The Physics and Astronomy Education and Career Landscape

Data from www.aip.org

Presented by
Dr. Mike Strauss
For REU Program
Physics Bachelor Degree Numbers

Number of Bachelor's Degrees Earned in Physics, Classes 1981 through 2016.

Physics Bachelor's Degrees Awarded

AIP|Statistics aip.org/statistics
What are new graduates doing?

Status of Physics Bachelors One Year After Degree, Classes 1995 through 2014

- Employed
- Physics or Astronomy Graduate Study
- Graduate Studies in Other Fields
- Unemployed

http://www.aip.org/statistics
A degree in physics leaves one poised to enter many professions that include but are not limited to traditional physics. The discipline of physics teaches skills that are transferable to these professions. These transferable skills include: mathematical modeling, problem solving, designing experiments, interpretation of experimental data, reflecting on answers before trusting them, research experience, laboratory technique, communication skills. Study physics and maximize your options!
Employment Where and What?

Initial Employment* Sectors of New Physics Bachelors, Classes of 2015 & 2016 Combined

- Private Sector: 66%
- College & University: 9%
- High School: 8%
- Active Military: 6%
- Civilian Gov’t, National Lab: 5%
- Other: 6%

Field of Employment for New Physics Bachelors in the Private Sector, Classes of 2015 & 2016 Combined

- Engineering: 35%
- Computer or Information Systems: 27%
- Non-STEM, Regularly Solves Technical Problems: 15%
- Non-STEM, Rarely or Never Solves Technical Problems: 7%
- Other STEM: 12%
- Other: 4%
- Physics or Astronomy: 7%

* 47% of new physics bachelors were employed in the winter following the year in which they received their degree.
Initial Employment Sectors of Astronomy Bachelors One Year After Degree, Classes of 2014, 2015, & 2016 Combined

- Private Sector, STEM*: 41%
- Private Sector, Non-STEM*: 17%
- College/University: 18%
- Other: 11%
- Civilian Government: 6%
- Nonprofit: 4%
- Military: 3%

The "Other" category is mostly comprised of middle and high schools, medical facilities, and nonprofit organizations.

*STEM refers to positions in science, technology, engineering and math.
<table>
<thead>
<tr>
<th>Sector</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Sector</td>
<td>54</td>
<td>61</td>
</tr>
<tr>
<td>Civilian Government*</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>High School Teacher</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>College or University**</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Active Military</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Total %</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

* Includes Federally Funded Research and Development Centers and National labs.
** Includes two- and four-year colleges, universities, and university affiliated research institutes.

Figure based on the responses of 1,657 physics bachelors

www.aip.org/statistics
Starting Salaries for Physics Bachelors
Classes of 2017 & 2018

The salary range for the 5% employed in other sectors is not shown. The full starting salary range is represented by the lines extending to each side of the box. The box represents the middle 50% (25th to 75th percentile) of the salaries. The vertical line within the box represents the median starting salary. STEM refers to positions in science, technology, engineering, and math. Regularly solving technical problems refers to respondents who selected "Daily", "Weekly", or "Monthly" on a four-point scale that also included "Rarely or Never" when asked how frequently they solved technical problems in their positions.
Salaries for Astronomy Bachelor’s Degree


Private Sector, STEM* (N=20)

Private Sector, Non-STEM* (N=21)

College / University (N=26)

Updated 2010-2012 plot is basically identical

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

*STEM refers to positions in natural science, technology, engineering and math.

http://www.aip.org/statistics
Physics and Other STEM Degrees

What Do New Bachelors Earn?
Starting Salaries for the Class of 2018

Computer Science
Engineering
Mathematics
Physics
Registered Nursing
Economics
Finance
Accounting
Business Admin/Mgmt
Architecture
Marketing
Chemistry
Sociology
Biology
Psychology

Starting Salary in Thousands

Bars represent the middle 50% of salaries, i.e. between the 25th and the 75th percentiles.
Reprinted from the Summer 2019 Salary Survey, with permission of the National Association of Colleges and Employers, copyright holder.
Knowledge and Skills Regularly Used by New Physics Bachelors Employed in the Private Sector, Classes of 2015 & 2016 Combined

