DOCUMENT RESUME

ED 395 537 HE 029 191

AUTHOR Mulvey, Patrick J.; Dodge, Elizabeth
TITLE 1994 Bachelors Degree Recipients Report.
INSTITUTION American Inst. of Physics, College Park, MD. Education and Employment Statistics Div.
REPORT NO AIP-R-211-26
PUB DATE Apr 96
NOTE 14p.
AVAILABLE FROM American Institute of Physics, Education and Employment Statistics Division, One Physics Ellipse, College Park, MD 20740-3843.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Astronomy; *Bachelors Degrees; Blacks; *College Graduates; *Employment Opportunities; *Employment Patterns; *Graduate Study; Higher Education; Hispanic Americans; Minority Groups; *Physics; Womens Education

ABSTRACT

This report summarizes trends in the postbaccalaureate plans and number of physics and astronomy degree recipients for 1994. Study data were drawn primarily from the questionnaire responses of 2,158 physics bachelors and 113 astronomy bachelors. Matriculation rates, employment prospects, course of study, and demographics for these disciplines are presented. The study shows that the number of bachelors degrees declined, continuing a five year trend fueled by the poor job market for physics graduates. Fewer students are entering graduate study in physics, choosing instead to enter the job market. Post-degree plans are compared across gender, citizenship status, and racial and ethnic background. African-Americans and Hispanics continue to be underrepresented among physics bachelors, and there are more women among astronomy bachelors than physics bachelors. The employer distribution of full-time employed physics bachelors during the summer following the academic year, 1989 to 1994, is reported, as is a breakdown in employment trends by gender. (JPB)

AMERICAN INSTITUTE OF PHYSICS
One Physics Ellipse
College Park, MD 20740-3843

EDUCATION AND EMPLOYMENT STATISTICS DIVISION

Tel. (301) 209-3070

AIP Pub No. R.211.26

April 1996

by Patrick J. Mulvey
Elizabeth Dodge

1994 BACHELORS DEGREE RECIPIENTS REPORT

AIP REPORT

One Physics Ellipse
College Park, MD 20740-3843

EDUCATION AND EMPLOYMENT
STATISTICS DIVISION

Tel. (301) 209-3070

by Patrick J. Mulvey
Elizabeth Dodge

AIP Pub No. R.211.26

April 1996

1994 BACHELORS DEGREE RECIPIENTS REPORT

HIGHLIGHTS:

- The number of bachelors degrees continues to decline slowly, dropping a total of 8% over the last five years.
- Postbaccalaureate plans for physics bachelors are shifting, with fewer opting for graduate study in physics and more entering directly into the job market.
- Degree recipients intending to pursue graduate study in physics and astronomy continue to be well supported, with 89% receiving teaching assistantships, research assistantships, or fellowships.
- The proportion of women among astronomy bachelors (25%) continues to be greater than among the physics bachelors (17%)
- The majority of physics bachelors diversify their studies, with 57% graduating with either a double major or a minor, most commonly in math.
- Secondary school continues to rise as an initial employer for recent physics bachelors.
- The median starting salary for physics bachelors in the class of 1994 was $27,000, unchanged from last year.

Undergraduate physics degrees are on the decline. The number of junior physics majors has dropped 13% since 1992, bringing 1995's total to a level not seen since the 30-year low reached around 1980. Though many factors may be influencing this decline, the most obvious is the poor job market in physics. The initial job market for physics bachelors remains well below what existed in the 1980s. Compared with a decade ago, a higher proportion of physics bachelors are still seeking employment several months after graduation. Those who have found jobs are taking longer to secure that first position and are less likely to receive multiple offers of

employment than the bachelors of the 1980s. Furthermore, employment prospects for physics doctorates continue to look bleak, possibly discouraging students who otherwise may have entered an undergraduate program intending to pursue that higher degree. It is difficult to predict how long this decline will continue, but until the outlook for physics employment improves, the trend is likely to persist.

The American Institute of Physics (AIP) has been surveying new physics and astronomy bachelors degree recipients at the end of each academic year for almost 30 years. The report series has established a basis for making historical comparisons and the evaluation of current trends. The findings in this report are primarily based on the information contributed by 2158 out of a total of 4615 physics bachelors and 113 out of 203 astronomy bachelors in the class of 1994. Their responses are supplemented by data on all the bachelors degree recipients provided by department chairpersons in the AIP survey of Enrollments and Degrees. (Single copies of the report covering that survey are available free from this division.)

