AMERICAN INSTITUTE OF PHYSICS

AIP REPORT

One Physics Ellipse
College Park, MD 20740-3843

STATISTICAL RESEARCH CENTER
Tel. (301) 209-3070

E-mail: stats@aip.org
www.aip.org/statistics

By Rachel Ivie
Stacy Guo
Arnell Carr

AIP Pub. Number R-392.6

December 2005

2004 PHYSICS & ASTRONOMY ACADEMIC WORKFORCE

HIGHLIGHTS

Over the last ten years, the number of full-time equivalent (FTE) positions in physics has increased by approximately 1% per year, reaching 9000 in 2004 **(Table 1)**. However, the percentage of FTE positions filled with temporary and non-tenure-track faculty has increased dramatically since 1998 and is now one in five positions **(Table 2)**.

The number of African American faculty members has increased by more than 20% since 2000, and the number of Hispanic faculty members has increased by more than 40% **(Table 7)**. However, the percentages of African Americans and Hispanics on physics faculties are still very low **(Table 6)**.

The number of faculty who left positions at graduate physics departments remained steady since 2002, but the number of vacancies decreased significantly at bachelor's departments **(Table 8)**. The retirement rate also dropped overall to 2.6%, but bachelor's departments had the largest decreases in retirements **(Table 9)**.

Graduate departments recruited for more tenured and tenure-track faculty than they had in 2003. However, bachelor's departments recruited for 30% fewer tenured and tenure-track faculty members. Instead, they recruited for more temporary and non-tenure-track faculty **(Table 10)**.

The stand-alone astronomy departments had about 590 FTE positions in 2004. The PhD astronomy departments were recruiting for 22 tenured or tenure-track faculty members for 2004-05 **(Table 11)**.

Bachelor's physics departments, like PhD physics departments, are hiring faculty members with experience—particularly those who have previously worked as postdocs, tenured or tenure-track faculty members, or research scientists **(Table 14)**.

Women are hired into ranked faculty positions at rates consistent with or better than degree production in the past. However, the percentage of female new hires among instructors and adjuncts is higher than among ranked faculty **(Figure 2)**.

At the end of 2003, media accounts led the academic community to believe that many universities faced possible financial crises due to budgetary shortfalls. Stories of these possible crises left many in the physics community wondering what effects would be felt by physics and astronomy departments. The effects of budgetary problems could have been numerous, ranging from negative impacts on faculty salaries to loss of faculty positions.

During the spring of 2004, the Statistical Research Center (SRC) of the American Institute of Physics sent a questionnaire to all 797 degree-granting physics and astronomy departments in the US. The purpose of this questionnaire, *The Academic Workforce Survey*, was to determine the number of faculty positions in physics and astronomy, the number of openings available, and the characteristics of faculty hired. Because *The Academic Workforce Survey* has been conducted by the SRC every two years since 1986, we are able to determine how the job market in physics and astronomy has changed. This survey also asked physics and astronomy departments to report their numbers of minority faculty.

Physics and astronomy departments have contributed greatly to our efforts to assess the status of the faculty workforce by consistently responding to our requests for data. The 2004 survey was no exception, because out of 797 physics and astronomy departments, we had a response rate of 97%. The SRC is grateful to the department chairs and staff who provided us with their information.

Most, but not all, of the numbers in this report are estimates in which we assume the few non-responding departments had similar experiences as the responding departments. The exception to this is the numbers of minority faculty, which are not population estimates, but based on the departments who answered. In effect, departments that did not respond to this question were assumed to have no minority faculty. The response rate to the minority questions was 95% of the population.

In spite of the media focus on the budget crisis at many colleges and universities, the academic workforce in physics and astronomy remains strong. The number of FTE faculty positions continued to grow, and graduate departments have shown no drop in the number of faculty for which they are recruiting. However, there are areas of concern. These are related to the percentage of temporary and non-tenure-track faculty, openings at bachelor's departments, and the situation of women and minorities on the faculty.

NUMBER OF FACULTY

We asked the physics and astronomy departments to report their number of FTE positions in teaching or research. In addition to the 768 departments who answered this question, we were able to estimate the FTE for the non-responding 29 departments from other sources.

