AMERICAN INSTITUTE OF PHYSICS

AIP REPORT

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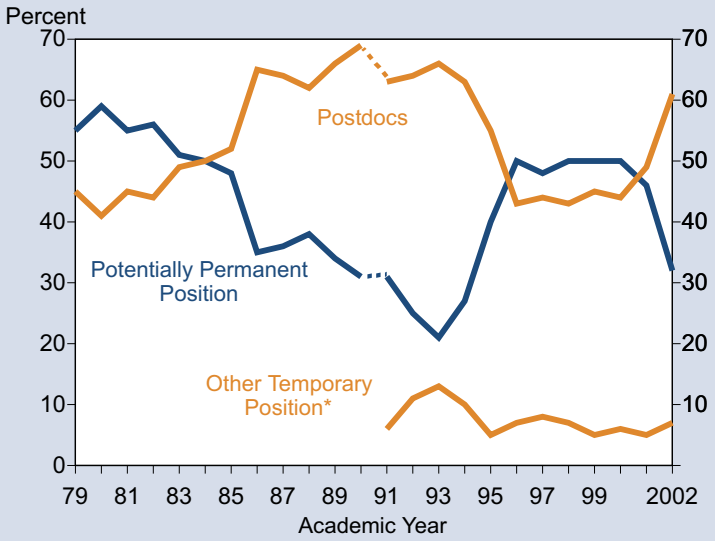
Initial Employment Report: Physics and Astronomy Degree Recipients of 2001 & 2002

Initial employment of physics PhDs, 1979 - 2002.



*In 1991, the survey questionnaire was changed to measure "other temporary" employment as a separate category.

AIP Statistical Research Center, Initial Employment Report.

Highlights

- The proportion of new physics PhDs taking postdocs has risen for the second consecutive year, with a significant increase among the degree recipients in the class of 2002. (see **Figure above**)
- The national laboratories tend to offer higher starting salaries than academia or private sector employers to physics PhDs accepting either potentially permanent positions or postdoctoral appointments. (**Figure 4**)
- Overall, physics PhDs are quite satisfied with the employment positions they had accepted. (**Table 4**)
- The proportion of physics bachelors securing employment in the private sector has declined in recent years with growth seen in the civilian government sector and in high school teaching positions. (**Figure 10**)

Highlights continued

- The field of employment for new physics bachelors working in the private sector has shifted recently, most likely in response to changing economic conditions, with fewer bachelors working in the fields of engineering and computer or information systems than during the late 1990's. (**Figure 11**)
- Physics bachelors working in civilian government positions or in the private sectors generally received the highest starting salaries. Even within the private sector salaries can vary greatly depending on whether or not the position is related to science or engineering. (**Figures 12** & **13**)
- Almost a third of the physics master's respondents continued with physics graduate study at another institution, and about an eighth continued with graduate study in other subjects (**Figure 15**). Foreign citizens were much more likely to pursue further physics graduate study than their American counterparts.
- Postdoctoral fellowships are the dominant post-degree outcome for new astronomy PhDs, comprising almost three-quarters of the combined classes of 2001 and 2002 (**Figure 19**). The median salary for new astronomers accepting postdocs in the academic sector is $41,800.

Upon receiving their degrees, physics and astronomy students face a wide variety of choices. These choices are influenced by personal factors such as long-term career goals, changes in field of interest, finance issues, and by socioeconomic factors, including the overall economic picture, and specific conditions in key employment sectors. This report will examine what physics and astronomy degree recipients were doing six months after the end of the academic year in which they received their degrees.

The information provided by the study's respondents demonstrates the diversity of initial outcomes. Many bachelor's and master's recipients choose to continue their studies in physics or other disciplines. Others enter the job market and secure employment in a wide range of fields. At the PhD level, there has been a sharp increase in the proportion of new doctorates accepting postdocs. The private sector continues to employ the majority of the PhDs accepting permanent employment.

The data presented here are the result of the American Institute of Physics' Initial Employment Survey for the physics and astronomy classes of 2001 and 2002. We surveyed degree recipients at the bachelor's, master's and PhD levels about their employment situation in the winter following the academic year in which they received their degree. This report is possible because of the many physics and astronomy departments who identified their degree recipients for us, and the degree holders who took the time to complete the questionnaire.

New Physics PhDs

The 1157 PhDs produced in the class of 2001 and the 1095 in the class of 2002 represented the seventh and eighth year of declining physics doctorate production in the US. The departmental Survey of Enrollments and Degrees show that these combined classes included 50% foreign citizens and 14% women. The reported median age was 29.6 for US citizens and 30.4 for foreign citizens. Overall, degree recipients reported a median of 6 full-time equivalent years of study to complete their degree.

This report combines the survey responses of the PhD classes 2001 and 2002. We contacted the thesis advisors of degree recipients whom we were unable to contact directly. Altogether, we received information on 63% of the degree recipients in these two classes. Two thirds of our response came from the degree recipients themselves, and one third came from advisors. The data gathered from advisors were limited to the degree recipient's type and location of initial employment (i.e. postdoc, potentially permanent position, in the US, etc), subfield of study, gender and citizenship.

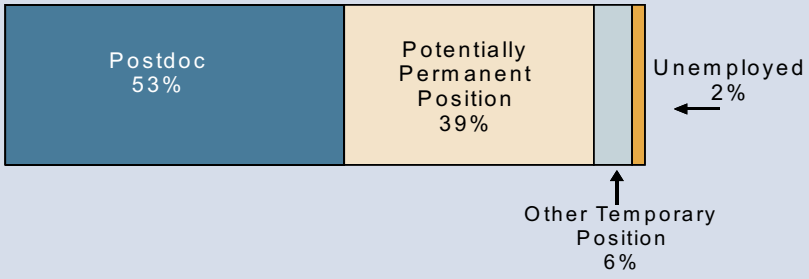
Given the high percentage of foreign citizens among physics PhD recipients, there is considerable interest in the proportion that leave the US after receiving their degree. Our respondent and advisor data indicate that approximately 15% of the foreign citizens and about 4% of the US citizens left the US after receiving their degrees. Since we are primarily concerned here with the job market for physics graduates within the US, the discussion that follows excludes those graduates who leave and examines initial employment outcomes only for the physics PhD recipients who, regardless of their citizenship, remained in this country.

To receive a physics PhD, individuals must choose to specialize in a specific subfield of physics. However, the skills they develop to obtain their PhD provide considerable flexibility in the career options that they commonly pursue. While obtaining a PhD they gain analytical and problem solving abilities, advanced math, software and laboratory skills as well as a basic understanding of the fundamental principles of science. Thus, PhD physicists are excellent candidates for a broad range of positions.

Unemployment rates for physics PhDs have been low in recent years. Two percent of the combined classes of 2001 and 2002 were unemployed in the winter following the academic year in which they received their degree (see **Figure 1**). In comparison, PhD classes in the early to mid 1990s experienced unemployment rates of 5 and 6%.

