

First Year Physics Graduate Students: Characteristics and Background

Data from the 2007-2008 and 2009-2010 Graduate Student Surveys

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REPORTS ON FIRST YEAR GRADUATE STUDENTS

**First-Year Physics Graduate
Students: Characteristics and
Background (August 2012)**

First-Year Physics Graduate
Students: Financial Support
(forthcoming)

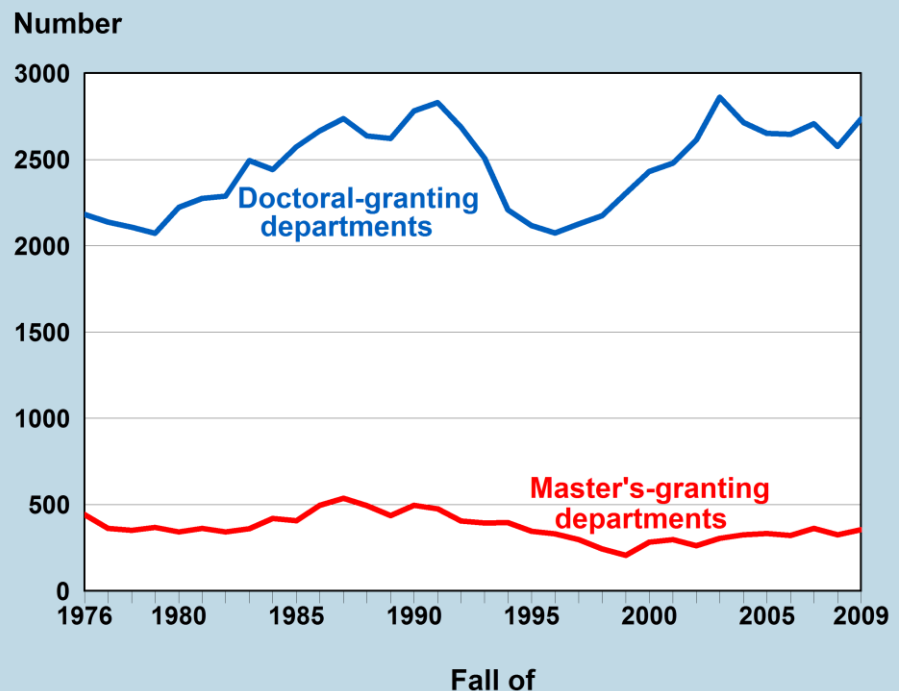
First-Year Astronomy Graduate
Students (forthcoming)

First-Year Graduate Students:
Choosing an Institution
(forthcoming)

The number of students enrolling in physics graduate programs has remained relatively unchanged in recent years at around 3,000 students. This period of stability follows steady increases in graduate-level enrollments at doctoral-granting departments during the late 1990's and early 2000's.

Figure 1

**Number of First-Year Physics Graduate Students in the U.S. by
Highest Degree of Department, Fall 1976 through Fall 2009.**



Source: AIP Survey of Enrollments and Degrees

<http://www.aip.org/statistics>

*Total first-year
graduate student
enrollments at physics
departments have
remained at about
3,000 students for the
last 6 years.*

THE 2008 AND 2010 FIRST-YEAR GRADUATE STUDENT SURVEYS

Students that were new to a physics graduate department were contacted in the spring and asked to provide information concerning their educational experiences.

Table 1

Characteristics of First-Year Physics Graduate Students in the U.S. by Highest Degree Awarded by Department, Fall 2007 and Fall 2009 Combined.

	Highest Degree Awarded by Dept	
	MS	PhD
<u>Gender:</u> *		
Male	77%	80%
Female	23	20
<u>Citizenship:</u> *		
U.S.	64%	56%
Foreign	36	44
<u>Median Age</u>	25.2	23.5
<u>Highest Degree Desired:</u>		
PhD	65%	90%
MS	18	4
Unsure	15	5
No Degree Intended	2	1
<u>Enrollment Status:</u>		
Full-time	96%	98%
Part-time	4	2
N	180	2,126

*Data from the AIP Enrollments and Degrees Survey, fall 2007 and fall 2009.