In spite of the fact that we have answers or estimates from 100% of the population of degree-granting physics and astronomy departments in the US, we should stipulate that this survey does not attempt to count all physicists and astronomers working in colleges and universities in the US. It does not include postdocs, or physicists and astronomers working in departments that do not grant physics or astronomy degrees. It also does not include physicists and astronomers conducting research at university

Table 1. Estimated Number of Full-Time Equivalent Physics Faculty and Average Number of Faculty, 1994 and 2004

Type of Department		1994	2004
PhD	FTE	4900	5400
	Average	27	29
Master's	FTE	800	900
	Average	10	12
Bachelor's	FTE	2500	2700
	Average	5	5.4
Overall	FTE	8200	9000
	Average	11	12

AIP Statistical Research Center: 2004 AWF Survey

Table 2. Percent of Full-Time Equivalent Physics Faculty Who Were Temporary or Non-Tenure-Track, 1998, 2000, 2002, 2004

Type of Department	1998 (%)	2000 (%)	2002 (%)	2004 (%)
PhD	12	11	14	18
Master's	12	16	19	19
Bachelor's	15	19	22	21
Overall	13	14	17	19

AIP Statistical Research Center:2004 AWF Survey

research institutes if those scientists are not included in the department's FTE count. However, the FTE count may include physicists and astronomers working in departments on grants or soft money. Furthermore, the number of physicists and astronomers in a department is often higher than the department's FTE. Because of part-time faculty and joint appointments, many departments have a larger number of physicists and astronomers than their FTE reflects.

Physics. Our data show that over the last ten years, the number of FTE positions in physics has grown by approximately 1% per year **(Table 1)**. Between 1994 and 2004, departments that grant a bachelor's degree increased their number of FTE positions by approximately 200. Master's departments showed an increase of 100 FTE positions. PhD departments showed an increase of 500 FTE positions, raising the number of FTE positions at PhD departments to 5400. Overall, the number of FTE positions in physics increased from 8200 in 1994 to 9000 in 2004.

In spite of the growth in the number of FTE physics positions, our data show that the percentage of these positions that are filled with temporary and non-tenure-track faculty has increased since 1998. Among bachelor's departments, this growth occurred mostly before 2002 and has slowed since. Among PhD departments, the number of non-tenure-track and temporary faculty began to increase after 2000. In that year, non-tenure-track and temporary faculty filled 11% of the FTE positions at PhD departments. By 2004, this percentage reached 18% **(Table 2)**. In fact, our data show that most of the growth in the number of FTE positions at PhD physics departments between 2002 and 2004 was due to an increase in the number of non-tenure-track and temporary faculty, rather than an increase of tenured and tenure-track faculty. These trends reflect a more general trend across all of higher education, as colleges and universities rely more and more on faculty members who are not given tenured or tenure-track status.[1, 2]

In 2004, there were about 500 departments that granted only bachelor's degrees in physics **(Table 3)**. Most of these departments are small in terms of number of faculty. In fact, two-thirds of bachelors' departments have six or fewer faculty members. Physics departments that grant PhDs tend to have many more faculty, with a median number of 24 faculty per department.

Table 3. Distribution of Physics Faculty by Department Type, 2004

	Type of Department		
	PhD	Master's	Bachelor's
Number of Departments	185	72	503
Median Number of Faculty	24	12	4
Number of Faculty in Smallest Third of Departments	5-20	5-9	1-3
Number of Faculty in Middle Third of Departments	20-34	9-13	3-6
Number of Faculty in Largest Third of Departments	34-100	13-28	6-39

AIP Statistical Research Center: 2004 AWF Survey

Table 4. Number of Bachelor's-Granting Departments by Number of Full-Time Equivalent (FTE) Faculty and by Cumulative Number of Bachelor's Awarded, 2002-2004

