



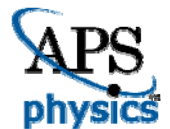
Breaking the Myth of the “Non-Traditional” Physicist

The Real Story About Employment for Physics PhDs

Crystal Bailey
American Physical Society

www.aps.org/careers

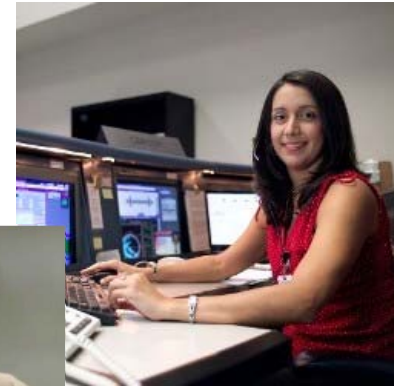
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Who is a Physicist?

Anyone with a Physics Degree

- BS
- BA
- MS
- PhD, etc.



Why?

- Definition is consistent with other disciplines (e.g. Chemistry)
 - Defines a common set of experiences (and texts)
 - Inclusive view is better for survival of discipline

What makes them Physicists?

Shared experiences creates familiarity—not only with the same Physics concepts, but also with the culture of the discipline.

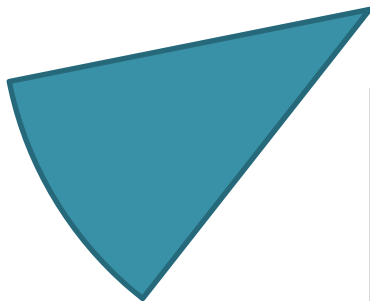
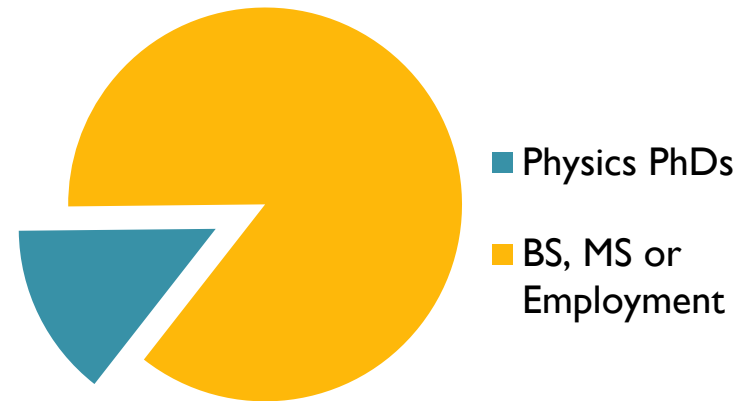
However, most importantly, even a basic Physics training imparts essential problem solving skills—“how to think”—which is the hallmark of a physicist.

Where do Physicists Work?

Not where you think!

What is a “traditional physicist”? A physics professor? A PhD researcher? The “most common” career path?

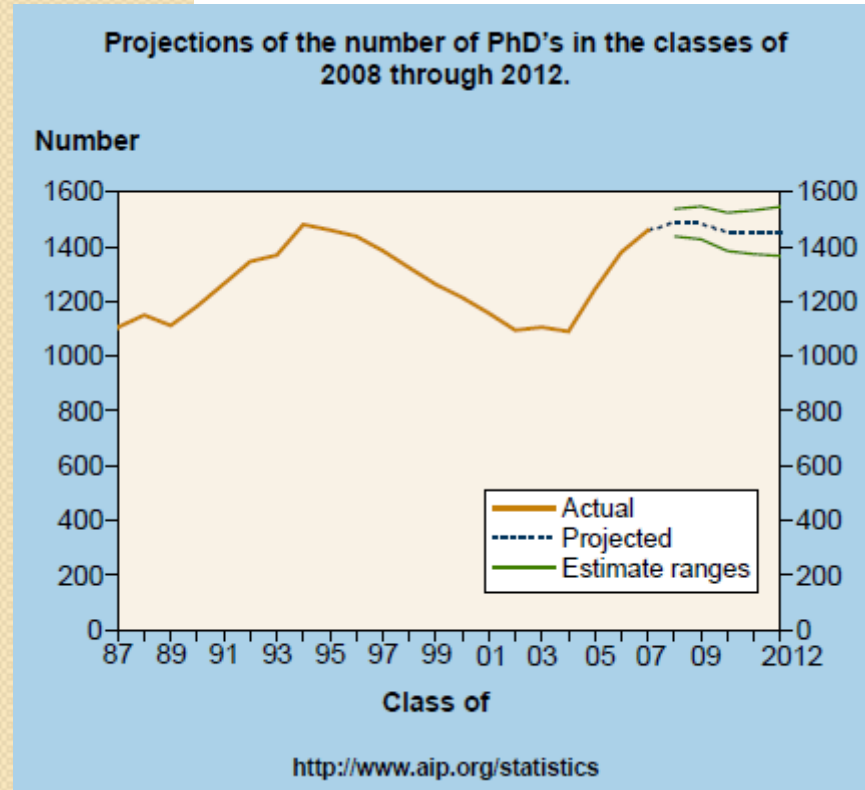
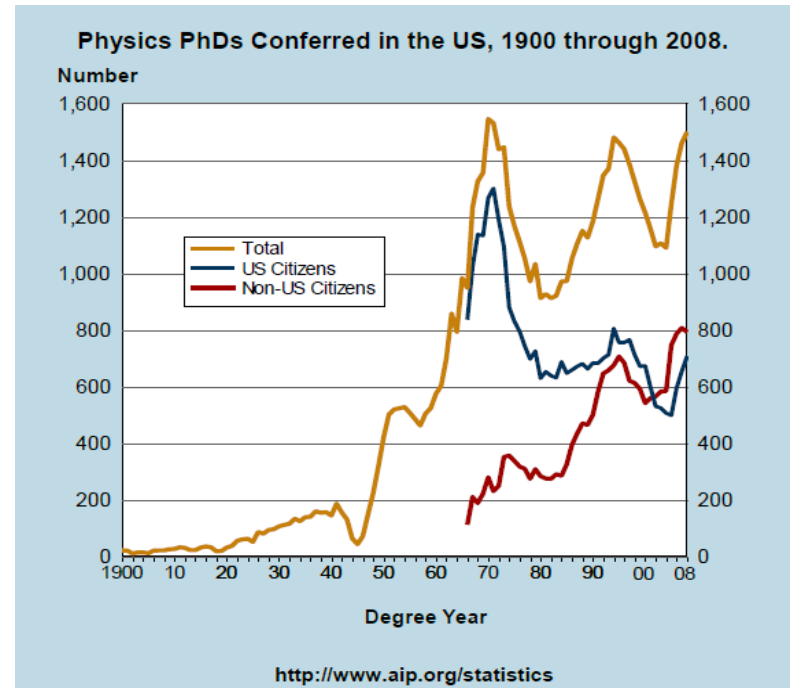
The AIP Statistical Research Center estimates that **1 in 7** physics bachelors will choose to finish a Physics PhD.



So ~14% of all Physics Degree holders will actually become Physics PhDs—and by extension “traditional physicists.”

PhD Job Force: Supply

In 2008, there was a 38% increase in the number of Physics PhDs produced compared to four years earlier.



At the time of the 2008 report, the AIP Statistical Research center estimated that the number of PhDs conferred should level off by 2012...

