

## FIRST-TIME, FULL-TIME GRADUATE STUDENT ENROLLMENT IN SCIENCE AND ENGINEERING INCREASES IN 2006, ESPECIALLY AMONG FOREIGN STUDENTS

by Julia Oliver<sup>1</sup>

After 2 years of decline, U.S. enrollment of foreign graduate students in science and engineering (S&E) fields increased in 2006. The increase was largely due to first-time, full-time enrollment of foreign students, which grew 16% over the 2005 level (table 1).<sup>2</sup> First-time, full-time enrollment of S&E graduate students with U.S. citizenship or permanent resident status rose by slightly more than 1%. Total enrollment of first-time, full-time S&E graduate students rose 6% over the 2005 level.

Total graduate student enrollment in S&E fields and the number of S&E postdoctoral appointees (postdocs) both rose in 2006, continuing multiyear trends. These and other observations are from the 2006 Survey of Graduate Students and Postdoctorates in Science and Engineering, cosponsored by the National Science Foundation (NSF) and the National Institutes of Health (NIH).

### S&E Graduate Student Enrollment

S&E graduate enrollment increased slightly in 2006 due to a rise in enrollment of both foreign students and of U.S. citizens and permanent residents (table 1). Foreign S&E graduate enrollment increased by 2% in 2006 after dropping in 2004 and 2005. Despite the increase in numbers in 2006, the percentage of foreign students among all S&E graduate students remained at the 2005 level (29%) and was down from 2003 (31%). Foreign enrollment has increased by 45% over the 10-year

period beginning in 1996, whereas enrollment for U.S. citizens and permanent residents has increased by 8% over the same period. Enrollment of U.S. citizens and permanent residents continued its rise in 2006, reaching a new peak (343,603), but the gains in numbers in 2004, 2005, and 2006 were much smaller than those in 2002 and 2003.

### Field of Study

Graduate enrollment in 2006 declined in two of the nine major S&E fields: agricultural sciences and computer sciences (table 2). Enrollment in computer sciences dropped less than 1% between 2005 and 2006; since its 2002 peak, enrollment has dropped almost 14%. Engineering enrollment increased 2% after dropping the previous 2 years; all engineering subfields showed increases from 2005 to 2006 except for civil engineering, which declined about 2%. Of the fields of study with the largest graduate enrollments (10,000 or more), growth of 3.0% or more occurred in mathematical sciences (3.0%), the engineering subfield of mechanical engineering (3.1%), and in the social sciences subfield of other social sciences (7.2%).

Trends in first-time, full-time S&E enrollment vary by field and citizenship (figure 1, table 3). Although first-time, full-time foreign enrollment grew in every field between 2005 and 2006, it declined for U.S. citizens and permanent residents in over half of the fields.



TABLE 1. Graduate enrollment in science and engineering fields, by citizenship, enrollment status, sex, and race/ethnicity, and S&amp;E postdocs by citizenship: 1996–2006

