Physics & Astronomy Career Workshop #1

Career Formation:
What Do Physicists Do, and What Should I Do?

20 January 2022
A FEW FACTS: PHYSICS DEGREES IN THE US

• 9300 people graduated with bachelor’s degrees in physics last year
• 1829 people graduated with PhDs in physics last year
• 434 people were hired as full-time physics faculty members in 2018/19
• 5% of all physics bachelor’s eventually end up as physics professors

Various reports, AIP Statistical Research Center
Physics Bachelors 1 Year Later
8,800 Recent Degree Recipients

- Workforce: 52%
  - Private Sector: 32%
  - College & University: 4%
  - High School Teaching: 3%
  - Active Military: 3%
  - Government: 3%
  - Other: 2%
  - Unemployed, Seeking: 5%

- Graduate Study: 29%
  - Astronomy or Physics: 25%
  - Other Fields: 4%

- Graduate Study: 19%
  - Engineering: 9%
  - Other Science & Math: 6%
  - Education: 2%
  - Other: 3%

AIP Statistical Research Center
Status of Physics Bachelors One Year After Degree, Classes of 1996 through 2018

AIP Statistical Research Center
Initial Employment* Sectors of New Physics Bachelors, Classes of 2015 & 2016 Combined

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

* 47% of new physics bachelors were employed in the winter following the year in which they received their degree.
Field of Employment for New Physics Bachelors

Employed in the Private Sector

- Engineering
- Computer or Information Systems
- Other STEM
- Physics or Astronomy
- Non-STEM: Regularly Solves Technical Problems
- Non-STEM: Rarely or Never Solves Technical Problems

AIP Statistical Research Center
Common Job Titles of New Physics Bachelors

**Engineering**
- Systems Engineer
- Electrical Engineer
- Design Engineer
- Mechanical Engineer
- Project Engineer
- Optical Engineer
- Manufacturing Technician
- Associate Engineer
- Application Engineer
- Development Engineer
- Process Engineer / Technician
- Product Engineer
- Product Manager
- Research Engineer
- Test Engineer
- Technical Services Engineer
- Integration Engineer

**Computer Hardware/Software**
- Software Engineer / Developer
- Programmer
- Web Developer
- IT Consultant
- Systems Analyst
- Technical Support Staff
- Data Analyst

**Business/Finance**
- Business Analyst
- Consultant
- Project Manager
- Investment Associate / Trader

**Research and Technical**
- Research Assistant
- Research Associate
- Research Technician
- Lab Technician / Assistant
- Scientist

**Education**
- High School Physics Teacher
- High School Science Teacher
- Middle School Science Teacher

Starting Salaries for Physics Bachelors
Classes of 2017 & 2018

- Private Sector STEM: 53%
- Private Sector non-STEM, Regularly Solves Technical Problems: 11%
- Private Sector non-STEM, Rarely or Never Solves Technical Problems: 3%
- Civilian Govt. (incl. National Labs): 6%
- Active Military: 5%
- High School Teachers: 7%
- College or University: 9%
Knowledge and Skills Regularly Used by New Physics Bachelors Employed in the Private Sector, Classes of 2015 & 2016 Combined

[Bar chart showing the percentage of students regularly using knowledge or skill in different fields: Engineering and Computer Science or Information Technology. The skills include Work on a Team, Solve Technical Problems, Technical Writing, Design & Development, Perform Quality Control, Use Specialized Equipment, Programming, Manage Projects, Knowledge of Phys. or Ast., Simulation or Modeling, Advanced Math, Work with Customers, Manage People, and Manage Budgets. The chart shows a comparison between the two sectors for each skill, with the percentage ranging from 0 to 100.]
Physics PhDs 1 Year Later

Physics Doctorates
1,850

Remained in the U.S.
1,600

47%
Postdoc Positions
560 University
150 Government*
40 Other

39%
Potentially Permanent Positions
455 Private Sector
100 Academe
45 Government*
25 Other

8%
Other Temporary Positions
90 Academe
30 Private Sector
10 Other

6% of those in the U.S. were unemployed the winter after receiving their degrees. <1% of those in the U.S. were not employed and not seeking employment.

