So I've decided to go to grad school, is it tenure or bust?

Adam Kuang, Commonwealth Fusion Systems

Theresa Wilks & Alex Tinguely, MIT Plasma Science and Fusion Center

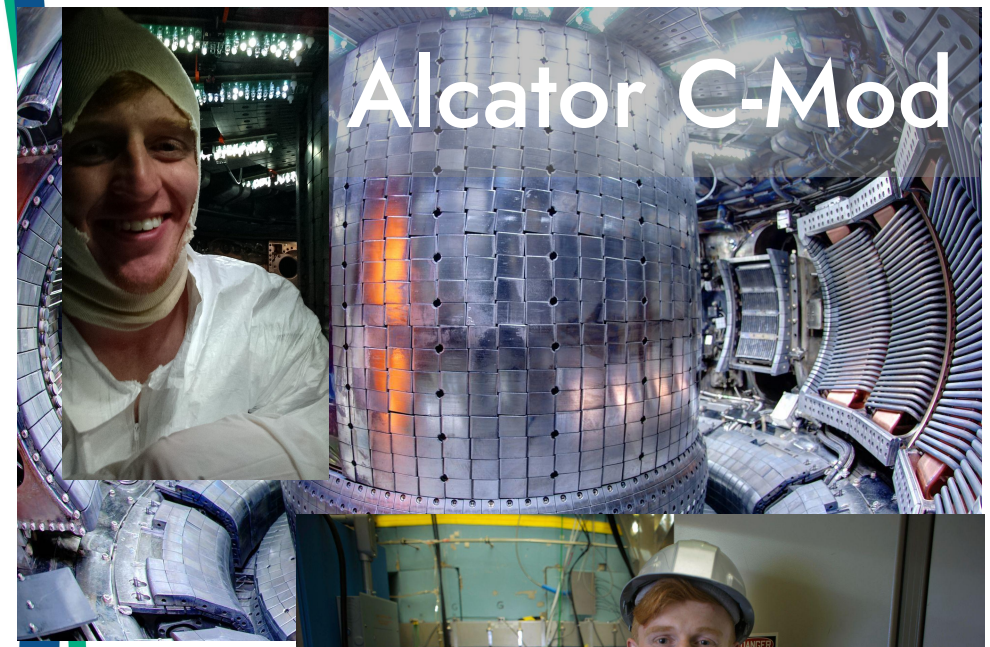
APS Career Mentoring Fellows

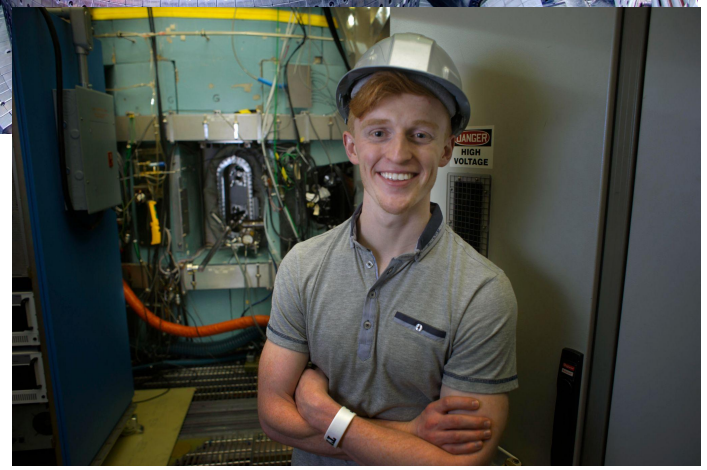
Presented at

8.398 Physics Seminar 12/6/2023

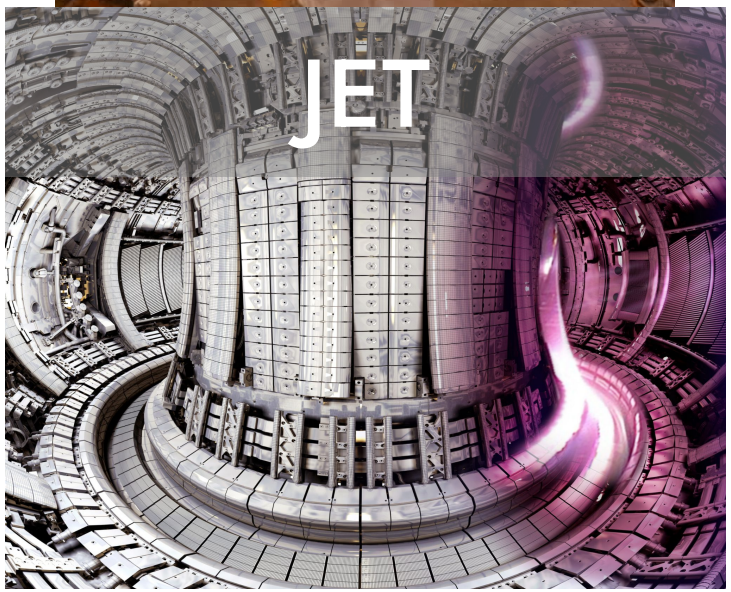
Alex Tinguely

PhD, MIT Physics ‘19





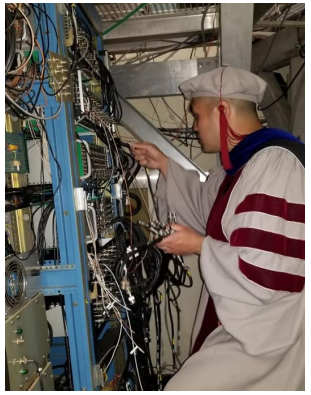
postdoc, UK ‘21



Adam Kuang

UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

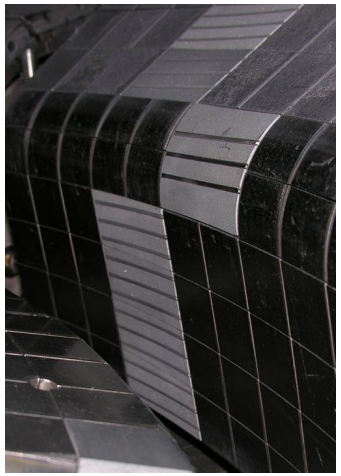
B.E. Mechanical ‘12
B.S. Physics ‘13

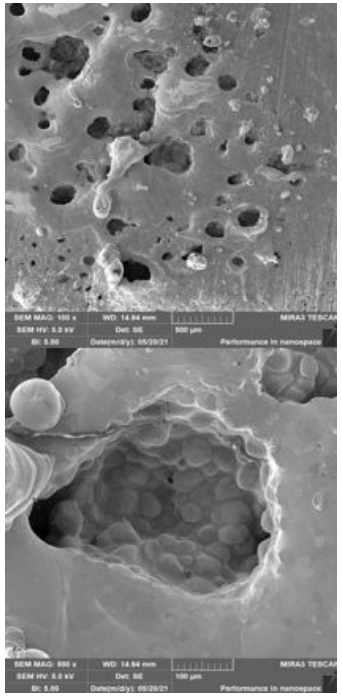


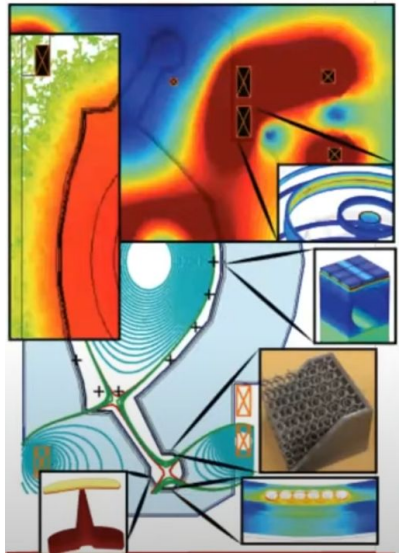
MIT
Ph.D Applied Plasma Physics, NSE ‘19

