

Recent Physics Doctorates: Skills Used & Satisfaction with Employment

Data from the degree recipient follow-up survey for the classes of 2009 and 2010

Garrett Anderson and Patrick Mulvey

REPORTS ON PHYSICS DOCTORATES

Physics Doctorates, One
Year Later (July 2012)

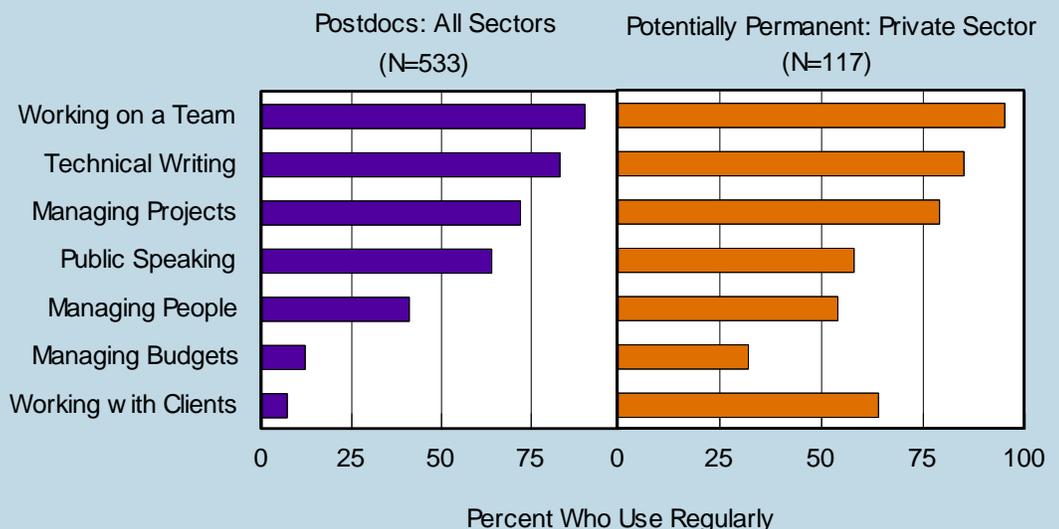
Physics Doctorates: Initial
Employment (July 2012)

**Recent Physics Doctorates,
Skills Used & Satisfaction with
Employment (March 2013)**

By the time people earn physics PhDs, they have learned a great deal about physics and how research is conducted. However, physics PhDs also develop skills and knowledge in a number of related areas, such as advanced mathematics, programming, modeling, and technical writing. New physics PhDs draw upon an arsenal of skills and knowledge in their early careers. This *focus on* in our series about new physics doctorates begins with a discussion about the types of skills and knowledge that physics PhDs from the classes of 2009 and 2010 used regularly in the jobs they held one year after earning their degrees. A summary of qualitative job satisfaction measures follows.

Figure 1

Interpersonal and Management Skills Regularly Used by New Physics PhDs, Classes of 2009 & 2010 Combined



Percentages represent the proportion of physics PhDs who chose “daily”, “weekly” or “monthly” on a four-point scale that also included “never or rarely”. Data only include U.S.-educated physics PhDs who remained in the U.S. after earning their degrees.

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

Compared to new postdocs, a larger proportion of new physics PhDs with jobs in the private sector regularly worked with clients, managed people, and managed budgets.

THE 2009 AND 2010 FOLLOW-UP SURVEYS OF PHYSICS DOCTORATES

Physics doctorate recipients are contacted in the winter following the academic year in which they receive their degrees. They are asked to share both objective and subjective information concerning their employment. This *focus on* series describes our findings.

