DOCUMENT RESUME

ED 423 744 HE 031 538

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TITLE Bachelor's Degree Recipients Report, 1997.
INSTITUTION American Inst. of Physics, College Park, MD. Education and Employment Statistics Div.
REPORT NO AIP-R-211.29
PUB DATE 1998-09-00
NOTE 10p.
AVAILABLE FROM American Institute of Physics, One Physics Ellipse, College Park, MD 20740-3843; phone: 301-209-3070.
PUB TYPE Collected Works - Serials (022) -- Reports - Evaluative (142)
JOURNAL CIT AIP Report; Sep 1998
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Astronomy; *Bachelors Degrees; College Outcomes Assessment; College Seniors; Decision Making; Employment Potential; Graduate Study; Higher Education; Labor Market; Majors (Students); *Physics; Student Financial Aid; Student Surveys
IDENTIFIERS *American Institute of Physics

ABSTRACT

This report analyzes data on bachelor's degree recipients in physics or astronomy in 1997. Data are from a survey of senior-level physics majors (n=1,696) and the American Institute of Physics' Enrollments and Degrees Survey, and include text, tables, and graphs. The report notes that: (1) the number of undergraduates who received bachelor's degrees in physics continued to decline; this class total (3,826) was 8 percent lower than in the previous year and 24 percent lower than in 1989; (2) the decline in undergraduate degrees granted has been three times as great at departments that also offer graduate-level degrees as at departments offering only undergraduate degrees; (3) almost one-third of bachelor's degree recipients reported a double major, with mathematics most commonly the other field; (4) 41 percent of degree recipients entered directly into the job market and 53 percent planned advanced study; (5) historically, although over half of newly conferred bachelors degree recipients entered graduate school immediately, in this class 33 percent planned further studies in physics and 20 percent planned further study in other fields; (6) median starting salary for 1997 graduates was $34,800, an increase of 12 percent over the previous year; and (7) of students planning advanced study, only 4 percent anticipated relying primarily on their own funds. (DB)

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HIGHLIGHTS

▸ The number of undergraduates receiving physics bachelor's degrees in the US continues to decline. The class of 1997 total (3,826) declined 8% from the previous year and 24% from the recent high in 1989. See **Figure 1**.

▸ The decline in physics bachelor's degree production has not been uniform across department type. Since 1989, the drop at departments that also offer a physics graduate program has been three times as great as at departments only offering an undergraduate degree in physics. See **Figure 2**.

▸ Almost one-third of the physics bachelor's recipients indicated that they had received a double major, with mathematics being the most common other field. See **Table 4**.

▸ While forty-one percent of physics bachelors entered directly into the job market after graduation, 60% of them indicated plans to pursue advanced study in the future. Of those degree recipients deferring their graduate study plans for a year or two, one-third are anticipating their field of study to be physics. See **Figure 6**.

▸ Historically, over half of newly conferred physics bachelors choose to immediately enter graduate school. For the class of 1997, 33% planned to pursue studies in physics or a related field and 20% chose to pursue other disciplines, with engineering being the most common non-physics field. See **Figure 6**.

▸ The median starting salary for 1997 physics bachelors with civilian employment was $34,800. This reflects an increase of 12% from the previous year and 29% over three years. This follows a period in the early 1990s when the job market was very tight and starting salaries for physics bachelors experienced little change.

▸ Physics bachelor's degree recipients planning to enter directly into physics graduate studies continue to be well supported, with only 4% anticipating the need to rely primarily on their own funds to support their education. See **Table 5**.

The number of physics bachelor's degrees conferred by the 761 degree-granting physics departments in the class of 1997 was 3,826, an average of five per department. Undergraduate physics degree production has been dropping steadily in recent years, and has now reached a 40 year low. In an attempt to avoid departmental reductions or consolidations, physics faculty have been looking for ways to recruit additional majors or expand the service component of their departments.