<http://www.aip.org/statistics>

In the fall of 2009 there were 190 departments with a doctoral physics program and 64 with a master's as their highest physics degree.

Most first-year students enrolled in PhD-granting physics departments are U.S. citizens. Among first-year students in master's-granting physics departments, nearly two-thirds are U.S. citizens. On the whole, students enrolling in doctoral-granting programs were younger than students enrolling in master's-granting departments.

Virtually all first-year students were enrolled on a full-time basis. The students enrolled in programs where the master's was the highest degree offered were less sure about the highest physics degree they planned to receive than students at doctoral-granting departments. Two-thirds of the students enrolled at master's-granting departments planned to enroll in a doctoral-granting department and continue on to pursue a physics PhD.

Physics programs in the U.S. attract students from all over the world. Recent incoming classes of physics graduate students were comprised of 43% non-U.S. citizens. As has been true in past years, Asia is the region that supplies the most students to U.S. physics graduate programs and China supplies more physics graduate students than any other country.

Table 2

Regions and Countries of Citizenship for Non-U.S. First-Year Physics Graduate Students in the U.S., Fall 2007 and Fall 2009 Combined.

	Percent
Asia	71
China	39
India	13
South Korea	3
Other Asia	16
Europe	11
Americas	7
Middle East	8
Africa	3
Australia, New Zealand	-
N	1,049

<http://www.aip.org/statistics>

Around 70% of non-U.S. students entering physics departments in the U.S. are from Asia.

Table 3**Educational Background of First-Year Physics Graduate Students in the U.S. by Citizenship, Fall 2007 and Fall 2009 Combined.**

	U.S. Citizens %	Foreign Citizens %
Bachelor's in Physics or Astronomy	94	91
<u>Prior Physics or Astronomy Graduate-Level Training:</u>		
None	75	53
Master's degree from a U.S. institution	6	4
Master's or equivalent degree from foreign institution	1	27
Course work at another U.S. institution	17	4
Course work at a foreign institution	1	13
N	1,185	1,083

<http://www.aip.org/statistics>

Over a quarter of non-U.S. citizens indicated they had received a physics or astronomy master's degree from a non-U.S. institution prior to enrolling at their current department.