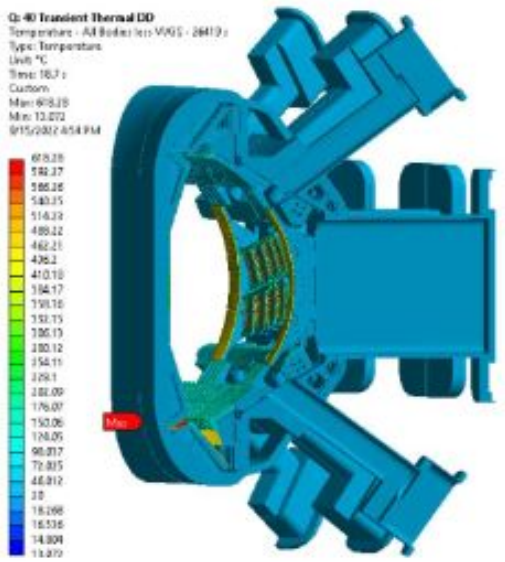
PSFC
Post. Doct. ‘19 - ‘22
Research Scientist ‘22

Commonwealth Fusion Systems
Senior Scientist









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Theresa Wilks

B.S. Mechanical and Nuclear Engineering at UC Berkeley

–SULI appointment at LBNL researching pulsed solenoid magnetic systems for heavy ion fusion

M.S. & Ph.D Nuclear Engineering, Georgia Tech

–Research on DIII-D tokamak experiment

–SGCSR appointment at NSTX-U at PPPL

Post-doctoral associate, MIT Plasma Science and Fusion Center (PSFC)

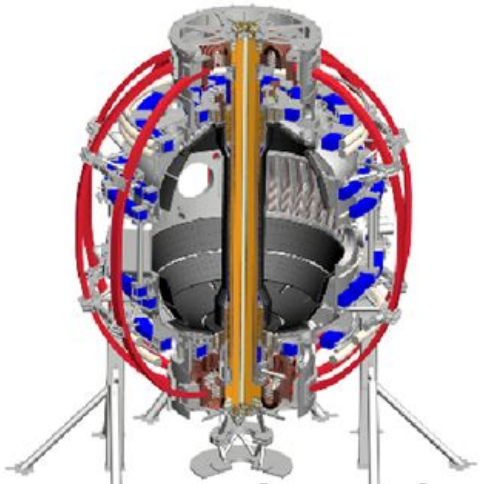
–Appointment at DIII-D tokamak

Research Scientist, MIT-PSFC

– Core edge integration, pedestal physics, ELM free regimes,

– Diagnostic development, experimental design and operation

– Student/postdoc mentorship

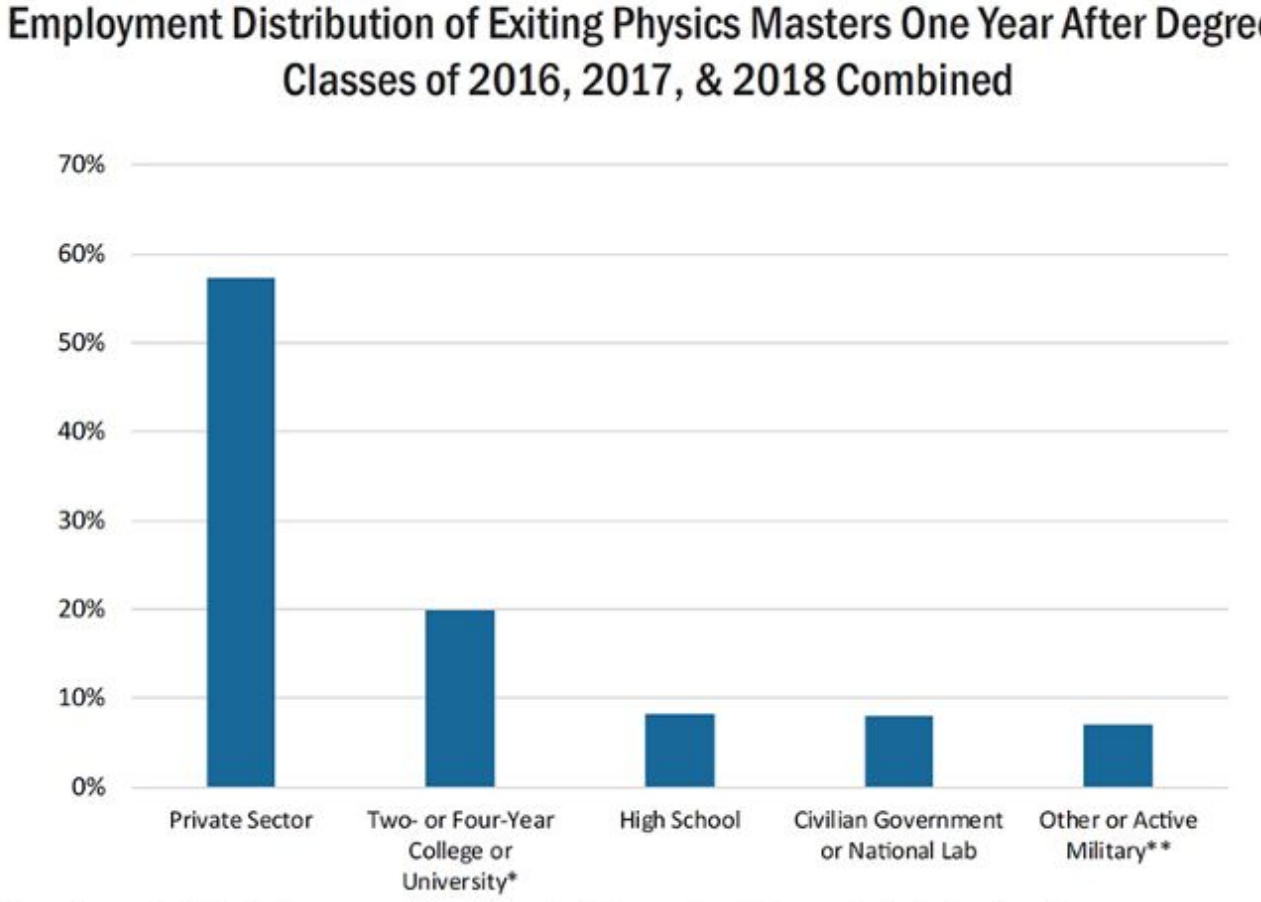

NSTX tokamak

Goals of **This Talk**

- Provide a **broad overview of career paths** available with physics degrees
- Give resources on **pursuing these career paths**

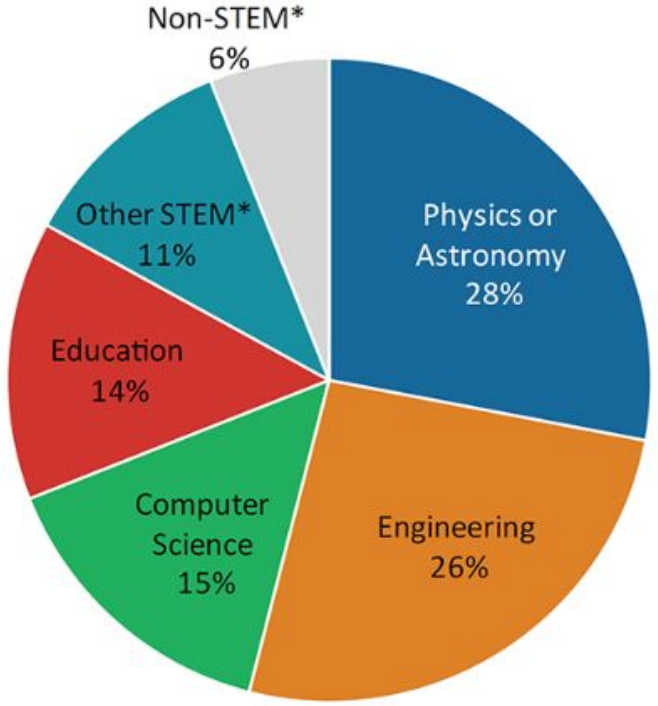
Working in Physics with a Master's Degree

What can you do with a Master's Degree in Physics?