The breadth of training these undergraduates receive allows them to pursue a very diverse set of career paths. This report focuses on the students' three main career paths: physics or astronomy graduate study; graduate or professional study in another field; and employment. Comparisons across these three career paths will include the background characteristics of the students, the departments from which they graduate, and other features of their educational experiences. It should be noted that 31% of the bachelors who indicated they intend to enter directly into the labor force also stated that they anticipated entering graduate study in one year, half of them indicating physics as their future discipline.

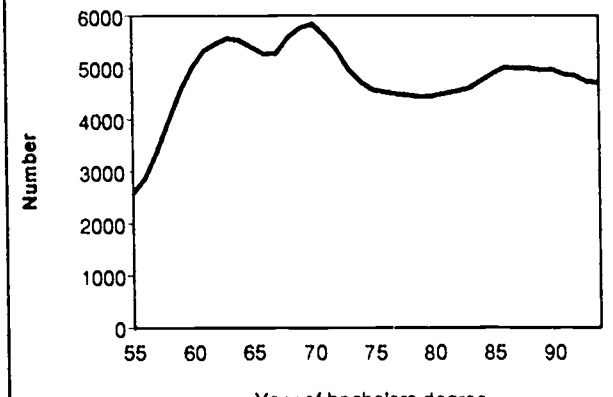
➤ The number of undergraduate degrees granted in physics has declined 8% during the last five years (**Figure 1**). This decline is expected to continue, at least in the short term, as the number of junior-level physics majors also declined in 1994 from the previous year.

➤ The decline is occurring at physics departments of all types but has been greater at the departments that also offer graduate degrees (9%) than at the four-year colleges (6%).

➤ The 4615 physics bachelors degrees granted in the 1993-94 academic year comprised less than one half of one percent of all bachelors degrees conferred that year in this country.

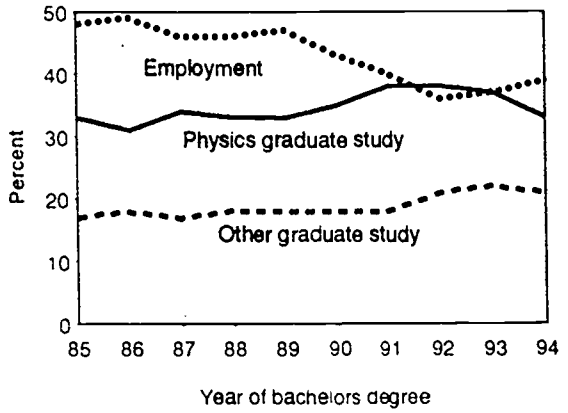
➤ After three years of approximate parity, the plans of recent bachelors to enter immediately into the job market appears once again to be more popular than plans to go on directly to graduate study in physics. (**Figure 2**)

Figure 1. Physics bachelors production in the US, 1955 to 1994.



Note: Degrees are reported using three-year averages.

Figure 2. Postbaccalaureate plans of physics bachelors, 1986 to 1995.



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

➤ In the class of 1994 women and men opted to immediately pursue graduate study in roughly equal proportions (**Table 1**). Women, who have historically been underrepresented among physics students, have registered slow gains in recent years. Their overall share of physics bachelors degrees is 17% for the class of 1994, up only slightly from 14% a decade ago.

➤ Non-US students obtaining a bachelors degree in physics from US institutions have very different postbaccalaureate plans depending on the type of visa they hold. Degree recipients on temporary visas are more likely to pursue graduate study in physics than their counterparts with permanent resident status. In contrast, a larger percent of degree recipients with permanent residence status pursue employment, an option their visa more easily allows. (**Table 1**)

➤ Half of the bachelors with foreign citizenship (permanent residents and temporary visas) come from Asia. This is still considerably less than the Asian representation (70%) among the foreign students receiving physics PhDs in this country for the same year.

Table 1. Demographic characteristics of new physics bachelors by postbaccalaureate plans, class of 1994.