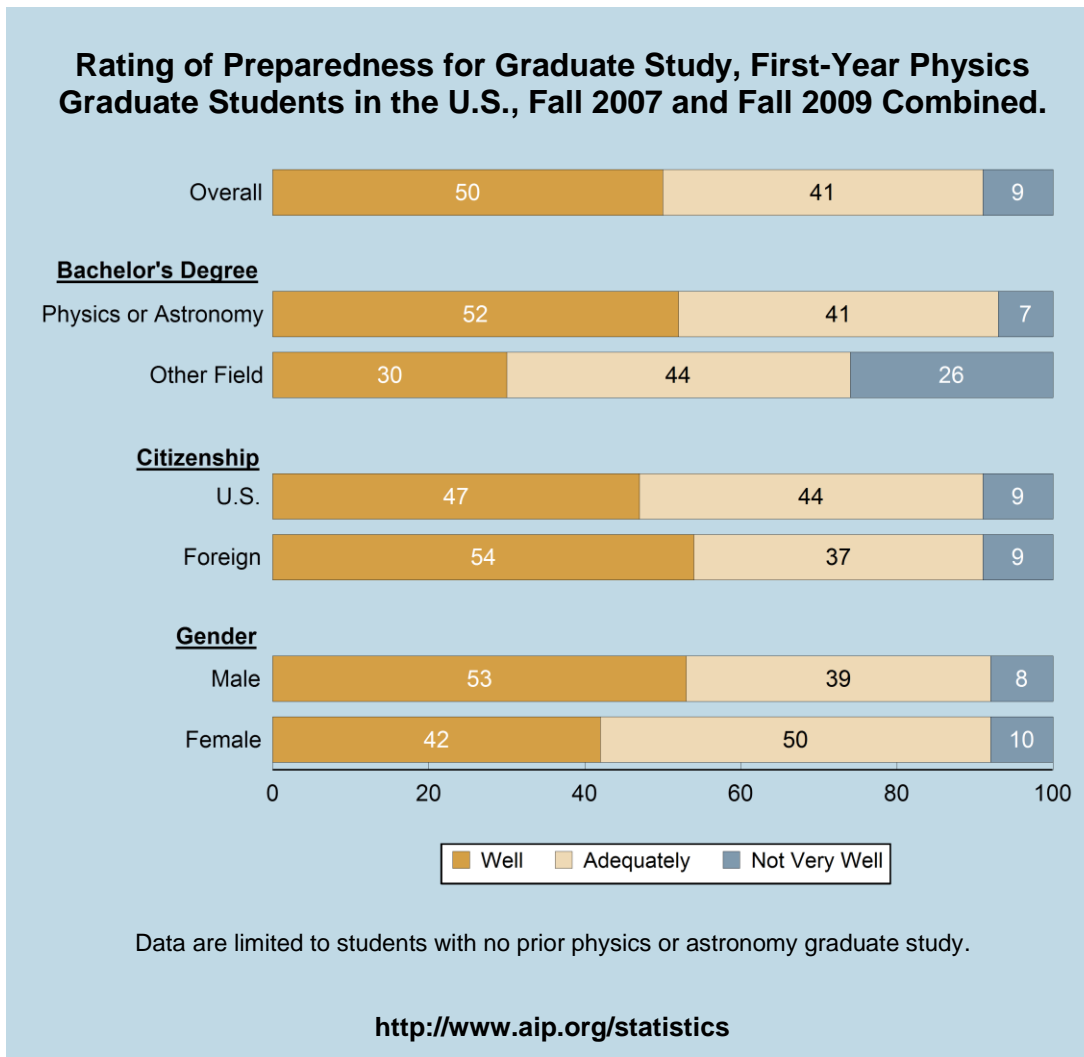
Although not a prerequisite, obtaining a physics or astronomy bachelor's degree (or its non-U.S. equivalent) is the path the vast majority of first-year students in physics graduate programs have followed. About half of the incoming students that did not have a physics or astronomy bachelor's held an undergraduate degree in engineering.

It is difficult to make comparisons of the educational backgrounds of U.S. and non-U.S. students due to the differences in how countries structure their educational systems. The data presented in Table 3 represents the student's perception of the level of graduate physics education they had experienced prior to enrolling as a new student in their current department. Prior to enrolling in their current department, a larger percentage of non-U.S. citizens had prior graduate-level training in physics or astronomy than U.S. citizens.

Students were asked to rate how well their undergraduate education prepared them for graduate study. The vast majority (91%) of entering physics graduate students felt adequately or well prepared for graduate school. The relatively small set of incoming students who had undergraduate degrees in fields other than physics or astronomy were the exception. About a quarter of these students reported they were not very well prepared.

There were some small but significant differences seen in the proportion of students who reported being well prepared when disaggregated by citizenship and gender. Non-U.S. citizens and men indicated that they were well prepared more frequently than was reported by U.S. students and women.

Figure 2



Over 90% of incoming graduate students reported their undergraduate education satisfactorily prepared them for their graduate studies.

Table 4

Research Subfields of First-Year Physics Graduate Students Enrolled in PhD-granting Departments in the U.S. by Citizenship, Fall 2007 and Fall 2009 Combined.