Exiting masters are individuals who, upon receiving their master's degrees, leave their current physics departments.
Figure includes US employed physics masters, including those who were employed part-time and not enrolled in a degree program and masters continuing in positions they held while pursuing their degrees. Other includes elementary and middle schools, health care facilities, and non-profit organizations. Figure based on responses from 349 individuals.
*Includes university-affiliated research institutes (UARI).
**Active military excludes those receiving their master's degrees from military academies.

AIP.org/statistics



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

~20% find jobs at colleges or universities

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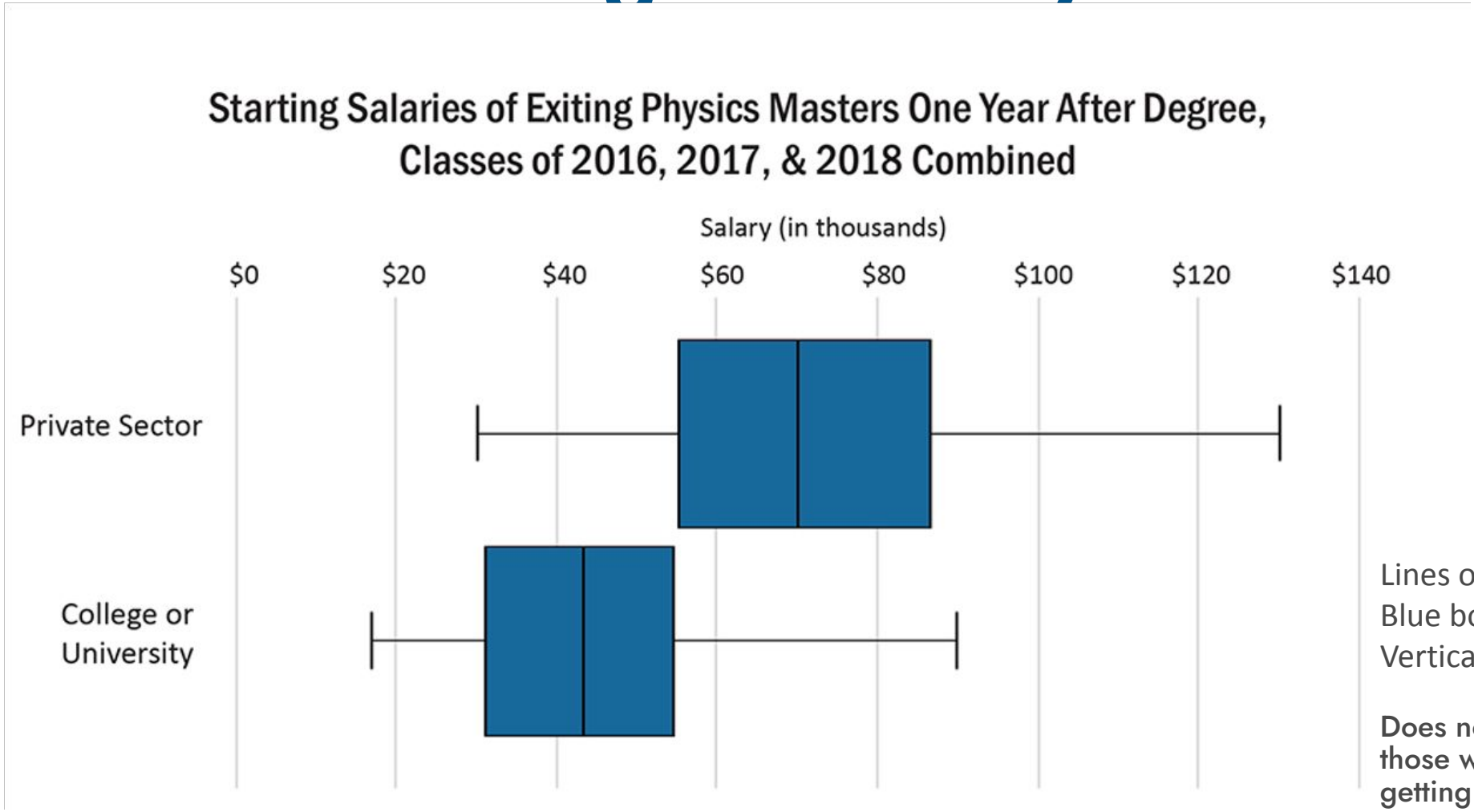
How much can you earn with a **Master's Degree in Physics?**



Lines outside box = Full range
Blue box = 25th – 75th percentile
Vertical line = median

Does not include part-time positions or those who held roles >1 year prior to getting master's

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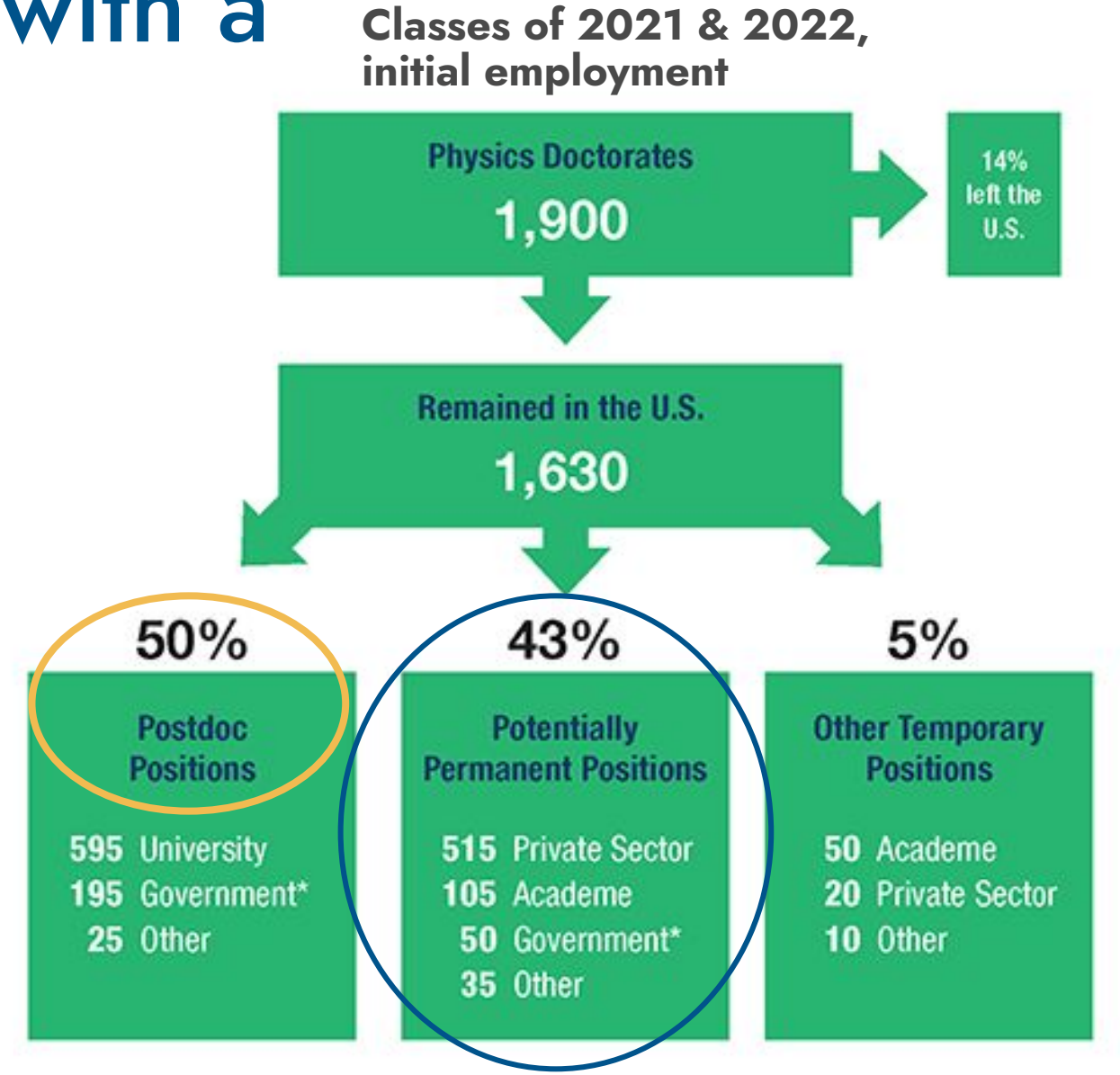
Working in Physics with a Doctoral Degree (PhD)

What can you do with a PhD in Physics?