Characteristic	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change 2005–06
S&E graduate enrollment	415,181	407,630	404,856	411,182	413,536	429,229	454,834	474,645	475,873	478,275	486,287	1.7
Full time	284,039	280,669	278,943	283,893	291,355	304,021	325,472	339,028	340,529	341,742	349,802	2.4
First time	73,448	73,600	74,373	75,447	78,332	82,411	86,827	89,331	86,565	89,038	94,413	6.0
Other	210,591	207,069	204,570	208,446	213,023	221,610	238,645	249,697	253,964	252,704	255,389	1.1
Part time	131,142	126,961	125,913	127,289	122,181	125,208	129,362	135,617	135,344	136,533	136,485	*
Men	253,510	245,619	241,429	242,786	243,057	251,810	266,217	276,248	274,008	271,967	275,181	1.2
Women	161,671	162,011	163,427	168,396	170,479	177,419	188,617	198,397	201,865	206,308	211,106	2.3
U.S. citizens and permanent residents												
S&E graduate enrollment	317,075	308,668	302,879	301,254	290,651	294,608	309,119	327,181	332,022	338,513	343,603	1.5
Full time	200,674	195,974	191,945	190,076	185,613	188,135	200,097	212,855	217,345	220,842	225,338	2.0
First time	NA	NA	NA	NA	46,301	48,207	54,625	59,649	58,853	60,157	60,978	1.4
Other	NA	NA	NA	NA	139,312	139,928	145,472	153,206	158,492	160,685	164,360	2.3
Part time	116,401	112,694	110,934	111,178	105,038	106,473	109,022	114,326	114,677	117,671	118,265	0.5
Men	182,519	174,934	169,490	165,823	156,975	157,945	164,891	174,818	176,297	177,900	179,783	1.1
Women	134,556	133,734	133,389	135,431	133,676	136,663	144,228	152,363	155,725	160,613	163,820	2.0
White, non-Hispanic	238,032	228,007	220,667	216,750	205,569	206,018	213,135	222,674	224,850	225,776	227,993	1.0
Asian/Pacific Islander	25,929	26,012	26,726	27,570	24,998	26,494	29,229	31,786	30,645	30,574	30,179	-1.3
Black, non-Hispanic	19,066	19,341	19,651	20,273	20,834	21,455	22,668	24,174	24,624	25,248	25,664	1.6
Hispanic	14,571	14,984	15,487	16,520	17,203	17,974	19,634	21,241	22,212	23,387	24,140	3.2
American Indian/Alaska Native	1,538	1,599	1,607	1,553	1,602	1,683	1,734	1,879	1,848	1,958	2,112	7.9
Other or unknown race/ethnicity	17,939	18,725	18,741	18,588	20,445	20,984	22,719	25,427	27,843	31,570	33,515	6.2
Temporary visa holder												
All S&E graduate students	98,106	98,962	101,977	109,928	122,885	134,621	145,715	147,464	143,851	139,762	142,684	2.1
Full time	83,365	84,695	86,998	93,817	105,742	115,886	125,375	126,173	123,184	120,900	124,464	2.9
First time	NA	NA	NA	NA	32,031	34,204	32,202	29,682	27,712	28,881	33,435	15.8
Other	NA	NA	NA	NA	73,711	81,682	93,173	96,491	95,472	92,019	91,029	-1.1
Part time	14,741	14,267	14,979	16,111	17,143	18,735	20,340	21,291	20,667	18,862	18,220	-3.4
Men	70,991	70,685	71,939	76,963	86,082	93,865	101,326	101,430	97,711	94,067	95,398	1.4
Women	27,115	28,277	30,038	32,965	36,803	40,756	44,389	46,034	46,140	45,695	47,286	3.5
S&E postdocs	26,569	27,264	27,876	28,980	30,224	30,196	31,937	33,666	34,065 r	34,456	34,813	1.0
U.S. citizens and permanent residents	12,930	12,835	12,966	12,725	12,627	12,073	13,524	13,542	13,969 r	14,078	14,035	-0.3
Temporary visa holders	13,639	14,429	14,910	16,255	17,597	18,123	18,413	20,124	20,096 r	20,378	20,778	2.0

\* = value < 0.05% but > -0.05%. NA = not available; citizenship of first-time, full-time students was not collected before 2000. r = data significantly revised; replaces previously published data.

S&E = science and engineering.

NOTE: Beginning in 2000, the few graduate students who were reported to be "Native Hawaiian/Other Pacific Islander" or "multiracial" were included in "Asian/Pacific Islander" or "other/unknown race/ethnicity," respectively.