	Sex		Citizenship		
Post-degree Plans	**Men** %	**Women** %	**US** %	**Permanent Resident** %	**Temporary Visa** %
Physics graduate study	33	30	33	28	49
Other graduate study	21	21	20	24	27
Employment	39	42	41	34	17
Undecided	7	7	6	14	7
	100%	100%	100%	100%	100%
Total	3823	792	4283	148	184
	83%	17%	93%	3%	4%

Table 2. Type of institution attended by selected racial and ethnic backgrounds for physics bachelors with US citizenship, class of 1994.				
Type of Bachelors institution	African-American %	Asian-American %	Hispanic %	White %
Public	58	41	60	60
Private	42	59	40	40
	100%	100%	100%	100%
PhD-granting	28	71	57	48
Masters-granting	16	3	15	10
Bachelors-granting	56	26	28	42
	100%	100%	100%	100%
Total	180	163	103	3775
	4%	4%	3%	88%

➤ The median age for all physics bachelors in the class of 1994 was 22. The sub-group of degree recipients entering directly into the job market had a median age of 23.

➤ An especially high proportion of Asian-Americans went to departments that offered a PhD. African-Americans and Hispanics continue to be severely underrepresented among the physics bachelors (**Table 2**). Of the 180 African-Americans who graduated in the class of 1994, 54% graduated from the 30 physics departments at historically black colleges and universities.

Table 3. Types of high school physics taken nationally in 1990 and the physics bachelors, class of 1994.		
Types of physics taken	**High school seniors 1990 %**	**Physics bachelors 1994 %**
Advanced placement	1	27
General	20	65
None	79	8
Total	100%	100%
	2.8 Million	4615

➤ While only 21% of all high school seniors in 1990 took a physics course, 92% of the class of 1994 physics bachelors had taken physics in high school (**Table 3**). Physics bachelors who had taken physics in high school were more likely to continue with graduate study in physics (34%) than those who did not (26%).

➤ About 10% of physics bachelors degree recipients have historically started their undergraduate education at a 2-year institution. Degree recipients transferring from a 2-year institution were more likely to enter directly into employment than those who enter four-year institutions directly after high school. (**Table 4**)

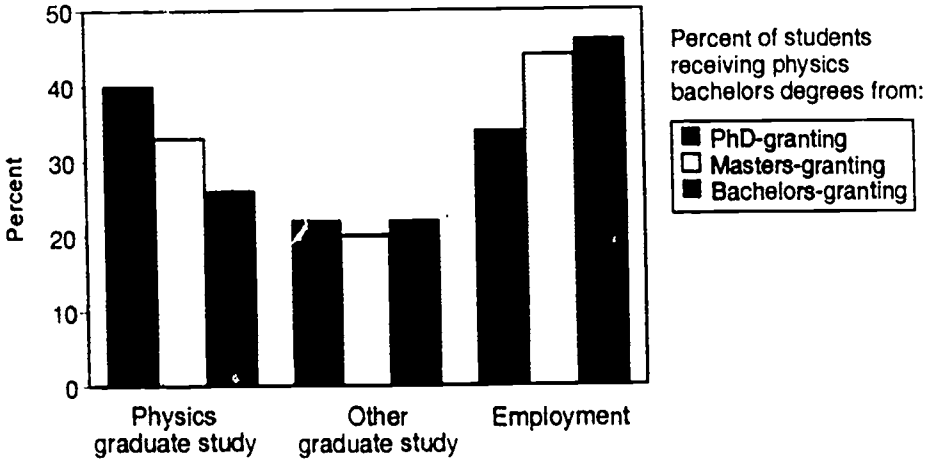
➤ A larger percentage of physics bachelors graduating from PhD-granting departments choose to continue with graduate study in physics than is the case for those graduating from masters departments and even more so than for those graduating from departments only offering a bachelors degree. (**Figure 3**)

Table 4. Postbaccalaureate plans of physics bachelors by whether student transferred from a two-year college, class of 1994.

	Transferred %	Did not Transfer %
Physics graduate study	28	33
Other graduate study	12	22
Employment	54	38
Undecided	6	7
Total	476 10%	4139 90%