		Cumulative number of bachelor's awarded 2002-2004					
		None	1 - 5	6 - 10	11 - 15	16 or more	Overall
Number Of FTE faculty	3 or less	15	76	46	24	9	170
	3.1 - 6	2	53	51	32	56	194
	6.1 - 9	0	14	25	15	42	96
	9.1 or more	0	5	4	15	18	42
	Overall	17	148	126	86	125	502

AIP Statistical Research Center: 2004 AWF Survey, and Enrollments and Degrees

As shown in **Tables 4 and 5**, there is a relationship between the number of FTE faculty and the number of bachelor's degrees awarded by the physics departments. Almost one-third of PhD physics departments awarded 40 or more bachelor's degrees during the three-year period 2002-04. Most of these departments have very large numbers of FTE faculty, usually more than 30. Bachelor's departments tend to have smaller faculties and award fewer bachelor's degrees annually. However, they are very efficient at doing so. For example, there are 125 bachelor's departments that awarded 16 or more bachelor's degrees during 2002-04. Of these, 85% have nine or fewer FTE faculty. In comparison, there were 70 PhD physics departments that awarded 19 or fewer bachelor's degrees during this period, and almost all of them had more than 15 FTE faculty members.

Astronomy. Although we have conducted *The Academic Workforce Survey* every two years for almost two decades, 2004 is the first year that we have collected these data from the stand-alone astronomy departments. In the 2004 survey, there were 37 stand-alone astronomy departments. There are about as many combined departments that grant both physics and astronomy degrees. However, we do not ask the combined departments to give us separate numbers of physics and astronomy professors. Therefore, the numbers for the stand-alone astronomy departments do not include all astronomy professors because many astronomers are working either in combined departments or in departments that award only physics but not astronomy degrees.

Most (30 out of 37) stand-alone astronomy departments grant graduate degrees. The 28 PhD-granting departments have an estimated 550 FTE positions. The seven bachelor's-granting stand-alone astronomy departments combined have approximately 30 FTE positions.

Table 5. Number of PhD-Granting Departments by Number of Full-Time Equivalent (FTE) Faculty and by Cumulative Number of Bachelor's Awarded, 2002-2004

		Cumulative number of bachelor's awarded 2002-2004					
		9 or less	10 - 19	20 - 29	30 - 39	40 or more	Overall
Number of FTE faculty	15 or less	9	11	6	3	3	32
	15.1 - 30	9	33	15	9	13	79
	30.1 - 45	2	5	8	7	19	41
	45.1 or more	0	1	0	4	22	27
	Overall	20	50	29	23	57	179

AIP Statistical Research Center: 2004 AWF Survey, and Enrollments and Degrees

MINORITY FACULTY

African Americans and Hispanic Americans are sorely underrepresented on physics faculties, as we can see in **Table 6**, which shows the representation of minority professors in physics and in all disciplines. While African Americans make up 5% of the faculty members in all disciplines, only 2% of physics faculty members are African American. Hispanic Americans are about 3% of all faculty members, and the proportion is about the same on physics faculties. The percentages of African Americans and Hispanics as faculty members in all disciplines are lower than the percentages of these two groups in the US population. Asian Americans, on the other hand, are better represented on physics faculties than among faculty in all disciplines.

Table 6. Race and Ethnicity of Physics Faculty, 2000 and 2004

	Physics		All Disciplines*
	2000	2004	2001
African-American	1.8	2.0	5.3
Asian	9.9	10.6	6.4
Hispanic	2.0	2.7	3.1
White	84.2	82.2	83.6
Other	2.0	2.2	1.6

AIP Statistical Research Center: 2004 AWF Survey

*Source: National Center for Education Statistics

While the percentages of African-Americans and Hispanics on the physics faculty are low, their numbers are startlingly low **(Table 7)**. In 2004, for example, all 185 PhD departments had just 64 African American faculty members. Out of these 64 faculty members, 28 work at just three institutions (Hampton, Florida A&M, and Howard), all of which are Historically Black Colleges and Universities (HBCUs). Only 30 other PhD-granting physics departments have any African American faculty, and most of these have only one. Out of more than 500 bachelor's-granting departments, less than 50 have at least one African-American faculty member. Only 12 bachelor's departments have more than one African American faculty member. Ten of these departments are HBCUs.