Will physics undergraduate degree production continue to fall? Data at the junior level suggests that the declining enrollments may have started to level off. With the well-publicized demand for graduates with computer and technical training as well as rising starting salaries for physics bachelors, undergraduate physics programs may be able to increase enrollments in the coming years.

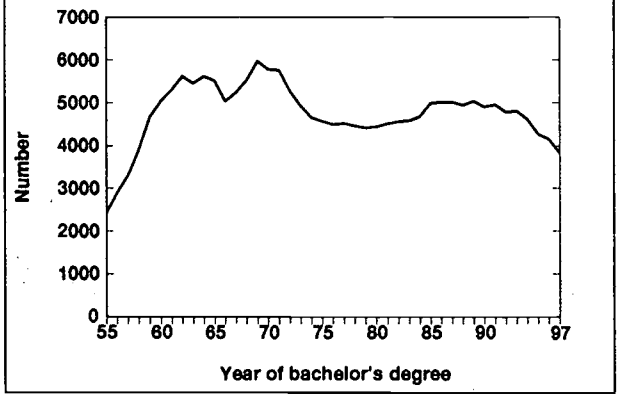
The data in this report are based on responses to a survey sent to senior-level physics majors at the end of their final academic year. Completed questionnaires were received from 1,696 physics bachelor's recipients who earned their degrees at US institutions between September 1996 and August 1997. This survey is part of an ongoing series that has been conducted by the American Institute of Physics (AIP) since the 1960s, documenting long-term trends in student characteristics and immediate postbaccalaureate plans.

The information in this report is supplemented with departmental data gathered in AIP's Enrollments and Degrees Survey. Single copies of the **Enrollment and Degree Report**, which incorporates information at all degree levels, are available free from the AIP Education and Employment Statistics Division. This report and data from other recent AIP reports can be found on our website http://www.aip.org/statistics.

BACKGROUND

▶ Bachelor degree production continues to fall with the degree class of 1997 declining 8% from the previous year (see **Figure 1**). In the eight years since 1989, which represents a recent high, the number of physics bachelors degrees awarded annually has declined 24%.

Figure 1. Physics bachelors production in the US, 1955 to 1997.

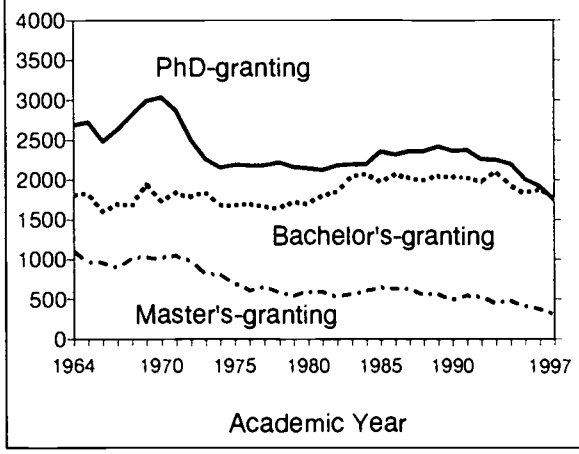


▶ Declines in undergraduate degree production have been far greater at departments which also offer graduate-level physics degrees. From the recent high in 1989, the decline in physics bachelor's degree production at master's- and doctoral-granting departments has been 52% and 28% respectively, whereas

the decline has only been 11% at departments that offer only a physics bachelor's degree (see **Figure 2**).

▶ The number of bachelor's degrees produced varies greatly by the type of physics program offered at a department. For the class of 1997, the 182 PhD-granting physics departments averaged two and a half times as many undergraduate physics bachelors per department as the 504 schools offering only a physics bachelor's degree.

Figure 2. Physics bachelor's degrees awarded by department type, 1964-1997.