Source: Outcome data comes from the AIP Follow-up Survey of Physics PhDs, the classes of 2015 and 2016 combined. The 1,850 physics doctorates is an average of the two degree classes. *Government includes local and federal government, government labs, and Federally Funded Research and Development Centers.

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.
Reasons for Accepting a Postdoctoral Fellowship, Classes of 2015 & 2016 Combined

- Necessary step to get a desired future position
- Obtain research experience in my field
- Work with a particular scientist or research group
- Could not obtain a suitable permanent position
- Personal or family-related reasons
- Switch to a different field
- Visa restrictions limited my options*

*Note: The asterisk indicates a reason that was significantly more influential compared to the others.
Employment Field of New Physics PhDs, Classes of 2015 & 2016 Combined

<table>
<thead>
<tr>
<th></th>
<th>Percent</th>
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<tbody>
<tr>
<td>Postdoctoral Position</td>
<td>69</td>
</tr>
<tr>
<td>Other Temporary Position</td>
<td>22</td>
</tr>
<tr>
<td>Potentially Permanent Position</td>
<td>18</td>
</tr>
</tbody>
</table>

Other Fields:
- Computer software: 23%
- Engineering: 14%
- Business or finance: 11%
- Other sciences: 9%
- Education: 3%
- Medical services: 1%
- Other: 5%

- Employment in physics - same subfield as dissertation
- Employment in physics - different subfield from dissertation
- Employment in other fields
Field of employment for new physics PhDs (potentially-permanent positions)

- Physics: 17%
- Engineering: 17%
- Computer software: 20%
- Computer hardware: 6%
- Business: 10%
- Data science: 6%
- Other STEM: 7%
- Medicine: 2%
- Education (physics): 17%
- Education (non-physics): 9%
- Non-STEM: 4%
- Other: 2%
Common job titles for new physics PhDs

**Engineering**
- Aeronautical Engineer
- Applications Engineer
- Battery Test Engineer
- Characterization Engineer
- Development Engineer
- Device Modeling and Testing Engineer
- Laser and Optics Engineer
- Process Technology Development Engineer
- R&D Engineer
- Systems Analyst
- Systems Engineer
- Technical Specialist
- Senior Design Engineer
- Sensor System Engineer

**Computer software**
- Analyst / Programmer
- Application Developer
- Associate Software Engineer
- Autonomy Engineer
- Flight Software Engineer II
- Mathematical Analyst and Developer
- Scientific Programmer

**Data science**
- Data Analyst
- Machine Learning Engineer
- Research Analytics Consultant
- Tech Data Scientist II

**Business**
- Algorithm Developer
- Credit Research Associate
- Data Analyst
- Quantitative Financial Analyst
- Risk Insights Analyst
- Senior Analytics Consultant
Starting Salaries for New Physics PhDs, Classes of 2015 & 2016 Combined

Potentially Permanent Positions
- Private Sector
- University & 4-Year College

Postdocs
- Government Lab
- University & UARI

Other Temporary Positions
- University & 4-Year College
Starting Salary Ranges for New Physics PhDs in Potentially Permanent Positions, Classes of 2014 through 2018

Salaries (in thousands)

- Data Science
- Computer Software
- Computer Hardware
- Business
- Engineering
- Non-STEM
- Physics
- Other STEM
- Medicine
- Education (non-Physics)
- Education (Physics)
Scientific and Technical Knowledge Used by New Physics PhDs Employed in Potentially Permanent Positions, Classes of 2015 & 2016 Combined

- Solve Technical Problems
- Programming
- Design and Development
- Basic Physics Principles
- Applied Research
- Advanced Physics Principles
- Basic Research
- Advanced Math
- Use Specialized Equipment
- Simulation and Modeling
- Quality Control
- Tech Support