Table 7. Number of African-American and Hispanic Physics Faculty by Department Type, 2000 and 2004

	Type of Department		
	PhD	Master's	Bachelor's
2004			
African-American	64	29	78
Hispanic	107	56	60
2000			
African-American	38	41	62
Hispanic	81	32	42

AIP Statistical Research Center: 2004 AWF Survey

This situation is directly the result of the low representation of African Americans among degree recipients. During the last 30 years, there have been an average of only nine African American PhD recipients per year in physics. In more recent years, the number of African Americans earning physics PhDs has been generally higher. Fortunately, this increase is reflected in an increased number of African Americans on the physics faculty. In 2004, there were a total of 171 African Americans on physics faculties. In 2000, the next most recent year we collected these data, there were 141.

Although the numbers are also low, there are more Hispanic than African American faculty in physics. In 2004, there were 223, which is a large increase from 2000, when there were 155. Like African Americans, the number of Hispanics earning PhDs in physics each year is low. Since 1973, there have been an average of only 15 Hispanic Americans earning physics PhDs each year. However, the number in more recent years has increased, resulting in more Hispanic physicists available to serve on faculties. Unlike African Americans, however, Hispanic physicists are not concentrated at certain universities. As a result, twice as many PhD departments have Hispanic faculty members as those that have African-American faculty members. In 2004, 67 PhD physics departments had at

Table 8. Estimated Tenured and Tenure-Track Physics Faculty Turnover, 2001 and 2003

	Type of Department			
	PhD	Master's	Bachelor's	Overall
Estimated Vacant Positions, 2003	186	48	106	340
Percent of Departments with Vacancies, 2003	57%	41%	19%	31%
Estimated Turnover, 2003	4.2%	6.8%	4.8%	4.6%
Estimated Turnover, 2001	4.3%	6.8%	7.2%	5.4%

AIP Statistical Research Center: 2004 AWF Survey

least one Hispanic faculty member. Forty bachelor's-granting departments had at least one Hispanic faculty member.

Astronomy. The 37 stand-alone astronomy departments have four African-American and six Hispanic faculty members (out of an estimated 590 FTE positions). The percentages of African-American and Hispanic faculty members in the astronomy departments are even lower than the physics departments. However, as we pointed out earlier, some of the numbers for faculty in physics departments include astronomers working in those departments.

TURNOVER, RETIREMENTS, AND RECRUITMENTS

Many departments, especially larger ones, experience a vacancy during any given academic year. Physicists and astronomers leave academic departments to take other jobs, both inside and outside the academy. In addition, faculty members retire or pass away. We asked departments to report how many faculty members left during the academic year 2002-03.

Physics. We estimate that 340 tenured, tenure-track,and permanent (for departments without a tenure system) physics faculty members left their positions during 2002-03 **(Table 8)**. This represents 15% fewer vacancies than during the academic year 2000-01. While the number of vacancies was almost identical in 2003 and 2001 for the graduate departments, the number of vacancies at bachelor's departments decreased significantly, from 162 in 2001 to 106 in 2003. This means that the number of vacancies at bachelor's departments returned to the level it was during the late 1990s, when the turnover rate was 4.5%.

Departments also had fewer faculty members retire than they did in the academic years ending in 2001 and 2002 **(Table 9)**. The estimated annual retirement rate during these two academic years was 3.1%, which was near its 2000 peak of 3.3%. In 2002-03 and 2003-04, however, the retirement rate was 2.6%, which is what it had been in the late 1990s. Where there had been 465 retirements during 2001 and 2002, there were just

Table 9. Estimated Annual Retirement Rates for Physics Faculty

	Type of Department			
	PhD	Master's	Bachelor's	Overall
Est. Number of Retirements, 2003 & 2004	220	44	122	386
Est. Percent of Departments with Retirements per Year, 2003 & 2004	42%	23%	11%	20%
Est. Annual Retirement Rate, 2003 & 2004	2.5%	3.1%	2.8%	2.6%
Est. Annual Retirement Rate, 2001& 2002	2.6%	4.0%	3.9%	3.1%