The proportion of new physics PhDs taking postdocs has risen for the second consecutive year, with a significant increase among the degree recipients in the class of 2002 (see **Cover Figure**). This is matched by a simultaneous decline in the proportion of new PhDs accepting potentially permanent positions. This change in the initial employment pattern for new PhDs follows four years in the late 1990's when the balance between postdocs and potentially permanent positions was relatively stable. Although there is an increase in postdocs among both US and foreign citizens, much of the change for the class of 2002 was a result of a sharp increase in the proportion of foreign citizens accepting postdocs. Looking just at the class of 2002, 72% of the foreign citizens accepted a postdoc, compared with 52% of the US citizens.

Figure 1. Initial employment status of physics PhDs, classes of 2001 & 2002.



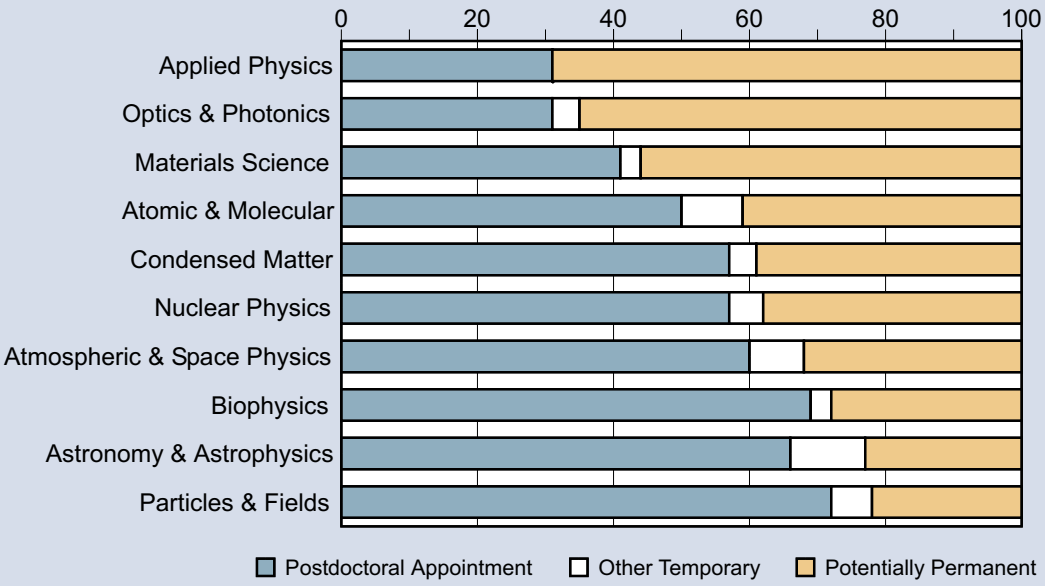
AIP Statical Research Center, Initial Employment Report.

A postdoctoral position often functions as a stepping-stone for those who aspire to employment in a university setting. Thus a career in academia was the desired goal of about 70% of all PhDs accepting postdocs. An increase in the proportion of PhDs taking postdocs has historically coincided with weak economic conditions. Currently, 43% of the responding postdocs reported accepting the position because no permanent position was available. But even among this group, over half indicated they had a career goal of working in academia. Postdocs are by definition temporary positions with 45% having an initial length of 2 years and 38% having initial lengths lasting 3 or more years. Some of these postdocs may be renewed at the end of their term.

In the combined classes of 2001 and 2002, 6% of the PhDs indicated they had accepted a non-postdoctoral temporary position. The majority (78%) of these positions are in an academic setting, such as visiting professors, lecturers and sabbatical replacements. The initial reported length of these positions averaged about 2 years. Sixty-three percent of the individuals accepting these other temporary positions indicated they did so because no permanent positions were available.

The subfield of dissertation is among the factors that have an effect on an individual's likelihood of accepting a potentially permanent position or a temporary one upon completing a PhD (see **Figure 2**). PhDs in more applied subfields, such as optics and applied physics, are more likely to take a potentially permanent position, whereas PhDs in more abstract fields, such as particles and fields and astrophysics, are more likely to accept a postdoctoral position. Similarly, a PhD's research method shows a correlation with the initial type of employment he or she accepts. PhDs whose dissertation research method was primarily computer modeling or experimental were more likely to accept potentially permanent positions, 46% and 36% respectively, than those whose research methods were primarily theoretical (24%).

Figure 2. Initial employment of physics and astronomy PhDs by subfield of dissertation, classes of 2001 & 2002.



AIP Statistical Research Center, Initial Employment Report.

The type of initial employment position PhDs accept is strongly associated with the economic sector in which they work. (see **Table 1**). As has been true for decades, the majority of postdocs and other temporarily employed PhDs are employed in academia, with a much smaller but significant number employed in the government sector. Very few physics postdocs hold positions in the private sector. PhDs accepting potentially permanent positions, by contrast, are concentrated in the private sector. Although the private sector continues to be the largest employer of PhDs in potentially permanent positions, the class 2002 shows a shift away from the private sector, with corresponding increases in both the academic and government sectors.

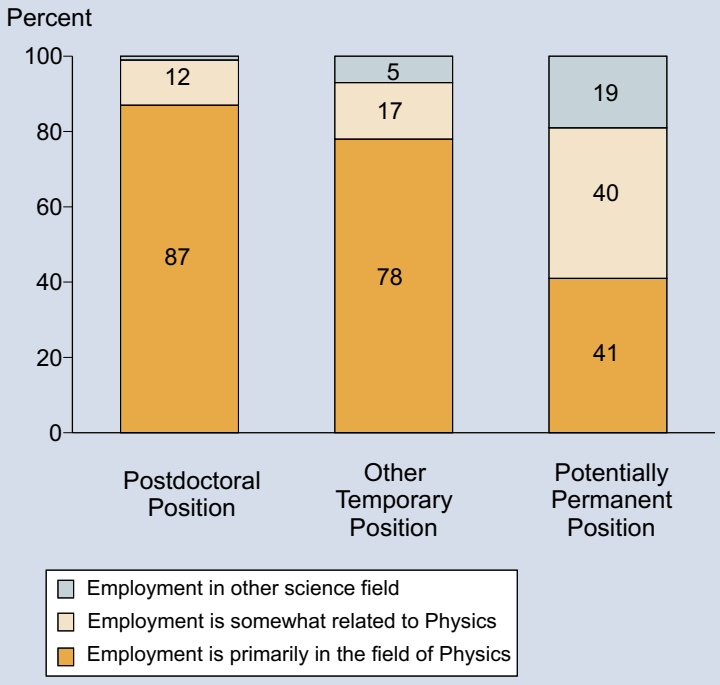
Table 1. Physics PhDs initial employment sectors, classes of 2001 & 2002.

	Postdocs %	Potentially Permanent %	Other Temporary %	Overall %
Academic	64	18	78	47
Government	27	13	8	20
Private Sector	2	65	9	27
Other	7	4	5	6

AIP Statistical Research Center, Initial Employment Report.

