InfoBrief
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Two Decades of Increasing Diversity More than Doubled the Number of Minority Graduate Students in Science and Engineering

by Peter Einaudi[1]

From 1989 through 2009 the number of minority U.S. citizens and permanent residents enrolled in graduate science and engineering (S&E) programs more than doubled, growing from approximately 37,700 in 1989 to 92,700 in 2009. Increases in Hispanic, black, and Asian/Pacific Islander S&E graduate students were similar over this period (approximately 17,800, 18,200, and 17,200, respectively); however, these gains almost tripled the number of Hispanic graduate students (approximately 190% growth) and more than doubled the number of blacks (approximately 155% growth) and Asians/Pacific Islanders (approximately 110% growth). Enrollment among American Indians/Alaska Natives also nearly tripled, increasing from approximately 900 in 1989 to approximately 2,600 in 2009 (approximately 195% growth). Minority enrollment among U.S. citizens and permanent residents enrolled in graduate S&E programs grew from approximately 13% in 1989 to approximately 24% in 2009 (figure 1). Due to extra variability of the methodological changes in the 2007 Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS), all growth rate calculations comparing pre- and post-2007 counts are rounded to the nearest 5% and counts are rounded to the nearest 100; see "Data Limitations and Availability" for more information.

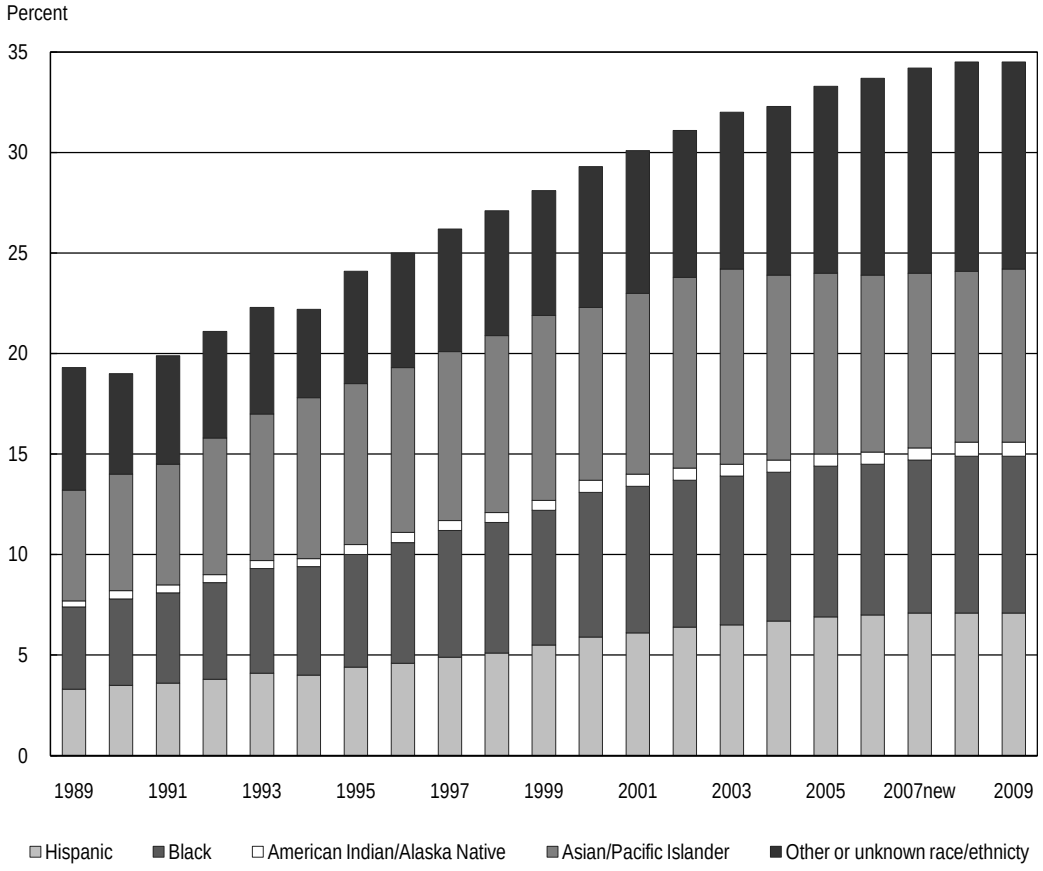
Despite these substantial gains, black and Hispanic U.S. citizens and permanent residents remain underrepresented within the S&E graduate student population when compared with the adult U.S. citizen population. In 2009, 7.8% of the U.S. citizens and permanent residents pursuing graduate S&E degrees were black and 7.1% were Hispanic. In 2009, 13.8% of U.S. citizens 21 to 45 years of age were black and 11.9% were Hispanic. In contrast, the percentage of American Indians/Alaska Natives in the 2009 S&E graduate student population was very similar to that of the adult U.S. citizen population (0.7% vs. 0.8%), and the percentage of Asians/Pacific Islanders pursuing S&E graduate degrees was more than twice that of the U.S. citizen population aged 21 to 45 years (8.6% vs. 3.8%).

These and other findings in this InfoBrief are from the fall 2009 GSS, cosponsored by the National Science Foundation (NSF) and the National Institutes of Health (NIH). The GSS is an annual survey of all academic institutions in the U.S. that grant research-based master's degrees or doctorates in science, engineering, or selected health (SEH) fields. The GSS collects data on the number and characteristics of graduate students, postdoctoral appointees (postdocs), and other doctorate-holding nonfaculty researchers in SEH fields.