About **50% work in postdoc positions**, which are contract based (1-3 years).

Meanwhile, ~43% find potentially permanent positions, a majority of which are in the private sector.



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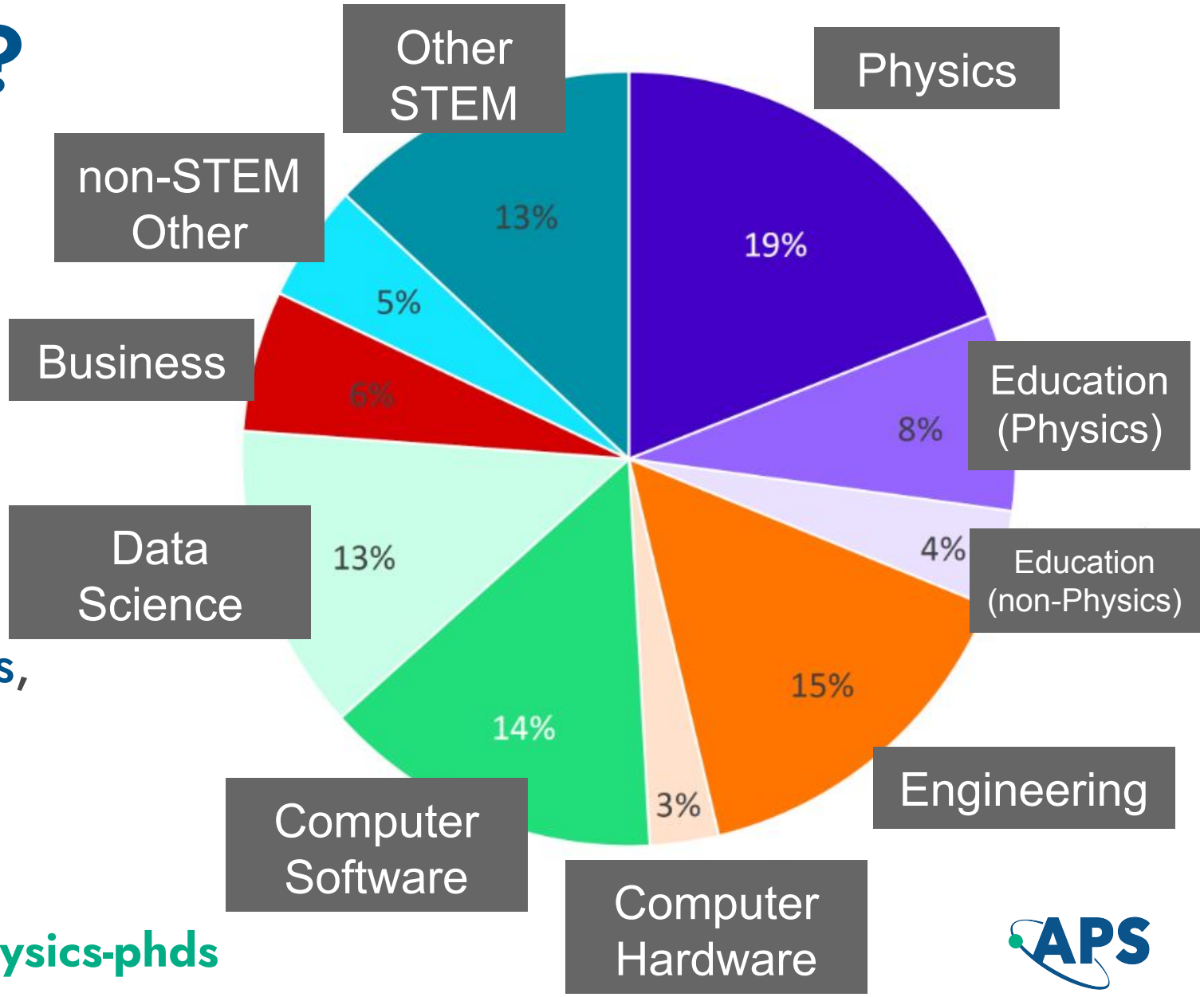
What can you do with a **PhD in Physics?**



Meanwhile, ~43% find potentially permanent positions, a majority of which are in the private sector.

aip.org/statistics/whos-hiring-physics-phds

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Common Job Titles of Physics PhDs

Engineering
- Aeronautical Engineer
- Aerospace Engineer
- Application Engineer
- Epitaxial Engineer
- MBE Production Growth
- Optical
- Process
- Software
- Simulation Engineer
- Test
- Thin Film Coating

Research & Development (R&D)
- R&D Physicist or Scientist
- Research Associate
- Research Engineer
- Research Scientist
- Scientist I, II, or III

Quantum
- Quantum Computing Applications Engineer
- Quantum Engineer
- Quantum Systems Engineer
- Quantum Measurement Scientist

Applied/Scientist
- Analyst
- AMO Physicist
- Application Scientist or Physicist
- Applied Mathematician
- Computational Physicist or Scientist
- Design Physicist
- Device Scientist
- Material Scientist
- (Principal) Physicist
- Project Scientist

Education
- Teaching Specialist
- Education Developer & Researcher
- Teacher Fellow

Other
- CEO/CTO
- Medical Physicist
- Lab Specialist
- Technical Staff

See Full List: aip.org/statistics/common-job-titles-new-physics-phd-recipients-potentially-permanent-non-education-physics

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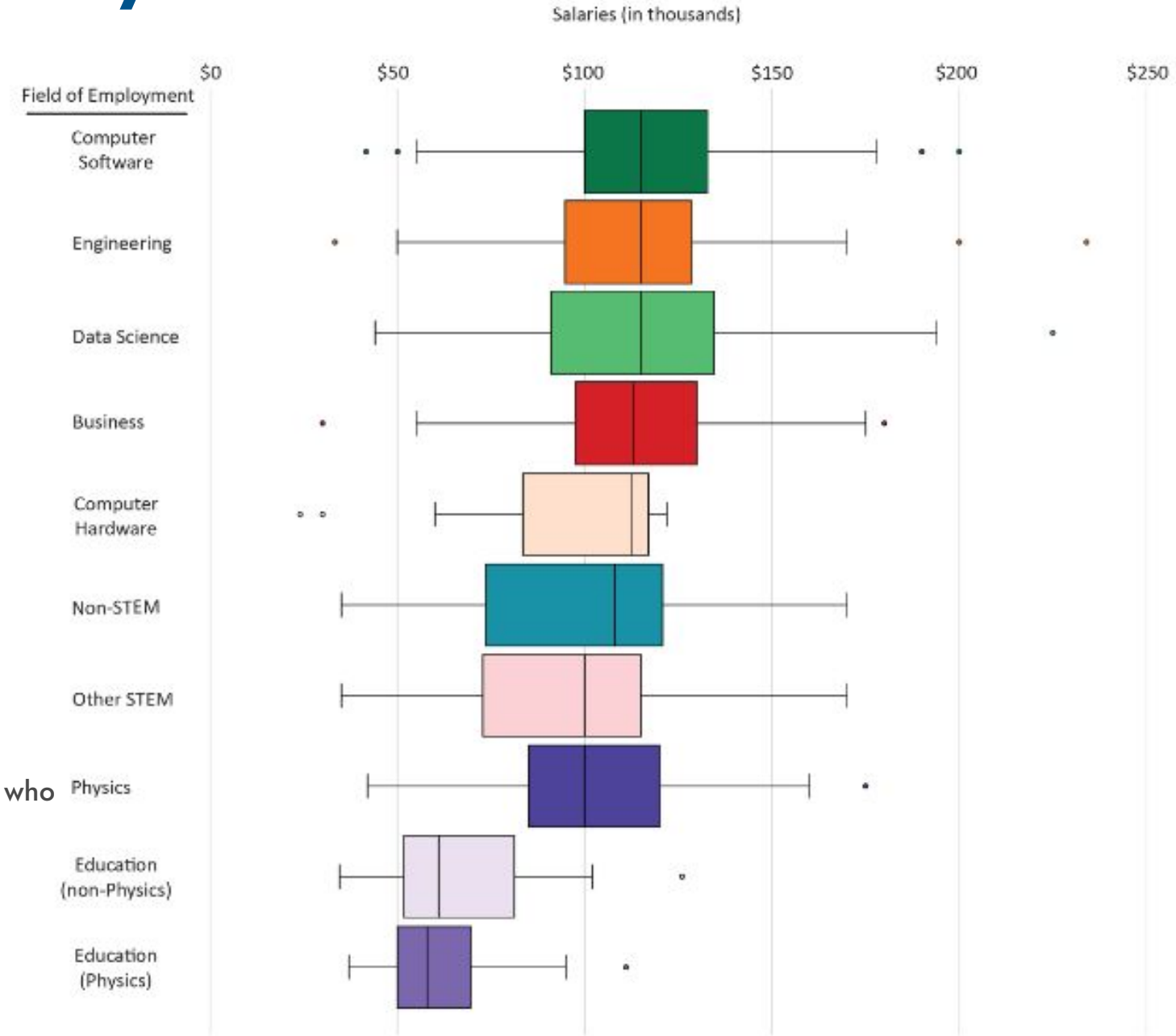
How much can you earn with a PhD in Physics?

