AMERICAN INSTITUTE OF PHYSICS

AIP REPORT

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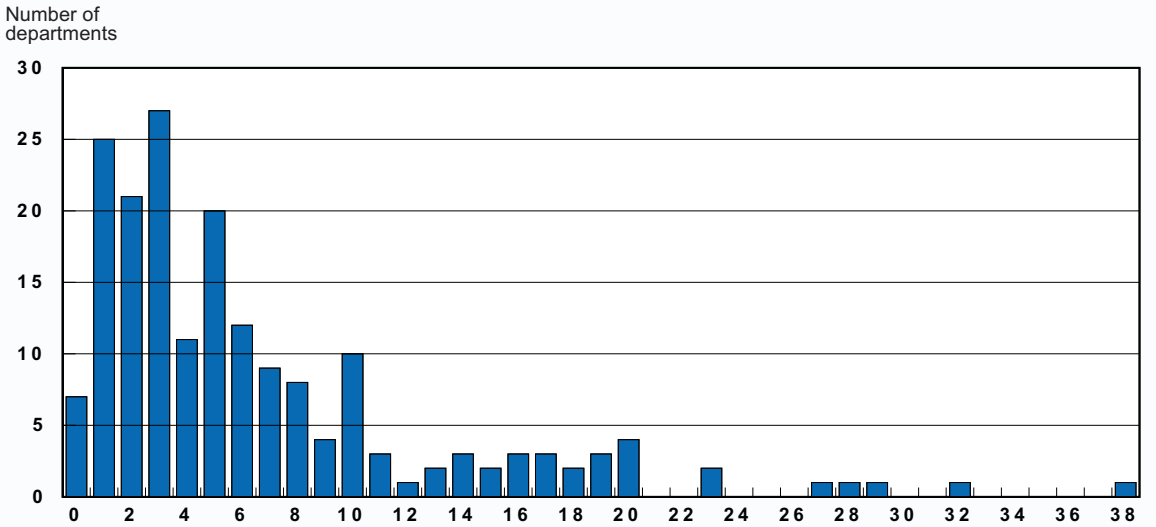
ENROLLMENTS AND DEGREES REPORT, 2006.

Number of doctoral granting departments by the average number of PhDs produced, classes of 2004 - 2006.



AIP Statistical Research Center, Enrollments and Degrees Report.

Highlights

➢The class of 2006 represents the seventh consecutive year that undergraduate physics degree production has increased. The 5,373 physics bachelors in the class of 2006 represent a gain of 5% from the previous year and a 47% increase over the class of 1999.

➢There were 1,380 physics PhDs produced in the class of 2006, up 11% from the previous year and 26% during the last two years.

➢The median number of degrees produced by the 187 physics doctoral departments for the class of 2006 was 5. Thirty-three (18%) of the doctoral-granting departments averaged eleven or more PhDs. These departments were responsible for producing half of the PhDs conferred during this time period.

➢Undergraduate astronomy degree production has also increased sharply during the past decade, up 98% since a recent low in 1997.

BACKGROUND

The findings presented in this report are based on an annual survey of all the physics and astronomy departments in the United States and Puerto Rico. The Statistical Research Center of the American institute of Physics has been conducting the Survey of Enrollments and Degrees for over four and a half decades. The high rate of participation, 96% of the class of 2006 data, on the part of the individual departments enables the AIP to report an accurate snapshot of the national statistics as well as present reliable long-term trends.

This report is a companion to the Rosters of Physics and Astronomy Departments. This report provides detailed aggregate data as well as an in depth analysis of enrollments and degree trends. The Rosters are also published annually and provide a snapshot of the most recent departmental-level data that are used to create many of the tables and figures in this report. The 2006 Rosters of Physics and Astronomy Departments can be found on our web site. http://www.aip.org/statistics/

Table 1. Departments by highest physics degree offered, academic year 2005-2006.

	Number of Depts.	Percent of Depts.
Bachelor's-granting	510	67
Master's-granting	63	8
PhD-granting	187	25
Total	760	100%

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During the 2005-2006 academic year there were 760 departments offering a physics degree and 75 departments at which an astronomy degree was available (see **Tables 1 and 2**). Half of the degree-granting astronomy departments were combined departments, offering both physics and astronomy degrees from within a single department. The other half were stand-alone departments conferring degrees in astronomy and astrophysics but not physics. Although administered independently of the physics department, the separate astronomy departments are at colleges or universities which also offer a physics degree.

Table 2. Number of degree-granting astronomy departments by highest astronomy degree offered, academic year 2005-2006.

	Combined with physics	Separate astronomy	Total
PhD-granting	11	29	40
Master's-granting	1	2	3
Bachelor's-granting	25	7	32
Total	37	38	75

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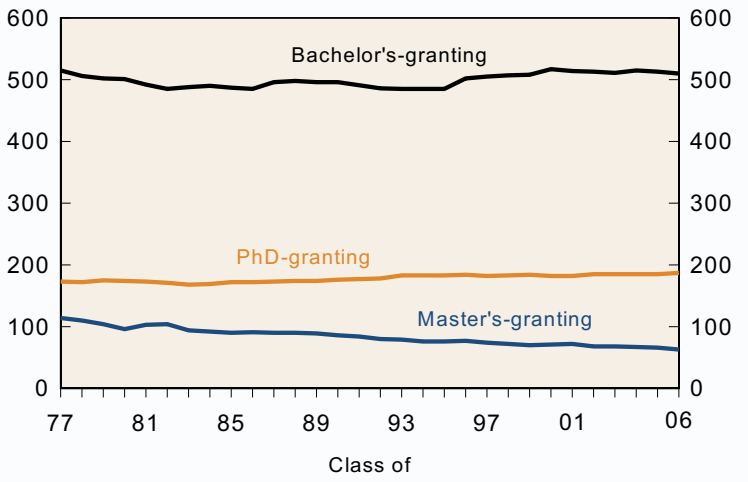
The combined departments are asked to report their astronomy enrollment and degree data separate from their physics data. The astronomy data from these departments are coupled with the data we receive from the stand alone astronomy departments allowing us to accurately report on the number of students pursuing and receiving astronomy degrees each year.

It should be noted that some students enrolled in a physics department may complete their doctoral dissertation in the subfield of astrophysics. These physics graduate students and degree recipients are included in the physics enrollment and degree totals presented in this report.

Figure 1. Number of departments offering a physics degree by highest physics degree offered, 1977 - 2006.



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Eight of the 185 PhD-granting physics departments, as well as eight of the 39 PhD-granting astronomy departments do not have an undergraduate degree program. Seven universities have two degree-granting physics departments, usually a department of physics and a department of applied physics.

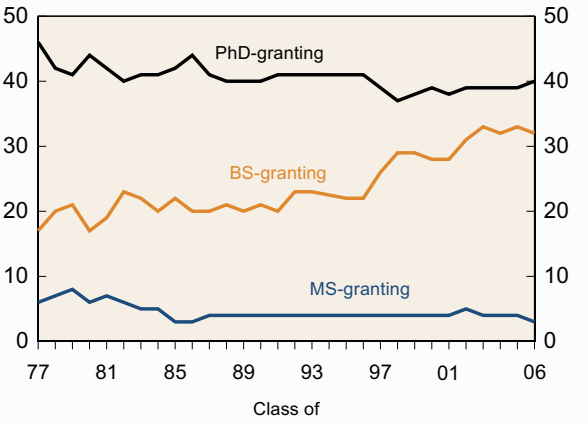
The AIP appreciates the ongoing efforts put forth by department chairs, faculty, and staff in providing their departmental data. Data for the non-responding departments were estimated using responses to this survey in previous years, and those estimates are included in the findings presented in this report.

The AIP Statistical Research Center also surveys physics and astronomy majors during their senior year, graduate students, and new degree recipients. This report will occasionally draw from the findings of these other surveys. The detailed findings from these surveys are published separately and can be found on our website http://www.aip.org/statistics/.

Each year a few departments change the level of the highest physics or astronomy degree they offer, and **Figure 1** presents almost 3 decades of physics department counts. An undergraduate-only department may add a graduate program at the master's or PhD-level. Similarly a department offering a master's or a PhD may discontinue its graduate program, choosing to only offer a bachelor's degree. Occasionally departments may no longer offer a physics degree altogether or add a physics or astronomy degree where one did not previously exist. The net change in the number of departments offering a physics degree between the academic years 2004-05 and 2005-06 was a loss of 4 departments. During the last decade there has been a positive net change of 11 physics departments. While the number of bachelor's- and PhD-granting departments have increased slightly in recent years, the number of departments which offer a master's as its highest physics degree has declined significantly.