Graduate Student Enrollment in S&E

In S&E fields, total graduate student enrollment (full-time and part-time) reached 545,685 in 2009, an increase of 3.1% from 2008 to 2009 (table 1). Graduate enrollment in engineering fields grew faster than in science fields for the fourth straight year (4.9% vs. 2.4% in 2009) and increased by approximately 40% over the past decade, as compared to approximately 30% for science fields. Although there was noted growth in S&E enrollment, assessing the overall trend in the

FIGURE 1. Graduate enrollment among U.S. citizens and permanent residents in science and engineering fields, by minority and other/unknown race/ethnicity: 1989–2009



NOTES: In 2007 the survey was redesigned and five fields were added or reclassified to improve reporting. "2007new" shows data as collected in 2007. See appendix A in *Graduate Students and Postdoctorates in Science and Engineering: Fall 2007* (NSF 10-307 at www.nsf.gov/statistics/nsf10307/) for more detail. Caution should be used when calculating year-to-year growth and interpreting trends. The "Asian/Pacific Islander" category includes "Asian" and "Native Hawaiian/Other Pacific Islander," the "Hispanic" category includes "Hispanic/Latino in one or more races," the "Other or unknown" category includes "Non-Hispanic/Latino in more than one race" and/or "ethnicity/race unknown or not stated."

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

selected health fields was not possible due to changes in the reporting of certain health fields. In particular, the 21.0% drop in the number of graduate students reported in "other health" fields in 2009 was primarily due to the exclusion of students in ineligible degree programs who had been included in prior years. Because these "other health" fields included ineligible students in prior years, the 2009 counts are not comparable to the 2008 and prior counts. Graduate enrollment within clinical health fields was fairly stable from 2008 to 2009 (0.8% growth) but had increased by approximately 45% over the prior 10 years.

The remainder of this InfoBrief focuses on the 2009 GSS data reported within S&E fields. Further analysis of GSS data on graduate enrollment in selected health fields can be obtained from NIH.[2]

Field of Study

From 2008 to 2009 the fastest growing graduate S&E fields were civil engineering, mechanical engineering, economics, biomedical engineering, political science, aerospace engineering, and agricultural sciences.[3] Of these fields, civil engineering experienced the fastest annual growth at 10.1%, but all grew by more than 7.0%. Over the 10-year span from 2000 to 2009, biomedical engineering easily outpaced all other S&E fields, increasing by approximately 145%.

Four fields declined from 2008 to 2009: psychology, sociology, history and philosophy of science, and

TABLE 1. Graduate enrollment in science, engineering, and health fields, by field: 2000–09

Field	2000	2001	2002	2003	2004	2005	2006	2007 old[a]	2007 new[a]	2008	2009	% change[b] 2000 –07	2007 –09	2000 –09	2008 –09
All survey fields	493,311	509,607	540,404	567,121	574,463	582,226	597,643	607,823	619,499	631,489	631,645	23.2	2.0	30	0.0
Science and engineering	413,536	429,229	454,834	474,645	475,873	478,275	486,287	502,375	516,199	529,275	545,685	21.5	5.7	30	3.1
Science	309,424	319,736	335,166	347,268	352,307	357,710	363,246	372,120	384,523	391,419	401,008	20.3	4.3	30	2.4
Agricultural sciences	12,023	12,235	12,698	13,197	13,445	13,123	13,016	13,222	13,528	14,153	15,200	10.0	12.4	25	7.4
Biological sciences	56,282	57,639	61,088	64,701	66,565	68,479	69,941	71,663	71,932	72,666	73,304	27.3	1.9	30	0.9
Communication[a]	ne	ne	ne	ne	ne	ne	ne	ne	7,303	8,444	9,418	-	29.0	-	11.5
Computer sciences	47,350	52,196	55,269	53,696	50,016	47,978	47,653	48,959	48,246	49,553	51,161	3.4	6.0	10	3.2
Earth, atmospheric, and ocean sciences	13,941	13,841	14,240	14,620	15,131	14,836	14,920	14,675	14,100	14,389	14,839	5.3	5.2	5	3.1
Family and consumer sciences/human sciences[a]	ne	ne	ne	ne	ne	ne	ne	ne	2,780	3,549	3,794	-	36.5	-	6.9
Mathematical sciences	15,650	16,651	18,163	19,465	19,931	20,210	20,815	21,335	20,975	21,400	22,226	36.3	6.0	40	3.9
Multidisciplinary/ interdisciplinary studies[a]	ne	ne	ne	ne	ne	ne	ne	ne	4,484	5,559	6,557	-	46.2	-	18.0
Neuroscience[a]	na	na	na	na	na	na	na	na	1,584	2,012	2,356	-	48.7	-	17.1
Physical sciences	30,385	31,038	32,341	34,298	35,761	36,375	36,901	37,111	36,824	37,319	38,149	22.1	3.6	25	2.2
Psychology	50,466	50,454	51,152	52,162	54,126	57,282	57,653	60,284	59,617	58,991	56,184	19.5	-5.8	10	-4.8
Social sciences	83,327	85,682	90,215	95,129	97,332	99,427	102,347	104,871	103,150	103,384	107,820	25.9	4.5	30	4.3
Agricultural economics	2,079	2,161	2,187	2,318	2,195	2,127	2,158	2,126	1,989	2,132	2,222	2.3	11.7	5	4.2
Anthropology	7,626	7,491	7,481	7,789	7,826	7,750	8,150	8,099	8,129	8,333	8,359	6.2	2.8	10	0.3
Economics	10,748	11,408	12,009	12,316	12,318	11,805	12,132	12,328	12,597	12,971	13,993	14.7	11.1	30	7.9
Geography	4,036	4,304	4,383	4,721	4,809	4,800	4,750	4,660	4,660	4,745	4,810	15.5	3.2	20	1.4
History and philosophy of science	532	571	663	737	994	965	968	1,119	1,054	1,177	1,006	110.3	-4.6	90	-14.5
Linguistics	2,674	2,744	2,875	3,028	2,941	3,187	3,074	3,076	2,879	3,095	3,170	15.0	10.1	20	2.4
Political science	31,131	31,805	34,934	36,880	39,023	40,780	41,784	41,854	41,349	40,871	43,919	34.4	6.2	40	7.5
Sociology	8,652	8,812	8,946	9,127	8,874	9,018	9,035	9,734	9,642	10,002	9,731	12.5	0.9	10	-2.7
Sociology/anthropology	745	808	719	773	839	848	837	831	682	653	576	11.5	-15.5	-25	-11.8
Other social sciences	15,104	15,578	16,018	17,440	17,513	18,147	19,459	21,044	20,169	19,405	20,034	39.3	-0.7	35	3.2
Engineering	104,112	109,493	119,668	127,377	123,566	120,565	123,041	130,255	131,676	137,856	144,677	25.1	9.9	40	4.9
Aerospace engineering	3,407	3,451	3,685	4,048	4,089	4,170	4,482	4,616	4,616	4,902	5,266	35.5	14.1	55	7.4
Architecture[a]	na	na	na	na	na	na	na	na	4,601	5,905	6,804	-	47.9	-	15.2
Biomedical engineering	3,197	3,599	4,338	5,301	5,807	6,067	6,482	6,881	6,904	7,339	7,904	115.2	14.5	145	7.7
Chemical engineering	7,056	6,913	7,414	7,516	7,452	7,173	7,261	7,383	7,584	7,892	8,188	4.6	8.0	15	3.8
Civil engineering[a]	16,451	16,665	17,713	18,890	18,561	18,114	17,802	19,867	16,071	16,931	18,638	20.8	16.0	15	10.1
Electrical engineering	33,611	36,100	39,948	41,763	38,995	37,450	38,265	40,207	40,588	41,164	41,218	19.6	1.6	25	0.1
Industrial engineering	12,119	12,940	14,033	14,313	13,852	13,650	13,829	14,290	14,474	15,692	15,825	17.9	9.3	30	0.8
Mechanical engineering	15,235	15,852	17,139	18,393	17,852	17,373	17,919	18,366	18,347	19,585	21,243	20.6	15.8	40	8.5
Metallurgical/materials engineering	4,377	4,721	4,992	5,131	5,059	5,160	5,268	5,365	5,314	5,539	5,863	22.6	10.3	35	5.8
Other engineering	8,659	9,252	10,406	12,022	11,899	11,408	11,733	13,280	13,177	12,907	13,728	53.4	4.2	60	6.4
Health[a]	79,775	80,378	85,570	92,476	98,590	103,951	111,356	105,448	103,300	102,214	85,960	32.2	-16.8	10	-15.9
Clinical medicine[c]	16,407	17,363	19,166	20,574	20,866	21,414	23,441	24,616	22,751	23,939	24,125	50.0	6.0	45	0.8
Other health[d]	63,368	63,015	66,404	71,902	77,724	82,537	87,915	80,832	80,549	78,275	61,835	27.6	-23.2	0	-21.0

