Navigating the job market as a physics and STEM degree holder (in the era of COVID)

Wennie Wang
04 December 2020
wwwwennie@uchicago.edu
Goals for today:

1) Provide a big picture of the career paths for physics (and STEM) degree holders

2) Provide tips and next steps for the job search market

Entrance Poll

https://tinyurl.com/y5foruyz
How many **PhDs** are there?

The number of Physics PhDs granted in the U.S. has almost doubled over the last two decades!

**About 1600** physics PhDs go into the U.S. job market every year.

Sources: ACE (1900-1919), NAS (1920-1961), AIP (1962-2018)
How many MS holders are there?

Additionally, of ~700 new Physics Master’s holders, >300 also look for jobs (or continue employment) every year.

*These departments offer a master’s as their highest physics degree.

http://www.aip.org/statistics
How many Bachelor’s are there?

>8500 Physics Bachelor’s degrees are awarded annually

About \textbf{half} go straight into the workforce
What are they doing (PhDs)?

2015-2016 graduates: 1 year after PhD

About **half** of Physics PhDs are initially employed in academic sector. However, ~73% of the potentially permanent jobs were in the private sector.

- **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.
What are they doing (PhDs)?

A majority work in the private sector

Source: NSF Survey of Doctoral Recipients, 2001 - 2013

<table>
<thead>
<tr>
<th>Sector</th>
<th>4-year colleges and universities</th>
<th>2-year and pre-college institutions</th>
<th>For-profit companies</th>
<th>Non-profit organizations</th>
<th>Federal government</th>
<th>State &amp; local government</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 - 14 years since receiving degree</td>
<td>43%</td>
<td>$</td>
<td>45%</td>
<td>6%</td>
<td>6%</td>
<td>$</td>
</tr>
<tr>
<td>15+ years since receiving degree</td>
<td>31%</td>
<td>5%</td>
<td>47%</td>
<td>8%</td>
<td>9%</td>
<td>1%</td>
</tr>
</tbody>
</table>

www.aps.org/careers

Slide from Crystal Bailey and Midhat Farooq
What are they doing (PhDs)?

Most still perform research in private sector jobs!

Source: AIP Statistical Research Center Report Common Careers of Physics PhDs in the Private Sector, June 2015
What are they doing (Master’s)?

Majority of Master’s holders also go into the private sector

~20% find jobs at colleges or universities
What are they doing (Bachelor’s)?

Physics Bachelors One Year Later

8,800 Recent Degree Recipients (2017 & 2018)

About half go straight into the workforce, largely finding jobs in the private sector.

Workforce

52%

Graduate Study
Astronomy or Physics

29%

Graduate Study
Other Fields

19%

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

Physics 25
Astronomy 4
Engineering 9
Other Science & Math 5
Education 2
Other 3

aip.org/statistics
What are they doing (Bachelor’s)?

2/3 of those who entered the workforce found jobs in the private sector

Majority working in STEM jobs

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

Percent: 0 5 10 15 20 25 30 35
Academic sector demand

About ~300 new tenure or tenure-track hires in 2016.

Recall: ~1600 PhDs looking for jobs yearly.
Given that we are graduating over 1,600 PhDs/yr, with half of them going into postdocs with an intention of continuing as physics faculty, supply will continue to outweigh demand for the academic career path.
Industry demand

Industry has been the largest employment base for Physics PhDs for decades.

Percentage of Physics PhDs* Employed in the Private Sector

Sources: NSF Integrated Survey Data, 1993 - 1999; Survey of Doctorate Recipients, 2001 - 2013

Source: NSF Survey of Doctoral Recipients, 2001 - 2013

*Data includes PhDs employed in potentially permanent positions only. Data excludes PhDs not in the labor force. Average unemployment is 3%.
The Impact of COVID on Job Market

- Govt/National labs and Academia have seen an increased proportion of temporary position recruitments
- Industry has seen an increased proportion of permanent position recruitments
- Number of 4-year college recruitments has fallen ~64% in 2020
Examples of Successful Physicists’ Careers

aps.org/careers/physicists/profiles
Neha Pachauri, PhD, Process Engineer

Neha first pursued science due to her natural inquisitiveness. After a Master’s degree, teaching physics made her want to dig deeper and get a PhD.

Looking to apply her training to real-world applications, Neha joined Intel’s fabrication facility. She found working on cutting edge technology to be intellectually stimulating.

Advice for students: Try new things and make time for a hobby.

Learn more: aps.org/careers/physicists/profiles/pachauri.cfm
Jessica Kirkpatrick, PhD, Director of Data Science and Digital Exploration

Though Jessica often struggled in courses due to a learning disability, she discovered her talent for physics in high school and got a PhD.

Currently, Jessica uses machine learning to predict locations with new sources of battery minerals. Her long-term goal is to start a company to solve social problems.

Advice for students: Learn to build projects with code, and start networking early.