The number of degree-granting astronomy departments has increased substantially in recent years (see **Figure 2**). This growth is primarily the result of colleges and universities with existing physics departments adding an astronomy bachelor's program to their current physics degree offerings.

Figure 2. Number of departments offering an astronomy degree by highest astronomy degree offered, 1977 - 2006.



Note: Figure includes stand-alone astronomy departments as well as combined physics and astronomy departments.

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UNDERGRADUATE ENROLLMENTS

An important role of most physics departments is to provide introductory-level course instruction to students majoring in fields other than physics or astronomy. In total, about 378,000 students took an introductory physics course during the 2005-06 academic year (see **Table 3**). The data presented in this table show the number of students who were enrolled in the different types of introductory courses by the highest physics degree offered by the department. The introductory physics course enrollments are divided into three categories depending on the amount of math required to take the course. One-third of the physics departments indicted they also offer an introductory-level physical science course with enrollments totaling 58,000 students.

Introductory astronomy course enrollments also play an important role for both astronomy and physics departments (see **Table 4**). All degree-granting astronomy departments offer an introductory astronomy course as well as the

Table 3. Introductory course enrollments at physics departments, academic year 2005-2006.

Highest physics degree offered	Calculus Based	Algebra Based	Conceptual	Physical Science
Bachelor's	46,000	45,000	32,000	33,000
Master's	17,000	17,000	13,000	8,000
PhD	100,000	79,000	29,000	17,000
Total	163,000	141,000	74,000	58,000

Note: In addition to the introductory course enrollments given above, a significant number of students take an introductory-level physics course at a two-year college. In 2002 this figure was approximately 120,000 students. (*Physics in the Two-year Colleges:2001-02,* Mark McFarling and Michael Neuschatz, June 2003, College Park MD: American Institute of Physics)

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Table 4. Introductory astronomy course enrollments by type of department, academic year 2005-2006.

Highest physics or astronomy degree offered	Type of Department: Physics Department	Type of Department: Astronomy Department
Bachelor's	53,000	8,000
Master's	24,000	3,000
PhD	53,000	37,000
Total	130,000	49,000

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majority (78%) of the physics departments at a college or university where a degree-granting astronomy program does not exist. Almost three-quarters of the 178,000 students enrolled in an introductory astronomy course during the 2005-06 academic year took the course at a physics department.

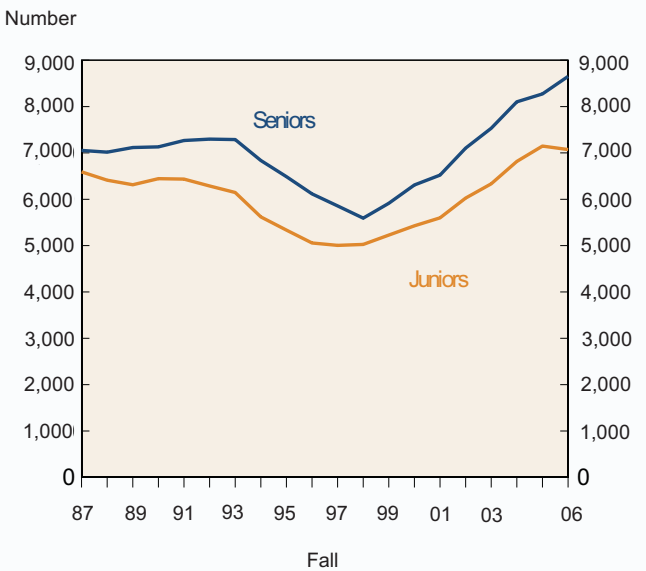
Figure 3 shows the changes in undergraduate physics enrollments over time. After eight years of steady increases, junior-level physics enrollments in the fall of 2006 leveled off at around 7,000 students. Overall, junior-level physics enrollments are up 41% since a low in the fall of 1998. As can be seen in the graph, the number of senior-level majors is significantly larger than each of the previous academic year's junior enrollments. This reflects the fact that about a third of senior-level students take more than 4 years to receive their bachelor's degree and subsequently are counted by their departments as a senior for more than one academic year.

Many factors can contribute to why physics bachelor's might require more than four years to obtain their undergraduate degree, including: taking additional course work for a double major, changing major, taking a leave of absence, holding employment while enrolled part-time, transferring from another institution.

UNDERGRADUATE DEGREES

Paralleling the significant increases in majors illustrated in Figure 3, physics bachelor's production has also been increasing (see **Figure 4**). The 5,373 physics bachelor's in the class of 2006 represents a 5% increase from the previous year and a 47% increase from a recent low in 1999. As has been historically true, foreign citizens make up only a small fraction of the undergraduate physics degrees conferred in the US, with 7% of

Figure 3. Junior and senior level physics major enrollments, fall 1987 - fall 2006.



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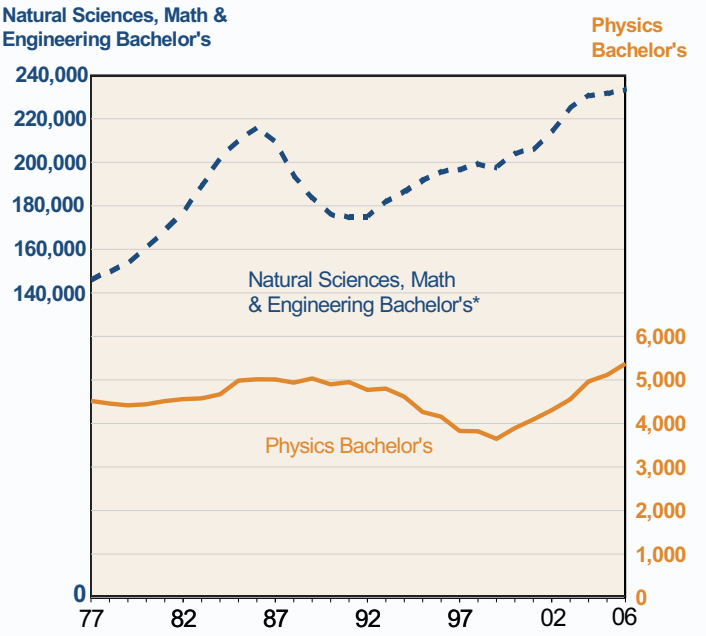
the class of 2006 being non-US citizens. The number of natural science, math and engineering bachelor's has been plotted in the same graphic using a different scale and shows that degree production in the general science fields has risen by a third during the last 15 years.

In the class of 2006, physics bachelor's represent only about one-third of one percent or 1 out of every 276 bachelor's conferred for all majors combined. **Table 4** compares the number of physics degrees conferred to related fields. Physics is the second smallest field and represents about 2% of all undergraduate degrees conferred in the natural sciences, math and engineering.

Figure 4. Physics bachelor's and Natural Sciences, Math and Engineering bachelor's produced in the US, 1977 to 2006.



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* NCES Digest of Education Statistics

The number of individuals receiving undergraduate astronomy degrees has also increased sharply in recent years, up an amazing 98% since a recent low in 1997 (see **Figure 5**). This increase coincides with a number of existing physics departments adding an astronomy

Table 4. Bachelor's degrees awarded in selected fields, class of 2006.

	Number
Engineering & Engineering Technologies	81,610
Biological sciences	69,178
Computer &Information sciences	47,480
Mathematics & Statistics	14,770
Chemistry	10,606
Physics	5,373
Geoscience	3,973

Non-physics data: NCES Digest of Education Statistics 2007, Table 265.

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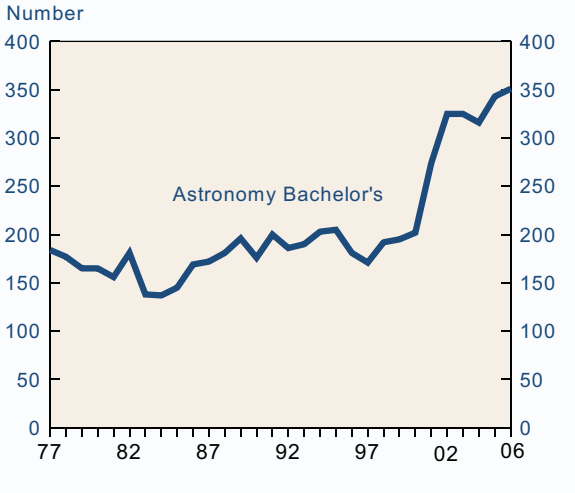
Figure 5. Astronomy bachelor's degrees awarded in the US, 1977 to 2006.