Starting Salary Ranges for New Physics PhDs in Potentially Permanent Positions Classes of 2016 through 2020



Lines outside box = Full range
box = 25th – 75th percentile
Vertical line = median
Dots = outliers

Data represents only US-educated PhDs who remained in the US after earning their degrees.

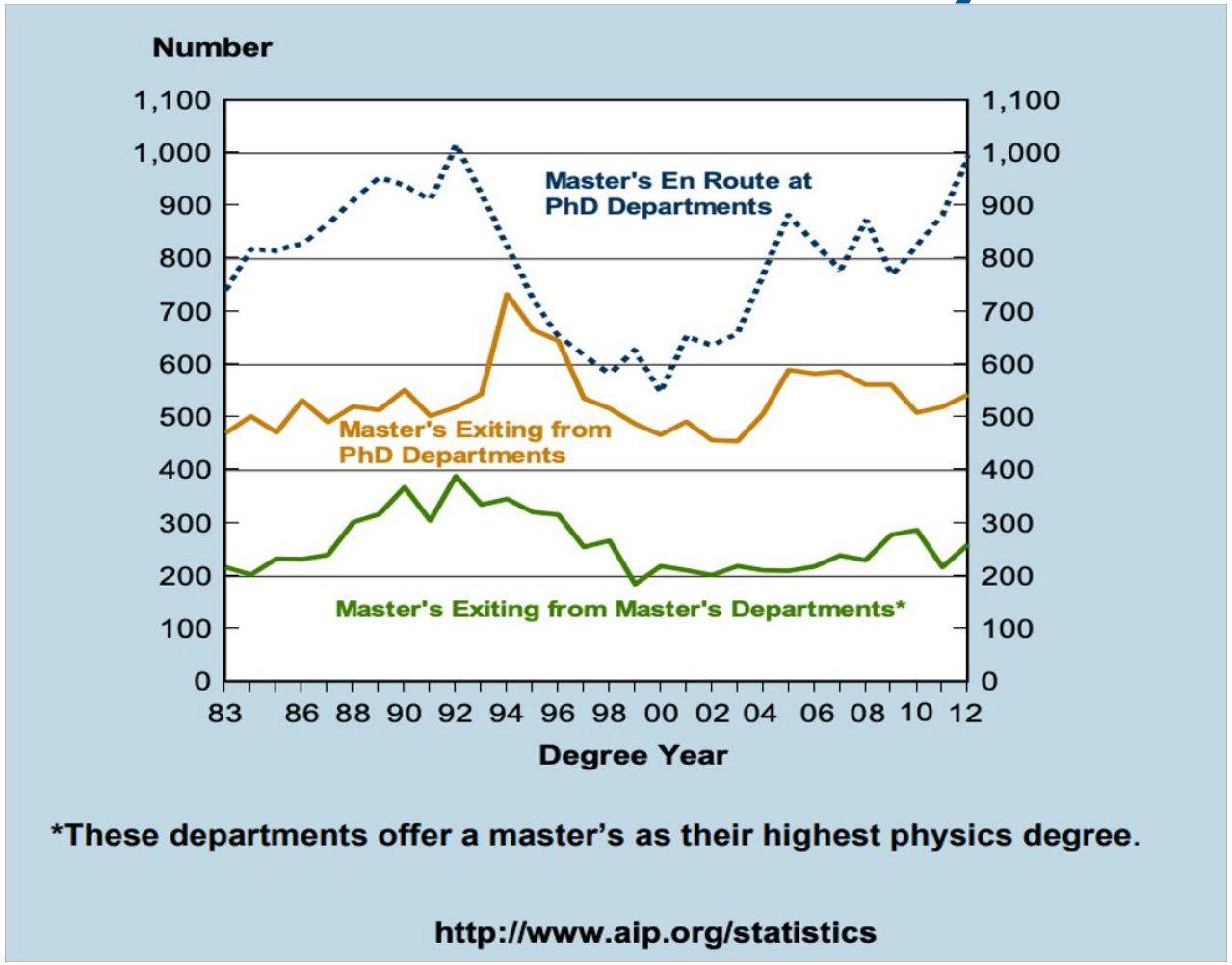
AIP.org/statistics

There are lots of jobs out there, and they pay well.

You will be fine with whichever physics degree you choose to pursue.