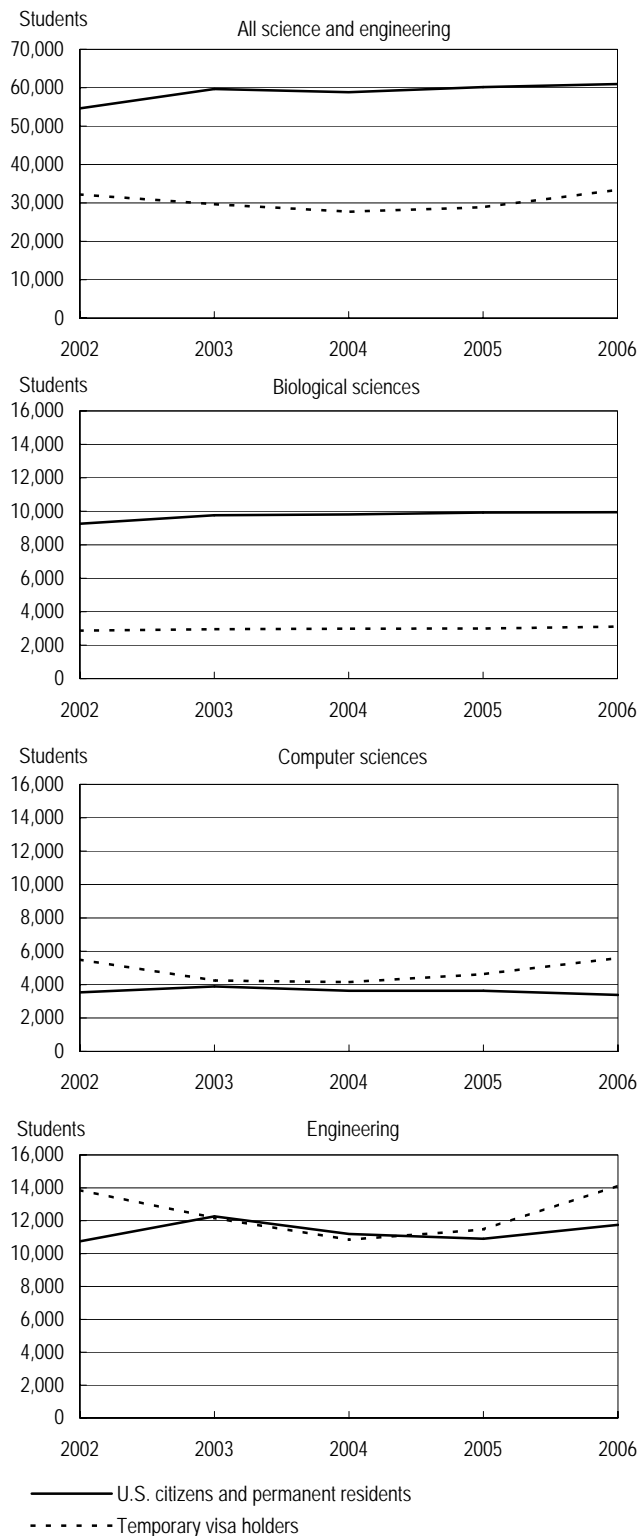
SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

TABLE 2. Graduate enrollment in science and engineering fields, by field: 1996–2006