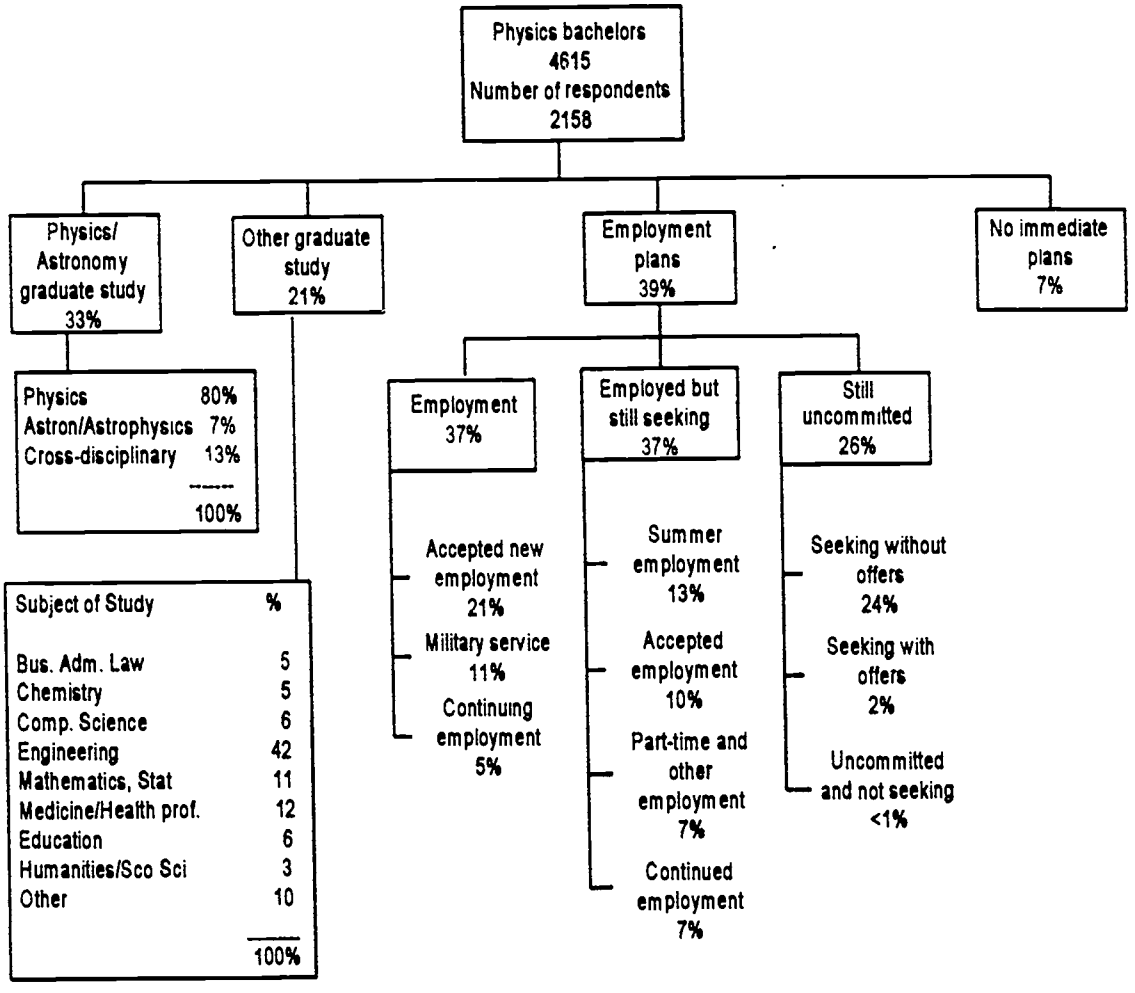
➤ Though representing only 25% of the degree-granting physics departments, the PhD-granting departments produce about 50% of the physics bachelors degrees.

Figure 3. Postbaccalaureate plans of physics bachelors by type of undergraduate institution, class of 1994.



Note: Seven percent of the physics bachelors had not decided upon a postbaccalaureate plan at the time the survey was conducted.

Figure 4. Postbaccalaureate plans of physics bachelors, class of 1994.



➤ Not only has the proportion of students intending to enter directly into graduate study in physics declined in 1994, but within this group a larger proportion are choosing a cross-disciplinary area of physics, such as geophysics, applied physics, lasers or optics. (**Figure 4**)

➤ Though the percent of physics bachelors who were still uncommitted at the end of the academic year is similar to last year, a larger percentage of the employed degree recipients are in positions from which they are continuing to seek other employment. (**Figure 4**)

➤ Though engineering is the most popular graduate study discipline for students who are not planning to continue with physics, advanced degrees in virtually all disciplines are pursued by physics bachelors. (**Figure 4**)

Table 5. Educational characteristics of new physics bachelors by postbaccalaureate plans, class of 1994.