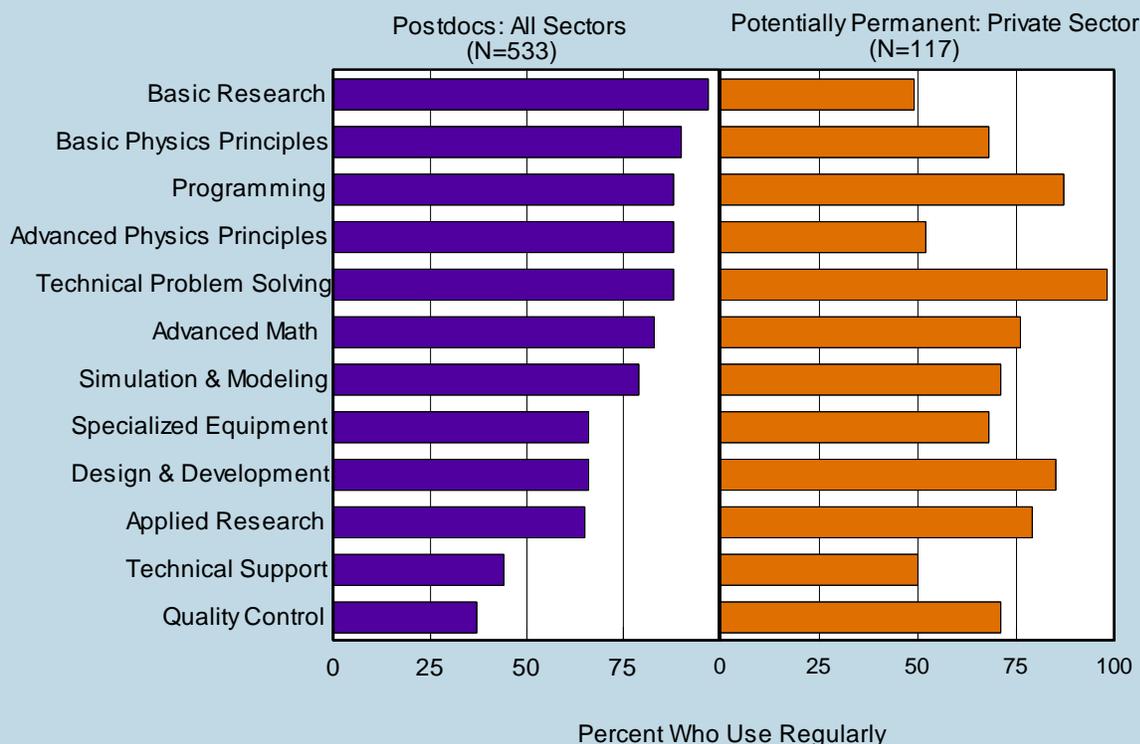
Comparing new physics PhDs who accepted postdoctoral positions to new PhDs who accepted potentially permanent positions in the private sector revealed some important similarities and differences in the skills and knowledge they regularly used.

Figure 1 (cover page) depicts the proportion of new PhDs who reported regularly using interpersonal and management skills and Figure 2 illustrates the use of specific scientific and technical knowledge in their positions.

Working on a team was an essential component of the employment of nearly all new physics PhDs. Technical writing and managing projects followed as the skills most frequently used by postdocs and PhDs in the private sector. A larger proportion of new PhDs in the private sector regularly worked with clients, managed people, and managed budgets than did new physics PhDs holding postdocs.

Figure 2

Scientific and Technical Knowledge Regularly Used by New Physics PhDs, Classes of 2009 & 2010 Combined



Programming, technical problem solving, and advanced math were used by more than three-quarters of new physics PhDs who accepted postdocs or jobs in the private sector.

Percentages represent the proportion of physics PhDs who chose “daily”, “weekly” or “monthly” on a four-point scale that also included “never or rarely”. Data only include U.S.-educated physics PhDs who remained in the U.S. after earning their degrees.

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

Scientific skills and technical knowledge, specifically programming, technical problem solving, and advanced math, were used by over three-quarters of new physics PhDs both in postdocs and in potentially permanent positions in the private sector. Basic physics principles and simulation and modeling were also regularly used by PhDs holding postdocs and private sector positions. In both academe and the private sector, employers tapped new physics PhDs to apply these kinds of skills to their unique ventures.

Differences by type of position can be readily inferred from the previous figures. Postdocs were far more likely than PhDs in the private sector to regularly do basic research and utilize advanced physics principles regularly in their work. A larger proportion of PhDs in the private sector were regularly involved in design and development, applied research, and quality control.

These differences reflect inherent differences in these types of employment; postdocs are temporary positions with research agendas largely motivated by scientific exploration, while jobs in the private sector typically involve producing a tangible product for a customer or providing a service to a client.

New physics PhDs clearly utilize a range of skills and knowledge acquired as part of their physics education or on the job. Every job has its unique challenges and opportunities which may or may not be well suited to a PhD's knowledge, skills, and interests.

Table 1

Qualitative Aspects of Initial Employment for Physics PhDs, Classes of 2009 & 2010 Combined

Percent agreeing with statement	Type of Employment: All Sectors	
	Postdoc	Potentially Permanent
	%	%
A physics PhD is an appropriate background for this position.	97	80
This position is professionally challenging.	89	79
I am satisfied with this position.	84	83
I consider myself underemployed in this position.	20	30
Number of respondents	539	225

The percentages represent the two positive responses on a 4-point scale, i.e., Very appropriate, Appropriate, Not very appropriate and Not at all appropriate. Data only include U.S.-educated physics PhDs who remained in the U.S. after earning their degrees.

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

Most new physics PhDs had a positive attitude about their job. However, postdocs tended to be more positive than PhDs in potentially permanent positions.

Overall satisfaction was high for both postdocs and PhDs accepting potentially permanent positions, but a higher percentage of the latter reported that they considered themselves underemployed in their positions. In general, new PhDs were *more* likely to be satisfied and *less* likely to feel underemployed when they agreed that a physics doctorate was an appropriate background for their positions and felt professionally challenged.