A large majority of the respondents who accepted postdoctoral and other temporary positions indicate that the focus of their work is primarily in the field of physics, with virtually all the rest indicating their employment was related to physics (see **Figure 3**). The picture among those who accepted potentially permanent positions is quite different, with 41% saying they were working primarily in the field of physics, and 40% saying they were in a cross disciplinary or related field. Almost a fifth (19%) of the new PhDs with

Figure 3. Initial employment of physics PhDs by field and type of position secured, classes of 2001 & 2002.



AIP Statistical Research Center, Initial Employment Report.

potentially permanently jobs felt their employment did not involve a significant amount of physics, but virtually all of these positions were science related or technical in nature.

Table 2 shows the other fields, besides physics, in which PhDs found work. Although quite varied, their employment was concentrated in three main fields, with engineering being the dominant field, followed by software development and business or finance. The most common reason cited for working in a field broader than physics was a change of interest, followed by pay and promotional opportunities. Fewer than 10% indicated it was because employment in physics was not available.

Focusing on PhDs who indicated their field was primarily physics, **Table 3** shows that postdocs were more likely than those with potentially permanent positions to continue in their subfield of dissertation. Still, looking just at respondents whose employment is primarily in the field of physics, we find that the likelihood of being employed in the subfield of dissertation also varies by which particular subfield they had studied. Among the larger subfields, those in astronomy-related fields were the most likely to remain employed in their subfield, followed by respondents in optics, photonics and particles and fields. Respondents in condensed matter and atomic and molecular physics were the least likely to be employed within their dissertation subfield. These differences of working in one's dissertation subfield by subfield were true regardless of employment type.

The work activities of new physics PhDs vary greatly by the type of positions secured. Postdocs are primarily involved in research, while PhDs in other temporary positions are mostly teaching and, to a lesser extent, doing research.

The work activities of PhDs in potentially permanent positions vary by employment sector and somewhat by how closely their employment is related to physics. Of the PhDs who indicated they were working primarily in the field of physics, those employed in the private sector are heavily involved in applied research as well as design and development, while PhDs who work in an academic setting are mostly teaching.

Table 2. Fields of employment for physics PhDs with potentially permanent positions who indicated their field of employment was broader than just physics classes of 2001 & 2002.

Engineering	43%
Computer Software	23
Business or Finance	16
Computer Hardware	4
Defense Related	3
Life Sciences or Biology	2
Medicine or Health	2
Other Science or Math	7
	100%

AIP Statistical Research Center, Initial Employment Report.

Table 3. Percent working in subfield of their dissertation for PhDs who indicated their field of employment was physics, classes of 2001 & 2002.

Employed in field of dissertation	Employment Type		
	Potentially permanent %	Postdoc %	Other Temporary %
Yes	62	82	58
No	38	18	42

AIP Statistical Research Center, Initial Employment Report.

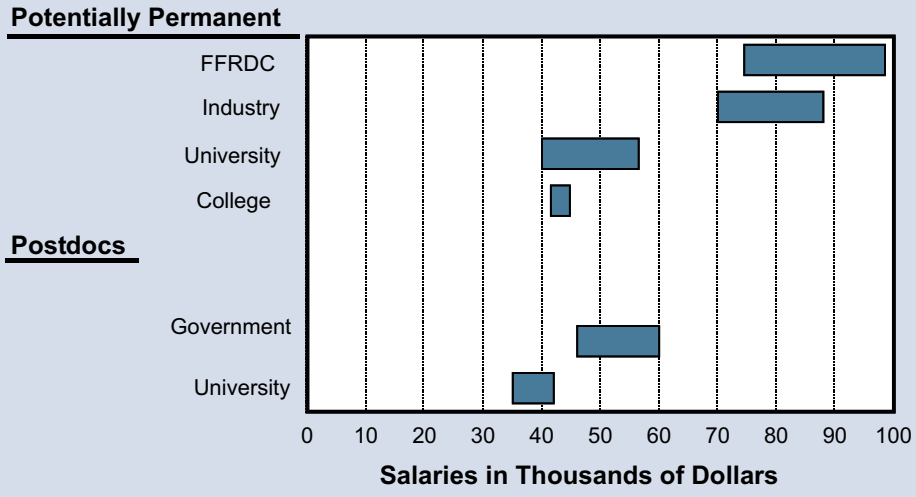
PhDs in potentially permanent positions who describe their field of employment as being cross disciplinary or in a related field are concentrated primarily in the private sector. Their work activities are more diverse: design and development, applied research, programming, systems software development, and simulation and modeling.

As has been true in the past, starting salaries for PhDs vary greatly by the type of position and by employment sector (see **Figure 4**). Potentially permanent positions in the private sector and at National Laboratories offer the highest salaries. The starting salaries of new faculty at colleges and universities are strikingly lower than in other potentially permanent positions. Even among postdocs, those in the government sector earn substantially more than those in academia.

Overall, physics PhDs are quite satisfied with their initial employment circumstances (see **Tables 4 & 5**). Not surprisingly, PhDs in potentially permanent positions who reported their field of employment was primarily physics, generally had the most positive outlook concerning their employment. Another measure revealing a high level of satisfaction with current employment was that over 90% of the respondents felt that physics was an appropriate background for their position. Even among the potentially permanently employed PhDs working primarily in other science fields, 68% felt that physics was an appropriate background for their position. The group expressing the least satisfaction was the 6% of the PhDs employed in non-postdoctoral temporary positions. Almost half of these primarily academically employed PhDs considered themselves to be underemployed.

The long-term career goals of physics PhDs vary considerably when divided by the type of initial employment they secured (see **Table 6**). For the potentially permanently employed, an aspiration for a career in the private sector is correlated with how closely related their current employment is to the field of physics. As in the past, the majority of postdocs aspire to positions in academia, especially at a university.

Figure 4. Typical range of salaries for physics PhDs, classes of 2001 & 2002.



Note: Typical salaries are the middle 50%, i.e. between the 25th and 75th percentiles. Government includes National Labs and other federal agencies.

AIP Statistical Research Center, Initial Employment Report.

Table 4. Qualitative aspects of initial employment for physics PhDs in potentially permanent positions, classes of 2001 and 2002.

Percent agreeing with the question:	Major Fields of Employment			
	Physics %	Engineering %	Software %	Business/ Finance %
A physics PhD is an appropriate background for my position	97	75	57	58
The position utilizes my overall knowledge of basic physics principle	96	71	20	5
My current position is professionally challenging	90	64	60	95
I am satisfied with my current position	89	71	83	79
I consider myself underemployed	7	29	14	6

Note: Response options were on a four-point scale, with two positive and two negative choices. The data presented indicate the proportion of PhDs selecting the two positive responses.

AIP Statistical Research Center, Initial Employment Report.

About three quarters of respondents found their advisors helpful in their career planning. Those taking postdocs were most likely to find their advisors helpful (81%), followed by individuals in potentially permanent positions primarily in physics (77%). Even among the PhDs with potentially permanent positions in other science fields, 51% felt their advisors were helpful in their career planning.

Yet another indication of the generally high level of satisfaction was that, overall, 88% of the respondents indicated they would still get a PhD in physics if given the opportunity to do it over again. This high satisfaction with their degree choice was true for respondents in temporary as well as permanent positions, and equally for women as for men.