...at close to the highest number/year produced in the past century (it turned out to be higher than predicted: **now 1600/year**).

Bottom line: the US can expect to continue putting large numbers of Physics PhDs into the workforce.

What are PhDs doing with their degrees?

Types of Positions Accepted by Employment Sector,
Classes of 2009 & 2010.

	Postdoc %	Potentially Permanent %	Other Temporary %	Overall %
Academic*	73	23	82	58
Private sector	1	57	9	19
Government	22	16	6	19
Other	4	4	3	4
N	740	365	89	1,194

Data only include U.S.-educated physics PhDs who remained in the U.S. after earning their degrees.

*Includes university affiliated research institutes.

<http://www.aip.org/statistics>

The largest percentage of Physics PhDs found initial employment in Postdoctoral and other temporary positions...

...but a significant number of graduates went straight into potentially permanent employment in the private sector.

PhD Job Force: Demand

The majority (74%) of graduates who initially become postdocs are in academic settings. The remainder are at national laboratories (22%).

Most postdocs go into their positions in the hopes of moving toward permanent employment.

Postdocs From the Classes of 2009 & 2010: "What Was the Most Important Reason for Taking This Temporary Position?"

	Percent
Necessary step to get desired future position	34
To obtain research experience in my field	22
To work with a particular scientist or research group	17
Could not obtain a suitable permanent position	13
To switch to a different field	6
Personal or family-related reasons	4
Visa restrictions limited my options	3
Other	1
N= 520	

Data only include U.S.-educated physics PhDs who remained in the U.S. after earning their degrees.

<http://www.aip.org/statistics>

Immediate Previous Positions of New Physics Faculty, 2007-08 for Tenured and Tenure-Track Hires*

	Highest Degree Awarded	
	PhD (%)	Bachelor's (%)
Postdoc	54	32
Research Scientist	24	8
Tenured or Tenure-Track Professor	20	16
Graduate Student	1	11
Adjunct, Part-time, or Visiting Faculty	1	28

*Includes permanent non-tenured faculty at schools without tenure. (Only the 5 most common categories of previous position are shown.)

<http://www.aip.org/statistics>

In fact, research shows that at PhD granting universities, previous experience as a postdoc (or as faculty) is a strong indicator of the likelihood of becoming a faculty hire.

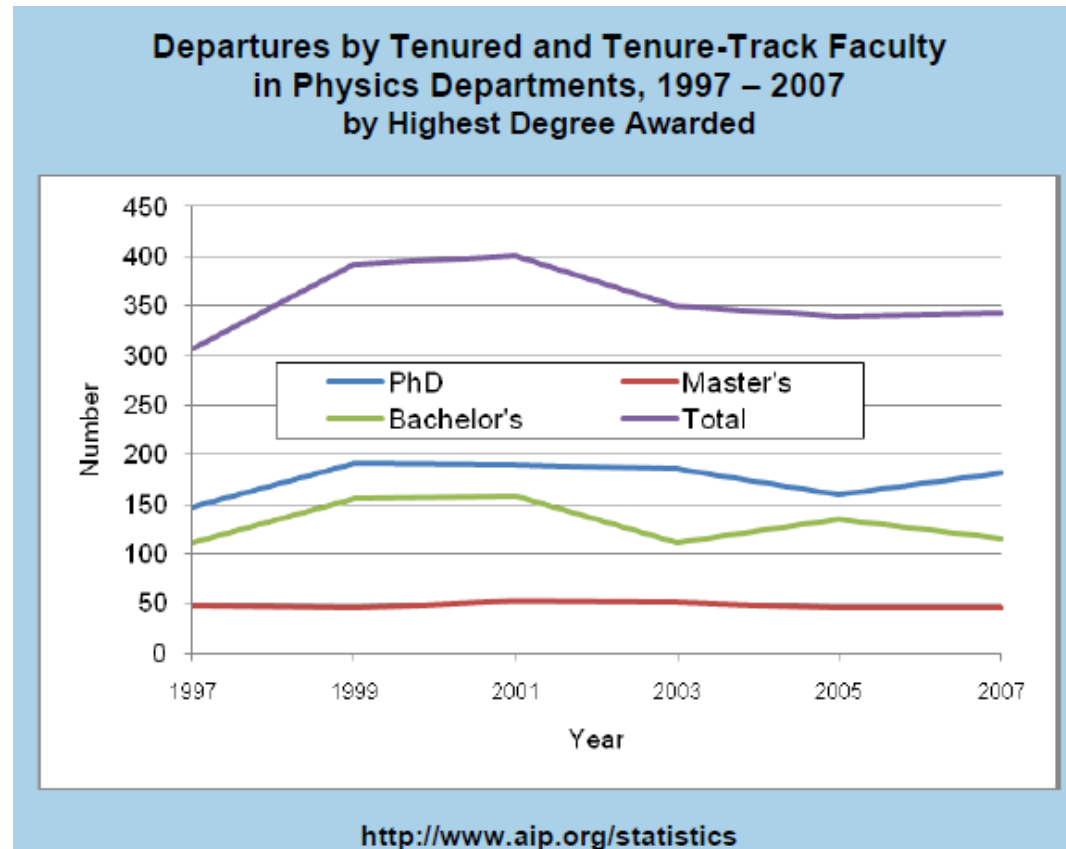
At the same time, becoming a new faculty hire with only a graduate degree is extremely unlikely—even at Bachelor's granting universities.

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However the number of departures of tenured and tenure-track faculty has changed little since 2003.

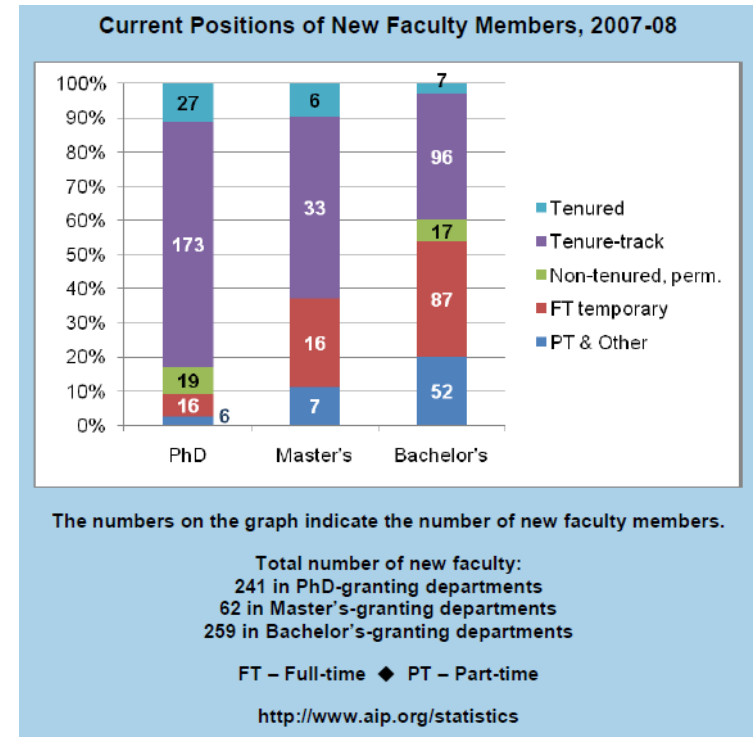


“While there were about 350 departures by tenured and tenure-track faculty during the 2006-2007 academic year...there were 475 recruitments for the same time frame, with 342 tenured and tenure-track faculty members hired in 2007-2008; this... is consistent with what we have seen in prior years.”