AIP Statistical Research Center: 2004 AWF Survey

Table 10. Physics Departments Recruiting New Faculty Members for 2003 and 2005

	Type of Department			
	PhD	Master's	Bachelor's	Overall
2005				
Number of Tenured & Tenure-Track Recruitments	284	58	127	469
Number of Temporary & Non-Tenure-Track Recruitments	32	15	106	153
2003				
Number of Tenured & Tenure-Track Recruitments	277	54	181	512
Number of Temporary & Non-Tenure-Track Recruitments	61	20	86	167

AIP Statistical Research Center: 2002, 2004 AWF Survey

386 in 2003 and 2004. During the earlier years, about one-third of departments had retirements, but during 2003 and 2004, only one-fifth of physics departments had someone retire. While all types of departments had fewer retirements, it is the master's and bachelor's departments that experienced the biggest drops in retirements. At master's departments, the number of retirements dropped by about one-fourth, and bachelor's departments dropped by about 30%. The percentage of bachelor's departments that had a faculty member retire was only 12% in 2003 and 2004, compared to 23% in 2001 and 2002. During times of economic uncertainty, it has been said that faculty members will often delay their retirements because they fear that the department will lose their position if they retire. Whether or not the budget crisis faced by some colleges and universities contributed to the lower retirement rate is unknown.

Because the turnover and retirement rates were lower, we can expect fewer recruitments and new hires for subsequent academic years. When a faculty member leaves, it can often take a physics department at least a full year to hire a replacement. A faculty member who leaves in the spring of one year creates a vacancy that will likely be advertised the following academic year, and if everything goes well, a new faculty member will start the year following that. However, not all positions for which departments are recruiting are filled in that time frame.

We asked departments to tell us the number of faculty members for which they were recruiting for the academic year 2004-05, which had not started at the time of the survey. During that year, physics departments were hoping to hire 469 new tenured and tenure-track faculty members, down from 512 in 2002-03 **(Table 10)**. PhD departments and master's departments were actually recruiting for more tenured and tenure-track faculty than they had been in 2003, but the bachelor's departments were recruiting 30% fewer tenured and tenure-track faculty members than they had two years earlier. Again, the economic uncertainly faced by many colleges and universities at this time could have played a role in this drop in recruitment, but it is also in line with the lower turnover rates at bachelor's departments.

Although tenured and tenure-track recruitments were higher at the graduate departments, recruitment of temporary full-time faculty was actually lower. In fact, recruitment for temporary full-time faculty at PhD departments dropped from 45 in 2002-03 to only 15 in 2004-05. In spite of the increase in temporary and non-tenure-track faculty among the FTE at PhD departments, it looks as though these departments may have begun to curb their use of these faculty. Recruitment of non-tenure-track permanent faculty remained constant at the graduate departments. At the bachelor's departments, recruitment of both temporary and non-tenure-track faculty increased by about one-fourth, perhaps in partial compensation for their lower number of tenured and tenure-track recruitments.

Astronomy. The 37 stand-alone astronomy departments had an estimated 21 faculty leave during the academic year 2002-03. During the two academic

Table 11. Tenured and Tenure-Track Turnover, Retirement, Recruitment, and New Hires at Astronomy Departments

Vacant Positions, 2003	21
Retirements, 2002 & 2003	15
New Hires, 2004	20
Recruitments, 2005	22

AIP Statistical Research Center: 2004 AWF Survey

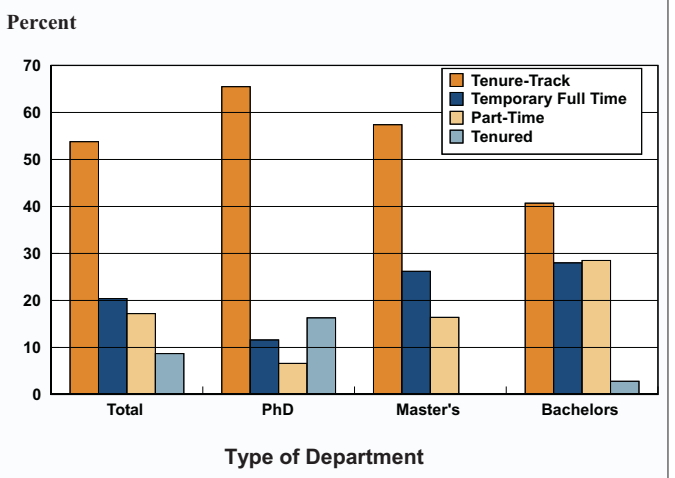
years 2002-03 and 2003-04, 15 faculty members retired from astronomy departments. This is a retirement rate of less than 2%. Most of the vacancies and retirements were at the PhD-granting astronomy departments.