na = not applicable; data were not collected at this level of detail. ne = not eligible; data were not collected for this field before 2007. - = not calculable.

[a] In 2007 the survey was redesigned and five fields were added or reclassified to improve reporting. "2007new" shows data as collected in 2007; "2007old" shows data as they would have been collected in prior years. See www.nsf.gov/statistics/nsf10307/ for more detail.

[b] "% change 2000–07" shows growth from 2000 to 2007old; "% change 2007–09" shows growth from 2007new to 2009; "% change 2000–09" shows growth from 2000 to 2009 and is rounded to nearest 5% to reflect the imprecision of this estimate due to inclusion of methodological changes.

[c] Clinical medicine includes research-oriented graduate students in these medical fields: anesthesiology, cardiology, endocrinology, gastroenterology, hematology, neurology, obstetrics/gynecology, oncology/cancer research, ophthalmology, otorhinolaryngology, pediatrics, preventive medicine/community health, psychiatry, pulmonary disease, radiology, surgery, and clinical medicine, not elsewhere classified.

[d] Counts within "other health" fields should not be used for trend analysis as counts prior to 2009 include significant numbers of ineligible students in practitioner-oriented degree programs. Starting in 2007, eligibility rules were clarified.

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

sociology/anthropology; however, only for the combined field of sociology/anthropology did the data constitute a substantive downward trend. For sociology (as a single field) and history and philosophy of science, the declines were modest in number and were the first declines in several years; the 10-year trends for both fields showed increasing enrollment. As with the "other health" fields, much of the decline seen over the past 2 years in psychology was from the exclusion of graduate students in ineligible practitioner-oriented programs rather than declining enrollment within eligible research-oriented programs.

Enrollment Status

The S&E graduate students in 2009 were enrolled mostly as full-time students with only 27.0% enrolled part time (table 2).[4] Although there were more part-time S&E graduate students in 2009 than ever before, the proportion of part-time S&E graduate student enrollment has been in decline since 1985, and it dropped again in 2009 as growth in full-time enrollment outpaced that of part-time enrollment (3.9% to 1.0%). In contrast to part-time enrollment, first-time, full-time enrollment in S&E fields continued to rise in 2009, marking the fifth year in a row that the number of first-time, full-time graduate students hit a record high. In 2009 a total of 115,755 students started full-time graduate study in S&E programs, up 6.4% from 2008. First-time, full-time students accounted for 29.0% of all full-time graduate students in S&E and for 21.2% of all graduate students in S&E. Both are the highest proportions for first-time, full-time students since the mid-1980s.

Sex and Citizenship

Of the 115,755 first-time, full-time graduate students in S&E fields, 56.5% were men, contributing to a second straight year where men's overall enrollment in S&E fields grew faster than women's. In 2009 men's enrollment in S&E fields grew by 3.6% and women's enrollment grew by 2.5%. Given the relative stability from 2006 through 2009 of the proportion of S&E graduate students who were women, it seems that the long-standing trend toward greater gender parity among graduate students in S&E fields has been interrupted. From 1977 (the first year the GSS surveyed both master's- and doctorate-level academic institutions) through 2007, the proportion of S&E graduate students who were women increased every year and grew from 25.0% to 43.5%.