--Focus on the Faculty Job Market in Physics and Astronomy Departments,
AIP Statistical Research Center

Not all faculty positions are created alike.

- The type of faculty position varies widely according to institution
- Many individuals who do get new faculty positions will spend time waiting for a desired situation to open up, or for tenure.



Bottom Line: the job market for faculty in universities and other institutions is very stable.

“Stable” means that overall, not many jobs are being lost. At the same time, not many are being created, either.

Given that we are graduating more than 1600 PhDs/yr, and with more than half of them going into postdocs with an intention of continuing as physics faculty, supply will continue to outweigh demand for the tenure-track academic career path.

PhD Employment in the Private Sector

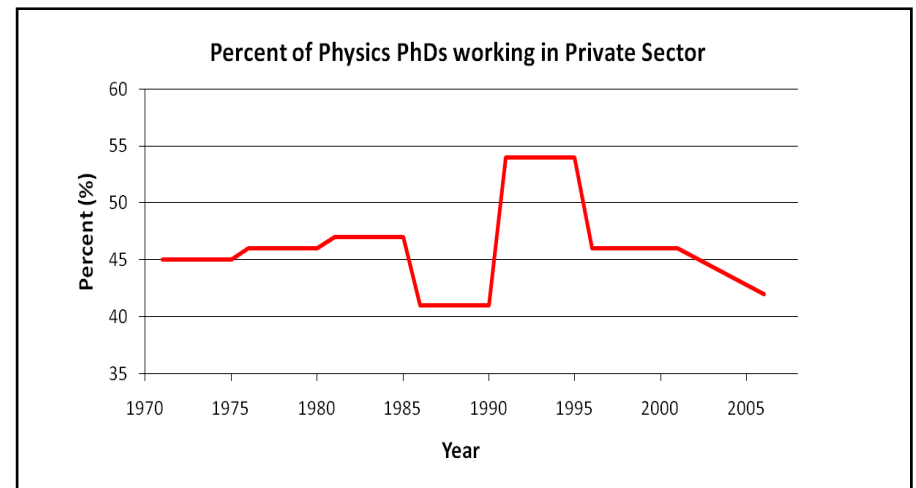
Recall that the majority (57%) of graduates who initially went into permanent employment positions were in the private sector.

According to the NSF Survey of Doctoral Recipients, in 2010 the private sector was the largest single employment base of Physics PhDs: about 47% (the next highest was 4 year colleges, at 38%).

This was also true in 2001, when the private sector employed 46% of Physics PhDs¹...

...and was also true in 1993, when the private sector again employed 46% of Physics PhDs².

In fact, the same data has shown consistent support for Physics PhDs in the private sector since 1971.



¹NSF Survey of Doctoral Recipients, 2001

²NSF Integrated Survey Data, 1993

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

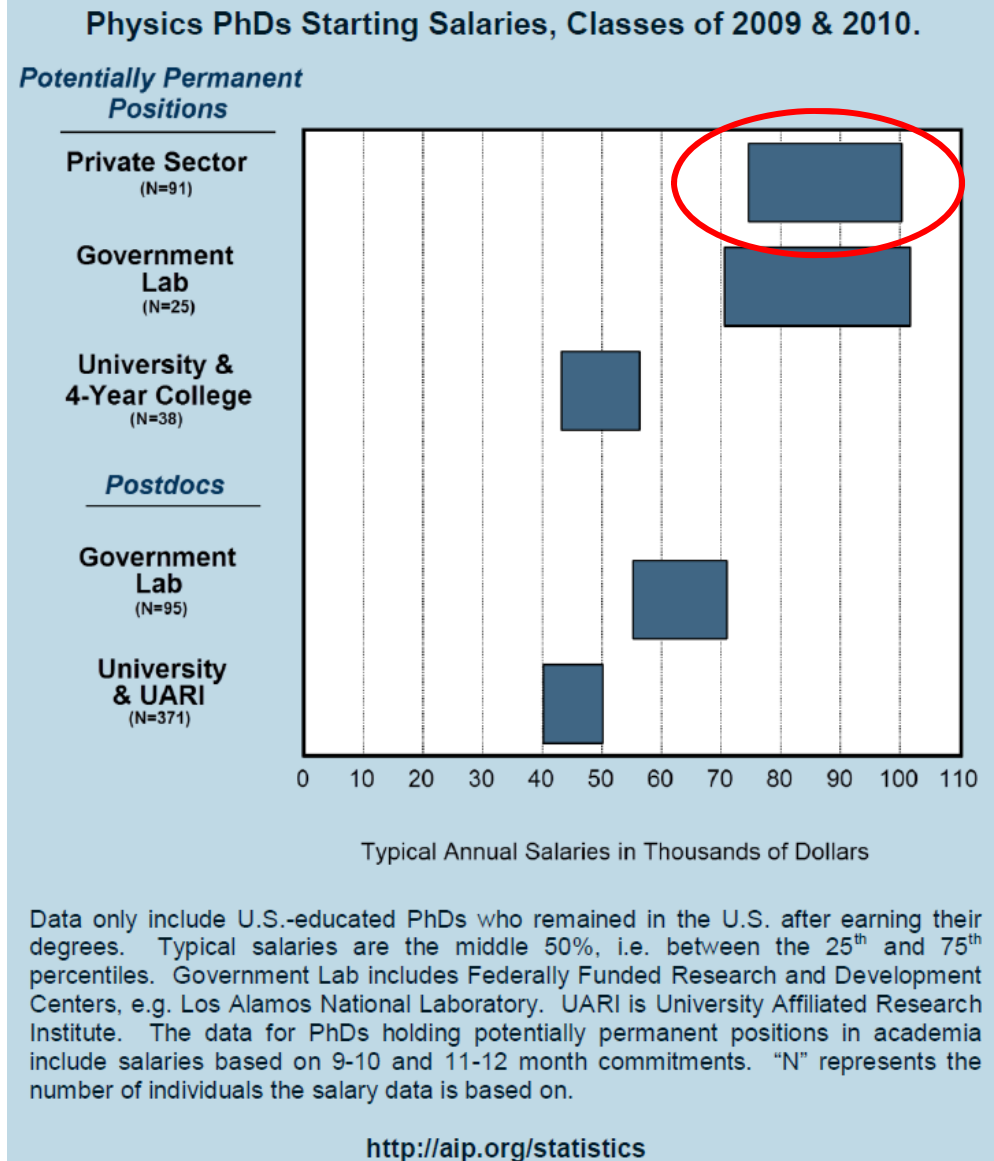
Not only does the private sector provide the largest number of jobs for physics PhDs, it also provides the highest-paying jobs, with a starting salary of **\$90K**

By comparison, average typical starting salaries at Universities and 4-year colleges is around \$50K...

...and a University postdoc position typically offers between \$40K and \$50K.

So, the private sector also offers well-paying employment to Physics PhDs.