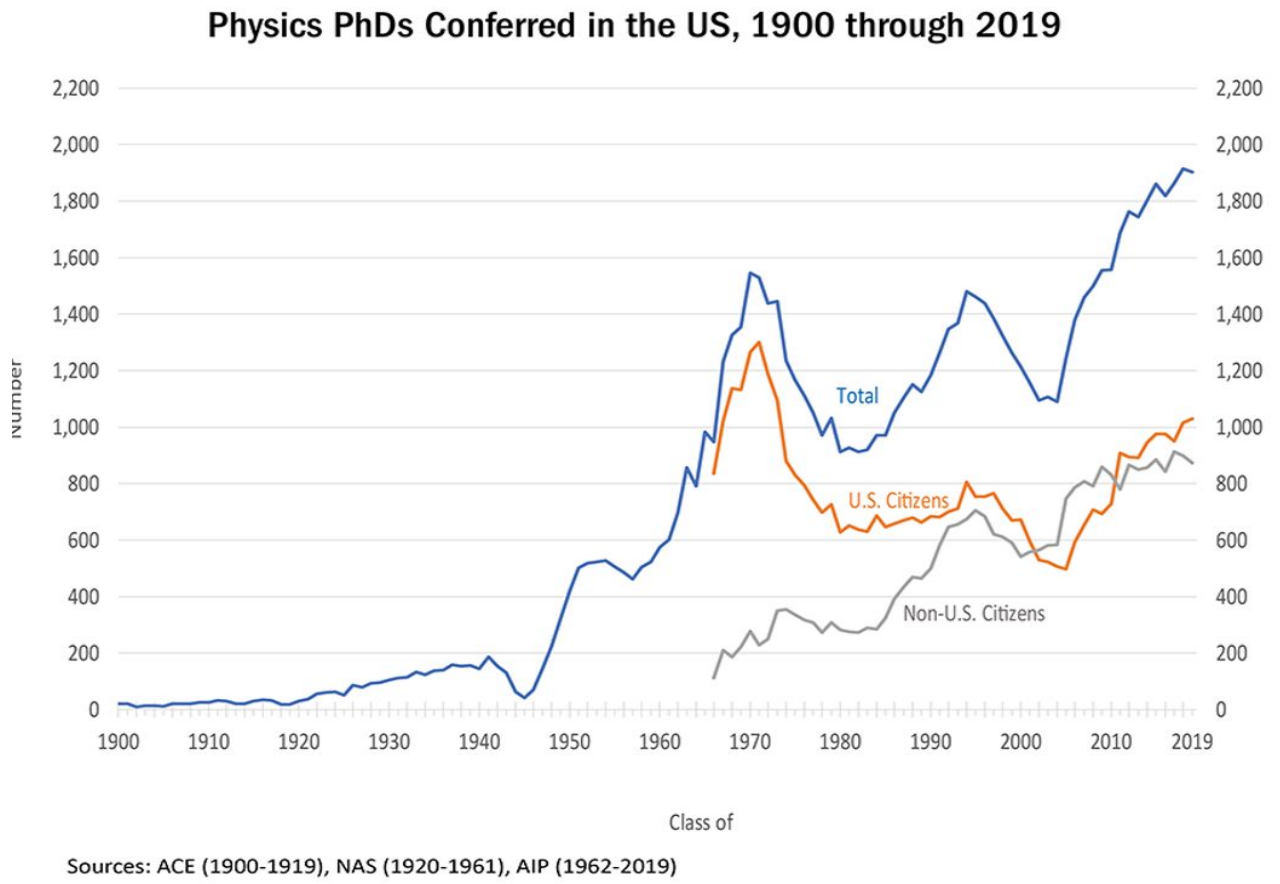
Physics Employment Sector Dynamics

Physics Master's Degrees Awarded Annually



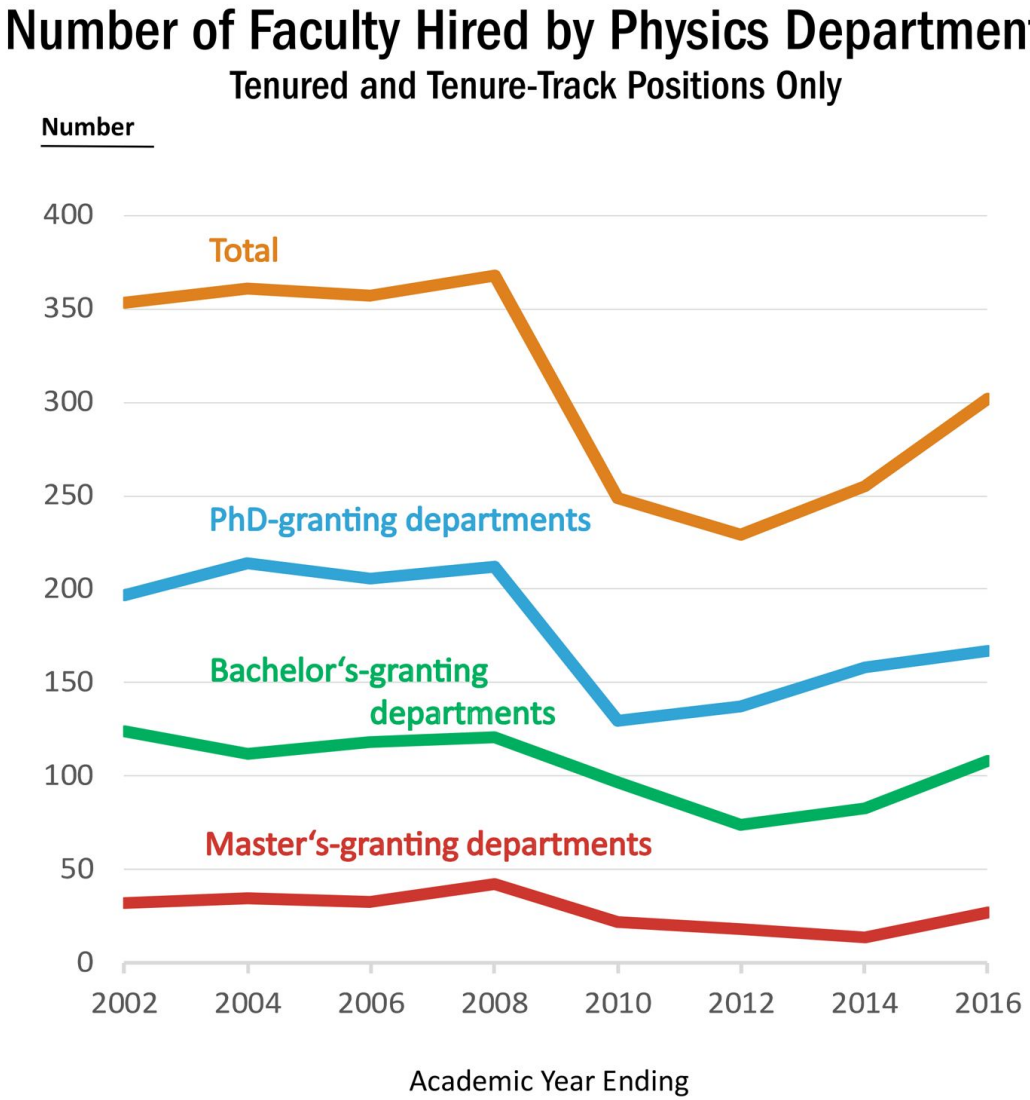
Additionally,
of ~700 new
Physics Master's holders,
>300 also look for jobs
(or continue employment)
every year.

Physics Doctoral Degrees (PhDs) Awarded Annually



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

Academic Sector **Demand**



- About **~300 new tenure or tenure-track hires** in 2016.
- While **~1600 physics PhDs** looking for jobs annually*

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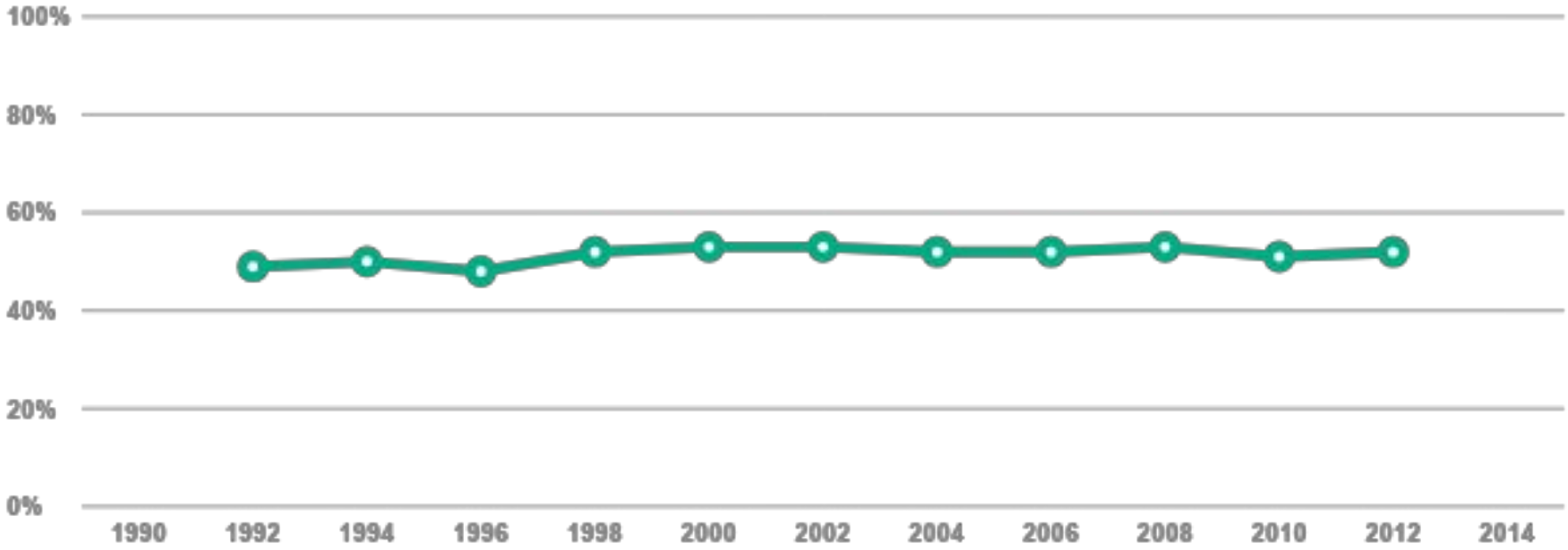
Industry **Demand**