	U.S. %	Foreign %	Overall %
Undecided	20	19	19
Condensed Matter	15	24	19
Particles & Fields	12	14	13
Astrophysics	13	4	9
Biophysics	6	7	7
Nuclear Physics	5	4	5
Optics & Photonics	4	5	5
Atomic & Molecular	4	4	4
Relativity & Gravitation	4	2	3
Materials Science	2	3	2
Plasma & Fusion	3	1	2
Applied Physics	1	3	2
Other	11	10	10
N	929	920	1,849

Data are limited to doctoral seeking students at PhD-granting departments.

<http://www.aip.org/statistics>

Eighty-one percent of first-year physics graduate students enrolled in a PhD-granting department had chosen which research specialty they would pursue.

U.S. students were 3 times more likely to specialize in astrophysics than non-U.S. students.

The degree program for students pursuing a physics PhD requires them to choose a research field in which to specialize. This does not hold true for students enrolled in a master's program where 12% indicated that their degree program did not require a research specialty.

The subfield table above looks at research specialties of PhD seeking students enrolled at doctoral-granting physics departments. The data in the table was provided by students in the middle of their first-year of graduate study, and as a result, about a fifth of the students had not yet chosen a field in which to specialize. Condensed matter was the subfield most frequently chosen regardless of citizenship but pursued by a larger percentage of non-U.S. students than U.S. students.

Overall, 35% of PhD students who had chosen a subfield indicated they were theorists. Non-U.S. students were more likely to be theorists than U.S. students, 45% and 28% respectively.

First-year students were asked where they would like to be employed 10 years after receiving their highest physics degree. Because these students are just beginning their graduate education many were undecided concerning which career path they planned to pursue in the future. It is likely that even students with career goals in mind will modify those goals as they progress through graduate school.

There is a difference in aspirations between U.S. and non-U.S. citizens. While many U.S. and non-U.S. citizens aspire to work in an academic setting, a greater proportion of the U.S. citizens aspired to positions at 2- or 4-year colleges.

When asked if they planned to pursue their career in the United States, about half of non-U.S. students indicated they were unsure. Of those indicating a preference, three-quarters indicated they hoped to pursue their career goals in the U.S.

Table 5

Preferred Future Employment Sector of First-Year Graduate Students in the U.S., Fall 2007 and Fall 2009 Combined.

<u>Employment Goals</u>	<u>Highest Anticipated Degree</u>		<u>Citizenship</u>	
	MS %	PhD %	U.S. %	Non-U.S. %
Unsure	19	18	20	16
University	6	46	33	55
Private Sector	34	15	16	17
National Lab or Gov't	18	11	15	7
2 or 4-Year College	5	8	12	3
Medical, Hospital	15	2	3	2
Other	3	-	1	-
N	124	1,999	1,077	1,023

Almost half of PhD-seeking first-year physics students aspire to work in a university setting.

<http://www.aip.org/statistics>

Survey Methodology

Each fall the Statistical Research Center conducts its Survey of Enrollments and Degrees, which asks all degree-granting physics and astronomy departments in the U.S. to provide information concerning the numbers of students they have enrolled and counts of recent degree recipients. In connection with this survey, we ask for the names and contact information for students currently enrolled in their graduate program. Seventy-three percent of the departments provided contact information for their graduate students.

The majority of the data in this *focus on* comes from physics and astronomy students who were identified as being new to a department in the academic years 2007-08 and 2009-10. An initial invitation to participate in the survey was sent to the students in April of their first year at a department. Non-responding students were contacted with up to three additional invitations. Respondents were considered first-year students if they had completed one or fewer years of graduate study at the department they were currently attending regardless if they had been previously enrolled at a different graduate-level program either within or outside the U.S.

According to the findings from the Survey of Enrollments and Degrees, there were 3,069 first-year physics students enrolled in the fall of 2007 and 3,089 in the fall of 2009. We received usable survey responses from 37% of the total number of first year students in the two academic years that were the focus of this study. Taking into account the proportion of students we did not have contact information for, we had a survey response rate of approximately 52%

In this report the notation “N” represents the number of individuals for whom we had data on a particular item.

We thank the many physics and astronomy departments and graduate students who made this publication possible.