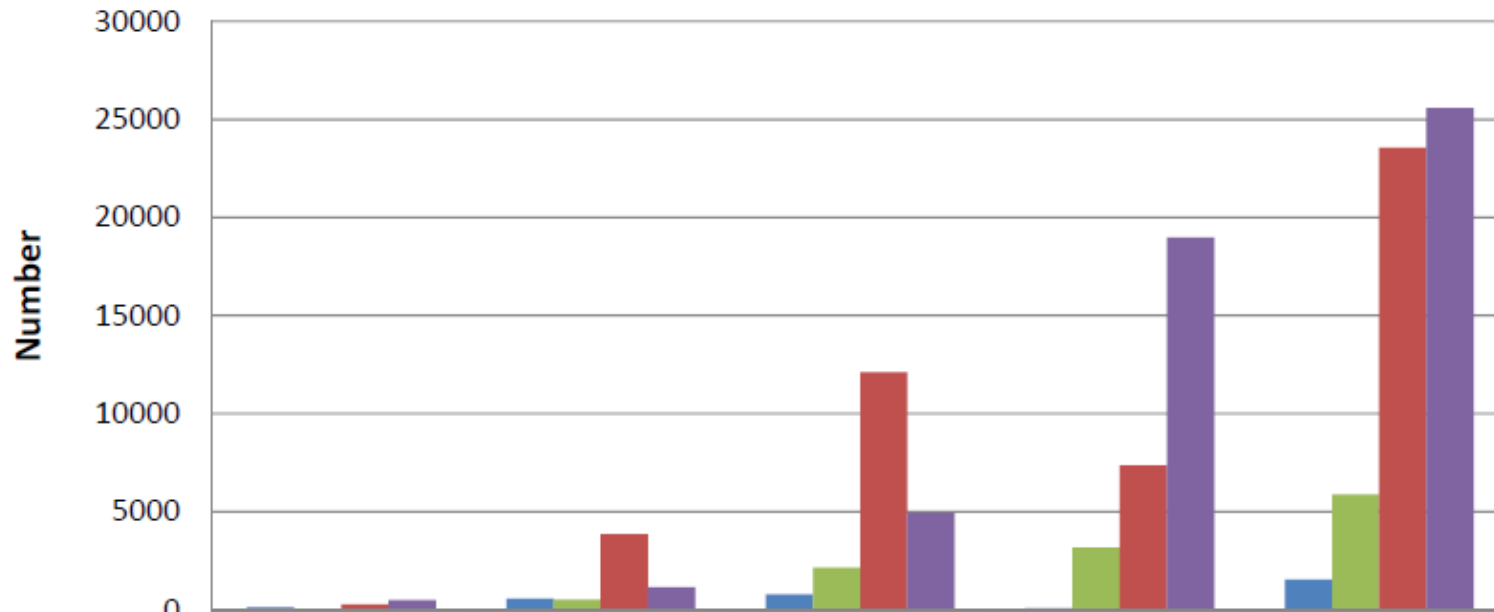
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PhD Salary Distribution, by Sector



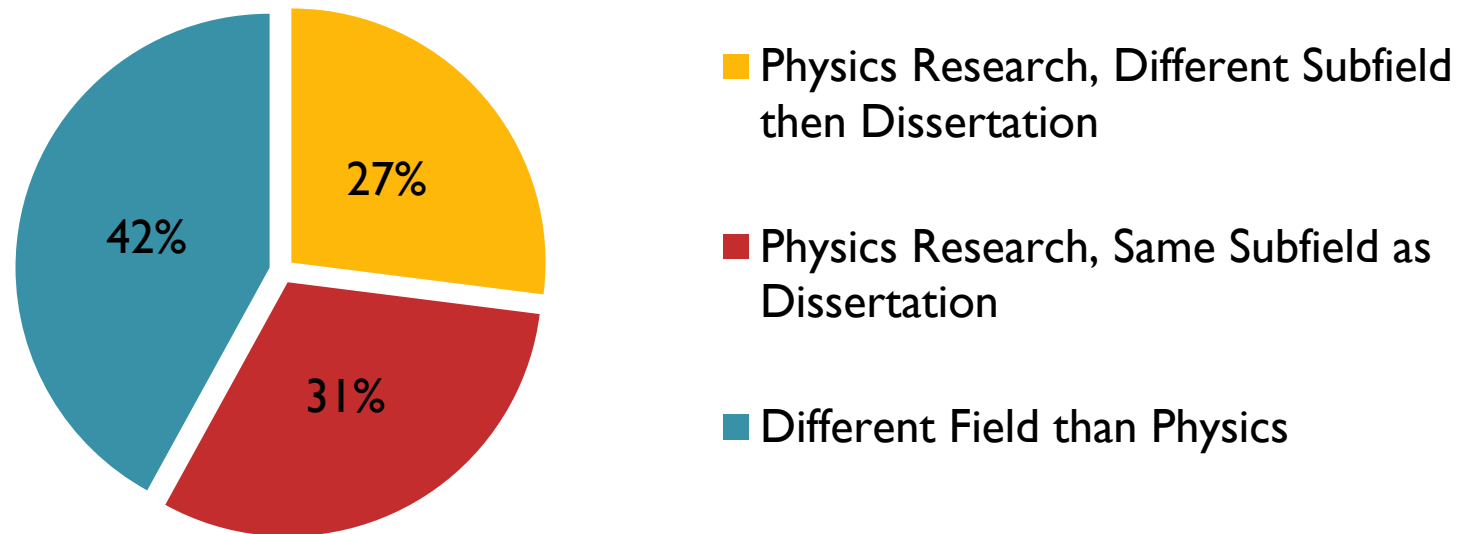
	<\$10K	\$10K - \$50K	\$50K - \$100K	\$100K - \$150K	Total
2-year college	110	567	785	68	1528
Government	40	505	2153	3168	5864
4-year college	266	3845	12102	7346	23558
Business/Industry	483	1144	4959	18985	25568

- 2-year college median salary (post secondary and pre-college teachers): \$53 K 1,528
- 4-year college median salary (research scientists and professors): \$74 K 23,558
- Government (research scientists, engineers, and management): \$105 K 5,864
- Business/Industry (engineers, top- and mid- level managers, non-science): \$120K 25,568

But Won't I Lose My Soul if I Go Into Industry?

NO!

Types of Positions Accepted by Private Sector Hires, 2009-2010



Source: AIP Statistical Research Center, *Physics Doctorates Initial Employment Report*, July 2012

Less than half of graduating PhDs found employment in fields such as Engineering, Business and Finance, Education, or Medical Services.

But the majority of physics PhDs who accepted employment in the private sector were doing **physics research**, either in or out of their dissertation subfield.

PhD Workforce: Summary

- The US produces about ~1600 physics PhDs a year—and is likely to continue producing physicists at this rate over the next several years—while there are only ~350 new faculty hires per year.
- Faculty positions are NOT the most common career path for physicists!
- Industry is the largest employment base for Physics PhDs...
...and for Physics Masters
...and Physics Bachelors.

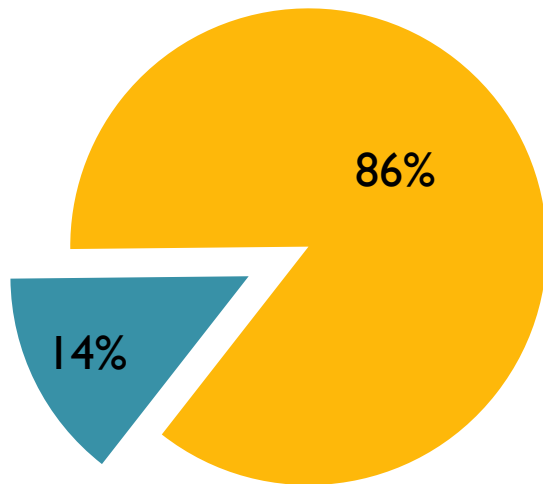
Your career path most likely will not be a straight line...