Field	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	% change 2005–06
All science and engineering	415,181	407,630	404,856	411,182	413,536	429,229	454,834	474,645	475,873	478,275	486,287	1.7
Science	311,957	306,482	304,818	309,491	309,424	319,736	335,166	347,268	352,307	357,710	363,246	1.5
Agricultural sciences	12,301	12,203	12,168	12,312	12,023	12,235	12,698	13,197	13,445	13,123	13,016	-0.8
Biological sciences	57,749	56,705	56,695	56,959	56,282	57,639	61,088	64,701	66,565	68,479	69,941	2.1
Computer sciences	34,626	35,991	38,027	42,478	47,350	52,196	55,269	53,696	50,016	47,978	47,653	-0.7
Earth, atmospheric, and ocean sciences	15,183	14,548	14,258	14,083	13,941	13,841	14,240	14,620	15,131	14,836	14,920	0.6
Atmospheric sciences	1,086	1,092	965	913	963	924	1,036	1,150	1,086	1,146	1,079	-5.8
Geosciences	7,304	6,959	6,687	6,637	6,596	6,544	6,712	6,889	7,358	7,212	7,177	-0.5
Oceanography	2,615	2,479	2,562	2,624	2,668	2,585	2,618	2,695	2,801	2,760	2,770	0.4
Other earth, atmospheric, and ocean sciences	4,178	4,018	4,044	3,909	3,714	3,788	3,874	3,886	3,886	3,718	3,894	4.7
Mathematical sciences	18,008	16,719	16,485	16,257	15,650	16,651	18,163	19,465	19,931	20,210	20,815	3.0
Physical sciences	32,333	31,105	30,575	30,691	30,385	31,038	32,341	34,298	35,761	36,375	36,901	1.4
Astronomy	874	778	820	832	888	916	990	1,080	1,119	1,191	1,211	1.7
Chemistry	19,334	18,774	18,482	18,416	18,105	18,366	19,045	20,049	20,776	21,101	21,351	1.2
Physics	11,728	11,147	10,809	10,869	10,841	11,248	11,701	12,555	13,298	13,472	13,722	1.8
Other physical sciences	397	406	464	574	551	508	605	614	568	611	617	1.0
Psychology	53,122	53,126	52,557	51,727	50,466	50,454	51,152	52,162	54,126	57,282	57,653	0.6
Social sciences	88,635	86,085	84,053	84,984	83,327	85,682	90,215	95,129	97,332	99,427	102,347	2.9
Agricultural economics	2,117	2,043	1,995	2,014	2,079	2,161	2,187	2,318	2,195	2,127	2,158	1.5
Anthropology	7,773	7,560	7,577	7,633	7,626	7,491	7,481	7,789	7,826	7,750	8,150	5.2
Economics	12,080	11,097	10,701	10,562	10,748	11,408	12,009	12,316	12,318	11,805	12,132	2.8
Geography	4,331	4,287	4,326	4,250	4,036	4,304	4,383	4,721	4,809	4,800	4,750	-1.0
History and philosophy of science	409	443	508	557	532	571	663	737	994	965	968	0.3
Linguistics	3,156	3,068	2,935	2,799	2,674	2,744	2,875	3,028	2,941	3,187	3,074	-3.5
Political science	33,252	32,083	30,828	31,372	31,131	31,805	34,934	36,880	39,023	40,780	41,784	2.5
Sociology	9,425	9,413	9,058	8,966	8,652	8,812	8,946	9,127	8,874	9,018	9,035	0.2
Sociology/anthropology	923	948	857	741	745	808	719	773	839	848	837	-1.3
Other social sciences	15,169	15,143	15,268	16,090	15,104	15,578	16,018	17,440	17,513	18,147	19,459	7.2
Engineering	103,224	101,148	100,038	101,691	104,112	109,493	119,668	127,377	123,566	120,565	123,041	2.0
Aerospace engineering	3,208	3,083	3,137	3,349	3,407	3,451	3,685	4,048	4,089	4,170	4,482	7.5
Biomedical engineering	2,689	2,797	2,855	3,069	3,197	3,599	4,338	5,301	5,807	6,067	6,482	6.8
Chemical engineering	7,408	7,288	7,093	6,883	7,056	6,913	7,414	7,516	7,452	7,173	7,261	1.2
Civil engineering	18,528	17,193	16,517	16,226	16,451	16,665	17,713	18,890	18,561	18,114	17,802	-1.7
Electrical engineering	29,941	30,787	31,384	31,822	33,611	36,100	39,948	41,763	38,995	37,450	38,265	2.2
Industrial engineering	12,675	11,957	11,221	11,803	12,119	12,940	14,033	14,313	13,852	13,650	13,829	1.3
Mechanical engineering	15,509	15,045	14,696	14,956	15,235	15,852	17,139	18,393	17,852	17,373	17,919	3.1
Metallurgical/materials engineering	4,747	4,688	4,680	4,481	4,377	4,721	4,992	5,131	5,059	5,160	5,268	2.1
Other engineering	8,519	8,310	8,455	9,102	8,659	9,252	10,406	12,022	11,899	11,408	11,733	2.8

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

FIGURE 1. First-time, full-time graduate enrollment in science and engineering fields, by citizenship and selected field: 2002–06



SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

The increase in 2006 in first-time, full-time enrollments of foreign students was largely the result of enrollment increases in engineering and computer sciences—the two fields attracting the largest numbers of first-time, full-time foreign students and having the greatest percentage growth in such students over 2005 levels. Mathematics and social sciences also experienced relatively large growth in full-time, first-time foreign students. Enrollment of such students all other S&E fields showed more modest increases.

Engineering and social sciences contributed most to the increase in 2006 in first-time, full-time enrollments of U.S. citizens and permanent residents.

### Demographics

Women accounted for 43% of all S&E graduate students in 2006, up 4 percentage points since 1996 (table 1). Enrollment of female students has increased every year for the last 20 years, including a 2% increase in 2006. In contrast, after reaching a peak of about 280,300 in 1992, enrollment of men declined every year from 1993 to 1998. Enrollment of men grew by 14% between 1998 and 2003, with foreign men accounting for most (85%) of this growth; enrollment of men has leveled off since then.