Learn more: aps.org/careers/physicists/profiles/kirkpatrick.cfm
During his PhD, Ramón became interested in issues contributing to the lack of diversity in physics. He completed a AAAS Fellowship in the Department of Education and then spent a few years consulting with academic institutions.

Currently he is an assistant professor specializing in physics education research with a focus on equity and inclusion.

Learn more: aps.org/careers/physicists/profiles/barthelemy.cfm
Paul Markoff-Johnson, MS
Director of Product Development

Paul gained an appreciation for physics when he saw its connection with math.

He switched majors from engineering to physics due to the broader scope, variety of career options, and the invaluable skill of using basic principles to solve problems.

Currently, Paul is the Director of Product Development at a company specializing in thin film technology.

Learn more: aps.org/careers/physicists/profiles/markoff.cfm
Jacqueline Benitez, BA
Distance Learning Educator

Jacque initially found physics challenging. However, her fascination with stars led her to attain a Physics bachelor’s with a concentration in Astronomy.

Teaching at a planetarium helped Jacque find her passion for education. Jacque now works at the California Academy of sciences, virtually facilitating science learning with students around the world.

Learn more: aps.org/careers/physicists/profiles/benitez.cfm
Maggie Seeds, BS/BA
Business & Technology Consultant

Maggie found physics to be a natural path that “helped train her brain to think analytically.”

Currently, Maggie’s consultant role ranges from technical to strategic, falling anywhere in the process of raw materials making it all the way to finished, marketable products.

Advice for students: Work on soft skills, especially how to communicate with different audiences.

Learn more: aps.org/careers/physicists/profiles/seeds.cfm
Combining his passion to give back to society with his love for physics, Thomas became a high school teacher. When teaching, he finds the physics material to be just as useful as the critical thinking skills taught in science courses.

Advice for students: Take different types of science courses and build communication skills through outreach activities.

Learn more: aps.org/careers/physicists/profiles/hefner.cfm
How can you start preparing?

Look Inwards/Reflect

Perform a detailed self-assessment
- Includes what you are good at doing and what you enjoy doing. Values are important!
- Where do I want to be in 1 year? 5 years?

Keep a Career Journal
- Track insights, contacts, skills.
- Note when you’re happiest and when you are the least happy.
- What is important to you?
  - Work-life balance? Money? Location?
  - Flexible schedule? Control over research?

Document Skills
- Record your skills – technical and non-technical. These will be the building blocks of every resume you’ll write.

www.aps.org/careers

Slide from Crystal Bailey and Midhat Farooq
How can you start preparing?

Write it down (formal documents)
Understand practices in the field

Explore the job market
• Many university “Beyond Academia”
• (e.g., UCBerkeley, UCSB, U. Washington)

Keep a “master copy” CV
• Transferable skills, active verbs

Establish an online presence
• LinkedIn, Github
• Personal website: free website builders

Communicate with your adviser/mentor early
How can you start preparing?

Use Resources (from APS)

APS Careers 2020 Guide
- Breadth of opportunities for physics graduates
- Advice from professionals
- List of companies hiring physicists

SPS Careers Toolbox
- Lists common job titles
- Effective job searching tips
- Resume, cover letter help
- Tips for interviewing

APS Careers Website
- APS Job Board
- Professional Guidebook
- Physicist Profiles
- Common Careers Paths

www.aps.org/careers
How can you start preparing?

Use Resources (general)

- Resume/CV/personal statements review
- Career coaching appointments
- Mock interviews

- Job boards of other professional societies (see also MRS, SPIE, ...)
- Careers in Physics Workshop/Webinar by Peter Fiske
- Linkedin page: Who is hiring right now
- Candor: Who's freezing hiring during COVID
- 1point3acres: Who’s hiring during COVID
- Google doc made by Dr. Karen Kelsk about academic hiring

Sign up for email lists to get notifications

(Courtesy of Shaowei Li, FECS Chair-elect)
How can you start preparing?

Use Resources

**APS Webinars**

- Summer series on various topics, including professional development during COVID, preparing for a career in data science, and a two-part series on science policy. All videos available: [go.aps.org/summer-webinars](http://go.aps.org/summer-webinars)

- Launched this Fall: Success in Industry Careers series, Sept 2020-May 2021

- Also launching series on topics relevant to career exploration and international physicists

**Sign up:**

[info.aps.org/careers/webinars](http://info.aps.org/careers/webinars)
How can you start preparing?