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bachelor's degree option to their already existing physics degree offerings. About one-third of the recent gains in undergraduate astronomy degrees is a result of these additional departments now offering an astronomy degree.

Overall changes in population demographics have had an impact on degree production for many majors. Increases in the number of 18-year-olds coupled with a larger proportion of high school graduates enrolling in college is driving an increase in the number of students entering the higher education system.

Although hard to measure, efforts of the physics community to enhance the undergraduate physics experience for students may also be affecting increases in physics bachelor's degrees. The National Task Force on Undergraduate Physics, produced a publication *Strategic Programs for Innovations in Undergraduate Physics: Project Report* (SPIN-UP). This report highlights different aspects of thriving undergraduate programs at a time when the enrollments at many departments were declining. There is also an annual workshop for new physics and astronomy faculty members organized by the American Association of Physics Teachers. These workshops have contributed to the national effort to improve physics and astronomy instruction.

Table 5. Number of physics bachelor's produced by highest degree offered, class of 2006.

Highest physics degree offered	Number of Depts	Degrees per department	
		Average	Median
Bachelor's	510	4.5	3
Master's	63	5.6	5
PhD	179	15.2	10

Note: There are an additional 8 PhD-granting departments which do not offer a degree at the bachelor's level.

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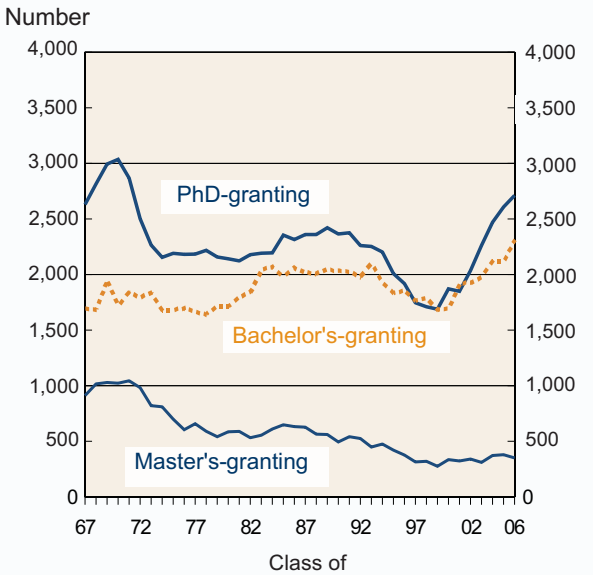
Figure 6. Physics bachelor's degrees awarded by highest physics degree offered, 1967-2006.



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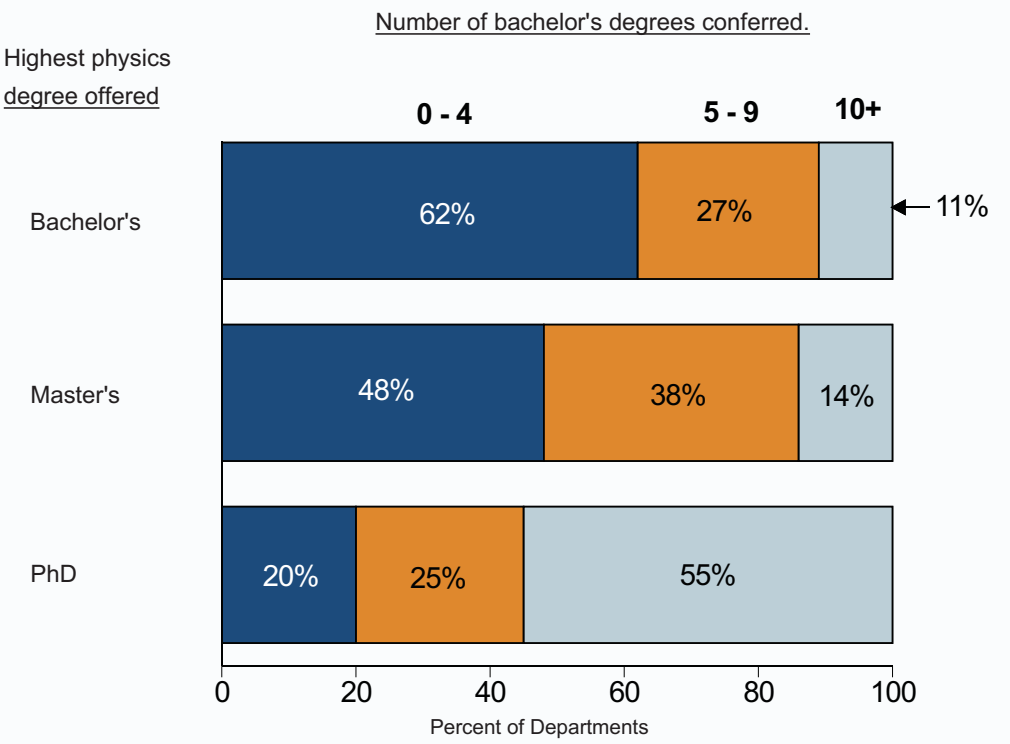
Although undergraduate degree production has been increasing, regardless of highest physics degree offered, the departments that also offer a doctorate in physics have shown the greatest increases, up 60% since the recent low for the class of 1999 (see **Figure 6**). This compares to increases of 37% and 27% at bachelor's- and master's-degree granting departments respectively.

The number of departments where the bachelor's is the highest physics degree offered exceeds the number of departments which also offer a PhD by nearly 3 to 1. These bachelor's-granting departments tend to be small and had a median output of 3 bachelor's in the class of 2006 (see **Table 5**). This compares to a median of 10 per

Figure 7. Size of undergraduate program by highest physics degree offered, class of 2006.



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department for the departments that also offer a doctorate. Although smaller, as a group, the far more numerous bachelor's only departments were responsible for 43% of all the physics bachelor's produced in the class of 2006.

Figure 7 further illustrates the differences in the number of undergraduate degrees produced by physics departments by the highest degree offered. The majority (62%) of the bachelor's-granting departments produced four or fewer physics bachelor's in the class of 2005-06. This compares to 48% of the master's-granting departments and only 20% of the PhD-granting departments.

Tables 6, **7** and **8** list the departments that were responsible for producing the largest number of physics bachelor's during the last three years. The tables are organized by the highest physics degree offered by the department and show three-year averages to minimize year-to-year fluctuations. The top 1% of the departments in annual undergraduate degree production, all having doctoral programs, were responsible for producing about 10% of the bachelor's produced.

Table 6. Bachelor's-granting departments averaging 10 or more physics bachelor's degrees per year, classes of 2004, 2005 and 2006.

	Annual Average		Annual Average
CA Poly St U-San Luis Obispo	28	Bates College (ME)	11
Harvey Mudd College (CA)	25	Bucknell U (PA)	11
US Air Force Academy (CO)	21	Colorado College	11
Illinois State U	19	Furman U (SC)	11
SUNY College-Geneseo (NY)	19	Grove City College (PA)	11
Williams College (MA)	19	Murray State U (KY)	11
Reed College (OR)	18	US Military Academy (NY)	11
U of Wisconsin-La Crosse	16	U of Puget Sound (WA)	11
Xavier U (LA)	16	U of Wisconsin, Eau Claire	11
Carleton College (MN)	15	Whitman College (WA)	11
College of Charleston (SC)	15	Adelphi U (NY)	10
Gustavus Adolphus Coll (MN)	15	Augustana College (IL)	10
Saint Olaf College (MN)	15	Benedict College (SC)	10
Bethel College (MN)	14	Bowdoin College (ME)	10
Colby Coll (ME)	13	Coll of Richard Stockton (NJ)	10
Dickinson College (PA)	13	Fordham U (NY)	10
Grinnell College (IA)	13	Hampden-Sydney Coll (VA)	10
Oberlin College (OH)	13	Luther College (IA)	10
The College of New Jersey	13	Macalester College (MN)	10
U of Northern Colorado	13	Shippensburg U (PA)	10
James Madison U (VA)	12	Sonoma State U (CA)	10
Occidental College (CA)	12	Swarthmore College (PA)	10
Taylor U (IN)	12	U of Wisconsin-River Falls	10

Note: List includes only those departments who contributed degree data for all 3 years.
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Table 7. Master's-granting departments averaging 7 or more physics bachelor's degrees per year, classes of 2004, 2005 and 2006.