As far as recruitment goes, the PhD astronomy departments were recruiting for 22 tenured or tenure-track faculty members to start in the 2004-05 academic year **(Table 11)**. The PhD departments were also recruiting for 5 temporary or non-tenure-track faculty members. Among the 7 bachelor's departments, there was only one recruited position, and this was for a temporary faculty member.

NEW HIRES

Especially during times of economic uncertainty, departments are very careful about selecting new faculty members. Finding the right person can be difficult and expensive, given not only the cost of the search but also the cost of a start-up package. As we will see, physics departments are increasingly turning

Figure 1. Employment Status of New Physics Faculty, 2004



AIP Statistical Research Center: 2004 AWF Survey

toward what they see as a sure thing—faculty members with experience, either as postdocs or at other Institutions.

Physics. For the academic year 2003-04, physics departments hired an estimated 638 faculty members **(Table 12)**. This is down somewhat from the 687 faculty members hired by these departments in 2001-02. However, the number of tenured and tenure-track faculty hired increased slightly to 361. While tenured and tenure-track new hires at PhD departments increased by 17, the number of new tenured and tenure-track faculty at bachelor's departments decreased by 12 positions. In addition, the number of new hires that were non-tenure-track decreased at bachelor's departments, where there were 45 fewer non-tenure-track hires. The extent to which these decreases are due to budgetary constraints is unknown. However, a lower number of new hires by

Table 12. Estimated Number of Physics Faculty Hired, 2002 and 2004

	Type of Department			
	PhD	Master's	Bachelor's	Overall
All Faculty, 2004	288	65	285	638
Tenured and Tenure-Track, 2004	214	35	112	361
All Faculty, 2002	274	71	342	687
Tenured and Tenure-Track, 2002	197	32	124	353

AIP Statistical Research Center: 2002, 2004 AWF Survey

Table 13. Current Positions of New Physics Faculty, 2004

	Type of Department		
	PhD (%)	Master's (%)	Bachelor's (%)
Full Professor	13.5	1.5	3.5
Associate Professor	14.0	8.0	3.5
Assistant Professor	57.0	48.0	53.0
Research Professor	2.5	1.5	0
Instructor/Adjunct	12.0	39.5	37.0
Visiting Professor	1.0	1.5	3.0

AIP Statistical Research Center: 2004 AWF Survey

bachelor's departments is certainly consistent with the lower turnover that we see there. The good news is that there has been little change in the number of tenured and tenure-track faculty hired overall, in spite of the changing economic situation at many colleges and universities.

Figure 1 shows the percentages of new hires that are tenured, tenure-track, temporary, and part-time. Overall, the majority of newly hired physics faculty are tenure-track, but there are differences by type of department. Bachelor's and master's departments hire a larger percentage of part-time and temporary faculty than physics departments that grant PhDs. In fact, the majority of new hires at bachelor's departments are either temporary or part-time.

Similarly, **Table 13** shows the percentage of new faculty members hired at various ranks. The most common rank of new faculty at all types of departments is assistant professor. However, bachelor's and master's departments hire much larger percentages of instructors (who are usually part-time or temporary) than PhD departments.

When we look just at tenured and tenure-track faculty, bachelor's departments are becoming more like PhD departments in terms of the types of faculty they hire. Out of the more than 110 tenured and tenure-track faculty who were newly hired at bachelor's departments, only nine had been graduate students before starting their jobs. At PhD departments, none of the more than 210 new tenured and tenure-track faculty members had been graduate students just before they were hired. Instead, bachelor's departments, like PhD departments, hire faculty members who previously worked as postdocs, tenured or tenure-track faculty at other departments, or research scientists **(Table 14)**.