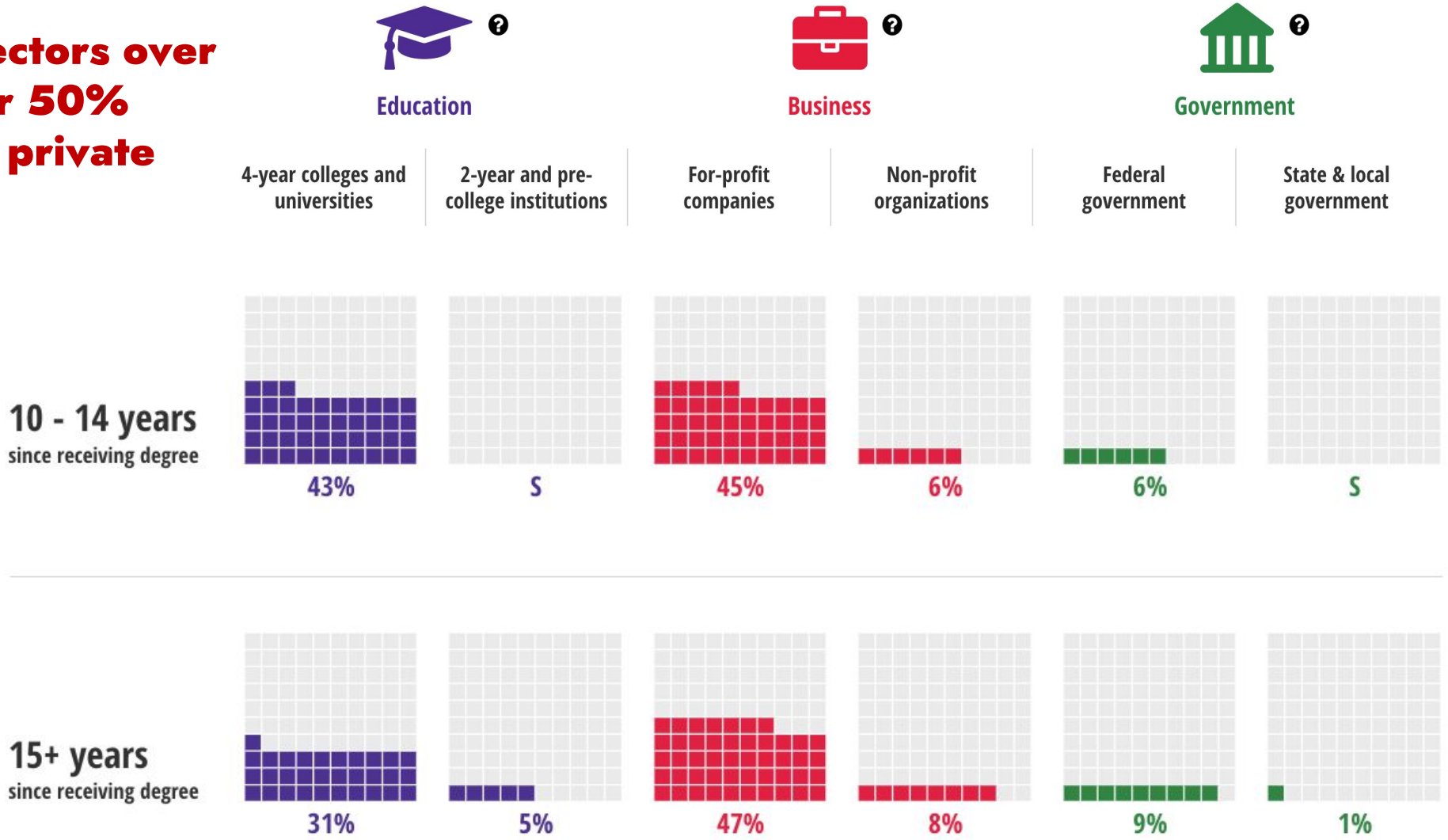


Industry has been a large employment base for Physics PhDs for decades with enough jobs to employ all physics degree holders.

Source: NSF Survey of Doctoral Recipients, 2001 - 2013

PhD employment over time

Many switch sectors over time, with over 50% working in the private sector



Source: NSF Survey of Doctoral Recipients, 2001 - 2013

Academia & Industry

Academia Offers

- More control over your research
- Flexible working hours
- Mentorship of next generation of physicists

Industry Offers

- High pay
- Work-life balance
- More options for where to live

While the academic job market is saturated and there are many more jobs in industry, both career options can be great choices depending on your interest and priorities.

CAREER FEATURE | 06 November 2023

How five researchers fared after their 'great resignation' from academia

A career leap into the unknown can be unsettling, but you can take steps to ease the transition.

Virginia Gewin

https://doi.org/10.1038/d41586-023-03484-7

https://www.nature.com/articles/d41586-023-03484-7

"During my transition out of academia, I went through a period in which I felt like I had failed. I wasn't strong enough. **If I were to go back, I would want to be part of graduate training that is more industry focused.** A lot of students don't have the right tools. They are problem solvers, but they don't know how to do that in an industry setting. For example, **machine learning** is becoming really important in a lot of technical industry jobs, and **Python** is a programming language that everyone in industry needs to know nowadays. Students also need to be able to **run models to test a product**. I would want to emulate engineering graduate programmes that cultivate industry partnerships and offer internships to provide students with that insight."

How can you **start preparing?**

Perform a Detailed Self-Assessment

- Includes what you are good at doing and **what you enjoy doing.** Values are important!
- Reflect on your working style: collaborative, independent, goal-oriented?

Keep a Career Notebook/Doc

- Track insights, skills, and contacts
- 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/CV** you'll write.

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How can you start preparing?

Build Your Network

- Join LinkedIn, Discord
- Attend alumni mixers, career fairs, conferences, etc.
- Volunteer (e.g. chair a conference session)
- Find internship REU/internship listings: careers.aps.org
- DOE Graduate Science Research Fellowship: https://science.osti.gov/wdts/scgsr

Connect with Academic Mentors

- APS National Mentoring Community is specifically designed for Black, Indigenous, and Hispanic/Latinx physics students: aps.org/nmc
- The program provides access to academic mentors around the world!
- Emergency funding is available for registered mentees.

Find Industry Mentors

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

How can you start preparing?

Attend Informational Interviews

Reach out to contacts in different types of roles and ask for a 30-minute chat.
Here, You get to ask the questions:

- Tell me about your career path
- What is a typical work day like?
- What aspects of your work do you like? Dislike?
- How can I prepare if I want to pursue a similar career path?
- **Don't ask for a job!**

CAREER FEATURE | 15 August 2023

How to make the leap into industry after a PhD

Landing that first job in industry requires planning, homework and networking – and a bit of soul-searching.