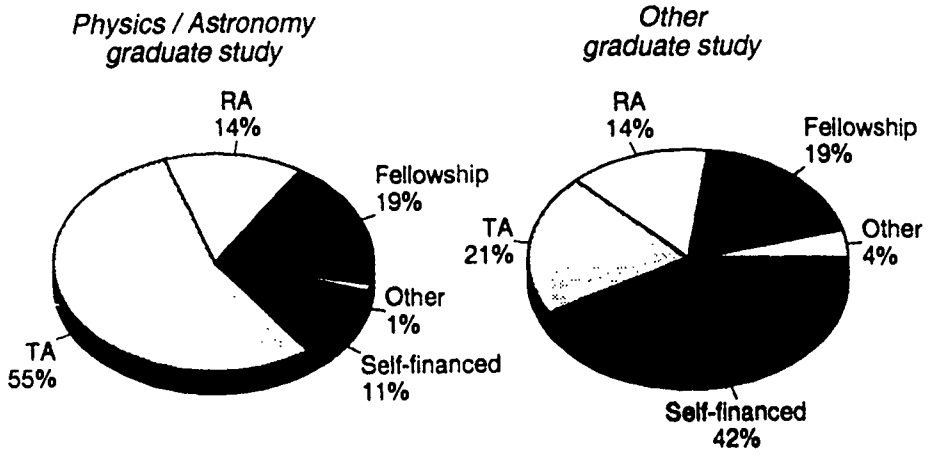
	Graduating with a double major		Graduating with a minor	
	Yes %	No %	Yes %	No %
Physics graduate study	33	33	34	33
Other graduate study	31	17	18	22
Employment	30	43	41	38
Undecided	6	7	7	7
Total	1292	3323	1615	3000
	28%	72%	35%	65%

➤ Over half of all physics bachelors also have a major or a minor in another field. Degree recipients graduating with a double major are more likely to pursue graduate study in a subject other than physics than those who majored only in physics. (**Table 5**)

➤ For physics bachelors with a double major, the most common other majors were mathematics (45%) and engineering (17%). Men and women obtain a double major in nearly equal proportions.

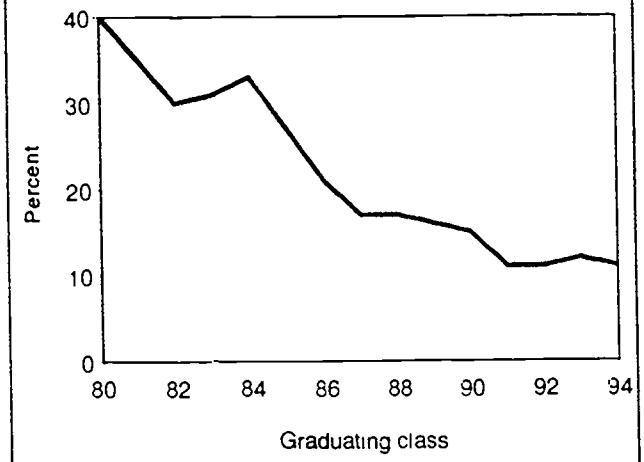
➤ Physics graduate study continues to be well-funded. Only 11% of the bachelors planning to continue immediately with graduate study in physics anticipate needing to use their own funds. This compares with 42% of the students choosing to enter a field other than physics (**Figure 5**). However, among students planning to study physics in a department offering the masters as its highest degree, the proportion anticipating needing to use their own funds rises to 22%.

Figure 5. Sources of anticipated support for students planning to begin graduate study in the fall, class of 1994.



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

Figure 6. Percent of physics bachelors who received multiple job offers classes 1980 to 1994.



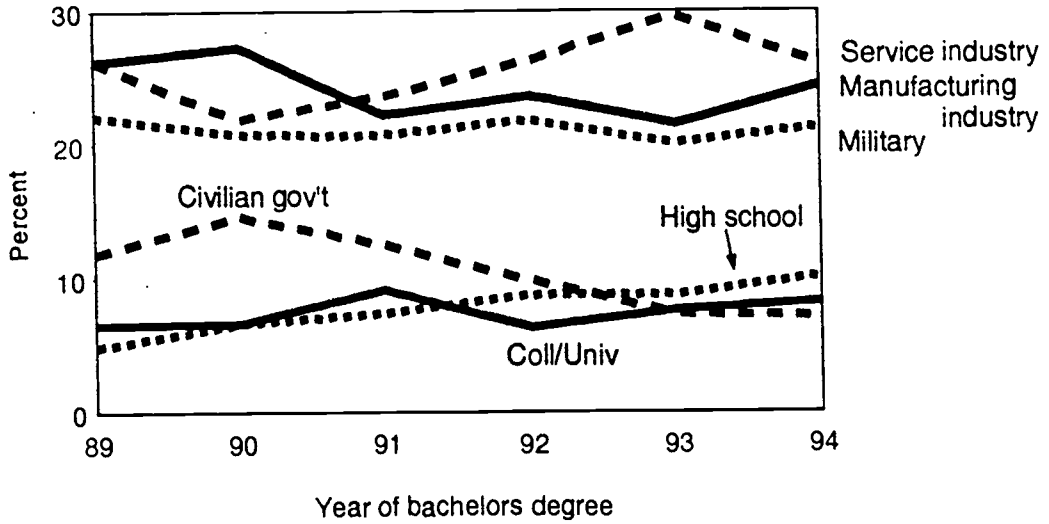
Note: Data are based on those physics bacnelors who planned to enter labor force after obtaining their degree.