Table 5. Qualitative aspects of initial employment for physics PhDs in temporary positions, classes of 2001 and 2002.

Percent agreeing with the question:	Postdocs %	Other Temporary %
A physics PhD is an appropriate background for my position	97	88
The position utilizes my overall knowledge of basic physics principles	90	79
My current position is professionally challenging	88	57
I am satisfied with my current position	80	60
I consider myself underemployed	17	48

Note: Response options were on a four-point scale, with two positive and two negative choices. The data presented indicate the proportion of PhDs selecting the two positive responses.

AIP Statistical Research Center, Initial Employment Report.

Table 6. Career goals of physics PhDs, classes of 2001 and 2002.						
	Desired Sector					
Type of Potentially Permanent Position	University %	2 or 4 year College %	Private Sector %	Civil Gvt. (incl FFRDC) %	Other %	Total %
Primarily in the field of physics	22	18	37	16	7	100
Somewhat related to physics	12	5	68	9	6	100
In other science field	2	2	82	5	9	100
Type of Temporary Position						
Postdoctoral	63	6	12	15	4	100
Other temporary	48	15	19	7	11	100

AIP Statical Research Center, Initial Employment Report.

Bachelor's Degree Recipients

In recent years undergraduate physics degree production has increased significantly. The 4305 bachelor's degrees conferred at 759 departments on the class of 2002 represented an 18% increase over the recent low of the class of 1999 and a 5% increase over the 4091 bachelor's degrees conferred in 2001. The combined classes of 2001 & 2002 included 23% women and 6% foreign citizens. Please refer to the *Enrollments and Degrees Report* for more detail about the bachelor recipient population.

Using a variety of methods, we obtained 2,256 usable survey responses from the physics bachelor's recipients in the classes of 2001 and 2002. These degree recipients are highly mobile and consequently difficult to reach. In many cases, departments do not keep accurate records on where their bachelor's students go after receiving their degrees. At the time of graduation, many of the students do not know what their addresses will be six months in the future.

The survey focused primarily on initial employment and further educational pursuits, but also included a few general evaluative questions about undergraduate education. We asked bachelors if they would still study physics if they had it to do over again. Eighty-five percent of responding bachelors indicated that they would still major in physics. Bachelor's recipients who chose to immediately continue their education at the graduate level held a slightly more positive attitude toward their undergraduate physics study than bachelors who entered the employment market directly. Ninety percent of the physics bachelors who enrolled directly into graduate school indicated that they would choose physics for their undergraduate degree again, this compared to 81% of the employed and 68% of unemployed physics bachelors.

We asked the degree recipients if they were pleased with the job market and career prospects available to them. Overall, 59% of the respondents indicated they were. The degree recipients pursuing further education, especially those continuing in physics,

were the most pleased (66%) with their available career options. Not surprisingly, unemployed respondents, who represent only a small portion of physics bachelors, expressed the least (18%) satisfaction with the job market.

The class of 2002 was asked about their total education-related debt. About 60% of our respondents had borrowed to cover their educational expenses. The overall median debt for those who borrowed was $17,000: $15,000 for physics bachelors from public colleges and universities and $18,000 for those from private schools. The National Center for Education Statistics published data on bachelor's degree recipients from the class of 1999-2000 that included statistics on educational debt for all disciplines. The overall proportion of bachelors with debt reported by the NCES is identical to what we found for physics bachelors, but the $17,000 median amount borrowed reported by our respondents is a bit higher than the $15,206 reported by the NCES for all bachelors. [1]

[1] U.S. Department of Education, National Center for Education Statistics. A Descriptive Summary of 1999-2000 Bachelor's Degree Recipients 1 Year Later: with Analysis of Time to Degree, NCES 2003-165.

The vast majority of physics bachelors reported that their debt had not greatly affected their post degree circumstances. The impact was lessened by the ability of many to defer their loan repayment by continuing their education or, in a few cases, entering debt-relieving programs such as Americorps or the Peace Corps. Only a few felt the need to accept a higher paying job in order to manage their monthly debt payments.

Physics Bachelors: Graduate Studies

As has been the case for many years, about half of the new physics bachelors go directly to graduate school (see **Figures 5** and **6**). The majority of these continuing students choose to study physics or astronomy, with the remainder pursuing a wide variety of fields, topped by engineering (see **Figure 7**).

About 60% of the physics bachelors continuing on with graduate study indicate that they plan to pursue a PhD. A little under one third enroll in master's programs, while ten percent are distributed among other types of degrees and certificates. Among those continuing in physics, fully three-quarters plan to pursue a physics PhD.

Figure 5. Initial outcomes of physics bachelor recipients, classes of 2001 & 2002.

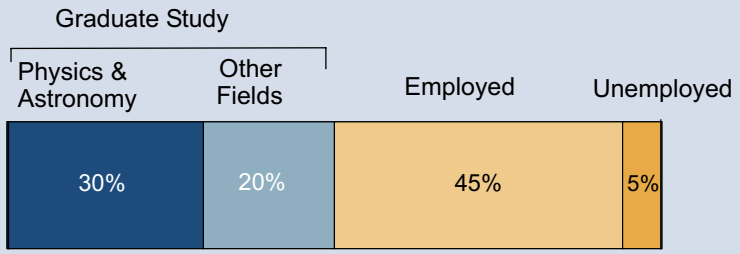


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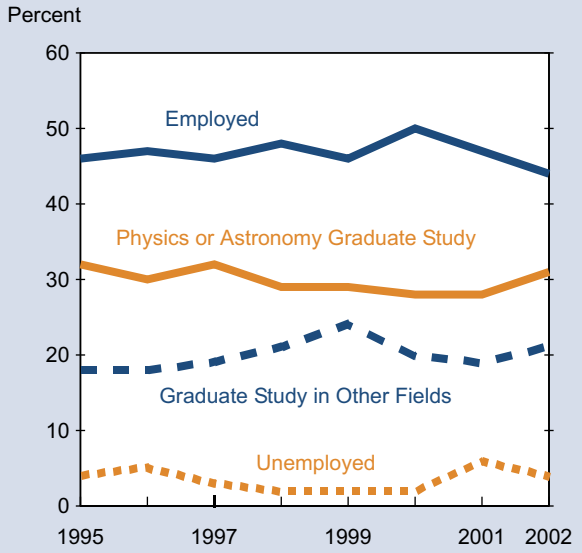
Figure 6. Trends in initial outcomes of physics bachelors, classes of 1995-2002.