On the other hand, among the S&E graduate students with temporary visas, the gap between enrollment of women and men continued to narrow (women's enrollment increased by 3.4% vs. 1.9% for men from 2008 to 2009). However, temporary visa holders were much more likely than U.S. citizens and permanent residents to be men (65.7% vs. 52.5% in 2009). Temporary visa holders also remained much more likely than U.S. citizens or permanent residents to be enrolled full time (86.9% vs. 67.1% in 2009).

Despite a substantial change in the number of S&E graduate students holding temporary visas over the past 10 years, their proportion among all S&E graduate students has been relatively stable. From 2000 to 2009 approximately 3 out of every 10 graduate students in S&E were temporary visas holders. The percentage of S&E graduate students holding temporary visas was approximately 30% in 2000 and 2009, with a high of approximately 32% in 2002. The 2002 mark was the highest ever recorded in the GSS and reflected an increase of 8.7% over the 23.3% reported in 1995. Graduate enrollment of U.S. citizens and permanent residents grew at a slightly faster rate than that of foreign students on temporary visas from 2008 to 2009 (3.4% vs. 2.4%), marking the first time this has happened since foreign enrollment rebounded in 2005.

Race and Ethnicity

From 1989 to 2009 the number of U.S. citizens and permanent residents from minority racial/ethnic groups enrolled in S&E graduate programs more than doubled, whereas the number of non-Hispanic white U.S. citizen or permanent resident graduate students increased by less than 10%. As a result, the racial/ethnic makeup of U.S. citizens and permanent residents enrolled in S&E graduate programs (U.S. S&E graduate students) has become increasingly diverse (figure 1).

The growth in the number of Hispanic, black, and American Indian/Alaska Native S&E graduate students from 1989 to 2009 has been remarkably consistent, with increases every year for blacks, in 19 of 20 years for Hispanics, and in 17 of 20 years for American Indians/Alaskan Natives. As a result of two decades of growth, the number of graduate students who were Hispanic U.S. citizens or permanent residents nearly tripled, growing by approximately 190% (from approximately 9,400 in 1989 to approximately 27,300 in 2009). S&E graduate enrollment among black U.S. citizens or permanent residents grew by approximately 155% (from approximately 11,800 to approximately 30,000) over this period, and American Indian/Alaska Native S&E graduate enrollment grew by approximately 195% (from approximately 900 to approximately 2,500).

S&E graduate enrollment among Asian/Pacific Islander U.S. citizens or permanent residents rose by approximately 110% over this period (from approximately 15,700 in 1989 to approximately 32,900 in 2009), but this growth was not as uniform as that among the other racial/ethnic minorities. In proportional terms, Hispanics

TABLE 2. Graduate enrollment in science, engineering, and health fields, by enrollment status, sex, citizenship, and race/ethnicity: 2000–09

Characteristic	2000	2001	2002	2003	2004	2005	2006	2007 old[a]	2007 new[a]	2008	2009	% change[b] 2000–07	2007–09	2000–09	2008–09
All survey fields	493,311	509,607	540,404	567,121	574,463	582,226	597,643	607,823	619,499	631,489	631,645	23.2	2.0	30	0.0
Science and engineering	413,536	429,229	454,834	474,645	475,873	478,275	486,287	502,375	516,199	529,275	545,685	21.5	5.7	30	3.1
Full time	291,355	304,021	325,472	339,028	340,529	341,742	349,802	362,976	371,542	383,560	398,498	24.6	7.3	35	3.9
First time	78,332	82,411	86,827	89,331	86,565	89,038	94,413	98,205	100,990	108,819	115,755	25.4	14.6	50	6.4
Other	213,023	221,610	238,645	249,697	253,964	252,704	255,389	264,771	270,552	274,741	282,743	24.3	4.5	35	2.9
Part time	122,181	125,208	129,362	135,617	135,344	136,533	136,485	139,399	144,657	145,715	147,187	14.1	1.7	20	1.0
Male	243,057	251,810	266,217	276,248	274,008	271,967	275,181	284,080	288,926	297,278	307,935	16.9	6.6	25	3.6
Female	170,479	177,419	188,617	198,397	201,865	206,308	211,106	218,295	227,273	231,997	237,749	28.0	4.6	40	2.5
U.S. citizens and permanent residents S&E graduate enrollment	290,651	294,608	309,119	327,181	332,022	338,513	343,603	353,142	365,091	369,781	382,342	21.5	4.7	30	3.4
Full time	185,613	188,135	200,097	212,855	217,345	220,842	225,338	233,343	240,319	245,691	256,503	25.7	6.7	40	4.4
First time	46,301	48,207	54,625	59,649	58,853	60,157	60,978	62,009	64,284	68,093	75,321	33.9	17.2	65	10.6
Other	139,312	139,928	145,472	153,206	158,492	160,685	164,360	171,334	176,035	177,598	181,182	23.0	2.9	30	2.0
Part time	105,038	106,473	109,022	114,326	114,677	117,671	118,265	119,799	124,772	124,090	125,839	14.1	0.9	20	1.4
Male	156,975	157,945	164,891	174,818	176,297	177,900	179,783	184,498	188,642	191,989	200,641	17.5	6.4	30	4.5
Female	133,676	136,663	144,228	152,363	155,725	160,613	163,820	168,644	176,449	177,792	181,700	26.2	3.0	35	2.2
Hispanic	17,203	17,974	19,634	21,241	22,212	23,387	24,140	25,032	25,739	26,098	27,265	45.5	5.9	60	4.5
Non-Hispanic White	205,569	206,018	213,135	222,674	224,850	225,776	227,993	232,043	240,204	242,623	250,443	12.9	4.3	20	3.2
Asian/Pacific Islander	24,998	26,494	29,229	31,786	30,645	30,574	30,179	31,279	31,897	31,477	32,879	25.1	3.1	30	4.5
Black	20,834	21,455	22,668	24,174	24,624	25,248	25,664	26,565	27,637	28,680	29,973	27.5	8.5	45	4.5
American Indian/ Alaska Native	1,602	1,683	1,734	1,879	1,848	1,958	2,112	2,168	2,262	2,618	2,549	35.3	12.7	60	-2.6
Other or unknown race/ethnicity	20,445	20,984	22,719	25,427	27,843	31,570	33,515	36,055	37,352	38,285	39,233	76.4	5.0	90	2.5
Temporary visa holders S&E graduate enrollment	122,885	134,621	145,715	147,464	143,851	139,762	142,684	149,233	151,108	159,494	163,343	21.4	8.1	35	2.4
Full time	105,742	115,886	125,375	126,173	123,184	120,900	124,464	129,633	131,223	137,869	141,995	22.6	8.2	35	3.0
First time	32,031	34,204	32,202	29,682	27,712	28,881	33,435	36,196	36,706	40,726	40,434	13.0	10.2	25	-0.7
Other	73,711	81,682	93,173	96,491	95,472	92,019	91,029	93,437	94,517	97,143	101,561	26.8	7.5	40	4.5
Part time	17,143	18,735	20,340	21,291	20,667	18,862	18,220	19,600	19,885	21,625	21,348	14.3	7.4	25	-1.3
Male	86,082	93,865	101,326	101,430	97,711	94,067	95,398	99,582	100,284	105,289	107,294	15.7	7.0	25	1.9
Female	36,803	40,756	44,389	46,034	46,140	45,695	47,286	49,651	50,824	54,205	56,049	34.9	10.3	50	3.4
Health	79,775	80,378	85,570	92,476	98,590	103,951	111,356	105,448	103,300	102,214	85,960	32.2	-16.8	10	-15.9