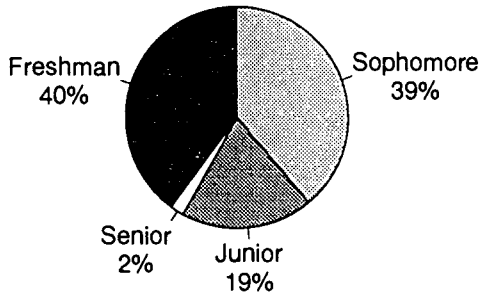
▶ The likelihood of going on to a physics bachelor's degree is much greater if the individual has taken a physics course while in high school. Ninety-two percent of the physics bachelor's degree recipients in the class of 1997 indicated they had taken a high school physics course. This compares with 24% of all the high school seniors four years earlier (**see Table 1**).

Table 1. Types of high school physics taken.

Types of Physics taken	1993 All High School Seniors %	1997 Physics Bachelors %
Advanced placement	1	29
General	23	63
None	76	8
Total	100%	100%
	2.9 Million	3,826

▶ Only one-fifth of the graduating class of 1997 had not declared their major as physics by the end of their sophomore year. **Figure 3** illustrates the points at which this year's physics bachelor's degree recipients formally declared physics as their major.

Figure 3. Year in college that physics bachelors formally declared physics as their major, class of 1997.



▶ Of the physics bachelor's class of 1997, 30% had declared a major in another subject prior to choosing physics. Of the students who changed their major to physics, almost half had previously chosen engineering (see **Table 2**).

Table 2. Initial major of physics bachelors, class of 1997.		
Physics	70%	
Other	30%	%
	Engineering	48
	Other physical sciences	13
	Mathematics	12
	Life science	5
	Computer Science	5
	Other	17

▶ The proportion of women among undergraduate physics degree recipients has been increasing slowly. Women represent 19% of the physics bachelors in the class of 1997. **Table 3** presents the demographic make-up of this year's physics bachelors.

Table 3. Demographic characteristics* of physics bachelors, class of 1997.	
	%
Gender	
Male	81
Female	19
Citizenship	
US	93
Foreign	7
*Race / Ethnicity***	
White	87
Black	5
Asian	4
Hispanic	2
Other	2

*Data from the AIP Enrollment and Degree Report.

**Breakdown for US citizens only.

▶ Sixty percent of all African-Americans who received physics bachelor's degrees in the class of 1997 earned them from the nation's thirty-four historically black colleges and universities that have degree-granting physics departments. In other words, only about 75 African-Americans earned physics bachelors from the 727 other departments.

▶ Undergraduate study in physics requires students to take a considerable amount of coursework in mathematics. Consequently, many physics majors use this to their benefit and obtain a second major or a minor in the subject. Overall, 31% of the 1997 physics bachelor's recipients earned a double major, and 41% minored in another field. (see **Table 4**).

Table 4. Other academic awards of new physics bachelors, class of 1997.			
Graduating			%
with a double major	31%	Mathematics	40
		Engineering	12
		Computer sci.	6
		Chemistry	6
		All others	36
Graduating with a minor	41%	Mathematics	53
		Engineering	4
		Computer sci.	4
		Chemistry	3
		All others	36