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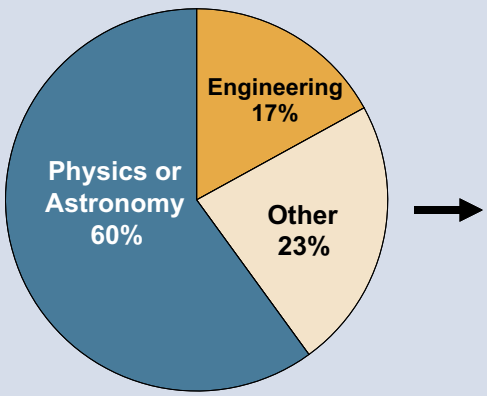
Bachelor's recipients who received their degrees from departments that also had a graduate program in physics were more likely to continue with graduate studies in physics or astronomy than those attending a department that only offered a bachelor's level degree in physics (see **Figure 8**). Some of this persistence may stem from the kind of students attracted to the larger, and generally more comprehensive programs.

Another influence may involve the students' opportunities to observe and interact with faculty and graduate students actively engaging in research.

Overall, almost a third of the respondents continuing onto physics graduate study who received their bachelors at an institution that also offered an advanced degree in physics chose to remain in the very same department. This was especially true for degree recipients who received their degree from departments where a masters was the highest physics degree offered, with almost half continuing on at the same department. Such undergraduates may not only prefer to remain in the same area, but may also have formed ties to particular faculty that help to facilitate research opportunities and financial aid.

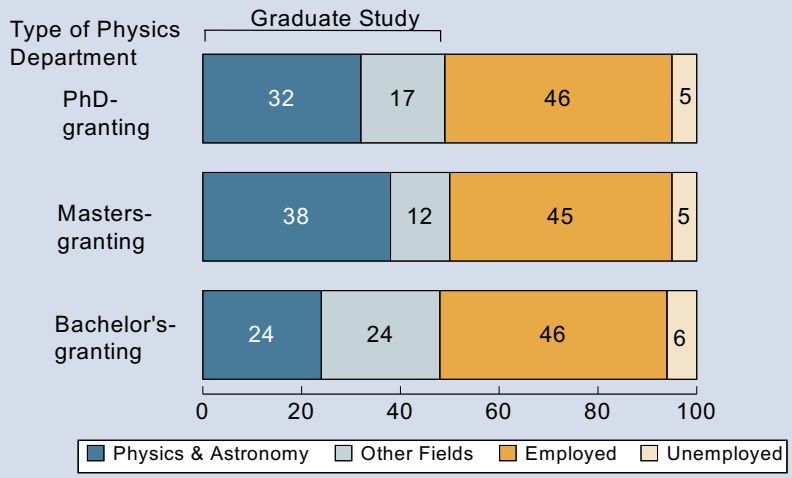
Figure 7. Field of graduate study chosen by physics bachelors in the classes of 2001 & 2002.



Medical, Health Services	5%
Mathematics	3
Education	3
Physical Sciences	2
Computer Science	2
Law	2
Life Science	1
Business	1
Other	4

AIP Statistical Research Center, Initial Employment Report.

Figure 8. Initial outcomes by type of department attended, bachelor classes of 2001 & 2002.



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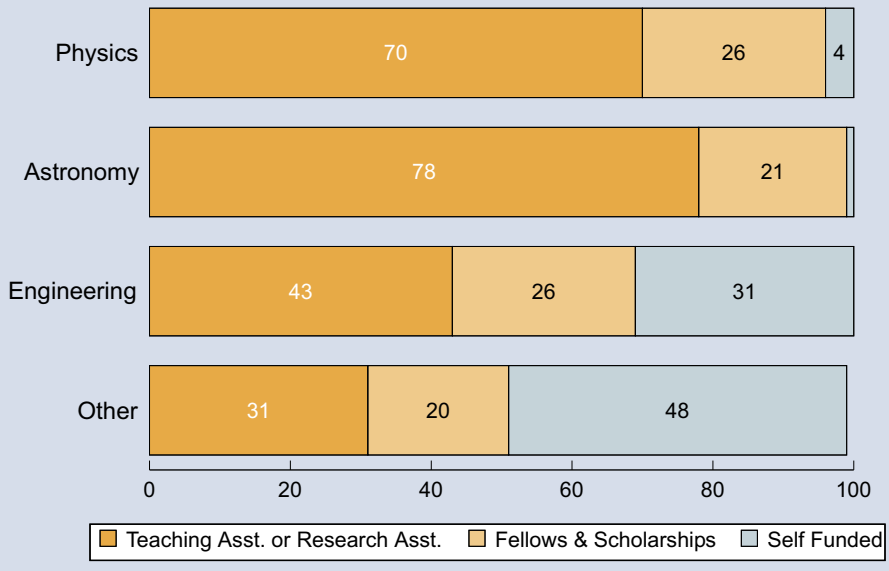
The primary type of support that physics bachelors rely on to fund their graduate studies varies greatly by the field of graduate study. The proportion of physics bachelors entering a graduate program who are self-financed is far lower for those pursuing physics or astronomy (4%) than for other disciplines (see **Figure 9**). Part of the discrepancy in funding across the disciplines is related to the degree pursued. Students in physics and astronomy, and those in math programs, are more likely to enroll in PhD programs, whereas those choosing to pursue graduate studies in fields such as education, engineering or humanities tend to have a larger proportion enrolling in master's degree programs. Traditionally, students in master's programs, regardless of discipline, are less likely to be supported than students in PhD programs.

Figure 9. Types of support for physics bachelors choosing graduate study, classes of 2001 & 2002.



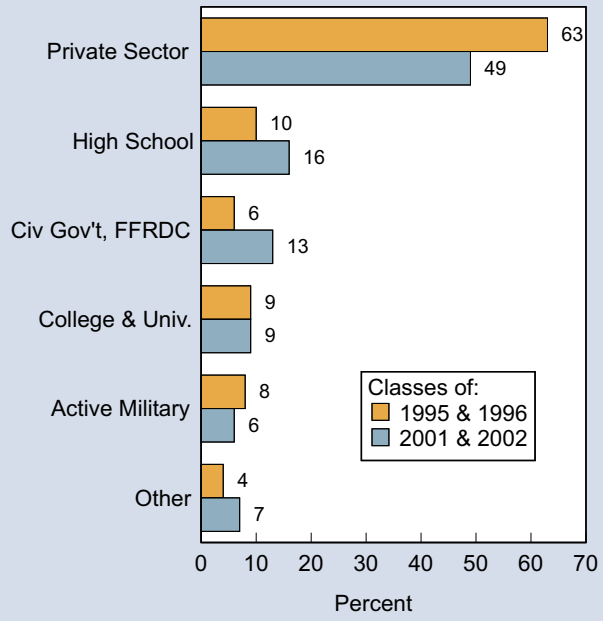
AIP Statistical Research Center, Initial Employment Report.

Physics Bachelors: Employment

As can be seen in Figure 6, the proportion of new physics bachelors entering directly into the workforce has held fairly steady in recent years. Bachelors who are unemployed but not seeking employment (1%), involved in volunteer work 2%, or employed outside the US (3%) are not included in the analysis.

Although the private sector continues to be the dominant employer, it now employees less than half of all physics bachelors in the combined classes of 2001 and 2002 (see **Figure 10**). The government sector and high school teaching have seen the greatest growth in recent years. The job market for new physics bachelors continues to be very diverse, with degree recipients finding employment in all sectors of the economy using their physics education in many ways.