S&E = science and engineering.

[a] In 2007 the survey was redesigned and five fields were added or reclassified to improve reporting. "2007new" shows data as collected in 2007; "2007old" shows data as they would have been collected in prior years. See appendix A in *Graduate Students and Postdoctorates in Science and Engineering: Fall 2007* (NSF 10-307 at www.nsf.gov/statistics/nsf10307/) for more detail. Caution should be used when calculating year-to-year growth and interpreting trends.

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NOTE: The "Asian/Pacific Islander" category includes "Asian" and "Native Hawaiian/Other Pacific Islander"; the "Hispanic" category includes "Hispanic/Latino, one or more races"; the "Other or unknown" category includes "Non-Hispanic/Latino, more than one race" and "ethnicity/race unknown or not stated."

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

increased from approximately 3% of all U.S. S&E graduate students in 1989 to approximately 7% in 2009, blacks increased from approximately 4% to approximately 8%, and American Indians/Alaskan Natives increased from less than 1% to approximately 1%. In contrast, the proportion of Asians/Pacific Islanders varied over time: it grew from approximately 6% in 1989 to approximately 9% in 1999, dropped below this level briefly in 2000 and 2001, peaked at approximately 10% in 2003, and then declined to approximately 9% in 2008 and 2009.

U.S. S&E graduate students of other or unknown race/ethnicity also grew substantially from 1989 to 2009, with the majority of this growth occurring over the past decade. In 1989 there were approximately 17,200 graduate students reported as "Other or unknown" race, approximately 18,600 in 1999, and approximately 39,200 in 2009. Since 2000 the "Other or unknown" race category has consisted of two collected categories: "More than one race (non-Hispanic/Latino)" and "Ethnicity/race unknown or not stated." In 2000 there were approximately 400 non-Hispanic graduate students with more than one race and approximately 20,000 graduate students with unknown or not stated race/ethnicity. In 2009 these figures were approximately 2,300 and 36,900. Since 2000 the "More than one race" category has grown much faster (approximately 425%) than the "Ethnicity/race unknown or not stated" category (approximately 85%); however, the vast majority of the S&E graduate students in the combined "Other or unknown" race category were those having unknown or not stated race/ethnicity.

First-Time, Full-Time Enrollment, by Citizenship and Field

In stark contrast to the substantial growth from 2008 to 2009 among U.S. citizens and permanent residents enrolling in full-time S&E programs for the first time (10.6%), the number of first-time, full-time graduate students with temporary visas declined (-0.7%) (table 3). This was the first decline in foreign first-time, full-time S&E enrollment since 2004. The year 2009 was the second year in a row that first-time, full-time enrollment in engineering grew faster among U.S. citizens and permanent residents (16.8%) than among foreign students with temporary visas (-1.9%). Similar numbers of temporary visa holders enrolled in science fields for the first time in 2008 and 2009, but these students were distributed differently, with more entering the social and agricultural sciences in 2009 and fewer

TABLE 3. First-time, full-time graduate enrollment in science, engineering, and health fields, by field and citizenship: 2005–09