...BUT! Smart planning requires being aware of—and prepared for—all possibilities.

There is a lot of great science to be done—and opportunities to be found—in a lot of places!

What about the non-PhD physicists?

According to the AIP Statistical Research Center, 86% of physics bachelors will not earn a Physics PhD.



- Physics PhDs
- BS, MS, Employment

- Roughly one-third to one-half of Physics Bachelors will go straight into the workforce, mostly in STEM fields.
- Another third will go into graduate study in Physics and Astronomy
- And the remainder will go into graduate study in other fields—including finance, law, and Medical Physics.

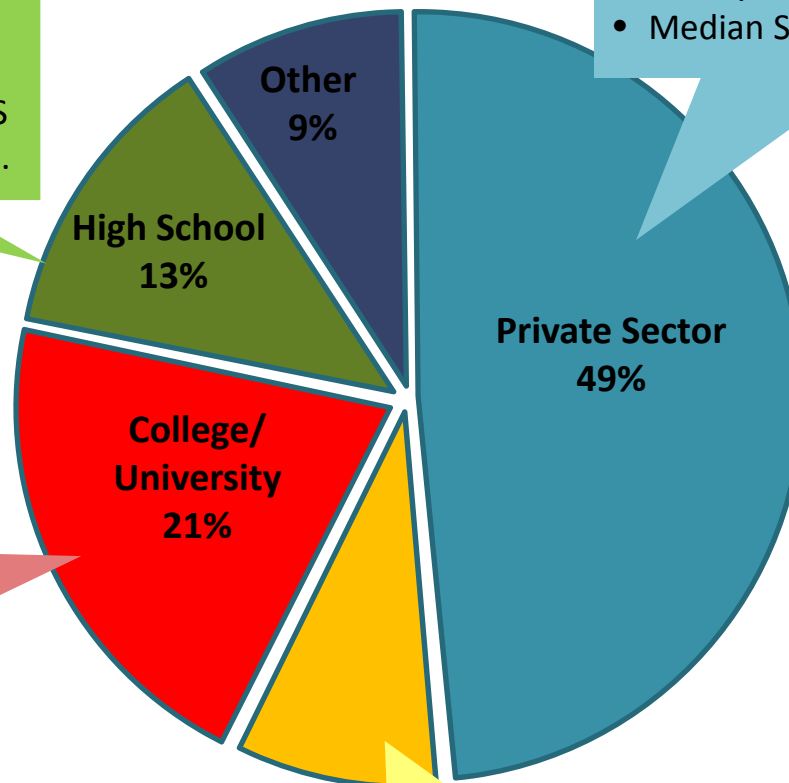
What types of employment are possible for these degree paths?

Master's Degrees

Between 2006-2008, 64% of physics masters recipients entered or remained in the workforce.

- High School teachers taught Physics, Chemistry and Math
- Salaries for those continuing employment after earning their MS were \$13,000 more than new hires.

- Almost entirely STEM occupations
- Mostly management-level positions
- Median Starting Salary: \$62,400

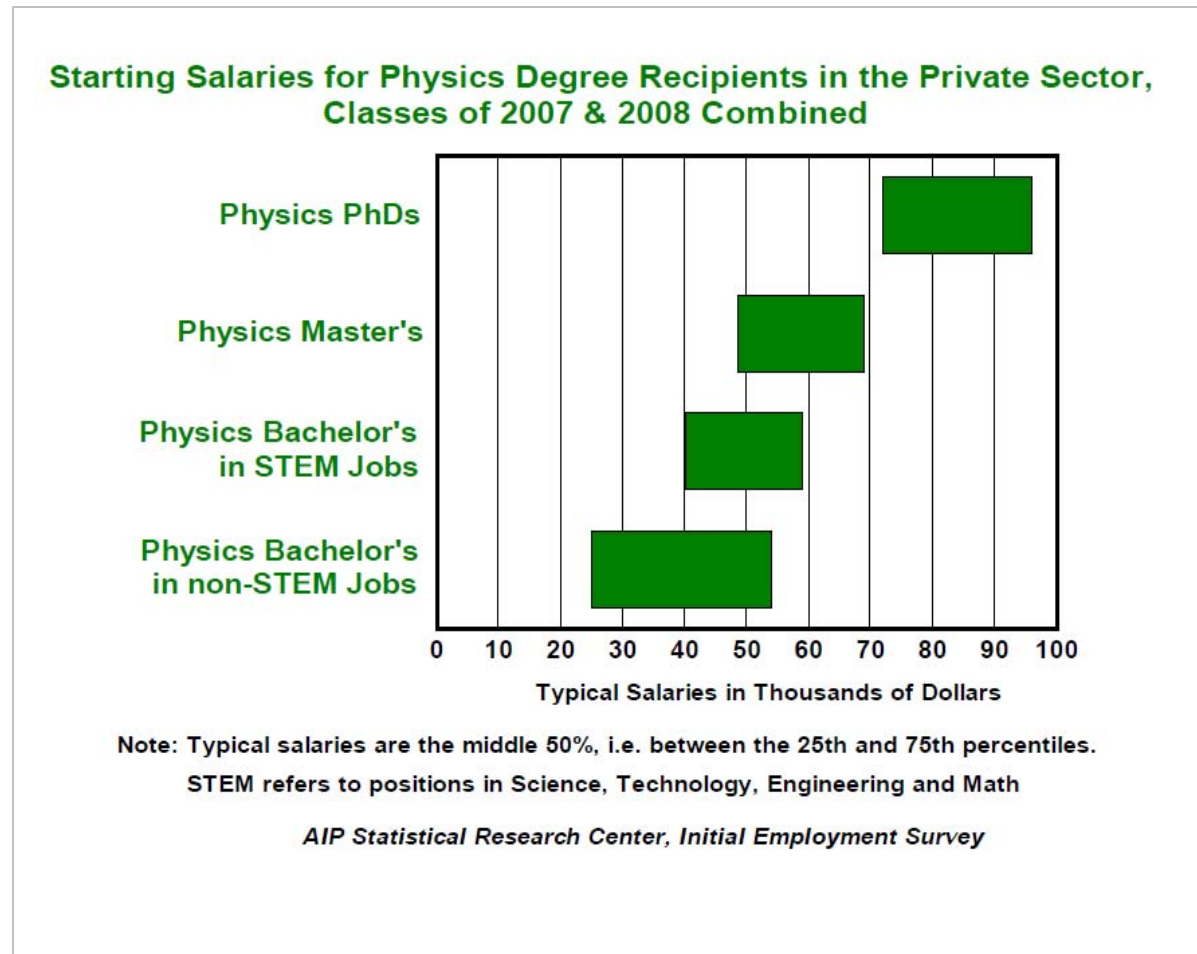


- Typical titles include lab coordinator, instructor, and lecturer.
- Median Starting Salary: \$35,000

Civilian Government
9%

- Positions mostly at National Labs, Armed Service Branches, or Trademark Office
- Median Starting Salary: \$57,000

Not surprisingly, physics master's degree holders also earn more than physics bachelor's:



A physics master's degree will open the door to more advanced positions in a variety of technical fields, with higher salaries.