Figure 10. Initial employment sectors of physics bachelors.



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The proportion of employed physics bachelors in part-time positions has doubled from about 3-4% in the late 1990's to about 8% in the combined classes of 2001 and 2002. In the combined classes of 2001 and 2002, about one-fifth of physics bachelors employed in colleges and universities are working part-time, as are 12% of individuals working in secondary schools and 5% of those in the private sector.

The work activities reported by new physics bachelors employed in the private sector were concentrated primarily in three areas: 1) computer programming, system administration, simulation and modeling, 2) design and development, 3) professional services (such as: legal, financial, health related and writing (see **Table 7**). Although still the predominant work activity, the proportion of new physics bachelors holding primarily computer-related jobs has steadily declined since the tech boom of the late 1990s. As in the past, positions accepted by physics bachelors in civilian government and at colleges and universities tend to involve working with computers or doing research.

Overall about one-fifth of the physics bachelors reported working directly in the field of physics. The proportion of bachelors employed in the field of physics at colleges and universities (47%) and national labs (44%) is considerably higher than the proportion of those employed in the private sector (6%). The majority of degree recipients employed as secondary school teachers indicated the field of employment as education, although many of them are teaching physics.

Figure 11 focuses on the recent changes in the fields in which the respondents in the private sector reported they were working. The proportion working in physics and other science fields is low but has been relatively stable in recent years. The

Table 7. Primary work activity for physics bachelors, classes of 2001 & 2002.			
	Employment Sector		
Activities related to:	Private Sector %	Civil Government %	Colleges & University %
Computer programming, system administration, simulation and modeling	28	34	17
Design and development	23	17	6
Service related activities (1)	19	3	4
Manufacturing (2)	13	6	3
Research	8	33	41
Management & Administration	5	3	10
Education	1	2	15
Other	3	2	4

Activities include: (1)Legal, financial, medical, writing (2) production, operations, construction, quality control

AIP Statistical Research Center, Initial Employment Report.

proportion of physics bachelors working in the fields of engineering and computer or information systems is down substantially for the class of 2002. This decline is offset by a dramatic increase in the proportion of bachelors accepting less-technical positions.

Figure 11. Fields of physics bachelors in the private sector, classes of 1999-2002.

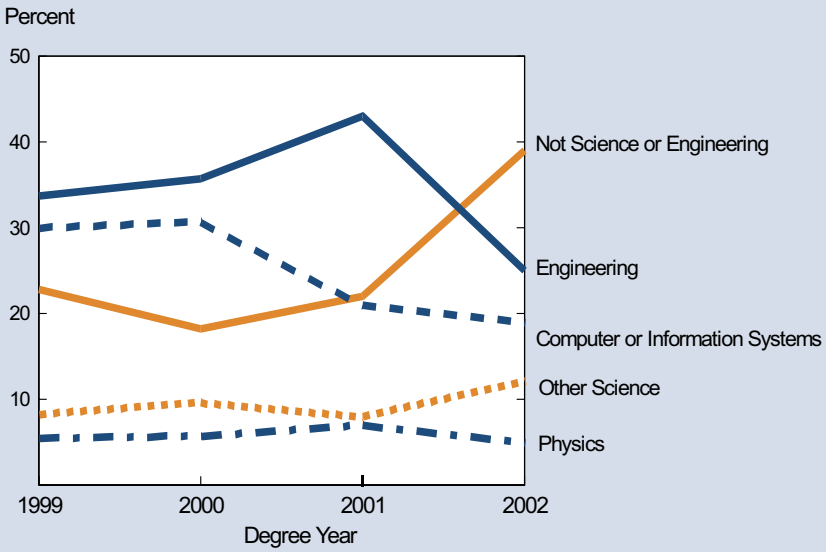

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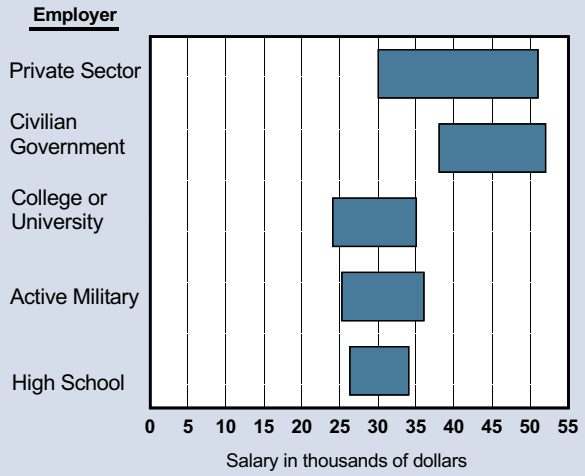
Figure 12. Typical range of starting salaries for physics bachelors, classes of 2001 & 2002.



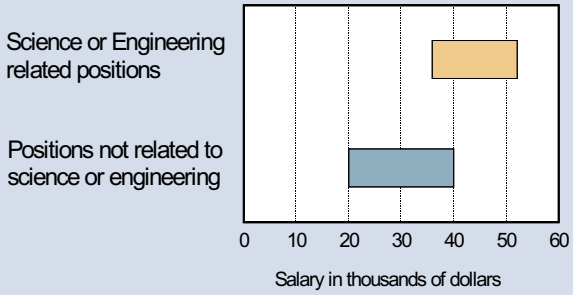
Note: Typical salaries are the middle 50%, i.e. between the 25th and 75th percentiles.

AIP Statistical Research Center, Initial Employment Report.

The types of positions new physics bachelors accept within the private sector can be divided into two categories: science and engineering related positions, and less technical positions. The proportion of less-technical positions in the private sector has risen sharply in recent years, from 23% in the class of 1999 to 39% in the class of 2002. The work activities of the less-technical positions have also shifted from administration and production to a variety of activities such as financial and legal services, sales and marketing.

Figure 12 presents the typical starting salaries for physics bachelors for the combined classes of 2001 and 2002. Bachelors employed in colleges and universities, in the active military and in high schools all have similar salary ranges. Bachelors employed in the civilian government and private sectors tend to earn considerably more. The private sector salary range has broadened as a result of the increasing proportion of less-technical positions, which tend to offer significantly lower starting salaries (see **Figure 13**). Among bachelors in the more technical positions, respondents in computer and engineering related positions tend to earn more than respondents in research positions in both the private and government sectors.

Figure 13. Typical range of starting salaries for physics bachelors employed in the private sector by whether position is related to science or engineering, classes of 2001 & 2002.



Note: Typical salaries are the middle 50%, i.e. between the 25th and 75th percentiles.