Frequency of Use:
- Daily or Weekly
- Monthly
Interpersonal and Management Skills Used by New Physics PhDs Employed in Potentially Permanent Positions, Classes of 2015 & 2016 Combined

- **Teamwork**: Showing usage frequency in Physics, Engineering, and Computer Science.
- **Technical Writing**: Frequency comparison across Physics, Engineering, and Computer Science.
- **Manage Projects**: Usage across different fields, indicating frequency of use.
- **Work with Clients**: Comparison of frequency used in Physics, Engineering, and Computer Science.
- **Public Speaking**: Frequency distribution in Physics, Engineering, and Computer Science.
- **Manage People**: Use of this skill in Physics, Engineering, and Computer Science.
- **Manage Budgets**: Frequency of use comparison for Physics, Engineering, and Computer Science.
Career Planning Process

Foundational activities: before you need a job

• Self-knowledge: what are my goals, interests, and values?
• Self-assessment: what are my skills and knowledge?
• Exploration: what kinds of careers are out there and whom can I talk to about them?

Workshops #1 and #2 concentrate on these

Focused activities: when you need a job

• Finding available positions
• Researching companies
• Writing a resumé to respond to a job ad
• Interviewing

Workshops #3 and #4 concentrate on these
University Career Services

[https://careers.unc.edu/](https://careers.unc.edu/)

UCS offers services for students at all degree levels and at all stages of the career planning process. Let’s hear from Stephenie McIntyre, Director of Career Education...
Foundational activities

Keep a career journal

Goals: what is important to me?
• Make the world better
• Make a lot of money
• Live in Colorado
• Work-life balance/time for family or hobbies
• Traveling (post-pandemic!)

Interests: how do I like to spend my time?
• Tinkering with equipment
• Coding
• Analyzing data/figuring out the Universe
• Writing
• Working with other people

Strengths: what am I really good at?
• Keeping track of details
• Seeing the big picture
• Writing
• Working with diverse teams
• Writing code
• Making equipment work
Foundational activities

Skills inventory: what can I do, and when have I done it?
Identify skills and an example of where you have used them

Technical skills
• Solving complex technical problems
• Teaching: conceptualizing & explaining
• Programming
• Documentation
• Data and error analysis
• Advanced mathematics
• Simulation and modeling
• Using (and repairing) specialized equipment
• Quality control
• Machining

Non-technical skills
• Functioning in a variety of environments and roles
• Writing concisely and accurately
• Presenting information orally
• Tailoring your message to an audience
• Supporting a position with argumentation, logic, data
• Conceiving/designing complex projects
• Implementing and managing to completion
• Managing/leading groups of people
• Managing projects (creating task lists, developing timelines, setting goals, etc.)
• Planning for and obtaining necessary resources (e.g. funding)
• Developing and managing budgets
• Working on a team

You will use this when you write a resumé in workshop #3
Foundational activities

Exploration: what careers am I interested in and whom can I talk to about them?

What careers?
Many resources on the department’s (new!) Career Info webpage:
https://physics.unc.edu/career-info/

Google sheet with alums (name, job, company):
https://docs.google.com/spreadsheets/d/10OxqWLSxJK1VeWKF84kigCPcu9ok2a3Us-MEMAQnP6g/edit

Whom to talk to?
Many physicists can be found on LinkedIn—you need to be there too!
https://www.linkedin.com/

For info on how to join, see
https://careers.unc.edu/students/networking-and-social-media/how-build-your-linked-in-presence
Foundational activities homework

**Self-knowledge**
Revisit your list of goals, interests, and strengths; incorporate Clifton and discuss with others

**Self-assessment**
Keep working on your skills inventory—what else have you done?

**Exploration**
Watch an APS webinar on a career sector that interests you: [https://www.aps.org/webinars/](https://www.aps.org/webinars/) (OK to do at 2X speed!)

**Exploration**
Look through profiles (including on LinkedIn—join now!) and use your goals/interests/strengths to identify career paths that sound appealing

**Exploration**
Identify individuals who have jobs that interest you whom you would like to contact

*You will use these in workshop #2*