	Annual Average		Annual Average
California State U-Northridge	14	San Diego State U (CA)	9
Appalachian State U (NC)	13	Virginia Commonwealth U	9
Miami U (OH)	12	Ball State U (IN)	8
Northern Arizona U	11	U of CO, Colorado Springs	8
San Jose State U (CA)	11	Creighton U (NE)	7
SUNY Binghamton U (NY)	11	Missouri State U	7
U of Central Oklahoma	11	U of Memphis (TN)	7
Cleveland State U (OH)	10	U of Puerto Rico, Rio Piedras	7
Stephen F Austin State U (TX)	10		

Note: List includes only those departments who contributed degree data for all 3 years.
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Table 8. PhD-granting departments averaging 20 or more physics bachelor's degrees per year, classes of 2004, 2005 and 2006.

	Annual Average		Annual Average
U of California-Berkeley	78	Cornell U (NY)	29
Mass Inst of Technology	75	U of California-Davis Applied	29
U of Washington	70	Carnegie Mellon U (PA)	28
Brigham Young U (UT)	52	Cornell U-Applied (NY)	28
U of California-Los Angeles	46	U of Wisconsin, Madison	28
Colorado School of Mines	43	U of California-Davis	27
U of IL-Urbana/Champaign	43	Stanford U (CA)	26
U of Arizona	37	U of Florida	26
U of California-San Diego	37	U of Minnesota-Minneapolis	26
U of Virginia	37	Rensselaer Polytech Inst (NY)	25
U of Maryland-College Park	35	Boston U (MA)	24
U of Texas-Austin	35	Michigan State U	24
California Inst of Technology	34	Purdue U-West Lafayette (IN)	24
Rutgers U-New Brunswick (NJ)	33	Oregon State U	21
U of California-Santa Barbara	32	Portland State U (OR)	21
Pennsylvania State U	31	Princeton U (NJ)	21
U of California-Santa Cruz	31	U of Massachusetts, Amherst	21
U of Chicago (IL)	31	College of William & Mary (VA)	20
U of Michigan-Ann Arbor	31	Columbia U (NY)	20
Ohio State U	30	Georgia Inst of Technology	20
U of Utah	30	Yale U (CT)	20

Note: List includes only those departments who contributed degree data for all 3 years.
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Table 9 lists the astronomy departments that granted the largest number of astronomy bachelor's during the last three years. All of the departments in the listing also have a doctoral program in astronomy. Ten of the 67 departments that offer an astronomy bachelor's degree were responsible for producing 40% of the astronomy bachelor's conferred in 2006.

In the physics degree classes of 2005 and 2006, about a third of new physics bachelor's immediately continued their education at the graduate-level in physics or astronomy. An additional fifth immediately enrolled in graduate programs in other fields, with engineering being by far the dominant field. The balance of new graduates, about 45%, entered directly into the workforce with the private sector hiring the majority of them. Many of these employed bachelor's will eventually enroll in a graduate program after having worked for a year or two.

In recent years about 15% of the physics bachelor's recipients eventually received a physics or astronomy PhD. It is estimated that about two-thirds of physics bachelor's will have at some time earned a master's or a PhD across a diverse set of fields.

Similar to the physics bachelor's, about half of the astronomy undergraduates immediately continue their studies at the graduate-level. But unlike physics, a greater proportion, about 80%, choose to pursue graduate studies in astronomy or physics. The private sector hires about half of the new astronomy bachelor's who go directly into the workforce.

GRADUATE ENROLLMENTS

In the fall of 2006 there were 2,976 first-year students at one of the 187 graduate departments that offer a physics doctorate and 320 new graduate students at one of the 63 departments where the master's is the highest physics degree offered (see **Figures 8 & 9**). Although first-year graduate school enrollments have remained fairly steady during the last few years, this "leveling off" follows sharp increases in first-year student enrollments starting back in the mid 1990's. Overall first-year student enrollments are up 23% from a recent low eight years earlier.

Table 9. Astronomy departments averaging 8 or more astronomy bachelor's degrees per year, classes of 2004, 2005 and 2006.

	Annual Average		Annual Average
U of California-Berkeley	27	U of Arizona	10
U of Colorado-Boulder	20	U of Maryland-College Park	10
Florida Inst of Technology	14	U of Minnesota, Minneapolis	10
U of California-Los Angeles	12	Pennsylvania State U	9
U of Mass-Amherst	11	Columbia U (NY)	8
U of Wisconsin-Madison	11	Michigan State U	8
Boston U (MA)	10	U of Hawaii, Hilo	8

Note: List includes only those departments who contributed degree data for all 3 years.

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Figure 8. First-year graduate physics student enrollments at master's-granting physics departments, fall 1967 to fall 2006.

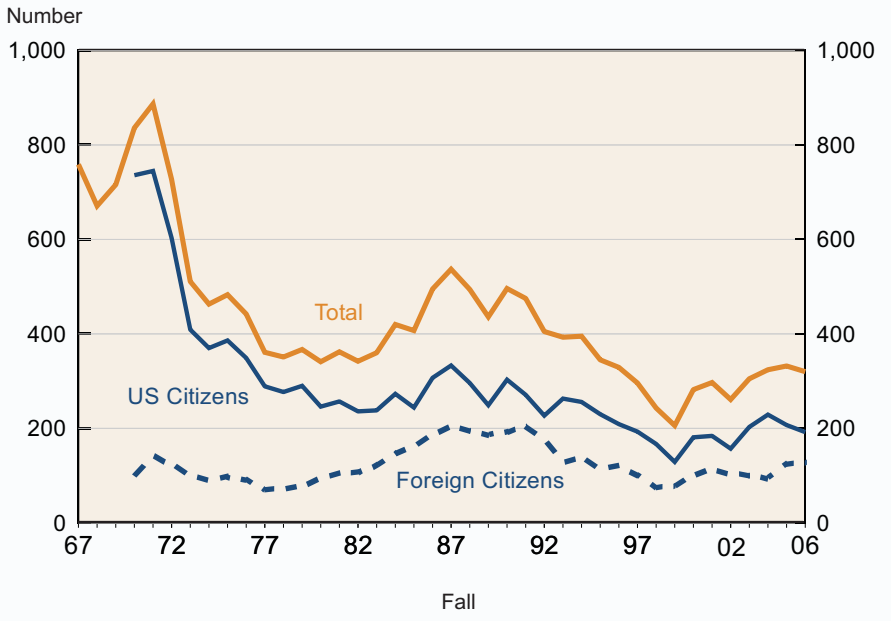

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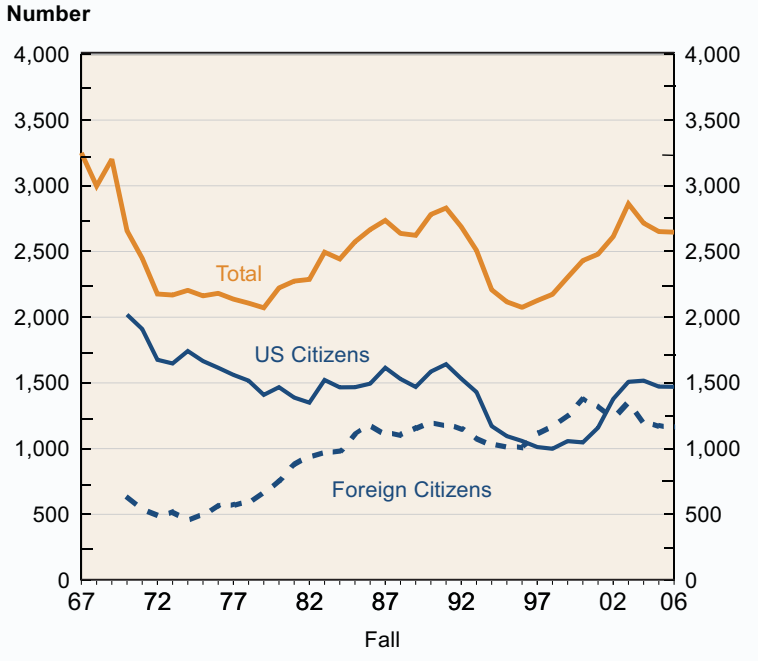
Figure 9. First-year graduate physics student enrollments at PhD-granting physics departments, fall 1967 to fall 2006.