Although both bachelor's and PhD departments expect their newly hired faculty members to have some experience, bachelor's departments are still more likely than PhD departments to hire faculty members

Table 14. Previous Positions of New Physics Faculty, 2004*

Type of Department			
PhD(%)		Bachelor's(%)	
Postdoc	40	Postdoc	34
Research Scientist	32	Tenured or Tenure-Track Professor	17
Tenured or Tenure-Track Professor	22	Research Scientist	13

AIP Statistical Research Center: 2004 AWF Survey

*Includes permanent non-tenured faculty at schools without tenure, and tenured and tenure-track faculty at other schools.

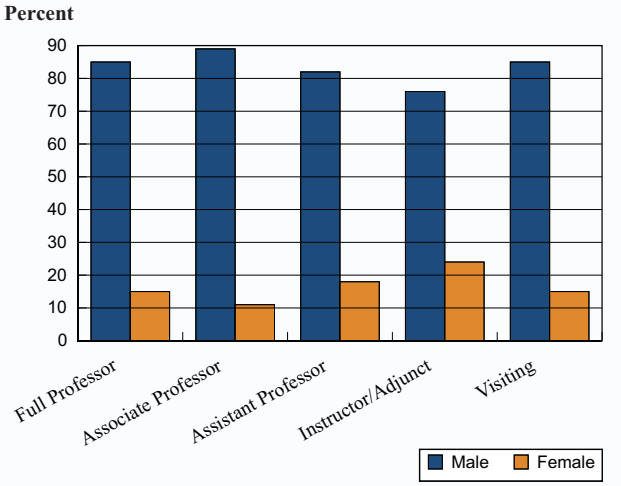
Table 15. Background of New Physics Faculty, 2004*

	Type of Department	
	PhD (%)	Bach (%)
Earned PhD in US within last 5 years	26	57
Earned PhD outside US, any year	33	10
Earned PhD in US > 5 years ago		
Previous Employer		
US Academic Institution	30	30
Industry, National Lab, Other	11	4

AIP Statistical Research Center: 2004 AWF Survey

*Includes permanent non-tenured faculty at schools without tenure, and tenured and tenure-track faculty at other schools.

Figure 2. Current Positions of New Physics Faculty by Gender, 2004



AIP Statistical Research Center: 2004 AWF Survey

who have earned their PhDs in the last five years **(Table 15)**. At bachelor's departments, the majority of new tenured and tenure-track faculty have earned their PhDs recently, although as we saw in Table 14, most of them had some experience before taking their current positions. At PhD departments, on the other hand, just over one-fourth of the new tenured and tenure-track faculty members are recent PhD graduates. About one-third of the new tenured and tenure-track faculty members at PhD departments earned their doctorates outside the US. This type of experience is less common for the new faculty members at bachelor's departments. Both PhD and bachelor's departments hire a significant percentage of more experienced tenured and tenure-track faculty members. That is, more than 40% of new tenured and tenure-track faculty members at PhD departments earned their PhDs more than five years ago. At bachelor's departments, about one-third of new tenured and tenure-track faculty members earned their PhDs more than five years earlier.

Departments continue to look for faculty members with experience, and many are also making efforts to hire female faculty members. **Figure 2** shows that the vast majority of newly hired faculty members are male. Although the percentages of newly hired female faculty are low, this is due almost entirely to their low representation among PhD recipients. For example, 18% of new assistant professors were female during the academic year 2003-04. Most new assistant professors have a postdoc or some other experience before becoming faculty members. Allowing for at least two years' work experience, we can look at the degree recipients for 2000-01 and earlier to get a very rough estimate of the candidate pool for new assistant professors. During 2000-01 (and for several years prior), women earned 13% of the physics PhDs in the US,[3] which is lower than the 18% hired as assistant professors for 2003-04. At the full professor level, 15% of the new hires were women, which is much higher than their representation among current full professors (5% in 2002).[4]