POSTBACCALAUREATE PLANS

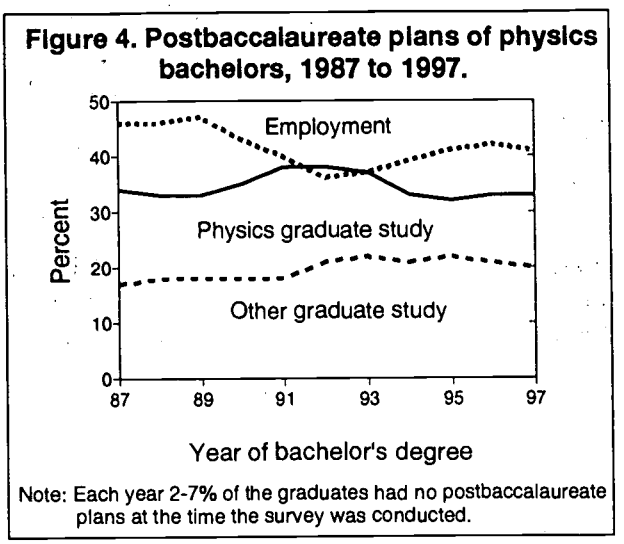


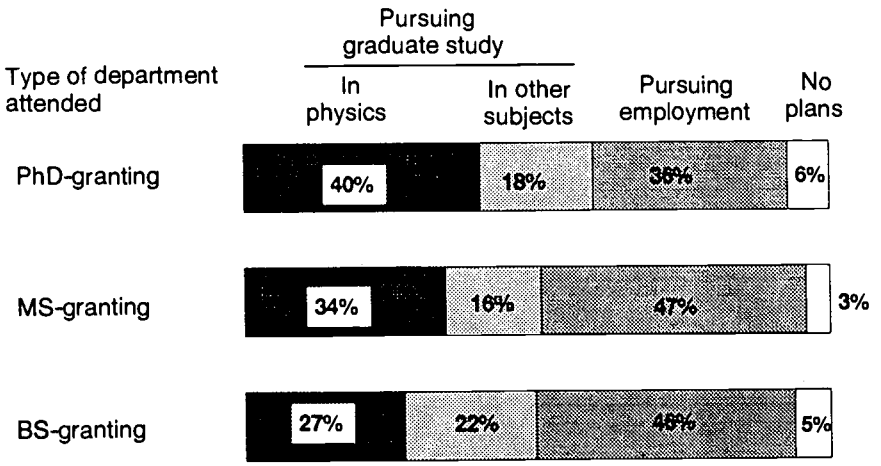
Figure 4. Postbaccalaureate plans of physics bachelors, 1987 to 1997.

Note: Each year 2-7% of the graduates had no postbaccalaureate plans at the time the survey was conducted.

▶ During the last few years there has been virtually no change in the postbaccalaureate plans of physics bachelors (see **Figure 4**). In 1997, 53% of the physics bachelors planned to enter graduate study immediately upon receiving their degree. Thirty-three percent chose to continue in physics, astronomy or a related field and 20% planned to pursue studies in other subjects.

▶ As in the past, 1997 bachelor's recipients who attended departments that also had graduate programs in physics were more likely to matriculate into graduate study in physics than those attending an institution that offers only a bachelors in physics (see **Figure 5**). Forty percent and 34% of the undergraduates at doctoral- and master's-granting departments, respectively, went directly into physics graduate studies, compared to only 27% of the students from departments where the highest physics degree available was the bachelors.

Figure 5. Postbaccalaureate plans of physics bachelors by type of undergraduate department, class of 1997.