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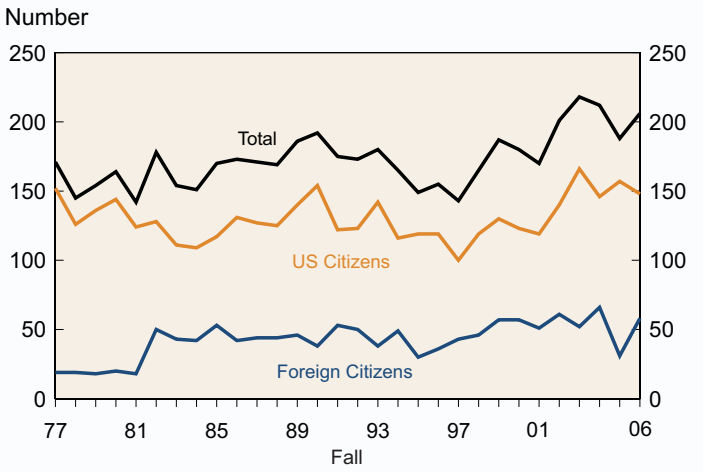
Some students who enrolled at master's-granting departments will subsequently enroll at a PhD-granting department in pursuit of the higher degree. Conversely, some students enrolled at a doctoral-granting department are enrolled with the master's being their highest intended physics degree.

International students make up a significant proportion of the incoming physics graduate students each year. In the fall of 2006, 40% of the first-year students at the master's departments and 44% at the doctoral-granting departments were non-US citizens. Just five years earlier non-US students comprised more than half of the first-year students enrolling at doctoral-granting departments. Recent sharp increases in the number of US students reestablished US citizens as the majority of first-year students starting in the fall of 2002.

Figure 10. First-year graduate astronomy student enrollments at departments that offer astronomy degrees, fall 1977 to fall 2006.



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Despite year-to-year fluctuations in recent years, first-year graduate student enrollments at the 43 graduate-level astronomy departments have been on the rise (see **Figure 10**). These increases have been driven, in large part, by US citizens. This is not unexpected, given the recent sharp increase in the number of US students receiving astronomy bachelor's degrees.

Table 10 presents the characteristics of first-year physics and astronomy students by the type of department in which they were enrolled. There are significant differences in the characteristics of students enrolling in graduate astronomy departments versus graduate physic departments. The representation of women at astronomy departments is about twice that of the student enrollment at physics departments and the proportion of non-US students is considerably smaller. Although physics and astronomy students are well supported, the students at astronomy departments are more likely to receive a research assistantship than their physics counterparts.

In the fall of 2006 there were just over 14,000 students enrolled in a US graduate physics program (see **Figure 11**). Non-US citizens comprised 47% of the students enrolled. As a result of sharp increases in the number of incoming students in recent years, total physics graduate student enrollments are up 31% from the recent low in the fall 1999. Only 6% of the graduate students were enrolled at a department where the physics master's was the highest degree offered.

GRADUATE DEGREES

There were 799 students who exited physics departments with a master's degree in the class of 2006. This represents an increase of 22% from just 4 years earlier and reflects the recent increases seen in first-year student enrollments. Non-US

Table 10. Characteristics of first-year physics graduate students, fall of 2006.

		Physics Depts		Astronomy Depts
		PhD-granting	Master's-granting	Both types
Number of departments		187	63	43
Gender		%	%	%
	Male	80	76	60
	Female	20	24	40
Citizenship				
	US	56	60	72
	Foreign	44	40	28
Type of support*				
	Teaching assistantship	66	68	47
	Research assistantship	13	10	27
	Fellowship	17	5	22
	Self-financed	1	14	13
	Other	3	3	1
Total first-year enrollments		2647	320	188

*Source: AIP Graduate Student Survey, limited to full-time students, 2005-2006.

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Figure 11. Graduate physics student enrollments, fall 1964 to fall 2006.

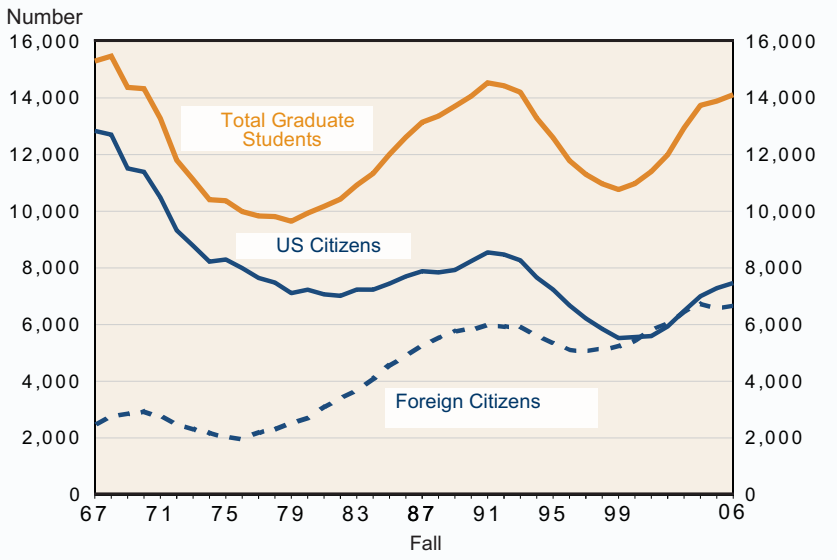

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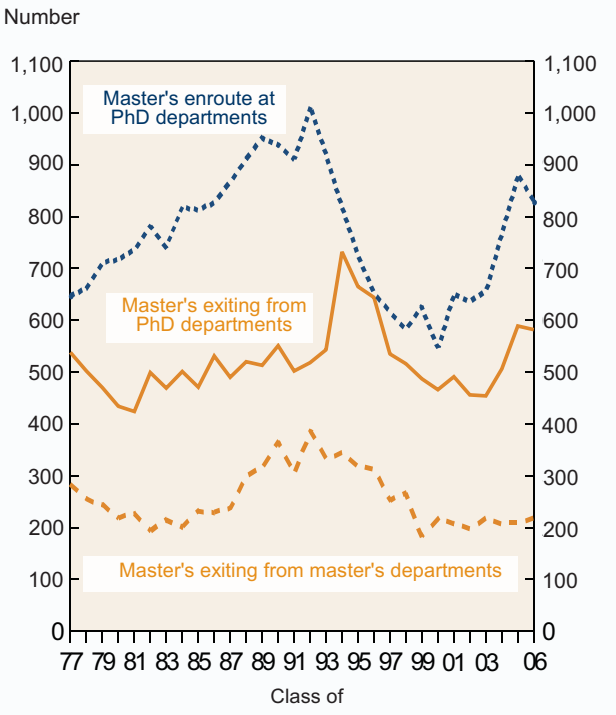
Figure 12. Master's degrees conferred by type of degree and department, 1977-2006.



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citizens represented 36% of the exiting master's in the class of 2006.

Table 11. Departments with the master's as the highest degree offered averaging 5 or more physics master's degree per year, classes of 2004, 2005 and 2006.

	Annual Average
Ball State U (IN)	9
Christopher Newport U (VA)	8
CA State U, Fresno	6
Cleveland State U (OH)	6
San Diego State U (CA)	6
U of Mass, Boston	6
Appalachian State U (NC)	5
CA State U, Fullerton	5
City College (NY)	5
Miami U (OH)	5
U of Louisville (KY)	5
U of Mass, Dartmouth	5
Western Illinois U	5

Note: List includes only those departments who contributed degree data for all 3 years.