Enrollment of minority students with U.S. citizenship or permanent resident status has increased in graduate S&E programs over the past decade (table 1). In contrast, enrollment of white citizens and permanent residents fell until 2001 and had a smaller percentage increase between 2001 and 2006 than did minority enrollment. In 2006 white, non-Hispanic students accounted for 66% of all U.S. citizens and permanent residents enrolled in S&E graduate programs, down 1 percentage point from 2005 and 9 percentage points since 1996 (75%). Asian/Pacific Islanders were the second largest racial/ethnic group, accounting for 8.8% of U.S. citizens and permanent residents enrolled in S&E graduate programs in 2006. Blacks accounted for 7.5%, followed by Hispanics (7.0%), and American Indian/Alaska Natives (0.6%). Between 1996 and 2006, underrepresented minorities (black, non-Hispanic; Hispanic; American Indian/Alaska Native) grew from 11% to 15% of U.S. citizens and permanent residents enrolled in S&E graduate programs.

TABLE 3. First-time, full-time graduate enrollment in science and engineering fields, by field and citizenship: 2002–06

Field	U.S. citizens and permanent residents						Temporary visa holders					
	2002	2003	2004	2005	2006	% change 2005–06	2002	2003	2004	2005	2006	% change 2005–06
All science and engineering	54,625	59,649	58,853	60,157	60,978	1.4	32,202	29,682	27,712	28,881	33,435	15.8
Agricultural sciences	1,856	1,971	1,870	1,828	1,764	-3.5	464	453	446	432	442	2.3
Biological sciences	9,261	9,763	9,808	9,925	9,946	0.2	2,866	2,956	2,988	2,993	3,109	3.9
Computer sciences	3,534	3,891	3,632	3,632	3,382	-6.9	5,503	4,243	4,151	4,626	5,601	21.0
Earth, atmospheric, and ocean sciences	2,548	2,573	2,468	2,270	2,289	0.8	537	531	458	488	506	3.7
Mathematical sciences	2,311	2,527	2,632	2,561	2,522	-1.5	1,607	1,658	1,620	1,635	1,820	11.3
Physical sciences	3,775	4,091	4,026	4,138	4,045	-2.2	2,505	2,750	2,577	2,519	2,581	2.5
Psychology	7,902	8,285	8,944	9,800	9,645	-1.6	518	573	534	558	579	3.8
Social sciences	12,689	14,285	14,285	15,098	15,638	3.6	4,344	4,352	4,101	4,162	4,668	12.1
Engineering	10,749	12,263	11,188	10,905	11,747	7.7	13,858	12,166	10,837	11,468	14,129	23.2

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Graduate Students and Postdoctorates in Science and Engineering.

### Postdoctoral Appointees

Numbers of postdocs in S&E fields rose over most of the period covered by this report, reaching a record high of 34,813 in 2006; however, growth slowed substantially after 2003 and for the past 3 survey cycles has grown about 1% per year (table 1). Numbers of postdocs with temporary visas increased about 2% over 2005 levels, whereas numbers of postdocs who were U.S. citizens or permanent residents fell by less than 1%.

The number of foreign postdocs has increased by 52% since 1996, whereas the number of U.S. citizen and permanent resident postdocs has grown by 9%.

### Data Comments and Availability

This publication provides the first release of data from the fall 2006 NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering. This survey is intended to cover students and postdocs in U.S. academic institutions. Data were collected from 12,320 departments at 586 institutions of higher education in the United States, Puerto Rico, and Guam. Of the departments surveyed, 97.4% responded; however, 2.6% of the reporting departments required imputation of missing data.

The full set of detailed tables from this survey will be available in the forthcoming report *Graduate Students and Postdoctorates in Science and Engineering: Fall 2006* at <http://www.nsf.gov/statistics/gradpostdoc/>. Individual detailed tables from the 2006 survey may be available in advance of the full report. For further information, or for details on the survey methodology used, please contact Julia Oliver.

### Notes

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2. Foreign students are those with temporary visas; first-time graduate students are those enrolled for credit at the institution at which they are pursuing a graduate degree for the first time as of fall 2006; full-time enrollment is defined by each institution, using that institution's policies and definitions.

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