➤ The anticipated funding for students planning to enter graduate study in disciplines other than physics vary greatly by field. 17% of the students planning to study mathematics, computer and physical science anticipated needing to self-finance their studies, whereas for engineering the figure was 43% and for medicine it was 69%.

➤ Women choosing to enter graduate study, regardless of the field of study, were twice as likely as the men to receive a fellowship. Approximately 50% of the African-Americans and Hispanics entering graduate study in physics anticipate receiving fellowships, compared with only 16% for whites.

➤ Of the bachelors entering directly into the labor force, the percentage who receive multiple job offers continues to remain low at 11%. This compares with a third or more back in the early 1980s. (**Figure 6**)

Figure 7. Employer distribution of full-time employed physics bachelors during the summer following academic year, 1989 to 1994.



Note: Graph includes students continuing employment which they held prior to graduation and excludes students holding positions considered to be summer employment.

Table 6. Employment sector of full-time employed physics bachelors by gender, class of 1994.							
	High School %	College/ University %	Manufacturing Industry %	Service Industry %	Civilian Gov't %	Military %	Other %
Women	20	14	24	21	10	11	-
Men	7	7	23	26	6	28	3

➤ At the end of the 1994 academic year, 12% of the employed physics bachelors, excluding summer positions, were employed only part-time. The majority of these part-time jobs were positions the degree recipients had started before graduation.

➤ Among the physics bachelors who indicated they held full-time, non-summer employment, 20% stated they were continuing in jobs they had started before graduation and 17% indicated their positions were temporary.

➤ Industry remains the major employer for new physics bachelors, employing about 50% of the degree recipients who held full-time, non-summer employment upon completing their degrees. The two components of the industrial employment sector, manufacturing and service, employ an equal share of the recent degree recipients. (**Figure 7**)

➤ One indirect measure of job satisfaction is whether an individual holding a full-time, non-summer position continues to seek other employment. For the degree recipients in service industry positions, almost half indicated they were still seeking employment, while for degree recipients holding manufacturing industry positions, the proportion still seeking was a third. One-fourth of the degree recipients in industrial positions, regardless of type, indicated they were continuing positions they held prior to receiving their degree.

➤ The proportions of degree recipients in military positions after graduation has been stable at around 20% and are filled predominantly by men. (**Figure 7 & Table 6**)

➤ During the last five years, the proportion of physics bachelors accepting secondary school positions has doubled and now represents 10% of the employed physics bachelors. As has been historically true, women accept a disproportionate number of the secondary school positions. (**Figure 7 & Table 6**)

➤ For the degree recipients who are employed full-time (excluding summer positions) at a college or university, 38% indicated they were continuing employment which started prior to receiving their degree. However, two-thirds of the degree recipients at positions at colleges or universities indicated their positions were temporary and 44% were actively seeking employment at the time they completed the survey. Many of these positions may be stopgap measures or extensions of lab assistantships they held as students.

➤ Fewer than half of degree recipients employed in service industry state they make significant use of their technical training. By comparison, 70-90% of the respondents in all other sectors say they often use their scientific and technical training in their current positions. Despite differences in their use of training, salaries in the service and manufacturing sectors of industry were similar. (**Table 7**)

➤ The overall median starting salary (full-time, non-summer) for women ($26,000) was slightly lower than for men ($27,000). However, women were more likely to make significant use of their technical training (77%) than men (67%). Both of these differences result in part from the larger proportion of women who accept academic positions.