Spoorthy Raman

'Hi, I see that you are in [Company XYZ]. I want to be somewhere like you someday. But I have no idea how to get there. Can I please have 15 minutes of your time to learn about you and your career journey?'

https://www.nature.com/articles/d41586-023-02558-w

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Resources to start preparing

APS Careers 2023 Guide

- Breadth of opportunities for physics graduates
- Advice from professionals
- **List of companies hiring physicists**

go.aps.org/careersguide

SPS Careers Toolbox

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

spsnational.org/sites/all/careerstoolbox

APS Careers Website

- APS Job Board
- Career Navigator Guidebook
- **Physicist Profiles**
- Common Careers Paths

aps.org/careers

What about **non-U.S. citizens?**

Recent policies hindering international physicists' employment in the United States

APS Government Affairs is advocating for better policies

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 Webinar Series on
  Career Development for International Physicists
  aps.org/webinars
- Employment Resources for International Members
  aps.org/careers/guidance/international/index.cfm

Become an APS Member

- **Stay current with provoking analysis and exceptional research publications**
- **Present your work and network with potential employers at APS Meetings (members get discounted meeting registration)**
- **Get involved in grassroots advocacy on issues like immigration, research funding, and more!**
- **Find community through involvement in forums and units**

Join Today:
aps.org/membership

Students get 1 year of free membership!

(your PI might also pay for this!)

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MIT Resources

- **MIT Career Advising & Professional Development** capd.mit.edu
  - Research Mentoring Certificate
  - Grant Writing Training Certificate
  - Fall and Spring Career Fairs
- **MIT Teaching + Learning Lab** tll.mit.edu
  - Kaufman Teaching Certificate Program
- **MIT Writing and Communication Center** cmsw.mit.edu/writing-and-communication-center/
  - CVs/resumes, cover letters
  - Conference and job talks
  - Interview practice
- **Create your own website** ist.mit.edu/news/create-website
- **SPS/PGSC Weekly Careers Newsletter** 8careers@mit.edu

Thank you for listening!

Any questions?

Extra material

https://www.nature.com/articles/d41586-023-01299-0

CAREER FEATURE | 17 April 2023

Leaving academia for industry? Here's how to handle salary negotiations

Don't sell yourself short when talking about pay, annual leave and other benefits, say scientists who have made the move.

Sarah Wild

https://www.nature.com/articles/d41586-023-02558-w

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Spoorthy Raman

Beyond Academia: Nature Careers Podcast, Jan - Feb 2022

https://www.nature.com/nature/articles?searchType=journalSearch&sort=PubDate&type=nature-careers-podcast&year=2022&page=2

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Job Satisfaction of Physics PhDs

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

	Sector of Employment		
Percent who felt:	Academic (%)	Private Sector (%)	Government (%)
A physics PhD is an appropriate background for this position.	87	83	81
This position is professionally challenging.	85	83	86
I consider myself underemployed in this position	26	19	29
Overall, I am satisfied with this position.	89	87	86

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.

AIP.org/statistics

What are they doing?
Doctoral Degree (PhD)

Type of Employment of New Physics PhDs by Employment Sector, Classes of 2019 & 2020 Combined

	Initial Employment Type			
Sector of Employment	Postdoc %	Potentially Permanent %	Other Temporary %	Overall %
Academic	73	18	62	49
Private	1	70	30	32
Government	23	8	3	15
Other	3	4	5	4
	100%	100%	100%	100%

Note: Data includes only US-educated physics PhDs who remained in the US after earning their degrees. Data are based on the responses of 809 postdocs, 650 individuals working in potentially permanent positions, and 99 individuals working in "other temporary positions."

AIP Statistics aip.org/statistics

2019-2020 graduates: 1 year after PhD

About **half of physics PhDs are initially employed** in the academic sector.

However, **~70% of the potentially permanent jobs are in the private sector.**

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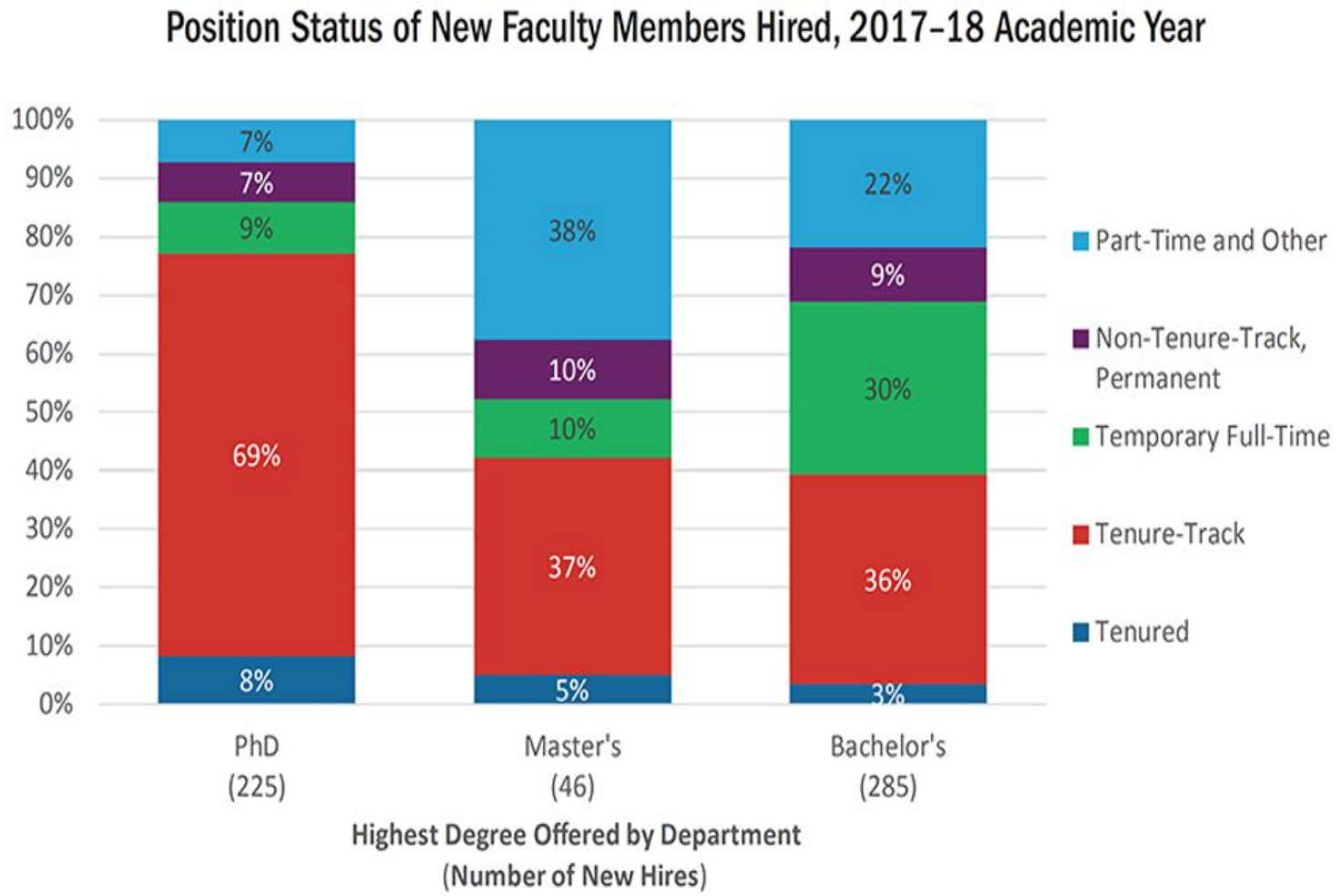
Academic Sector **Demand**



Faculty position types vary widely by institution.

Total of 556 new faculty hires (including all position types).

Academic Sector **Demand**

Estimated Number of Faculty Departures in Physics Departments, 2016–17 Academic Year

	Highest Physics Degree Offered			
	PhD	Master's	Bachelor's	Overall
Number of Departures	202	31	138	371
Percent of Departures Among Faculty Members	3.4%	3.5%	3.8%	3.5%
Percent of Departments with Departures	61%	31%	25%	35%
Percent of Departing Faculty Members that Left Without Tenure	10%	15%	24%	16%
Total Headcount of Faculty Members	6,015	870	3,615	10,500

Note: The total headcount of faculty members is for the academic year of 2017–18. The total number of faculty members in this report differs from the total number reported in "The Number of Faculty Members in Physics Departments", which reported full-time equivalent (FTE) faculty totals, not headcount totals.

AIP Statistics aip.org/statistics

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.**

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