Elon Musk, Physics MS

Founder and CEO

Tesla Motors, Space-X – Hawthorne, CA

Educational Background

BS – Physics, University of Pennsylvania

MS – Applied Physics/Materials Science, Stanford

As founder and CEO of Space-X, a company pioneering private, commercial space flight, Elon has definitely put his physics training to good use.

On 25 May 2012, the SpaceX Dragon vehicle docked with the International Space Station, ushering in a new era of exploration, travel, and private enterprise in space.



Ginger Kerrick, Physics MS

Flight Director

NASA Johnson Space Center – Houston, TX

Educational Background

BS – Physics, Texas Tech University

MS – Physics, Texas Tech University

Though her original goal was either to become an astronaut or a basketball player, various life circumstances sent her down a different path.

As flight director for NASA, Ginger uses her Physics training every day to solve problems creatively and quickly, to help get astronauts home safely.

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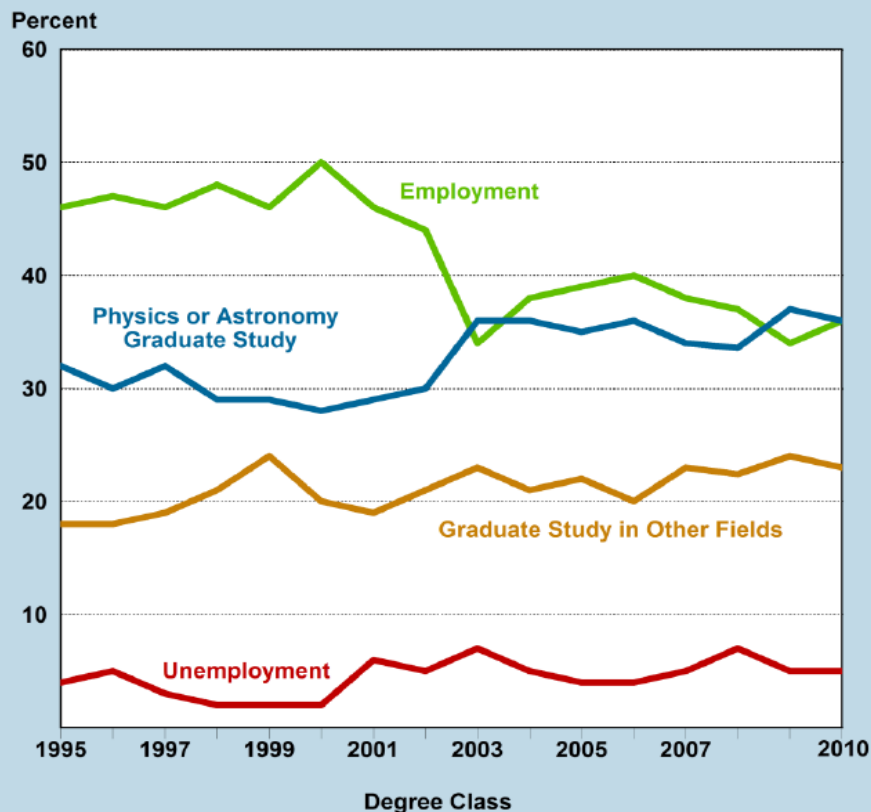
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Bachelor's Degree

Between 1995 and 2007, about one-third to one-half of Bachelor's degree recipients went directly into the workforce.

Trends in Status One Year After Earning a Physics Bachelor's, Classes 1995 through 2010



<http://www.aip.org/statistics>

The remainder went on to graduate school:

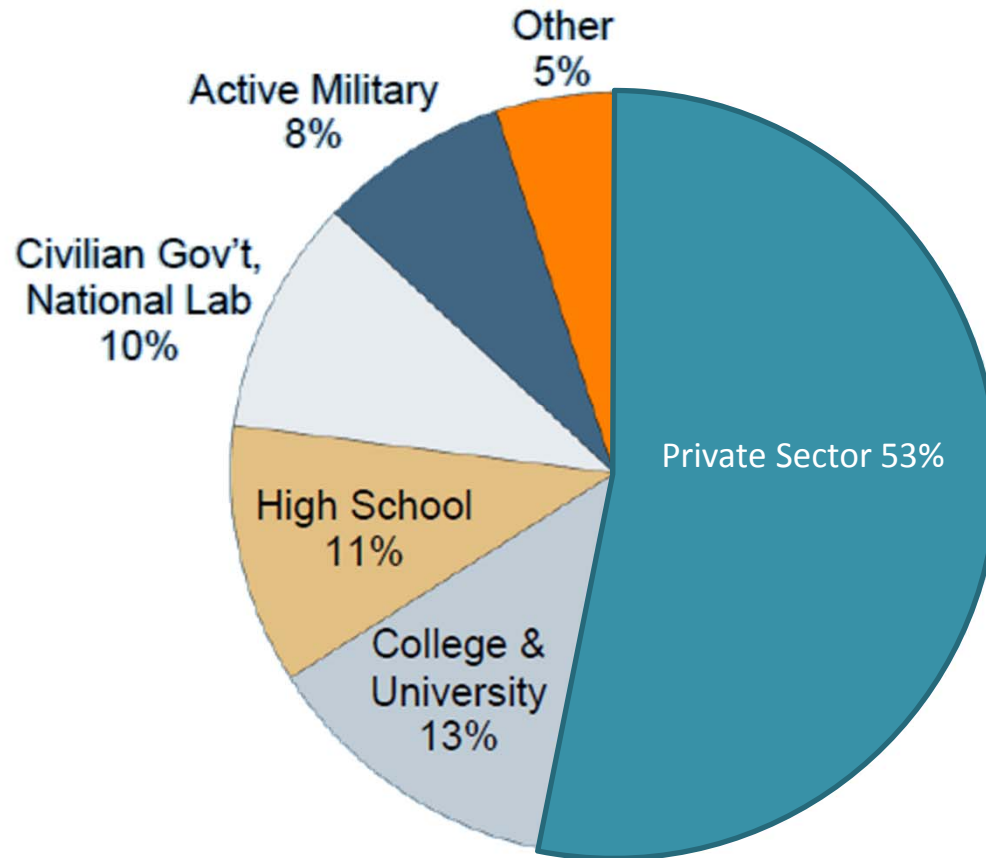
- Mostly in Physics and Astronomy
- A significant proportion went to graduate school in other fields.

Many physics bachelor's degree recipients pursued advanced degrees in other areas...

...and less than 7% of them were unemployed!

Initial Employment of Physics Bachelors

Initial Employment Sectors of Physics Bachelor's, Classes of 2009 & 2010 Combined



Physics Bachelors in 2009-10 found initial employment in a variety of areas.

Over half of physics bachelor's degree recipients in 2009-2010 found work in the private sector.