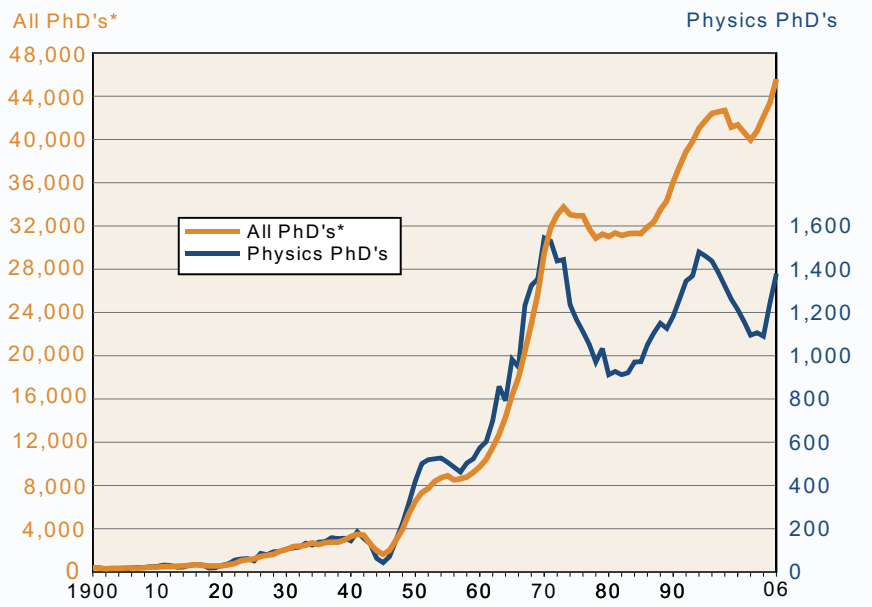
AIP Statistical Research Center, Enrollments and Degrees Report.

Slightly over a quarter of the physics master's degrees in the class of 2006 were from departments where the master's was the highest physics degree available (see **Figure 12**). Clearly, all the master's recipients who received their degrees from these departments intended to receive a master's, although many will enroll in another department to continue their education in physics or another field. This is not necessarily the case for the 582 master's recipients exiting departments that also offer a PhD. Although a proportion of these masters set out with the intention of receiving a master's degree by enrolling in one of the parallel masters' programs that exist at doctoral-granting departments, others originally aspired to receive a PhD.

Table 11 lists the departments averaging the largest number of physics master's for the classes of 2004, 2005, and 2006. The table is limited to departments where the master's was the highest degree offered. Combined, these 13 departments awarded 36% of the master's degrees in these years, but represented only 21% of the master's-granting departments

Figure 13 shows over a century of physics PhD production and PhD production as a whole from US institutions. The first thing that is clear from the figure, with the exception of the early 1900's, is that overall PhD production and especially physics PhD production have rarely seen periods of stability.

Figure 13. Physics PhD's and all PhD's conferred in the US, 1900 to 2006.



AIP Statistical Research Center, Enrollments and Degrees Survey
* NSF Survey of Earned Doctorates

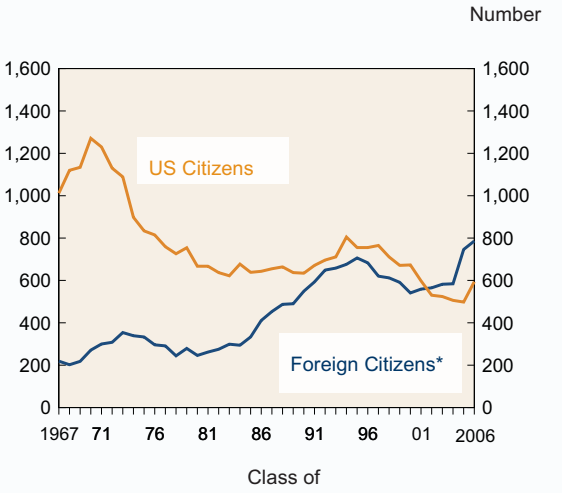
The 1,380 physics PhDs in the class of 2006 represent an increase of 11% from the previous year and 26% from just two years earlier. Physics PhDs in the class of 2006 represent just 3% of all the PhDs conferred at US institutions.

In addition to interest in the field, there are many factors that influence the number of individuals pursuing and receiving doctoral degrees in the US. Many of the influences that affect students in pursuit of a physics PhD also influence PhD productions as a whole in this country.

Changes in the number of students receiving undergraduate degrees can affect PhD production. The number of physics bachelors produced has increased steadily since 1999 and a significant fraction of them, typically about a third, choose to immediately continue with graduate study in physics or astronomy. Also changes in amount and distribution of federal funding for S&E research will influence the number of students departments will admit into their S&E programs.

Another factor affecting PhD production is the number of non-US citizens pursuing PhDs in this country. As can be seen in **Figure 14**, the number of non-US citizens receiving physics PhDs started

Figure 14. Citizenship of physics PhD's, 1967 to 2006.



**Foreign citizens include individuals with permanent resident status and those with temporary visas.*

Sources: NSF (1966-1991) AIP (1992-2005)
AIP Statistical Research Center, Enrollments and Degrees Report.

increasing steadily in the early 1980's while the number of US citizens remained relatively stable.

Degrees to both non-US citizens and US citizens started declining in the mid 1990's, but the number of non-citizens receiving PhDs started rebounding beginning with the class of 2000, while the number of US citizens continued to steady decline until the class of 2005. The number of US citizens in the class of 2006 increased 19% over the previous year. The proportion of foreign citizens among the class of 2006 was 57%, down from the all time high of 60% for the class of 2005.

Physics doctoral departments vary greatly by size (see **Cover Figure**). Looking at a three-year average in PhD production (classes of 2004, 2005, 2006), over half (56%) of the departments averaged between one and five physics doctorates per year, and were responsible for producing 24% of the PhD during that time period. Seven departments were either small or new, and only averaged one PhD or less. About a quarter of the departments were of moderate size averaging between 6 and 10 PhDs and produced 27% of the physics PhDs.

Thirty-three (18%) of the doctoral-granting departments averaged eleven or more PhDs. These departments were responsible for producing half of the PhDs conferred during this time period. Five very large departments each averaging over 26 PhDs a year were responsible for producing 12% of all the PhDs. **Table 12** lists the departments that averaged the largest number of PhDs.

Physics PhD's take a median of 6 full-time equivalent (FTE) years of graduate study to complete their degree, with about 1 in 7 requiring 8 or more years. The median age of new PhD recipients is 30, with 12% being 35 or older by the time they receive their degree.

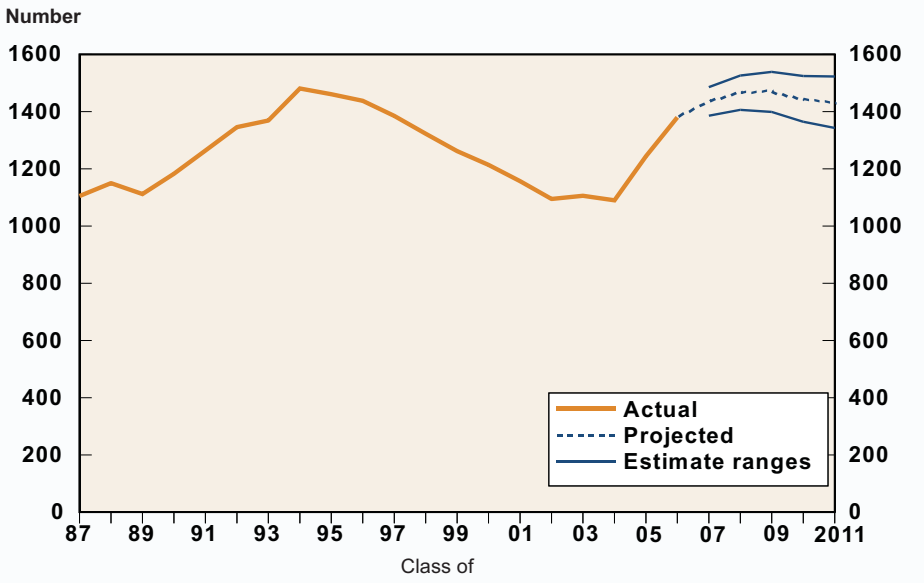
Table 12. Departments averaging 15 or more physics doctorates per year, classes of 2004, 2005 and 2006.

	Annual Average		Annual Average
MA Inst of Technology	38	U of Washington	19
U of Maryland, College Park	32	Princeton U (NJ)	18
U of Illinois-Urbana/Champaign	29	U of Colorado, Boulder	18
U of California-Berkeley	28	Columbia U (NY)	17
U of Texas-Austin	27	Stanford U-Applied (CA)	17
CA Inst of Technology	23	U of Florida	17
U of Wisconsin, Madison	23	Rutgers U, New Brunswick (NJ)	16
Cornell U (NY)	20	U of Michigan, Ann Arbor	16
U of California, Santa Barbara	20	U of Rochester (NY)	16
U of Chicago (IL)	20	Michigan State U	15
Stanford U (CA)	19	Ohio State U	15
SUNY-Stony Brook U (NY)	19		

Note: List includes only those departments who contributed degree data for all 3 years.