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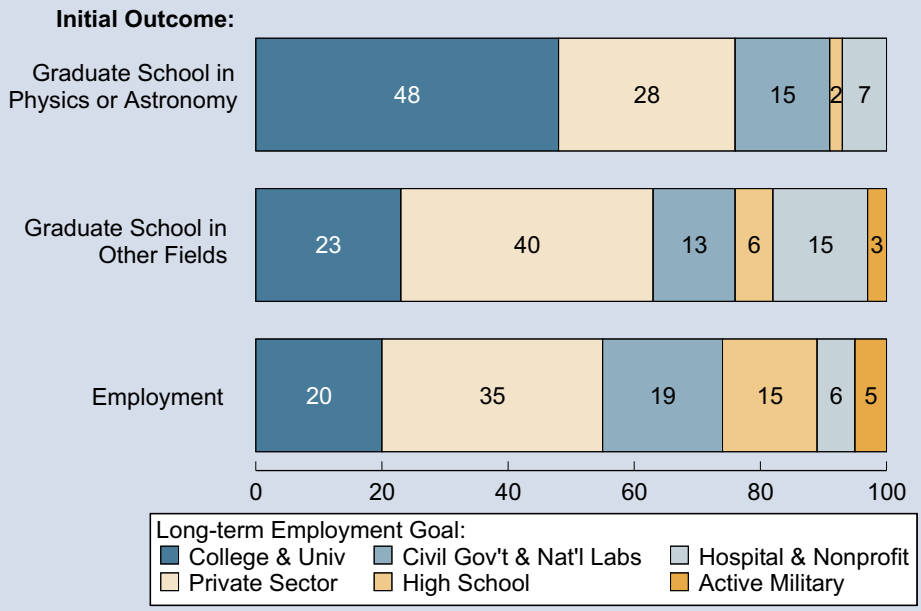
Physics Bachelors: Long Term Career Goals

The career aspirations of physics bachelors (10 years in the future) vary somewhat by what they do immediately after receiving their degree. (see **Figure 14**). Almost half of the physics bachelors pursuing graduate studies in physics or astronomy aspired to positions in a college or university setting, the majority citing research as their preferred work activity. This contrasts quite sharply with the bachelors pursuing graduate studies in other fields, where employment in the private sector was the preferred long-term career goal. The employed physics bachelors had the most diverse long-term career goals, with the largest proportion aspiring to positions in the private sector.

Figure 14. Long-term career goals for physics bachelors by initial outcome, class of 2002.



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Master's Degree Recipients

There were 701 exiting physics master's degrees conferred in the class of 2001 and 657 in the class of 2002 at 254 departments. Overall, 30% of exiting masters graduated from a physics department that offered a masters as its highest degree. The remaining 70% left departments that offered a PhD. According to the AIP Enrollments and Degrees survey, the combined exiting master's classes for the two years included 20% women and 39% foreign citizens

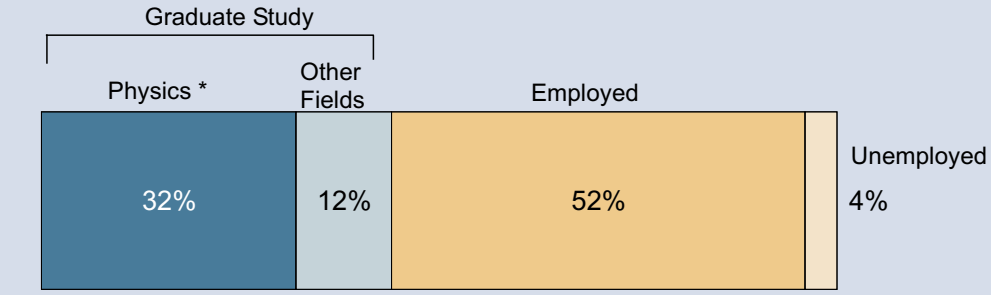
Also awarded in each of those academic years were about 650 master's en route degrees given to students continuing their studies toward a physics PhD at the same department. We do not include these en route degrees in the statistics cited in this report.

It is often difficult to obtain current address information for master's recipients, in part because of their mobility after leaving school. As a result, we have supplemented the data we could collect directly from degree recipients with follow-up information from the students faculty advisors. Overall, we were able to collect information on a little over half of the master's classes of 2001 & 2002, with about half of this information coming directly from the students.

The post-degree outcomes for the combined 2001 and 2002 physics master's classes are shown in **Figure 15**. Almost a third of exiting physics masters continued with physics graduate study at another institution, and about an eighth continued with graduate study in other subjects, the most common of which was engineering.

As in the past, master's recipients who were foreign citizens were more likely to continue with physics graduate studies than their American counterparts. This is especially true for the class of 2002, with over one-half of the foreign physics master's recipients versus less than one-fifth of US physics masters choosing to pursue further graduate study in physics. This is most likely a result of a combination of poorer economic conditions and the availability of visas that foreign students need to transition into employment in the US.

Figure 15. Initial outcomes of physics masters, classes of 2001 and 2002.



* At a different university from the one where they recieved their master's degree.

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A little over half of the masters, made up of predominantly US citizens, indicated that they had entered directly into the workforce. The private sector is still the largest employer of new physics masters (see **Figure 16**), although somewhat less so than it was a few years earlier. The starting salaries for physics masters employed in the private sector and at colleges and universities are shown in **Figure 17**.

The most common work activities for physics masters employed in the private sector involved design, development and research, with fewer having their primary work activities involve programming, simulation and modeling, and system administration than in the past. An individual's work activity is closely related to the field of their employment. **Figure 18** shows the distribution of field of employment for physics masters working in the private sector. Forty-three percent of the masters employed in the private sector are working within the field of engineering and almost a quarter are working in the field of physics. Academia, including high schools, had the highest concentration (over half) of physics masters indicating that they were working in the field of physics.

Master's recipients were asked whether they would major in physics again if given the opportunity and about their impression of the job market and career options available to them. For the most part, physics masters felt good about their choice of major (85%), but not as positive about the job market and career options, with 40% expressing dissatisfaction.

Figure 16. Employer distribution of full-time US employed physics masters, classes of 2001 & 2002.

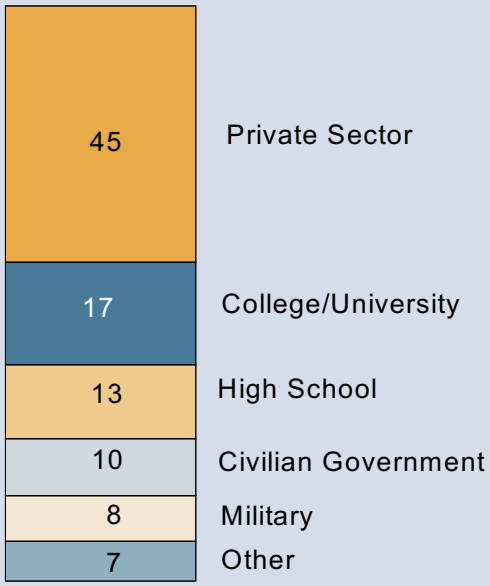

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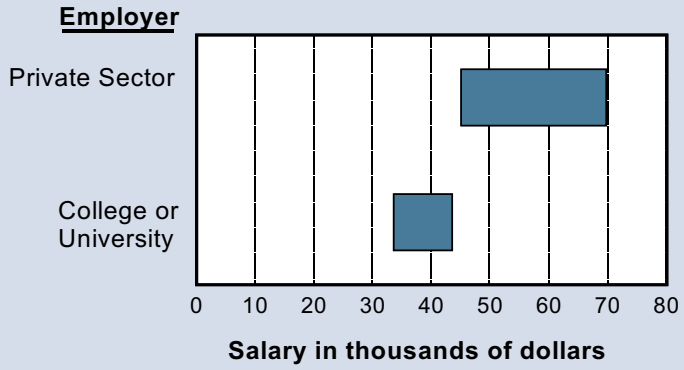
Figure 17. Typical range of starting salaries for physics masters, classes of 2001 & 2002.



