	19,010	18,547	-2.4	-3.0

[a] Postdoc data from 2010 and 2011 were reimputed following the 2012 data collection; these data supersede those contained in previous reports.

[b] Ethnicity and race data are available for U.S. citizens and permanent residents only.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering.

for two or more races and separate reporting of Native Hawaiians and Other Pacific Islanders from Asians. The new classification was optional in 2008 and 2009 IPEDS but mandatory beginning in 2010 and may have contributed to a significant increase in the reporting of Not Hispanic or Latino, More than one race.

3. The CIP provides a taxonomic scheme that supports the consistent reporting of fields of study and program completions activity. For more information, see http://nces.ed.gov/ipeds/cipcode/.

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