The percentage of female new hires among instructors and adjuncts (who are usually part-time) is higher than among ranked and visiting professors. In 2003-04, one-fourth of new adjuncts and instructors were women. In contrast with ranked and visiting professors, the proportion of new instructors and adjuncts who do not have PhDs is sizeable (45%). In 2003, women earned 21% of the master's degrees in physics, which is higher than the percentage of physics PhDs earned by women.[3] This may partially account for the higher percentage of women among instructors and adjuncts. In addition, there may be other

explanations, ranging from individual choice, to family constraints (such as the "two-body problem"), to discrimination. At the aggregate level, probably all of these contribute to the higher proportion of women among the newly hired instructors and adjuncts.

Astronomy. Astronomy departments hired 30 new faculty members for the year 2003-04. All but one of the new hires were at PhD astronomy departments. Two-thirds of the new hires were tenured or tenure-track. Astronomy departments have a higher percentage of new hires who are non-tenure-track permanent than physics departments do. Almost one-fourth of the new hires at astronomy departments fall into this category.

Women have traditionally earned a higher percentage of degrees in astronomy than in physics. In 2004, five of the 30 new faculty members at astronomy departments were women. This is 17%, which is lower than the proportion of women earning PhDs several years earlier, when women earned about one-fourth of the astronomy PhDs.[3] However, our previous analyses have shown that over the long-term, the percentage of astronomy faculty who are women is consistent with the percentages earning PhDs in the past.[4]

CONCLUSION

We began this report by describing the media coverage of the financial crises affecting colleges and universities in 2003. These reports predicted significant problems for faculty employment, and some universities did indeed feel such effects. Overall, however, predictions proved worse than the actual situation in physics and astronomy. For example, the number of full-time equivalent (FTE) faculty positions has continued to grow, reaching 9000 in 2004.

On the other hand, there are a number of reasonable concerns about the physics and astronomy workforce. First, the percentage of the faculty who are employed in temporary and non-tenure-track positions (at PhD departments with a tenure system) increased. This increase may be coming to an end, as PhD departments are reporting that they are recruiting for fewer temporary faculty.

In spite of increasing numbers of African-American and Hispanic faculty, the proportion of minority faculty members in physics and astronomy continues to be very low. Whether or not the numbers of African American and Hispanic faculty continue to increase depends partly on the numbers of African Americans and Hispanics earning degrees in the future.

There is a higher proportion of women among newly hired instructors and adjuncts than among ranked faculty. Women continue to be hired as ranked faculty members in proportions consistent with degree production. The reasons for the higher rates among instructors and adjuncts are of concern to many in the physics community.

Finally, recruitment of tenured and tenure-track faculty has dropped significantly at bachelor's departments, with signs that these departments are recruiting temporary and non-tenure-track faculty instead. Whether or not this change is the result of temporary budgetary issues can be explored further when we next collect these data.

While bringing to light issues related to the faculty job market in physics and astronomy, this survey did not address certain concerns that are very salient to faculty members, including the issue of salary. When faced with budgetary problems, one area that universities may use as a cost-saving device is faculty salary increases. Nevertheless, in spite of the predicted problems, there are still tenured and tenure-track jobs in physics and astronomy, particularly at the graduate departments.

REFERENCES

1. US Department of Education, National Center for Education Statistics (2002). *Tenure Status of Postsecondary Instructional Faculty and Staff: 1992-1998.* (NCES 2002-210), by Basmat Parsad and Denise Glover. Project Officer: Linda J. Zimbler. Washington, DC.

2. AAUP Research Office (2005). http://www.aaup.org/Issues/part-time/Fac%20Status%20Trend.pdf . John W. Curtis, Director of Research (compiled from US Department of Education IPEDS Fall Staff Survey). Washington, DC.

3. P. J. Mulvey and S. Nicholson, *Enrollments and Degrees Report, 2003*, American Institute of Physics, College Park, MD, 2005.

4. R. Ivie and K. Nies Ray, *Women in Physics and Astronomy, 2005,* American Institute of Physics, College Park, MD, 2005.