	U.S. citizens and permanent residents							Temporary visa holders						
Field	2005	2006	2007 old[a]	2007 new[a]	2008	2009	% change 2008–09	2005	2006	2007 old[a]	2007 new[a]	2008	2009	% change 2008–09
All survey fields	79,531	81,142	82,127	83,932	87,812	92,275	5.1	30,688	35,340	38,109	38,517	42,823	42,481	-0.8
Science and engineering	60,157	60,978	62,009	64,284	68,093	75,321	10.6	28,881	33,435	36,196	36,706	40,726	40,434	-0.7
Science	49,252	49,231	50,005	52,017	54,748	59,733	9.1	17,413	19,306	20,382	20,708	23,479	23,519	0.2
Agricultural sciences	1,828	1,764	1,837	1,848	1,996	2,359	18.2	432	442	476	508	601	635	5.7
Biological sciences	9,925	9,946	10,230	10,507	10,870	11,825	8.8	2,993	3,109	3,255	3,242	3,658	3,618	-1.1
Communication[a]	ne	ne	ne	1,229	1,489	1,677	12.6	ne	ne	ne	302	423	442	4.5
Computer sciences	3,632	3,382	3,077	3,034	3,324	3,659	10.1	4,626	5,601	6,275	6,222	7,110	6,898	-3.0
Earth, atmospheric, and ocean sciences	2,270	2,289	2,364	2,271	2,306	2,533	9.8	488	506	497	478	598	620	3.7
Family and consumer sciences/human sciences[a]	ne	ne	ne	456	515	576	11.8	ne	ne	ne	36	64	57	-10.9
Mathematical sciences	2,561	2,522	2,629	2,561	2,548	2,808	10.2	1,635	1,820	1,966	1,871	2,043	2,080	1.8
Multidisciplinary/ interdisciplinary studies[a]	ne	ne	ne	584	859	1,131	31.7	ne	ne	ne	187	281	281	0.0
Neuroscience[a]	na	na	na	180	259	334	29.0	na	na	na	93	45	61	35.6
Physical sciences	4,138	4,045	4,146	4,089	3,988	4,424	10.9	2,519	2,581	2,641	2,622	2,904	2,852	-1.8
Psychology	9,800	9,645	9,985	9,861	10,407	10,347	-0.6	558	579	639	615	675	633	-6.2
Social sciences	15,098	15,638	15,737	15,397	16,187	18,060	11.6	4,162	4,668	4,633	4,532	5,077	5,342	5.2
Engineering	10,905	11,747	12,004	12,267	13,345	15,588	16.8	11,468	14,129	15,814	15,998	17,247	16,915	-1.9
Health[a]	19,374	20,164	20,118	19,648	19,719	16,954	-14.0	1,807	1,905	1,913	1,811	2,097	2,047	-2.4

na = not applicable; data were not collected at this level of detail. ne = not eligible; data were not collected for this field before 2007.

[a] In 2007 the survey was redesigned and five fields were added or reclassified to improve reporting. "2007new" shows data as collected in 2007; "2007old" shows data as they would have been collected in prior years. See appendix A in *Graduate Students and Postdoctorates in Science and Engineering: Fall 2007* (NSF 10-307 at www.nsf.gov/statistics/nsf10307/) for more detail. Caution should be used when calculating year-to-year growth and interpreting trends.

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

entering psychology and the computer, biological, and physical sciences.

Postdoctoral Appointees in S&E

The GSS also collects information about postdocs who work at U.S. academic institutions (and their affiliates, such as research centers and hospitals) granting research-based master's or doctoral degrees in SEH fields. In total, 57,805 postdocs were reported in 2009, a 6.7% increase over 2008 (table 4). Over 70% of the postdocs were in S&E fields.

Field of Appointment

Although most S&E postdocs work in science fields (84.3% in 2009), the proportion has declined each year since 2001 (when it was 89.6%), reflecting increasing numbers of postdocs working in engineering fields. From 2000 to 2009 the growth of engineering postdocs (approximately 95%) substantially outpaced that of science postdocs (approximately 30%). Single-year growth rates for engineering postdocs were 10.5% in 2008 and 17.5% in 2009.

Within each engineering field, postdoc employment grew substantially from 2000 to 2009. Mimicking the trend seen among graduate students, biomedical engineering was by far the fastest growing postdoc field over the past decade, increasing by approximately 335% from 2000 to 2009. The fastest growing science fields for postdocs from 2000 to 2009 were mathematical sciences (approximately 90% growth), computer sciences (approximately 75% growth), and psychology (approximately 65% growth).

Demographic Characteristics

In 2009, 65.3% of postdocs in S&E were men and 55.5% were temporary U.S. visa holders. The gap in the gender composition of S&E postdocs narrowed slightly from 2008 to 2009 as women's appointments grew at a slightly faster rate than men's (8.2% vs. 6.1%). The percentage of S&E postdocs who were women increased from 34.2% in 2008 to 34.7% in 2009. Over the past decade, the number of female postdocs increased by approximately 60%.

For the third straight year, growth in appointments of U.S. citizens and permanent residents outpaced that for temporary visa holders, increasing by 11.7% from 2008 to 2009 as compared with 3.2% for temporary visa holders. As a result, the percentage of postdocs who were U.S. citizens or permanent residents (44.5%) rose to the highest level since 1998, when it was 46.5%.

As seen in figure 2, the proportion of postdocs with temporary visas is correlated to the proportion of graduate students with temporary visas, although a higher percentage of postdocs than graduate students hold temporary visas. The percentage of foreign graduate students declined each year from 2002 to 2005, but an increasing enrollment of foreign graduate students since 2005 may suggest that the decreases seen in the percentage of foreign postdocs could level off and begin to rise over the next few years.

Survey Information

During the production of this InfoBrief the America COMPETES Reauthorization Act of 2010 was signed into law. Section 505 of the bill renames the Division of Science Resources Statistics as the National Center for Science and Engineering Statistics (NCSES). The Center retains its reporting line to the Directorate for Social, Behavioral and Economic Sciences within the National Science Foundation. The new name signals the central role of NCSES in the collection, interpretation, analysis, and dissemination of objective data on the science and engineering enterprise.

Conducted since 1966, the GSS is an annual survey of all academic institutions in the U.S. granting research-based master's or doctoral degrees in SEH fields. The 2009 GSS collected data from 13,285 organizational units (departments, programs, affiliated research centers, and health care facilities) at 575 institutions of higher education and their affiliates in the United States, Puerto Rico, and Guam. The institutional response rate was 99.3%. An overview of the survey objectives and design can be found at http://www.nsf.gov/statistics/srvygradpostdoc/.