Skills Used

- Work on a Team
- Solve Technical Problems
- Technical Writing
- Design & Development
- Perform Quality Control
- Use Specialized Equip.
- Programming
- Manage Projects
- Knowledge of Phys. or Ast.
- Simulation or Modeling
- Advanced Math
- Work with Customers
- Manage People
- Manage Budgets

Percent regularly using knowledge or skill

Employment in Engineering

Employment in Computer Science or Information Technology

Percentages represent the physics bachelors who indicated they use a knowledge or skill “daily,” “weekly,” or “monthly” on a four-point scale that also included “never or rarely.”
Job Satisfaction of Physics Bachelor’s Degree

Job Satisfaction of Physics Bachelors in Private Sector STEM Positions, Classes of 2013 & 2014 Combined

- Job Security
- Level of Responsibility
- Opportunity for Advancement
- Salary and Benefits
- Intellectual Challenge
- Overall

Percentages represent the physics bachelors who chose “very satisfied” or “somewhat satisfied” on a four-point scale that also included “somewhat dissatisfied” and “very dissatisfied.” STEM refers to natural science, technology, engineering and math.

Figure based on the responses of 670 physics bachelors employed in private sector STEM positions.

www.aip.org/statistics

Job Satisfaction of Physics Bachelors in Private Sector Non-STEM Positions, Classes of 2013 & 2014 Combined

- Job Security
- Level of Responsibility
- Opportunity for Advancement
- Salary and Benefits
- Intellectual Challenge
- Overall

Percentages represent the physics bachelors who chose “very satisfied” or “somewhat satisfied” on a four-point scale that also included “somewhat dissatisfied” and “very dissatisfied.” STEM refers to natural science, technology, engineering and math.

Figure based on the responses of 266 physics bachelors employed in private sector non-STEM positions.

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More than a Bachelor’s Degree?

Starting Salaries in the Private Sector
Physics Degree Recipients, Classes of 2013 & 2014

Note: Typical salaries are the middle 50%, i.e. between the 25th and 75th percentiles. STEM refers to positions in Science, Technology, Engineering, and Math.
Physics Bachelor’s Pursuing Graduate School

Field of Graduate Study for Physics Bachelors One Year After Degree, Classes of 2013 & 2014 Combined

- Physics or Astronomy: 59%
- Engineering: 20%
- Other: 21%

Mathematics
- Medicine
- Education
- Physical Sciences
- Computer Science
- Social Sciences
- Law
- Business
- Humanities
- Other

Figure based on 2,709 physics bachelors who enrolled in graduate school following graduation.

http://www.aip.org/statistics
Physics PhDs Conferred in the US, 1900 through 2010.
Ph.D.s Conferred
Citizenship of Physics and Astronomy Ph.Ds

Physics PhDs Conferred in the U.S., 1900 through 2016.

Astronomy PhDs Awarded by Citizenship, Classes 1983 through 2012.

Sources: ACE (1900-1919), NAS (1920-1961), AIP (1962-2016)

http://www.aip.org/statistics
Women in Physics and Astronomy

Percent of Physics Bachelors and PhDs Earned by Women, Classes of 1977 through 2017

Percent of Bachelor's Degrees and Doctorates in Astronomy Earned by Women, Classes 1987 through 2017.

Source: AIP Statistical Research Center, Enrollments and Degrees Survey.
Under-represented groups in Physics

Number and Percent of Physics Bachelor's Degrees Earned by African-Americans

Number of Physics Doctorates Earned by African-Americans and Hispanic-Americans, Classes 1997 through 2016.
Subfields of Physics

Average Number of PhDs Granted by Subfield from Physics Departments Annually, Classes of 2017 and 2018 Combined