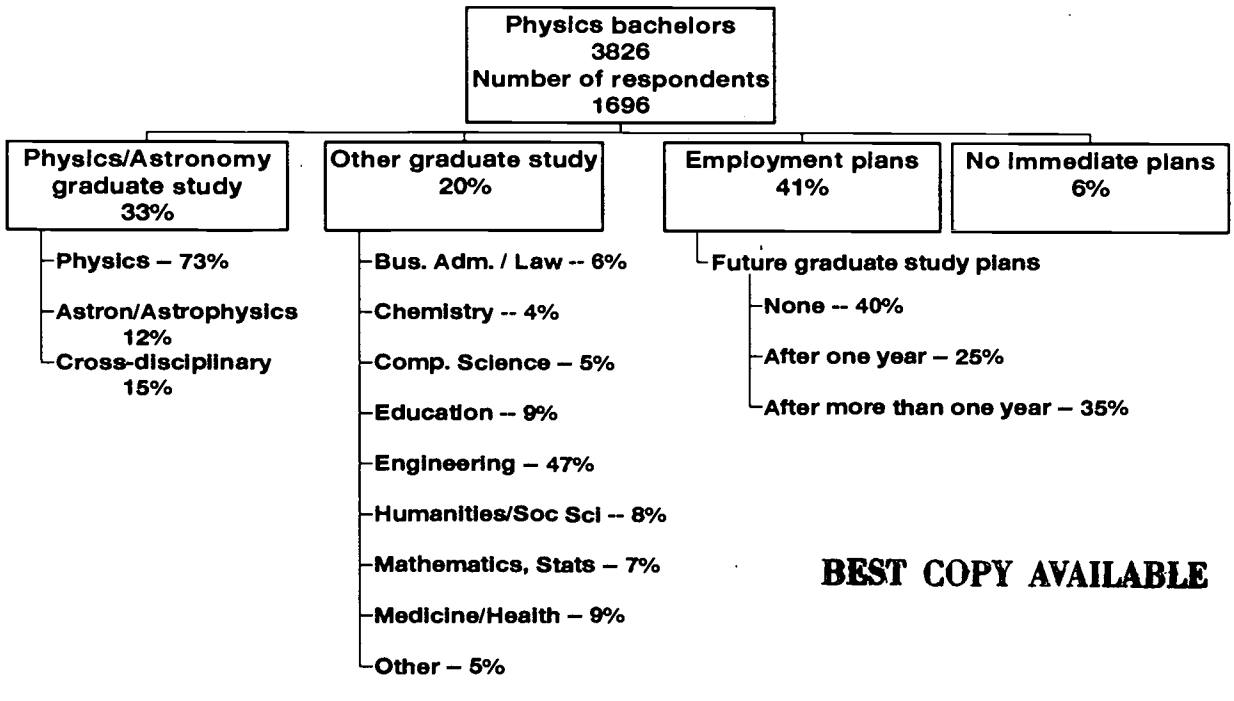
▶ Two-thirds of the physics bachelor's class of 1997 indicated that their undergraduate studies involved a research component that went beyond their course work requirements. These degree recipients were more than twice as likely to immediately pursue graduate studies in physics as those who did not have undergraduate research experience.

▶ Physics bachelor's degree recipients traditionally have pursued graduate study in a wide range of disciplines. For those choosing not to continue in physics, engineering remains by far the most popular field of study (see **Figure 6**).

▶ Sixty percent of the degree recipients in the class of 1997 who planned to enter directly into the job market upon receiving their degree indicated an intention to pursue graduate study after a respite of a year or more. Over one third of these students plan to continue their studies in physics (see **Figure 6**).

▶ Teaching assistantships continue to be the dominant source of support for bachelor's recipients planning to enter their first year of graduate study in physics (see **Table 5**). Only 4% anticipate needing to support themselves

Figure 6. Postbaccalaureate plans of physics bachelors, class of 1997.



primarily from their own funds. The level of support for those switching to graduate study in other fields is less generous, leaving 36% to rely mainly on their own resources.

Table 5. Primary sources of anticipated support for students planning to begin graduate study in the fall, class of 1997.

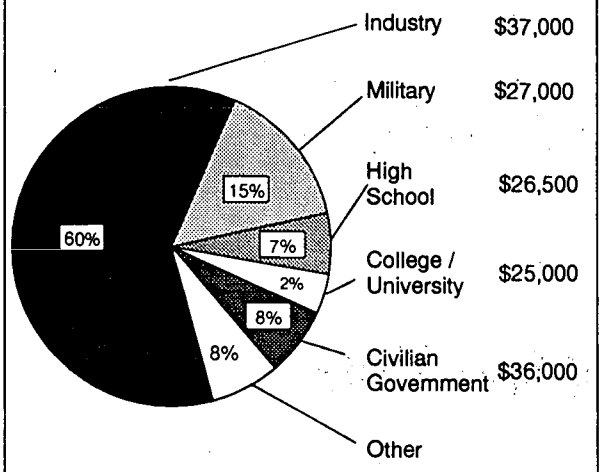
	Phys/Astr Graduate Study %	Other Graduate Study %
Teaching Asst.	54	25
Research Asst.	16	16
Fellowship	25	17
Self-financed*	4	36
Other	1	6

*Self-financed includes funds from: employment, family, savings and loans.