Data Limitations and Availability

This publication provides the first release of data from the fall 2009 cycle of the GSS. The full set of detailed statistical tables from this survey will be available in the forthcoming report *Graduate Students and Postdoctorates in Science and Engineering: Fall 2009* at http://www.nsf.gov/statistics/gradpostdoc/.[5] Individual detailed tables may be available upon request in advance of the full report by contacting Kelly Kang (kkang@nsf.gov, 703-292-7796).

The GSS data from 1972 through 2009 are available in public-use format on the NSF website (http://www.nsf.gov/statistics/srvygradpostdoc/pub_data.cfm) and from the WebCASPAR data system (http://webcaspar.nsf.gov/).

Due to methodological changes in 2007, the data collected from 2007 through 2009 are not strictly comparable to those collected prior to 2007. As a result, care should be used when assessing trends within the GSS data. In this InfoBrief, the "2007new" column reports the data as collected in 2007 and the "2007old" column provides data as they would have been collected in 2006. Ten-year trends reported in the tables are labeled "% change 2000–09." Note that these percentages are rounded to the nearest 5% to reflect the extra variability in the estimate because of the methodological change that occurred in 2007. To help

TABLE 4. Postdoctoral appointees in science, engineering, and health fields, by sex, citizenship, and field: 2000–09

Characteristic	2000	2001	2002	2003	2004	2005	2006	2007 old[a]	2007 new[a]	2008	2009	% change[b] 2000–07	2007–09	2000–09	2008–09
All survey fields	43,115	43,311	45,034	46,728	47,240	48,555	49,343	50,712	50,840	54,164	57,805	17.6	13.7	35	6.7
Science and engineering	30,224	30,196	31,937	33,666	34,065	34,456	34,887	35,894	36,223	38,203	40,804	18.8	12.6	35	6.8
Male	21,296	20,941	21,807	22,882	23,080	23,227	23,361	24,412	24,631	25,119	26,647	14.6	8.2	25	6.1
Female	8,928	9,255	10,130	10,784	10,985	11,229	11,526	11,482	11,592	13,084	14,157	28.6	22.1	60	8.2
U.S. citizens and permanent residents	12,627	12,073	13,524	13,542	13,969	14,078	14,111	14,903	15,107	16,274	18,175	18.0	20.3	45	11.7
Temporary visa holders	17,597	18,123	18,413	20,124	20,096	20,378	20,776	20,991	21,116	21,929	22,629	19.3	7.2	30	3.2
Science	26,911	27,044	28,371	29,856	30,116	30,290	30,245	30,986	31,281	32,741	34,388	15.1	9.9	30	5.0
Agricultural sciences	822	833	963	1,054	959	1,007	927	948	985	1,147	1,083	15.3	9.9	30	-5.6
Biological sciences	16,734	17,032	17,640	18,625	18,716	18,747	18,807	19,218	19,109	19,827	20,159	14.8	5.5	20	1.7
Communication[a]	ne	ne	ne	ne	ne	ne	ne	ne	30	32	38	-	26.7	-	18.8
Computer sciences	344	336	356	355	384	406	467	516	456	493	594	50.0	30.3	75	20.5
Earth, atmospheric, and ocean sciences	1,155	1,049	1,129	1,182	1,263	1,364	1,495	1,322	1,250	1,339	1,424	14.5	13.9	25	6.3
Family and consumer sciences/human sciences[a]	ne	ne	ne	ne	ne	ne	ne	ne	8	19	22	-	175.0	-	15.8
Mathematical sciences	385	353	395	449	468	500	579	621	624	723	737	61.3	18.1	90	1.9
Multidisciplinary/ interdisciplinary studies[a]	ne	ne	ne	ne	ne	ne	ne	ne	244	348	459	-	88.1	-	31.9
Neuroscience[a]	na	na	na	na	na	na	na	na	285	343	645	-	126.3	-	88.0
Physical sciences	6,270	6,223	6,619	6,829	7,059	7,011	6,703	6,760	6,719	6,885	7,447	7.8	10.8	20	8.2
Psychology	730	809	815	960	902	884	873	1,106	1,088	1,077	1,219	51.5	12.0	65	13.2
Social sciences	471	409	454	402	365	371	394	495	483	508	561	5.1	16.1	20	10.4
Engineering	3,313	3,152	3,566	3,810	3,949	4,166	4,642	4,908	4,942	5,462	6,416	48.1	29.8	95	17.5
Aerospace engineering	111	128	140	141	141	153	165	178	178	154	168	60.4	-5.6	50	9.1
Architecture[a]	na	na	na	na	na	na	na	na	5	11	22	-	340.0	-	100.0
Biomedical engineering	220	262	284	388	425	477	591	640	640	710	960	190.9	50.0	335	35.2
Chemical engineering	703	574	758	686	689	702	735	758	790	880	1,084	7.8	37.2	55	23.2
Civil engineering[a]	295	268	342	300	313	384	458	419	417	465	535	42.0	28.3	80	15.1
Electrical engineering	525	436	613	646	654	689	721	885	884	987	1,025	68.6	16.0	95	3.9
Industrial engineering	48	21	43	45	50	51	51	73	71	115	109	52.1	53.5	125	-5.2
Mechanical engineering	480	501	441	543	514	562	644	725	722	784	948	51.0	31.3	100	20.9
Metallurgical/materials engineering	507	479	507	539	567	578	571	555	564	605	758	9.5	34.4	50	25.3
Other engineering	424	483	438	522	596	570	706	675	671	751	807	59.2	20.3	90	7.5
Health[a]	12,891	13,115	13,097	13,062	13,175	14,099	14,456	14,818	14,617	15,961	17,001	14.9	16.3	30	6.5