AIP Statistical Research Center, Enrollments and Degrees Report.

Figure 16 Projections of the number of PhDs in the classes of 2007 through 2011.



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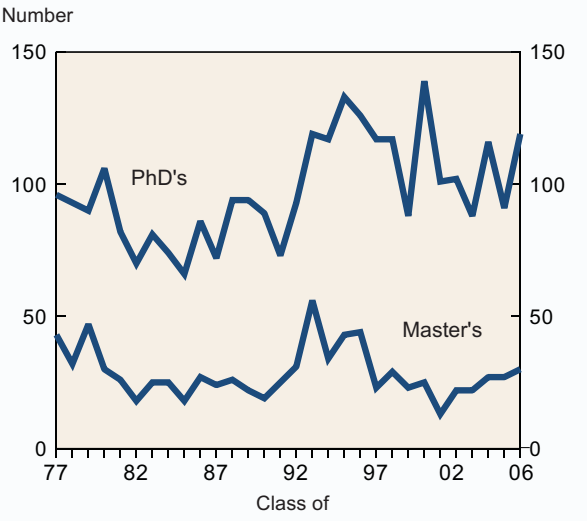
The types of employment new physics PhDs accept fall into three main categories: temporary postdocs, other temporary positions, and potentially permanent positions. The types of positions new PhDs accept are influenced by changing economic conditions and shifting patterns of long term career goals. For the class of 2006 PhDs who remained in the US, about 60% were working as postdocs in the winter following their degree. An additional 8% accepted a temporary non-postdoc position and 27% accepted a potentially permanent position. For more information on the types of jobs new degree recipients accept, see the Initial Employment Report at www.aip.org/statistics.

Figure 16 shows projected PhD production through the class of 2011. These projections are based on past first-year student enrollment figures factoring in the time it has historically taken students to earn physics PhDs. PhD production is expected to level off in a few years, and the majority of the degrees will again be conferred to US citizens by the end of this decade.

Figure 17. Astronomy master's degrees and doctorates awarded in the US, 1977-2006.



Note: The astronomy doctorate totals presented here do not include astrophysics degrees conferred by physics departments. Those degrees are included among the physics totals.

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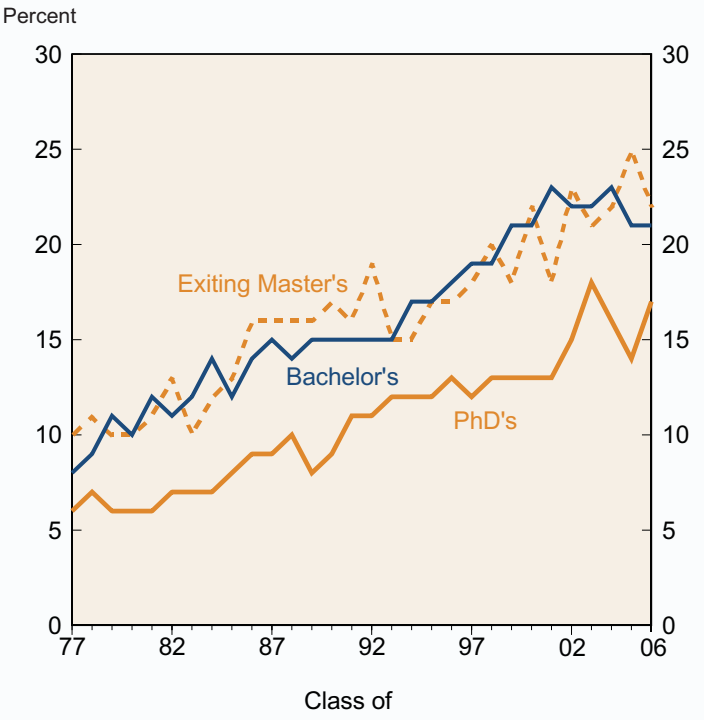
Unlike physics, the number of astronomy and astrophysics PhDs from the 40 doctoral-granting astronomy departments has not been increasing in recent years with 119 PhDs conferred in the class of 2006 (see **Figure 17).** PhD astronomy departments average about 3 PhDs a year. Non-US citizens made up 28% of the class of 2006. This compares to 57% non-citizens among physics PhDs. Postdoctoral appointments are the prevailing post-degree outcome for new astronomy PhDs, with about three-quarters of new doctorates accepting one. There were 30 exiting astronomy master's degrees conferred in the class of 2006. Of these 16 were women and 8 were non-US citizens.

Figure 18. Percent of bachelor's, master's and doctorates in physics earned by women, 1977-2006.



Note: A form change occured in 1994 resulting in a more accurate representation of women among physics bachelors. Some of the increase in 1994 only, may be a result of that change.

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WOMEN

The representation of women among physics undergraduates has consistently been among the lowest in natural sciences, math and engineering fields. The class of 2006 was no different and was comprised of 21% women, unchanged from the previous year (see **Figure 18**). In spite of the attention it has been getting, the representation of women among physics bachelor's has actually declined slightly (2%) from a couple of years earlier.

There are seventeen women's colleges in the US with undergraduate physics programs averaging about 3 bachelors each in the class of 2006. The women receiving physics bachelor's from these departments represent about 4.5% of all the women receiving physics bachelor's in the class of 2006.

The proportion of exiting master's degrees conferred to women historically has tracked very closely to the proportion among undergraduate degree recipients. The exiting master's in the class of 2006 included 22% women, which corresponds to 173 individuals. Women represented 17% or 237 of the physics PhDs in the class of 2006. Non-US citizens made up 59% of the women receiving physics PhDs in the class of 2006.

Although also declining slightly in 2006, the proportion of women among astronomy degree recipients has increased significantly over time (see **Figure 19).** In the class of 2006, women comprised 36% of the bachelor's and 31% of the PhDs receiving their degrees from degree-granting astronomy departments.

MINORITIES

Figure 19. Percent of bachelor's degrees and doctorates in astronomy earned by women, 1977-2006.

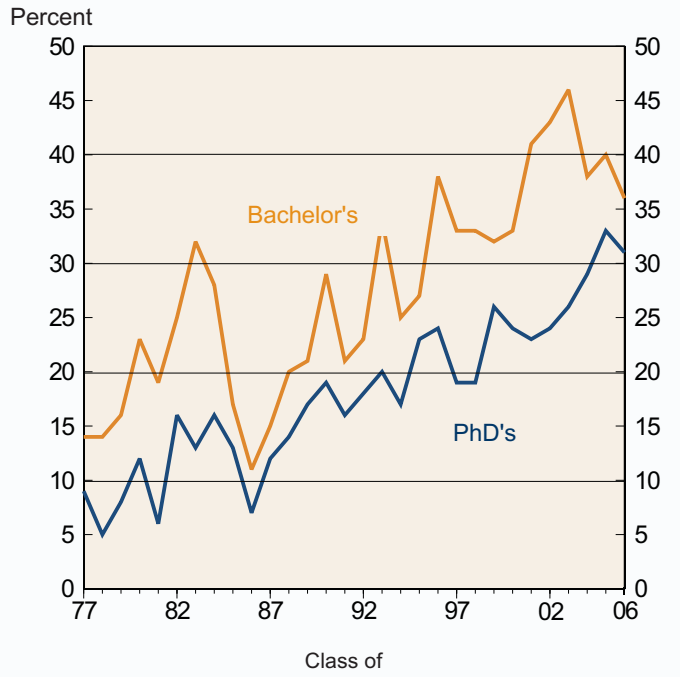

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Table 13 shows the number and percent of physics degree recipients who were US citizens, by their minority or ethnic group. There has been no significant change in the proportion of underrepresented minorities among US physics degree populations for many years. There has been a fluctuation in the number of African-Americans receiving physics PhDs during the last decade. In the late 1990's physics departments averaged about 10 PhDs to African-Americans each year. This jumped to an average of 18 a year in the early 2000's. In recent years this number has declined, with departments averaging about 11 PhDs a year to African-Americans.

Among the 752 departments that offer an undergraduate physics degree in the US, 35 or 4.6% are located at an Historically Black College or University (HBCU). These few departments produce a significant proportion of the African-Americans who receive physics degrees each year. In the class of 2006, 54% of the African-Americans receiving physics bachelor's degrees did so at an HBCU. Fewer than half of all African-Americans who earn a physics bachelors do so at one of the 730 majority institutions. Of

Table 13. Number and percent of physics degrees granted to US citizens by minority / ethnic group status, class of 2006.

