

## Career Outcomes for PhD Physicists – Information from the NSF’s Survey of Doctoral Recipients

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AIP gathers data on the initial career steps of physics PhD recipients during their first year after receiving their degree. Through our Survey of Society members, we also get a picture of longer-term career outcomes for those physics doctorates who join AIP member societies. But first-year data give a very limited picture of true career trajectory, especially given the large proportion of new PhD’s who move into a postdoc immediately following graduation. And only a bit more than half of all employed physics PhD’s who earned their degree in this country belong to an AIP member society. The representation is especially low among those working in the private sector.

About the only source of relatively representative data on the career outcomes of all US physics PhD’s is the National Science Foundation’s Survey of Doctoral Recipients (SDR), a biennial longitudinal survey that follows about 40,000 PhD’s, including approximately 1,850 physicists. These represent the almost 34,000 non-postdoc physicists up to the age of 75 who earned their doctorates and are employed in the US. Among the limitations of the dataset are that National Labs are not identified as a separate sector -- most National Lab employees likely classified themselves as working in the government / non-profit sector, with a smaller number putting themselves in academe.

The first table gives the broadest description of the sectors in which PhD physicists work.

**PhD Physicists Employer Type - 2001**

	<b>N</b>	<b>Percent</b>
Industry	15,619	46
Academe	11,421	34
Government, Non-Profit, Hospital	6,259	19
Other	430	1
Total	33,729	100

The next two tables take the same distribution and break it down by five-year degree cohorts. The variations between the cohorts can reflect both the impact of the economic climate when the PhD's emerged, and also changing patterns that characterize careers as they advance over time, including different retirement ages and post-retirement arrangements in different sectors. The oldest group may include individuals who have opted for a semi-retirement status, and the most recent group does not include a substantial number who were still in a postdoc at the time of the survey.

In the future, we expect to be able to secure additional data sets, allowing us to conduct longitudinal analyses. Doing so will facilitate the separation of the intertwining effects of career trajectory patterns and the effects of the particular economic and social conditions faced by different cohorts when they first enter the job market and at critical later career stages.

### Employer Type by Year of PhD (N) – 2001

Year of PhD	Employer Type				Total (rounded)
	Industry	Academe	Government, Non-Profit, Hospital	Other	
1946 – 1965	855	1,166	352	*	2,400
1966 – 1970	1,651	1,823	857	*	4,330
1971 – 1975	2,383	1,655	1,244	*	5,310
1976 – 1980	1,706	1,031	975	*	3,710
1981 – 1985	1,938	1,409	733	*	4,130
1986 – 1990	1,837	1,634	938	*	4,540
1991 – 1995	2,981	1,463	770	*	5,330
1996 – 2000**	2,269	1,242	389	*	3,980
<b>Total</b>	15,620	11,423	6,258	430	33,732

\*Too few to show.

\*\*Excludes recent PhD's who were still in postdocs at the time of the survey.

### Employer Type by Year of PhD (%) - 2001

Year of PhD	Employer Type				Total
	Industry	Academe	Government, Non-Profit, Hospital	Other	
1946 – 1965	36%	49%	15%	*	100%
1966 – 1970	38%	42%	20%	*	100%
1971 – 1975	45%	31%	23%	*	100%
1976 – 1980	46%	28%	26%	*	100%
1981 – 1985	47%	34%	18%	*	100%
1986 – 1990	41%	36%	21%	*	100%
1991 – 1995	56%	28%	15%	*	100%
1996 – 2000**	57%	31%	10%	*	100%
<b>Total</b>	46%	34%	19%	*	100%

\*Too few to show.

\*\*Excludes recent PhD's who were still in postdocs at the time of the survey.

The next three tables take the employment sector variable and further refine it to reflect the actual work activity of respondents. Most of those in academe who reported teaching as their primary work activity are employed in two-year and four-year colleges, while most of those who reported research as primary have appointments in universities. Research-Industrial includes those in the private sector who indicated either basic or applied research as their main focus. Applications include such work activities as computer programming / systems development, professional services in finance, law, and health, and design of equipment and process engineering. Managers and supervisors could be drawn from any sector, and, not surprisingly were more prevalent among cohorts in the later stages of their careers.

Because of exclusion of retirees and postdocs, caution should be used in interpreting the findings presented in the cohort tables for the oldest and most recent cohorts respectively.

### PhD Physicists Work Activity - 2001

	N	Percent
Teaching	5,801	17
Research - Academic	4,246	13
Research - Government/Non-Profit	3,488	10
Research - Industry	6,082	18
Applications	9,311	28
Managing/Supervising	4,184	12
Other	616	2
Total	33,729	100

### Work Activity by Year of PhD (N) - 2001

Year of PhD	Work Activity							Total (rounded)
	Teaching	Research - Academic	Research - Government/ Non-Profit	Research - Industry	Applications	Managing/ Supervising	Other	
1946 – 1965	539	501	178	475	376	229	*	2,400
1966 – 1970	1,098	459	309	713	981	676	*	4,330
1971 – 1975	934	421	516	744	1,654	981	*	5,310
1976 – 1980	458	263	670	591	966	679	*	3,710
1981 – 1985	531	765	505	776	893	587	*	4,130
1986 – 1990	895	677	660	645	1,148	429	*	4,540
1991 – 1995	724	706	448	1,124	1,873	443	*	5,330
1996 – 2000**	621	454	203	1,014	1,421	161	*	3,970
<b>Total</b>	<b>5,800</b>	<b>4,246</b>	<b>3,489</b>	<b>6,082</b>	<b>9,312</b>	<b>4,185</b>	<b>617</b>	<b>33,731</b>

\*Too few to show.