Table 2 (next page) depicts some qualitative differences by type of employer due to the wide variety of potentially permanent jobs accepted by new physics PhDs.

Three-quarters of PhDs with potentially permanent positions in the private sector agreed that a physics PhD was an appropriate background for their positions. Additionally, over 80% felt challenged by and satisfied with their private sector positions.

Ninety percent of PhDs at academic institutions and government research facilities agreed that a physics PhD was an appropriate background for their potentially permanent positions, but a smaller proportion in academia felt professionally challenged. New physics PhDs who accept potentially permanent positions in academia are often in teaching-intensive positions with limited opportunities for research. This likely contributed to the greater proportion who felt underemployed compared to new PhDs who were employed by the government.

Generally PhDs who were not satisfied with their positions considered themselves underemployed. The converse, however, was not always true. Given contextual factors such as work-life-balance and economic circumstances, it is reasonable that some of these PhDs, having been hired during the recent recession, would consider themselves underemployed but still be satisfied with their positions.

Table 2

Qualitative Aspects of Initial, Potentially Permanent Employment for Physics PhDs, Classes of 2009 & 2010 Combined

Percent agreeing with the statement	Potentially Permanent Employment		
	Private Sector	Academic*	Government
	%	%	%
I am satisfied with this position.	83	84	88
This position is professionally challenging.	82	73	85
A physics PhD is an appropriate background for this position.	75	90	90
I consider myself underemployed in this position.	31	33	17
Number of respondents	118	52	41

The percentages represent the two positive responses on a 4-point scale, i.e., Very appropriate, Appropriate, Not very appropriate and Not at all appropriate. Data only include U.S.-educated physics PhDs who remained in the U.S. after earning their degrees.

*The academic sector only includes universities, four year colleges, and university affiliated research institutes (UARI's).

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

Three-quarters of PhDs with potentially permanent employment in the private sector felt that a physics PhD was an appropriate background for their position, compared to 90% of those in government and academe.

Table 3**Opinions about the Postdoc Experience
PhD Classes of 2009 & 2010 Combined**

Percent agreeing with the statement	%
I feel the knowledge and skills I was developing in my postdoc would be valuable in my future career pursuits.	95
I was pleased with the amount of mentoring I was receiving.	84
Number of respondents	522

The percentages represent the two positive responses on a 4-point scale, e.g. Strongly agree, Agree, Disagree and Strongly disagree. Data only include U.S.-educated physics PhDs who remained in the U.S. after earning their degrees.