	Bachelor's		Exiting Master's		PhD's	
	Number	Percent	Number	Percent	Number	Percent
White	4296	86	457	89	509	86
Asian-American	223	4	17	3	39	6
African-American	184	4	14	3	11	2
Hispanic-American	177	4	18	3	16	3
Other	119	2	9	2	19	3
Total US Citizens	4999	100%	515	100%	594	100%

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the 35 HBCUs that award physics degrees, 4 also have a doctoral granting program.

Table 14 lists the institutions that have recently averaged the most physics bachelor's degrees to African-Americans. All the institutions listed are either an HBCU or in the case of Chicago State, a Predominately Black College or University.

Hispanic-Americans are also not evenly distributed across the country. Rather than being concentrated at specific universities, the majority of Hispanic-American physics bachelor's receive their degrees from states with large Hispanic populations, as well as from Puerto Rico.

California leads the county in conferring the largest number of physics bachelor's to Hispanic-Americans. Nine percent of the California's bachelor's were Hispanic. This accounts for 25% of all the Hispanics receiving physics bachelors' degrees in the class of 2006. California is a very populous state and was responsible for producing 12% of all physics bachelor's in the class of 2006.

Other states with a large proportion of Hispanics among their physics bachelor's are: New Mexico (13%), Texas (11%), Arizona (9%) and Florida (9%). All of the physics bachelor's from Puerto Rico were Hispanic, representing 11% of all the Hispanics in the physics bachelor's class of 2006.

Table 14. Departments averaging 3 or more African-American physics bachelor's per year, classes of 2004, 2005 and 2006.

	Annual Average
Xavier U (LA)	16
Benedict College (SC)	7
Spelman College (GA)	5
Morgan State U (MD)	4
North Carolina A&T State U	4
Tuskegee U (AL)	4
Chicago State U (IL)	3
Florida A&M U	3
Jackson State U (MS)	3

Note: List includes only those departments who contributed degree data for all 3 years.

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There are also influences which effect physics more directly. There has been a steady increase in the number and proportion of high school students taking a physics class, with particularly fast growth in the number of students taking Advanced Placement (AP) physics. The likelihood of an individual choosing to major in physics in college is much greater if he or she has taken a physics course while in high school, and this is especially true for AP physics takers.

APPENDIX

A1. Trend in astronomy enrollments* and degrees, academic years 1996 to 2007.

	Number of astronomy degrees granted			Undergraduate astronomy major enrollments		Graduate astronomy student enrollments	
Academic Year	Bachelor's	Exiting Master's	PhD's	Juniors	Seniors	1st-year	Total
1996-97	177	23	117	265	332	155	837
1997-98	192	29	116	252	330	143	777
1998-99	195	23	88	263	340	165	799
1999-00	202	25	139	395	409	187	838
2000-01	274	13	101	391	461	180	809
2001-02	325	22	102	420	478	170	807
2002-03	325	22	88	385	576	201	892
2003-04	316	27	116	441	540	218	966
2004-05	343	27	91	437	584	212	999
2005-06	351	30	119	511	565	188	1,026
2006-07				379	569	206	1,077

* Includes part-time students.
** Thirty-four Master's came from the Arizona Summer Science Institute for science teachers at the University of Arizona.

Note: The astronomy doctorate totals presented here do not include astrophysics degrees conferred by physics departments. Those degrees are included among the physics totals.

AIP Statistical Research Center, Enrollments and Degrees Report.

A2. Trend in physics enrollments* and degrees, academic years 1996 to 2007.

	Number of physics degrees			Undergraduate physics major enrollments		Graduate physics student enrollments	
Academic Year	Bachelor's	Exiting Master's	PhD's	Juniors	Seniors	1st-year	Total
1996-97	3,826	789	1,385	5,057	6,116	2,404	11,786
1997-98	3,821	782	1,323	5,006	5,857	2,423	11,302
1998-99	3,646	671	1,262	5,026	5,593	2,417	10,971
1999-00	3,894	684	1,214	5,227	5,913	2,510	10,768
2000-01	4,091	701	1,157	5,428	6,309	2,713**	10,978
2001-02	4,305	657	1,095	5,599	6,521	2,777	11,402
2002-03	4,553	672	1,106	6,026	7,104	2,875	11,995
2003-04	4,965	716	1,090	6,333	7,532	3,168	12,141
2004-05	5,113	798	1,244	6,817	8,102	3,040	13,738
2005-06	5,373	799	1,380	7,141	8,272	2,984	13,889
2006-07				7,072	8,651	2,967	14,114

* Includes part-time students.
** A change in wording on the 2001 questionnaire resulted in more accurate data on first-year graduate students. This change was responsible for 3% of the 8% increase in total first-year students between 2000 and 2001.

AIP Statistical Research Center, Enrollments and Degrees Report.

A3. Trend in physics enrollments* and degrees by institution type, academic years 1996 to 2007.

Academic Year	Number of physics degrees granted: Bachelor's	Exiting Master's	PhD's	Undergraduate physics major enrollments: Juniors	Seniors	Graduate physics student enrollments: 1st-year	Total
Doctorate-granting institutions							
1996-97	1,746	535	1,385	2,200	3,133	2,074	10,900
1997-98	1,710	516	1,323	2,223	2,899	2,127	10,432
1998-99	1,688	487	1,262	2,363	2,814	2,174	10,256
1999-00	1,871	466	1,214	2,412	3,053	2,304	10,104
2000-01	1,849	491	1,157	2,565	3,270	2,431**	10,272
2001-02	2,036	456	1,095	2,684	3,399	2,480	10,622
2002-03	2,262	454	1,106	2,951	3,792	2,614	11,237
2003-04	2,470	506	1,090	3,058	4,079	2,863	12,141
2004-05	2,608	589	1,244	3,357	4,491	2,716	12,898
2005-06	2,712	582	1,380	3,552	4,437	2,652	12,977
2006-07				3,490	4,710	2,647	13,276
Master's-granting institutions							
1996-97	314	254		530	667	330	886
1997-98	320	266		561	636	296	870
1998-99	275	184		478	576	243	715
1999-00	335	218		465	589	206	664
2000-01	323	210		438	574	282**	706
2001-02	340	201		443	594	297	780
2002-03	310	218		494	610	261	758
2003-04	372	210		548	694	305	800
2004-05	379	209		562	756	324	840
2005-06	350	217		575	745	332	912
2006-07				522	742	320	838
Bachelor's-granting institutions							
1996-97	1,766			2,327	2,316		
1997-98	1,791			2,222	2,322		
1998-99	1,683			2,185	2,203		
1999-00	1,688			2,348	2,271		
2000-01	1,919			2,425	2,465		
2001-02	1,929			2,472	2,528		
2002-03	1,981			2,581	2,702		
2003-04	2,123			2,727	2,759		
2004-05	2,126			2,898	2,855		
2005-06	2,311			3,014	3,090		
2006-07				3,060	3,199		

* Includes part-time students.

** A change in wording on the 2001 questionnaire resulted in more accurate data on first-year graduate students. This change was responsible for half of the increase at PhD institutions and a quarter of the increase at masters institutions.

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Reaching the Critical Mass: The Twenty Year Surge in High School Physics (July 2008)
An analysis and interpretation of information collected in a nationwide survey of teachers of physics at the secondary level.

Initial Employment Report: Physics and Astronomy Degree Recipients of 2003 & 2004 (February 2007)
A description of the initial employment and continuing education of physics and astronomy degree recipients.

Rosters of Physics and Astronomy Departments with Enrollment and Degree Data, 2006 (September 2007)
Two reports detailing data for both physics and astronomy degree-granting departments in the U.S.

2006 Salaries Society Membership Survey Tables (July 2007)
Collection of twelve tables each focusing on different aspects of PhD employment. The statistical data are based on salaries reported by U.S.-resident members of AIP's ten Member Societies during March 2006. Tables can be purchased individually for $5.00 each or as a collection for $25.00. Members of AIP's Member Societies and the Society of Physics Students receive a 20% discount. To order go to http://store.aip.org/statistics

Women in Physics and Astronomy, 2005 (February 2005)
Data on the current and historic trends in the representation of women in physics, including comparative data on women in related fields.

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