Note: Typical salaries are the middle 50%, i.e. between the 25th and 75th percentiles.There were too few respondents in the categories of Active Military, High School and Civil Government to accurately report salaries.

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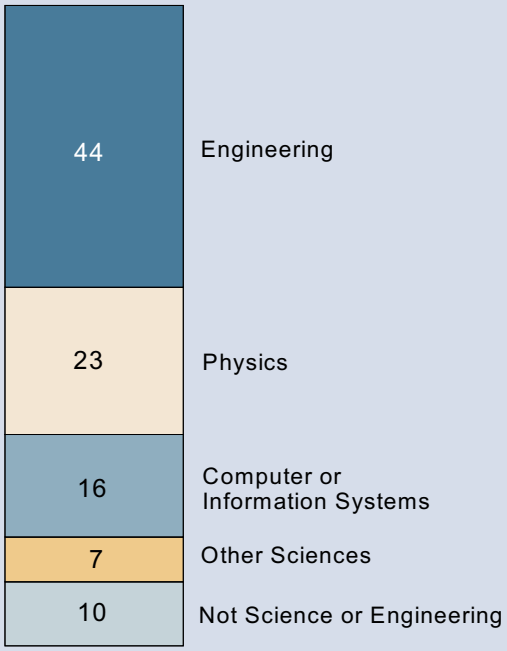
Figure 18. Field of employment for physics masters recipients working in the private sector, classes of 2001 & 2002.



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Astronomy Degree Recipients

In the 2001 and 2002 academic years, the AIP Survey of Enrollments and Degrees gathered astronomy degree recipient information from 70 departments. About half of the astronomy departments are combined with physics departments at the same university, and half are administered as separate programs. The data presented here do not include students who got their degrees in astrophysics from a physics department. They were included in earlier discussions of physics degree recipients.

The astronomy PhD classes of 2001 and 2002 were very similar in size, including 101 and 102 students, respectively. The combined classes include 24% women and 27% foreign citizens. We were able to obtain information about 64% of these degree recipients, either through direct contact with the students from their advisors. The data presented here do not include the 14% of astronomy PhDs who accepted employment outside of the US.

Postdoctoral appointments remain the dominant post degree outcome for new astronomy PhDs, comprising almost three quarters of the combined classes of 2001 and 2002 (see **Figure 19**). The median salary for postdocs at colleges and universities is $41,800.

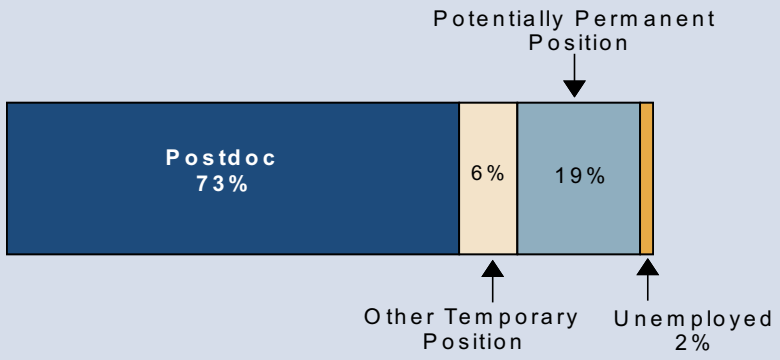
Most astronomy PhDs (74%) indicated they were working in the field of astronomy, with an additional 21% indicating their employment was related to astronomy. Seventy-eight percent of the astronomy PhDs who indicated that they were working in the field of astronomy were employed in the subfield of their dissertation. Overall, three-quarters of the employed astronomers report research as their primary work activity.

Astronomy PhDs felt very positive about their degree and employment situation. Very few (7%) described themselves as underemployed. Most felt challenged by their work (89%); virtually all believed that astronomy was an appropriate background for their position (97%) and, given the choice, would get a PhD in astronomy again (89%).

At the bachelor's level, astronomy degree production has continued the dramatic rise that began with the class of 2001. The class of 2000 had 202 bachelors, the class of 2001 had 274, and the class of 2002 had 325 bachelors. Much of this increase coincided with a sharp rise in the number of women receiving astronomy bachelor's degrees. The combined classes of 2001 and 2002 contained 42% women and 6% foreign citizens.

About half of astronomy bachelors chose to continue their studies at the graduate level (see **Figure 20**). The remaining half of the astronomy bachelors, those who chose to enter directly into the workforce, were spread across a variety of sectors, work activities and fields. The private sector remains the largest employer of new

Figure 19. Initial employment of astronomy PhDs, classes of 2001 & 2002.



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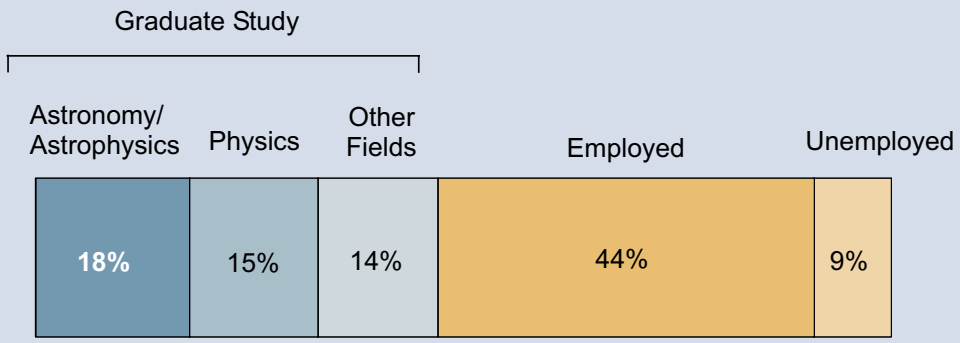
astronomy bachelors, employing about a third of those entering the work force. Even so, the private sector employs a smaller proportion of astronomy than physics bachelors, in part due to the more limited scope of industrial applications for astronomy undergraduates.

While pleased with their choice of majors with 81% saying they would choose astronomy again, astronomy bachelors were less positive about the job market they encountered. Only half of the astronomy bachelors who responded to our survey were satisfied with the job market and career prospects available to them after graduation.

When astronomy bachelors were asked about their long-term career goals, the most often mentioned choice was research and/or teaching in an academic setting.

The population of exiting master's degrees in astronomy is very small (13 in the class of 2001 and 22 in the class of 2002), too few to allow detailed analysis of outcomes. Most of this group entered directly into the workforce.

Figure 20. Post-degree outcomes for astronomy bachelors, classes of 2001 & 2002.



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