<http://www.aip.org/statistics>

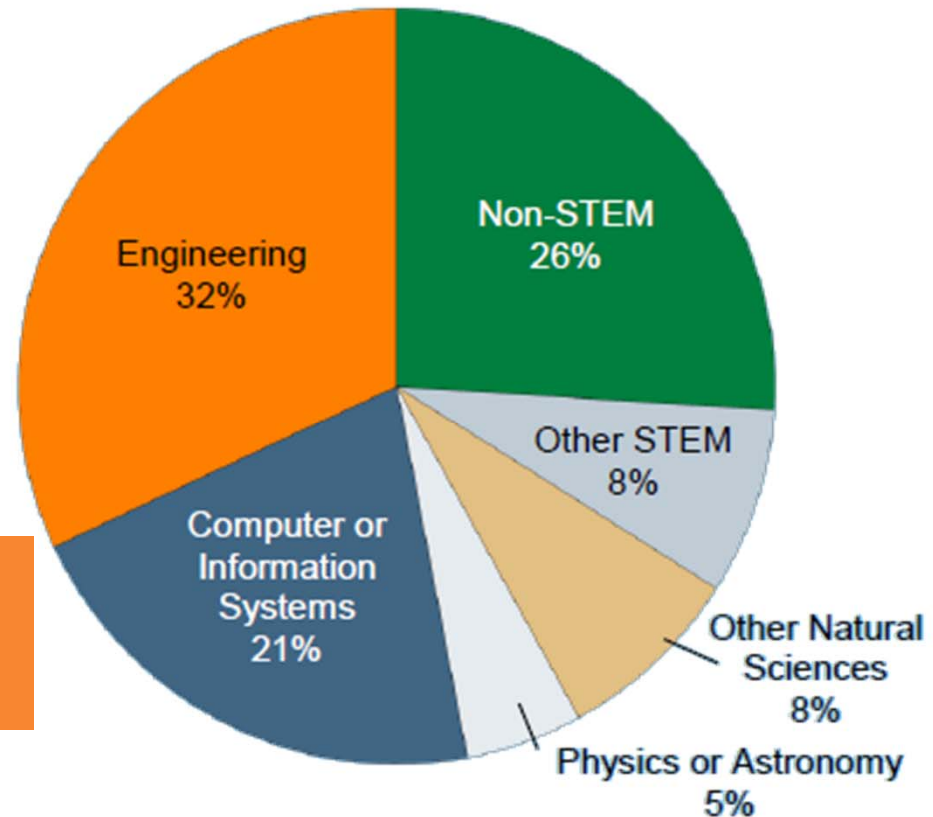
Physics Bachelors in the Private Sector

Field of Employment for Physics Bachelor's in the Private Sector, Classes of 2009 & 2010 Combined

Of these, many went into engineering or computer science.

A significant portion went into "non-STEM" fields

Physics bachelors are highly employable, in a variety of career paths.



STEM refers to natural Science, Technology, Engineering, and Mathematics.

<http://www.aip.org/statistics>

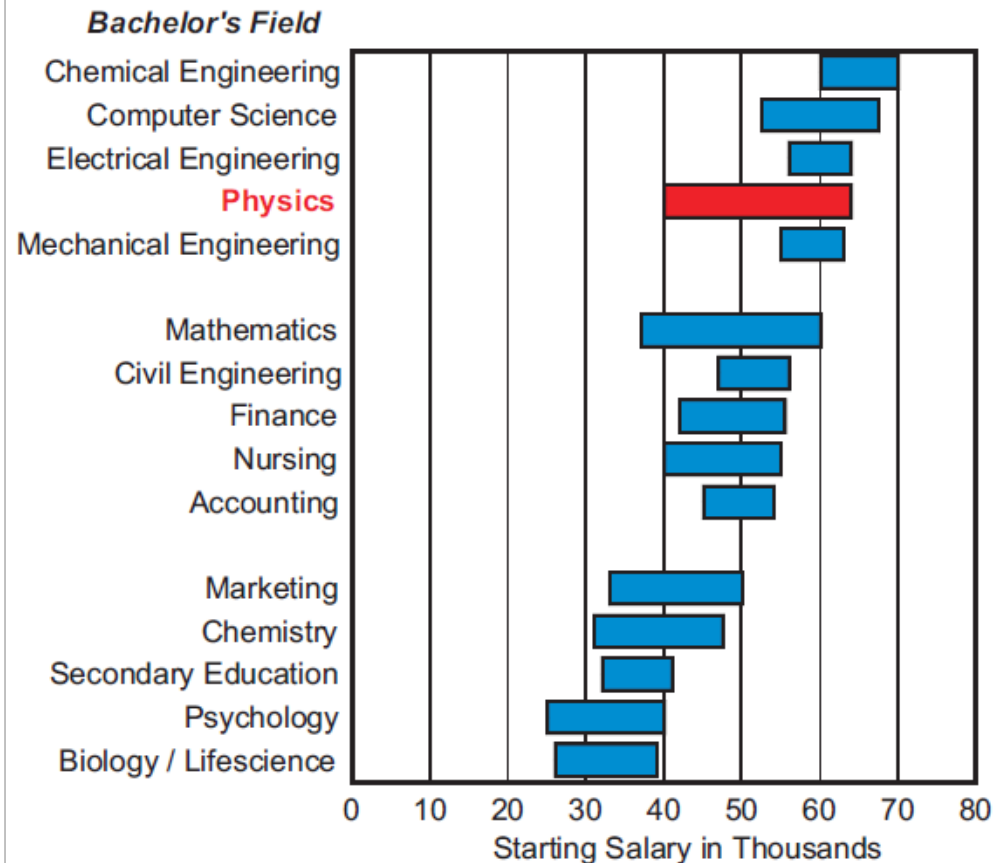
In fact...

A physics bachelor's degree now ranks higher in starting salary than many other technical fields (including mechanical engineering).

The typical starting salary for a physics bachelor degree has increased by nearly **\$10,000** since 2003.

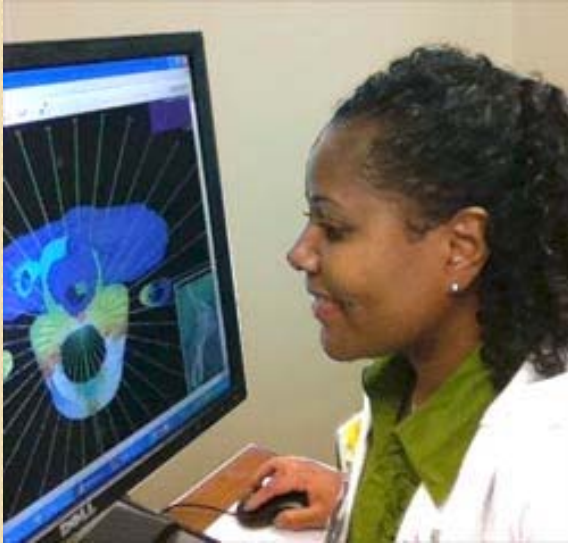
What's a Bachelor's Degree Worth?

Typical Salary Offers by Campus Recruiters, AY 2008-09



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

Reprinted from the Fall 2009 Salary Survey, with permission of the National Association of Colleges and Employers, copyright holder.



Christina Barrow, Physics BS

Medical Physicist

Department of Veteran Affairs, Baton Rouge, LA

Educational Background

BS – Physics

MS – Medical Physics

At the Dept. of Veteran Affairs, Christina is responsible for quality assurance of radiation treatments for cancer patients. Her work allows VA medical personnel to have access to the latest techniques in patient care.

David X. Cohen, Physics BS

Writer and Executive Producer

Television show *Futurama*

Educational Background

BA – Physics, Harvard University

MS – Computer Science, UC Berkeley

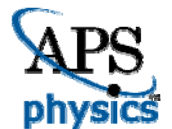
David claims that his choice to study physics was a “pathetic form of rebellion” against his parents, who are both Biologists.