➤ On the whole, the median salary for physics degree recipients employed in newly-accepted positions ($27,000) was a little better than for those continuing in employment they had started prior to graduating ($25,000). This reflects the larger percentage of the degree recipients among the continuing employment group that indicated their positions were temporary. Women were more likely than men to indicate their full-time non-summer employment positions were only temporary, 26% to 20% respectively.

Table 7. Use of training and starting salaries for full-time employed physics bachelors, class of 1994.

Use of science / technical training*	High School %	College / University %	Manufacturing Industry %	Service Industry %	Civilian Gov't %	Military %
Extensive/ moderate	95	85	77	45	83	70
Little / none	5	15	23	55	17	30
Median starting salaries**	$22,500	$20,000	$30,000	$30,000	$27,000	$24,000

* Includes degree recipients in positions they started prior to receiving their degree.

** Salary data includes only newly accepted positions.

ASTRONOMY

➤ One quarter of the 203 astronomy bachelors in the class of 1994 were conferred to women (**Table 8**). Astronomy bachelors coming from PhD-granting departments were more likely to continue with graduate study than those graduating from four-year colleges.

➤ As was true for the physics bachelors, over half of the astronomy bachelors degree recipients in the class of 1994 graduated with either a double major or a minor (**Table 9**). The majority of the astronomy students with double majors chose physics as their other subject, reflecting the close connection between the two fields. The most popular minor was in mathematics, with about a third having received one in that subject.

Table 9. Educational characteristics of astronomy bachelors, class of 1994.

	Yes %	No %	Total %
Graduating with a double major	46	54	100
Graduating with a minor	29	71	100
Took high school physics	96	4	100

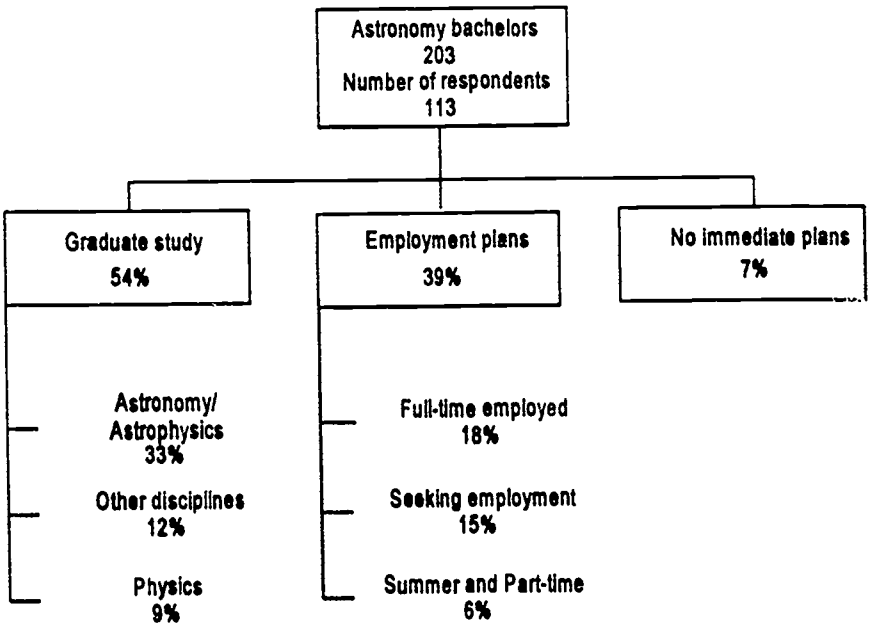
Table 8. Characteristics of astronomy bachelors, class of 1994.

Characteristics		Totals from Enrollment and Degrees Survey %
Sex	Female	25
	Male	75
Citizenship	US	96
	Foreign	4
Type of bachelors institution	PhD-granting	68
	MS-granting	7
	BS/BA-granting	25
	Public	66
	Private	34
Total number of Astronomy Bachelors		203

➤ Similar to the physics bachelors, over half of the astronomy bachelors in the class of 1994 anticipate continuing on immediately with graduate study. However, a much larger percentage of this group (77%) plan to pursue graduate study in either astronomy or physics. **(Figure 8)**

➤ Astronomy bachelors continuing with graduate study in astronomy or physics anticipated being well-supported, with only 5% stating they will need to use there own funds. This compares with 36% of the astronomy bachelors indicating graduate study in a subject other than physics or astronomy.

Figure 8. Postbaccalaureate plans of astronomy bachelors, class of 1994.



This report was prepared with the help of Starr Nicholson.