Build Your Network
- Join LinkedIn
- Attend alumni mixers, career fairs, conferences, etc.
- Volunteer or Job Shadow

Find Career Mentors
- Join the APS IMPact program to find industry mentors: impact.aps.org
- Ask faculty mentors to connect you to industry professionals/past students

Attend Informational Interviews
- Reach out to contacts and ask for a 20-minute chat
- Here, you get to ask the questions!
  - Ask about their career path, their typical work day
  - Ask what aspects of work they like or dislike
- Don’t ask for a job!
What about non-US Citizens

Recent executive orders hindering international physicists’ employment in the US Harvard-MIT filed lawsuit and APS provided additional support

Important Resources

APS International Affairs Website
aps.org/programs/international/

APS Office of Government Affairs Website
aps.org/policy/

APS IMPact Program – Effort to add more mentors from non-US backgrounds
impact.aps.org

APS Series on Career Development for International Physicists – Coming Summer 2021

Sign up to receive updates when this series goes live!
info.aps.org/careers/webinars
Exit Poll

https://tinyurl.com/y2jwx6tw
Summary

• Hundreds of physics degree holders enter the job market every year
• Majority find careers in the private sector
• You can start preparing now by expanding your network and using APS Resources
• Finding a job is a job in and of itself- time intensive!

Thank you!
More info: aps.org/careers
Back up slides
Typical Starting Salaries of New Physics PhDs

Potentially Permanent Positions

Private Sector
University & 4-Year College

Postdocs

Government Lab
University*

Other Temporary Positions

University* & 4-Year College

Salary in thousands of Dollars

Figure includes only doctorates in full-time, newly accepted positions from the classes of 2015 and 2016 combined. Typical salaries are in the middle 50% i.e., between the 25th and 75th percentiles.
How much do physics Master’s earn?

Typical Salaries for Physics Masters, Classes of 2014, 2015 & 2016 Combined

- **Private Sector**
- **4YR College & University**

Typical Salaries (in thousands)

www.aps.org/careers

Slide from Crystal Bailey and Midhat Farooq
How much do physics Bachelor’s earn?

Typical Starting Salaries for New Physics Bachelors, Classes of 2015 & 2016 Combined

<table>
<thead>
<tr>
<th>Sector of Employment</th>
<th>Typical Salaries (in thousands of Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Sector STEM</td>
<td>70</td>
</tr>
<tr>
<td>Private Sector non-STEM, Regularly Solves Technical Problems</td>
<td>60</td>
</tr>
<tr>
<td>Private Sector non-STEM, Rarely or Never Solves Technical Problems</td>
<td>50</td>
</tr>
<tr>
<td>Civilian Govt. (Incl. Natl. Labs)</td>
<td>40</td>
</tr>
<tr>
<td>Active Military</td>
<td>30</td>
</tr>
<tr>
<td>High School Teachers</td>
<td>20</td>
</tr>
<tr>
<td>College or University</td>
<td>10</td>
</tr>
</tbody>
</table>

Figure includes only bachelors in full-time, newly accepted positions.

Typical salaries are in the middle 50% i.e., between the 25th and 75th percentiles. STEM refers to positions in natural 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.

www.aps.org/careers  Slide from Crystal Bailey and Midhat Farooq
How many PhDs are there?

2015-2016 graduates: 1 year after PhD

~1600 Physics PhDs go into the job market every year

Physics Doctorates
1,850

Remained in the U.S.
1,600

13% left the U.S.
2016-2017 saw 371 total faculty departures. In 2018-2019, there were 571 recruitments, of which 369 were tenured/tenure-track.

Compared to the supply of ~1600 PhD’s each year, this is still relatively low.
Job Satisfaction of Physics Bachelors In Private Sector STEM Positions (2013 & 2014)

Exiting masters are individuals who, upon receiving their master’s degrees, leave their current physics departments.

Percentages represent the physics masters who chose “very satisfied” or “somewhat satisfied” on a four-point scale that also included “somewhat dissatisfied” and “very dissatisfied”. Figure is based on the responses of 86 individuals.

http://www.aip.org/statistics
# Job Satisfaction of Physics PhDs

## Subjective Aspects of Initial Employment for Physics PhDs Holding Potentially Permanent Positions by Sector, Classes of 2015 & 2016 Combined

<table>
<thead>
<tr>
<th>Percent who felt:</th>
<th>Sector of Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Academic (%)</td>
</tr>
<tr>
<td>A physics PhD is an appropriate background for this position.</td>
<td>87</td>
</tr>
<tr>
<td>This position is professionally challenging.</td>
<td>85</td>
</tr>
<tr>
<td>I consider myself underemployed in this position.</td>
<td>26</td>
</tr>
<tr>
<td>Overall, I am satisfied with this position.</td>
<td>89</td>
</tr>
</tbody>
</table>

The percentages represent the two positive responses on a four-point scale, such as Very appropriate, Appropriate, Not very appropriate, and Not at all appropriate. Data only include US-educated physics PhDs who remained in the US after earning their degrees.
Demographic breakdown of PhDs

Number of Doctorates Earned in Physics, Classes 1972 through 2017.

Number of Physics Doctorates Earned by African-Americans and Hispanic-Americans, Classes 1996 through 2017.
Demographic breakdown of Master’s

Note: Exiting physics master’s are individuals who upon receiving their degrees leave their current departments. They include graduates from departments where the master’s is the highest degree offered as well as master’s leaving departments that offer a PhD.

http://www.aip.org/statistics
Demographic breakdown of Bachelor’s