\*\*Excludes recent PhD's who were still in postdocs at the time of the survey.

## Work Activity by Year of PhD (%) - 2001

Year of PhD	Work Activity							Total
	Teaching	Research - Academic	Research - Government/ Non-Profit	Research - Industry	Applications	Managing/ Supervising	Other	
1946 – 1965	22%	21%	7%	20%	16%	10%	*	100%
1966 – 1970	25%	11%	7%	17%	23%	16%	*	100%
1971 – 1975	18%	8%	10%	14%	31%	19%	*	100%
1976 – 1980	12%	7%	18%	16%	26%	18%	*	100%
1981 – 1985	13%	19%	12%	19%	22%	14%	*	100%
1986 – 1990	20%	15%	15%	14%	25%	9%	*	100%
1991 – 1995	14%	13%	8%	21%	35%	8%	*	100%
1996 – 2000**	16%	11%	5%	26%	36%	4%	*	100%
Total	17%	13%	10%	18%	28%	12%	2%	100%

\*Too few to show.

\*\*Excludes recent PhD's who were still in postdocs at the time of the survey.

The next two tables look at differences in sector and work activity patterns between US citizens and non-citizens. The largest differences seem to stem from two different factors. The first noticeable difference, the relative paucity of foreign citizens working in the government / non-profit sector, is probably related to security regulations that forbid non-citizens from taking many jobs in government agencies and national labs.

The second big difference, the low percentage of foreign citizens in managerial or supervisory jobs, is largely due to timing. Managerial jobs tend to be more prevalent among more senior employees, who got their degrees earlier. However, there are few non-citizens among these earlier cohorts of PhD's. One reason is because foreign student presence in US physics PhD programs has only recently risen to its current level of around 50%. The second reason is because the study records citizenship status in 2001, and the longer that respondents who originally came from other countries have been living and working in the US, the more likely it is that they will either have applied for and received US citizenship, or else have returned to their country of origin. Support for these assumptions can be seen in the distribution for naturalized citizens, which closely parallels the distribution for native-born citizens. Of course, some of the discrepancy between citizens and non-citizens may also be due to language barriers, regulations, or discrimination against non-citizens, but there is no way to discern this in the current dataset.

### Work Activity by Citizenship (N) - 2001

Citizenship	Work Activity							Total
	Teaching	Research - Academic	Research - Government/ Non-Profit	Research - Industry	Applications	Managing/ Supervising	Other	
Non-US Citizens	389	549	139	819	1,133	88	0	3,117
US Citizens – Naturalized	1,133	770	509	1,341	1,657	817	91	6,318
US Citizens – Native Born	4,279	2,927	2,839	3,922	6,521	3,279	525	24,292
<b>Total</b>	<b>5,801</b>	<b>4,246</b>	<b>3,487</b>	<b>6,082</b>	<b>9,311</b>	<b>4,184</b>	<b>616</b>	<b>33,727</b>

### Work Activity by Citizenship (%) - 2001

Citizenship	Work Activity							Total
	Teaching	Research - Academic	Research - Government/ Non-Profit	Research - Industry	Applications	Managing/ Supervising	Other	
Non-US Citizens	13%	18%	5%	26%	36%	3%	0%	100%
US Citizens – Naturalized	18%	12%	8%	21%	26%	13%	1%	100%
US Citizens – Native Born	18%	12%	12%	16%	27%	14%	2%	100%
<b>Total</b>	<b>17%</b>	<b>13%</b>	<b>10%</b>	<b>18%</b>	<b>28%</b>	<b>12%</b>	<b>2%</b>	<b>100%</b>

Many of the same patterns that characterized the citizenship tables can also be seen in the gender tables below, because of similar reasons. Women have historically been greatly underrepresented among the ranks of PhD physicists, and although their presence has risen in recent decades, it was still below 15% in 2001. This (along with, we suspect, gender discrimination in career advancement) may account for the moderate discrepancy in the percentage of women versus men in managerial and supervisory roles. On the other hand, the higher percentage of women in academia, in both primarily research and teaching roles, may be due to aggressive recruitment of women by colleges and universities in recent years, although nothing in the current data set can directly corroborate that surmise.

**Work Activity by Gender (N) - 2001**

Gender	Work Activity							Total
	Teaching	Research - Academic	Research - Government/ Non-Profit	Research - Industry	Applications	Managing/ Supervising	Other	
Women	615	376	172	505	482	189	63	2,402
Men	5,186	3,870	3,316	5,577	8,829	3,996	553	31,327
Total	5,801	4,246	3,488	6,082	9,311	4,185	616	33,729

### Work Activity by Gender (%) - 2001

Gender	Work Activity							Total
	Teaching	Research - Academic	Research - Government/ Non-Profit	Research - Industry	Applications	Managing/ Supervising	Other	
Women	26%	16%	7%	21%	20%	8%	3%	100%
Men	17%	12%	11%	18%	28%	13%	2%	100%
Total	17%	13%	10%	18%	28%	12%	2%	100%

**The use of NSF data does not imply NSF endorsement of the research methods or conclusions contained in this report.**