- Condensed Matter Physics: 370
- Particles and Fields: 290
- Astronomy | Astrophysics | Cosmology: 280
- Atomic, Molecular, and Optical Physics: 150
- Biological Physics: 140
- Nuclear Physics: 130
- Materials Science | Nano-science | Surface Physics: 90
- Optics | Photonics: 80
- Computational Physics: 50
- Plasma | Fusion Physics: 40
- Applied | Engineering Physics | Energy Research: 30
- Quantum Foundations | Information Theory: 30
- Complex Systems Research | Statistical | Non-linear | Thermal Physics: 30
- Relativity | Gravitation: 30
- Soft Matter | Polymer Physics: 30
- Other: 130

Note: These data are estimated from responses to the AIP Follow-up Survey of Physics PhDs and total 1,900 individuals. Additionally, there was an average of 180 astronomy PhDs conferred at departments that offer an astronomy degree.
The numbers on the graph indicate the number of new faculty members.

Total number of new faculty:
241 in PhD-granting departments
62 in Master’s-granting departments
259 in Bachelor’s-granting departments

FT – Full-time ◆ PT – Part-time

http://www.aip.org/statistics
# After Physics Graduate School?

<table>
<thead>
<tr>
<th>Sector of Employment</th>
<th>Initial Employment Type</th>
<th>Overall %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Postdoc %</td>
<td>Potentially Permanent %</td>
</tr>
<tr>
<td>Academic*</td>
<td>75</td>
<td>20</td>
</tr>
<tr>
<td>Private</td>
<td>1</td>
<td>70</td>
</tr>
<tr>
<td>Government</td>
<td>21</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: Data only include US-educated physics PhDs who remained in the US after earning their degrees. Data are based on the responses of 655 postdocs, 523 individuals working in potentially permanent positions and 126 individuals working in “other temporary positions.”

*The academic sector includes two- and four-year colleges, universities, and university affiliated research institutes.

[http://www.aip.org/statistics](http://www.aip.org/statistics)
After Physics Graduate School?

Initial Employment of Physics PhDs, 1979 through 2014.

In 1991, the survey questionnaire was changed to measure “other temporary” employment as a separate category. Data are limited to PhDs who earned their degrees from a US university and remained in the US.

www.aip.org/statistics


Data are limited to PhDs who earned their degrees from a US university and remained in the US.

www.aip.org/statistics
Ph.D. Starting Salaries

Starting Salaries for Physics PhDs, Classes of 2013 & 2014 Combined

<table>
<thead>
<tr>
<th>Position</th>
<th>Salaries in Thousands of Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Sector</td>
<td></td>
</tr>
<tr>
<td>University &amp; 4-year College</td>
<td></td>
</tr>
<tr>
<td>Postdocs</td>
<td></td>
</tr>
<tr>
<td>Government Lab</td>
<td></td>
</tr>
<tr>
<td>University &amp; UARI</td>
<td></td>
</tr>
</tbody>
</table>

Note: Typical salaries are the middle 50%, i.e., between the 25th and the 75th percentiles. Data are limited to PhDs who earned their degrees from a US university and remained in the US. Academic includes: Universities, university-affiliated research institutes (UARI) and observatories. Government includes: National laboratories and other federal agencies. The academic and government salary ranges are based on 89 and 19 respondents respectively.

http://www.aip.org/statistics
Data include U.S.-educated physicists who earned their PhD 10-15 years earlier and were working full-time in the U.S. in 2011. Respondents were asked to provide their current annual salary excluding bonuses, overtime and additional compensation. Typical salaries are the middle 50%, i.e. between the 25th and 75th percentiles.
## Ph.D. Preparation and Satisfaction

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

<table>
<thead>
<tr>
<th>Percent agreeing with statement</th>
<th>Type of Employment: All Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Postdoc</td>
</tr>
<tr>
<td>A physics PhD is an appropriate background for this position.</td>
<td>97%</td>
</tr>
<tr>
<td>This position is professionally challenging.</td>
<td>89%</td>
</tr>
<tr>
<td>I am satisfied with this position.</td>
<td>84%</td>
</tr>
<tr>
<td>I consider myself underemployed in this position.</td>
<td>20%</td>
</tr>
<tr>
<td>Number of respondents</td>
<td>539</td>
</tr>
</tbody>
</table>

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](http://www.aip.org/statistics)
Discussion/Questions