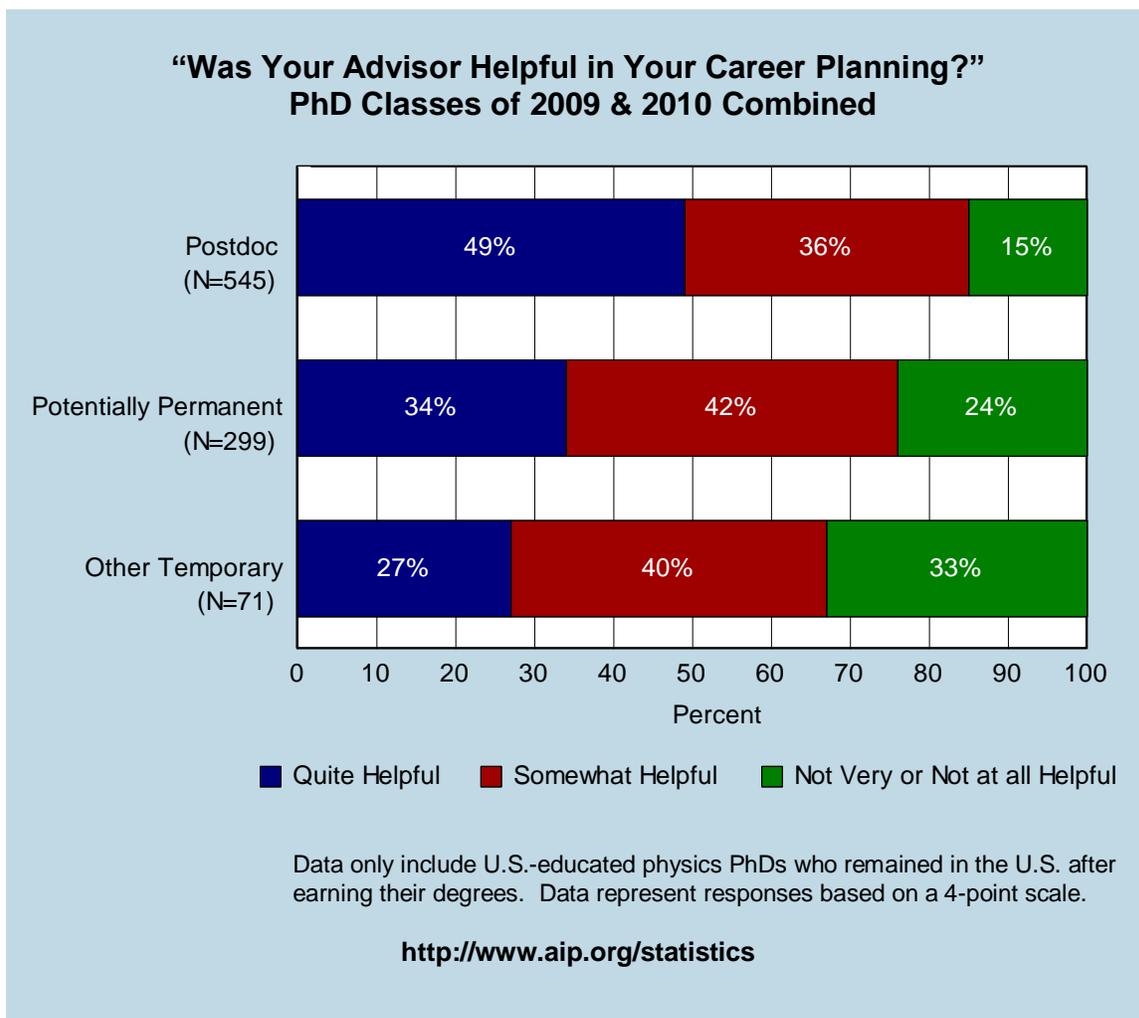
<http://www.aip.org/statistics>

New physics PhDs felt that their postdoctoral experiences were valuable bridges between their education and their future careers.

New PhDs who accepted postdocs were asked for their opinions about their postdoctoral experiences as an extension of their education and an investment in their future careers. The vast majority felt the knowledge and skills they were developing would be valuable in their future career pursuits and a strong majority were pleased with the amount of mentoring they were receiving. In previous versions of this report there were differences in the proportions of new PhDs agreeing with these statements by sex and citizenship. These differences were not evident for the classes of 2009 and 2010.

These two measures are somewhat interdependent. Nearly all postdocs (97%) who were pleased with their mentoring felt their postdoc would prove beneficial in their future career pursuits. A smaller proportion (85%) who felt that their postdoc would be valuable in future career pursuits were also pleased with their mentoring. In other words, satisfaction with the development of valuable knowledge and skills did not necessarily correspond to satisfaction with mentoring, but satisfaction with mentoring nearly always corresponded with satisfaction in the development of valuable knowledge and skills. A good mentor can be an invaluable asset in career development.

Figure 3



Most new physics PhDs found their advisors helpful in their career planning.

Accepting a postdoc has long been a common stepping stone for new physics PhDs striving for an academic career. As such, a career path that involves taking a postdoc is likely the most familiar path for advisors to assist PhDs in pursuing. Indeed, the majority (85%) of all postdocs reported that their advisors were helpful in their career planning, with nearly half claiming that their advisors were “quite helpful”. PhDs who accepted potentially permanent employment found their advisors only slightly less helpful, with 76% reporting that they were helpful in their career planning.

Two-thirds of PhDs who were in other temporary positions, mostly lecturers and visiting professors, reported that the career planning help they received from their advisors was helpful. Asked why they accepted their other temporary position, 44% reported that they “could not obtain a suitable permanent position”. This is likely reflected in their less favorable view of their advisors’ career planning help than reported by new PhDs accepting postdocs or potentially permanent positions.

Survey Methodology

Each fall the Statistical Research Center conducts its Survey of Enrollments and Degrees, which asks all degree-granting physics and astronomy departments in the U.S. to provide information concerning the numbers of students they have enrolled and counts of recent degree recipients. In connection with this survey, we ask for the names and contact information for their recent degree recipients. This degree recipient information is used to conduct our follow-up survey in the winter following the academic year in which they received their degrees. The data in this *focus on* come from that survey.

Recent PhD recipients can be very difficult to reach because they tend to move after receiving their degrees. Many times the departments do not provide or don't have accurate contact information for their alumni. To assist us in determining outcome information and to help obtain updated contact information, we contact the advisors of non-responding degree recipients, when possible.

The follow-up surveys for the classes of 2009 and 2010 were administered in a web-based format. Non-responding degree recipients were contacted up to four times with invitations to participate in the survey. The physics PhD classes of 2009 and 2010 consisted of 1,554 and 1,558 PhDs, respectively. We received post-degree information on 51% of these degree recipients. Thirty-three percent of our responses came from advisors, and the remainder came from the PhD recipients themselves. The information obtained from the advisors is limited to subfield of dissertation, US citizenship, sex, employment status, sector of employment, and location (in or out of the U.S.). PhDs who left the U.S. after receiving their degrees are not included in the analysis.

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