▶ As has historically been true, industry remains the predominant employer for new physics bachelor's degree recipients who go directly into the job market. **Figure** 7 illustrates the employer distribution and starting salaries for degree recipients holding full-time potentially permanent employment.

▶ The overall median starting salary for the 1997 physics bachelors who secured full-time, potentially permanent, civilian employment was $34,800. This represents an increase of 12% from the previous year and 29% from the class of 1994. This follows a period of stability in the early 1990s, when starting salaries for physics bachelors experienced little change.

Figure 7. Employer distribution and median starting salaries for full-time employed physics bachelors, class of 1997.



Note: Graph only includes degree recipients who indicated their positions were potentially permanent.

ASTRONOMY

▶ The 69 degree-granting astronomy departments in the US conferred 177 astronomy bachelor's degrees on the class of 1997. About half of these departments are "stand-alone", devoted strictly to astronomy, and half are administered in connection with a physics department.

▶ The representation of women among astronomy bachelor's degree recipients continues to be greater than for physics. Women made up 33% of the graduating astronomy seniors in the class of 1997, compared with only 19% for physics (see **Table 6**).

▶ As was also the case for physics bachelors, virtually all astronomy degree recipients indicated that they took physics in high school (see **Table 6**).

▶ Over two-thirds of the astronomy bachelor's recipients graduated with a double major, the majority of which were in physics. Of the 33% of astronomy degree recipients who earned a minor in another subject, almost half were in mathematics (see **Table 6**).

Table 6. Background and educational characteristics of astronomy bachelors, class of 1997.

	%
*Gender**	
Male	67
Female	33
*Citizenship**	
US	91
Foreign	9
Took HS Physics	
Yes	96
No	4
Graduating with a double major	
Yes	62
No	38
Graduating with a minor	
Yes	33
No	67

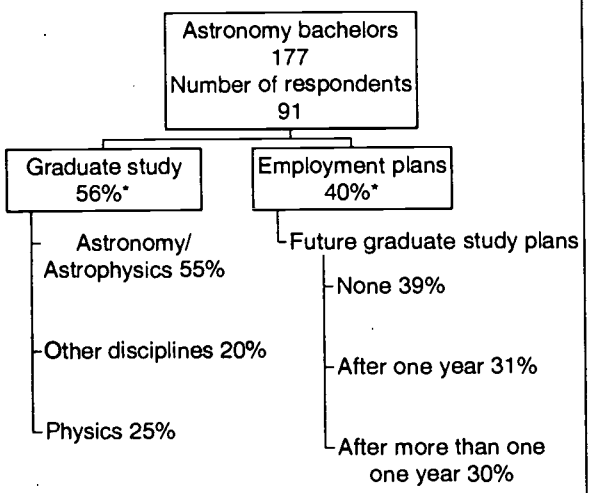
* Data from the AIP Enrollment and Degree Survey

▶ As in past years and similar to physics bachelors, graduate study has been the predominant postbaccalaureate choice for astronomy bachelors, with 56% choosing this path in 1997. Over half of these students are continuing their studies in the fields of astronomy or astrophysics and another quarter chose to pursue physics (see **Figure 8**).

▶ However, of the astronomy bachelor's degree recipients (40%) who chose to enter directly into the job market, 61% also indicated they intended to continue with graduate study in the future. Over half of these degree recipients who were planning to enter graduate study after a delay said they intended to continue in astronomy or physics (see **Figure 8**).

▶ Industry employed the largest proportion (roughly 1/3) of the new astronomy degree recipients who immediately entered the job market upon receiving their degree. Over half of all employed astronomy bachelors indicated they were continuing to look for other employment at the time the survey was completed.

Figure 8. Postbaccalaureate plans of astronomy bachelors, class of 1997.



* Four percent of the Astronomy bachelors indicated they had no immediate plans at the time the survey was completed.

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