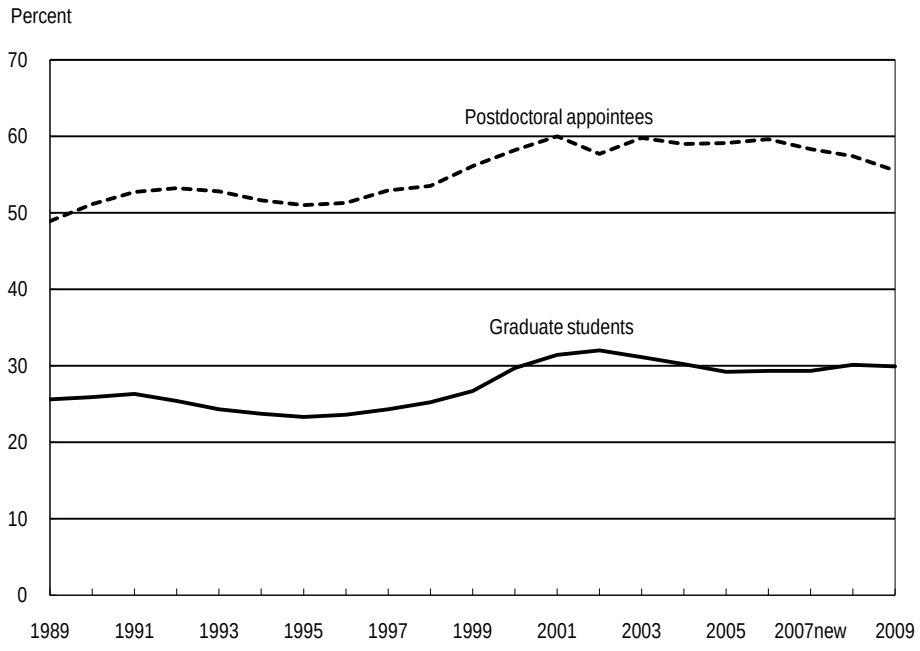
na = not applicable; data were not collected at this level of detail. ne = not eligible; data were not collected for this field before 2007. - = not calculable.

[a] In 2007 the survey was redesigned and five fields were added or reclassified to improve reporting. "2007new" shows data as collected in 2007; "2007old" shows data as they would have been collected in prior years. See appendix A in *Graduate Students and Postdoctorates in Science and Engineering: Fall 2007* (NSF 10-307 at www.nsf.gov/statistics/nsf10307/) for more detail. Caution should be used when calculating year-to-year growth and interpreting trends.

[b] "% change 2000–07" shows growth from 2000 to 2007old; "% change 2007–09" shows growth from 2007new to 2009; "% change 2000–09" shows growth from 2000 to 2009 and is rounded to the nearest 5% to reflect the imprecision of this estimate due to the inclusion of methodological changes.

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

FIGURE 2. Graduate students and postdoctoral appointees in science and engineering fields with temporary visas: 1989–2009



NOTES: In 2007 the survey was redesigned and five fields were added or reclassified to improve reporting. "2007new" shows data as collected in 2007. See appendix A in *Graduate Students and Postdoctorates in Science and Engineering: Fall 2007* (NSF 10-307 at www.nsf.gov/statistics/nsf10307/) for more detail. Caution should be used when calculating year-to-year growth and interpreting trends.

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

readers understand trends in light of the change in 2007, two additional columns are included in the tables. The "percentage change 2000–07" reflects the growth from 2000 to 2007old and the "percentage change 2007–09" reflects the growth seen from 2007new to 2009. Please see appendix A, "Technical Notes," in *Graduate Students and Postdoctorates in Science and Engineering: Fall 2007* (NSF 10-307) for a more detailed discussion of these changes.

Estimates for the adult U.S. citizen and permanent resident population are based on the 2009 American Community Survey (ACS) conducted by the U.S. Census Bureau (http://usa.ipums.org/usa/sda/).

Age was limited to 21–45 in order to better estimate the graduate student population.

The GSS collects data on graduate students, postdocs, and other doctorate-holding nonfaculty researchers in research-oriented science, engineering, and health fields. Practitioner-oriented degrees within these fields (e.g., master's degrees in nursing and physical therapy) are not eligible for the GSS. Although these degrees have never been eligible in GSS, many respondents were not aware of this. After these exclusions were made more explicit in 2007, fewer graduate students in practitioner-oriented degree programs have been reported in the past three survey cycles. The large drop from 2008 to 2009 within the "other health" fields resulted from an increased effort to eliminate ineligible students from the GSS. The majority of excluded degrees are located within these "other health" fields. The GSS Field Code List provides a complete list of eligible and ineligible fields (http://www.nsf.gov/statistics/nsf10307/pdf/Complete_GSS_Code_List.pdf).

Notes

1. Peter Einaudi, research analyst, RTI International, 3040 Cornwallis Road, P.O. Box 12194, Research Triangle Park, NC 27709-2194.

2. The GSS collects data on health fields selected by NIH. These fields make up about one-third of all health fields in the U.S. Department of Education Classification of Instructional Programs (CIP) taxonomy. The majority of excluded degrees are in practitioner-oriented fields that do not meet the research-based criteria for GSS eligibility. NIH information on trends seen within selected health fields can be found at http://www.report.nih.gov/nihdatabook/Default.aspx?catid=19.

3. The five fields (communication, family and consumer sciences/human sciences, multidisciplinary/interdisciplinary, architecture, neuroscience) first reported in 2007 also grew quickly; however, these trends should be treated with caution given the lack of comparable data. High growth rates may also be due to increasing awareness of these fields' eligibility and therefore increased reporting of these fields, rather than growth within the field.

4. Full-time enrollment is defined according to the institution's policies and definition. First-time graduate students are those enrolled for graduate credit for the first time as of fall 2009 at the institution at which they are pursuing a degree.

5. For further information on the survey, please contact 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).

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