As a writer for the show *Futurama*, David says his physics training helps him incorporate an understanding of how the world actually works into the show, which is set in a fictional world.

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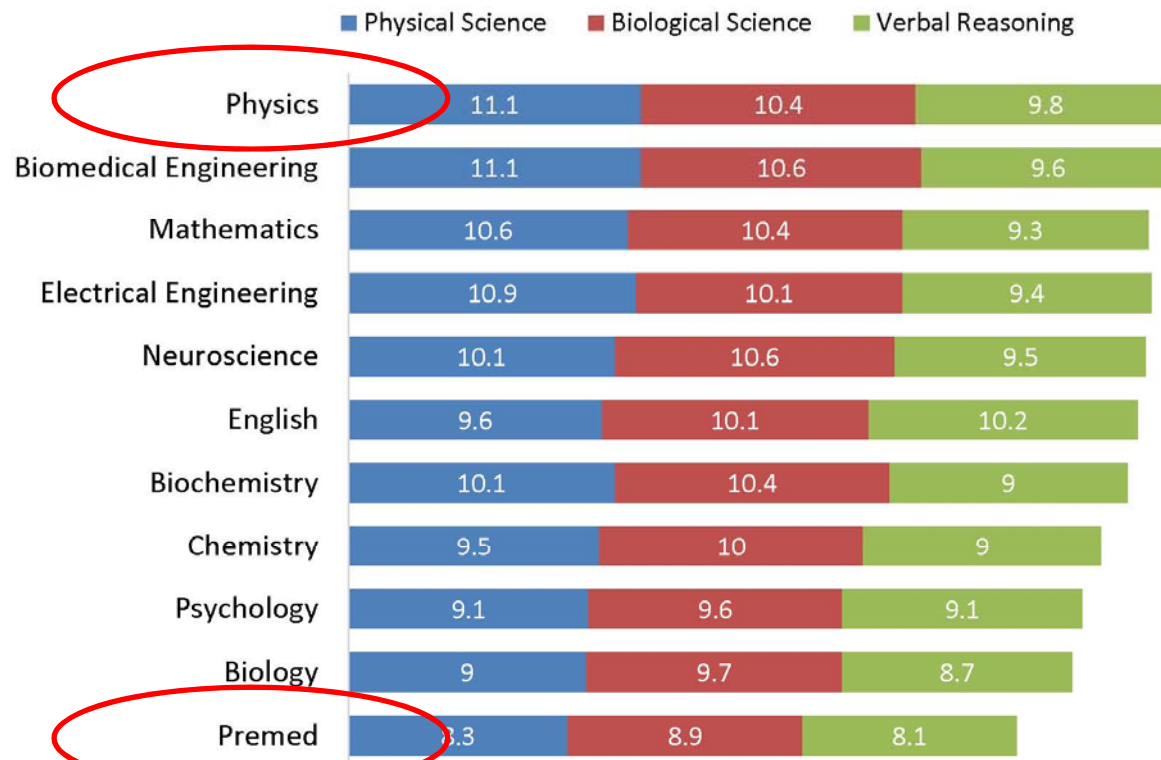


Beyond the Bachelor's Degree

Medical School

Physics majors out-performed many other majors (including pre-med) on all three sections on the MCAT.

Average MCAT Scores by Selected Major*, 2012



* Based on test takers who applied to medical school, and based on applicants' most recent MCAT scores. Source: AIP Statistical Research Center compiled from the Data Warehouse of the Association of American Medical Colleges.

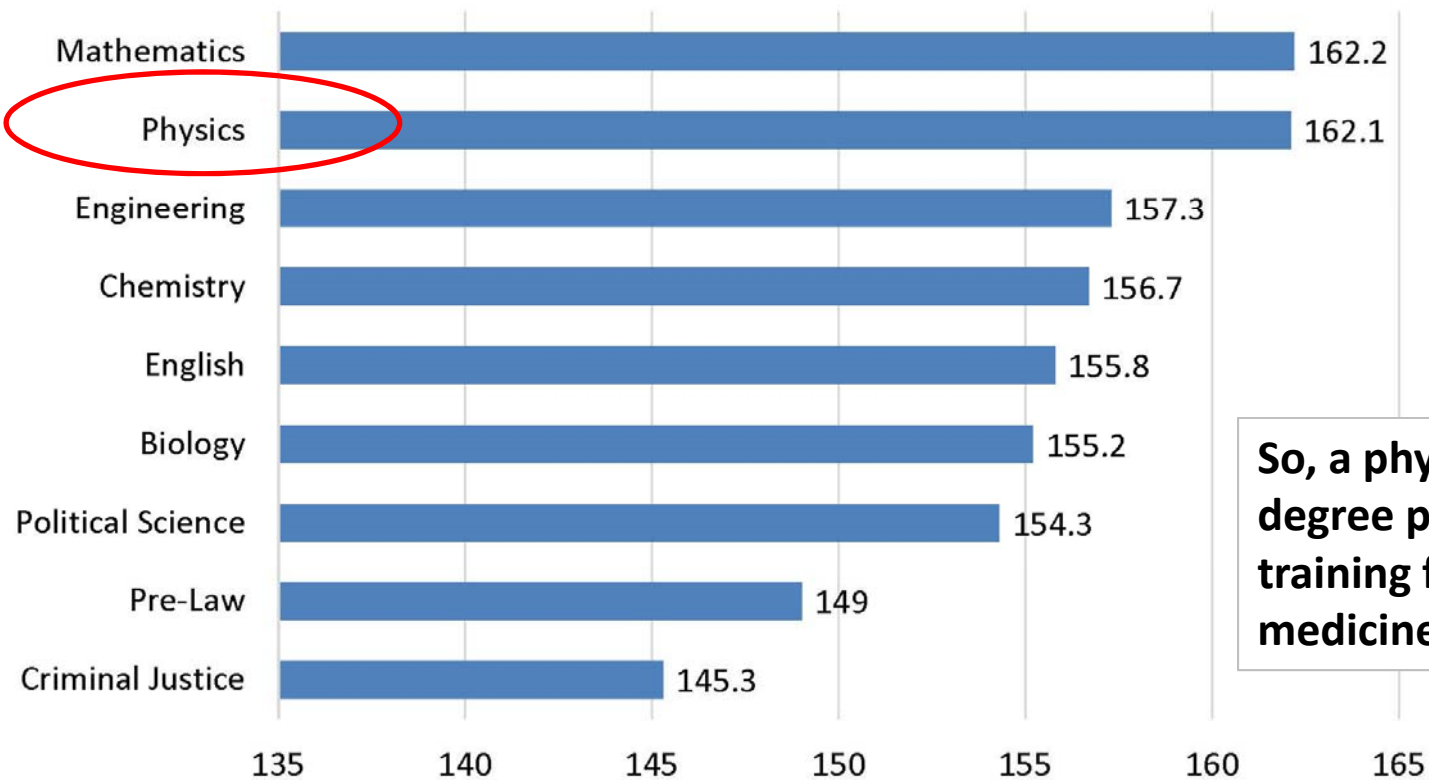
Physics majors also account for less than 1% of individuals taking the exam...

These factors make Physics majors stand out compared to other med school applicants.

Or Law School?

Physics majors also received the highest average LSAT scores compared to several other majors (including Pre Law).

Average LSAT Scores by Selected Major, 2012



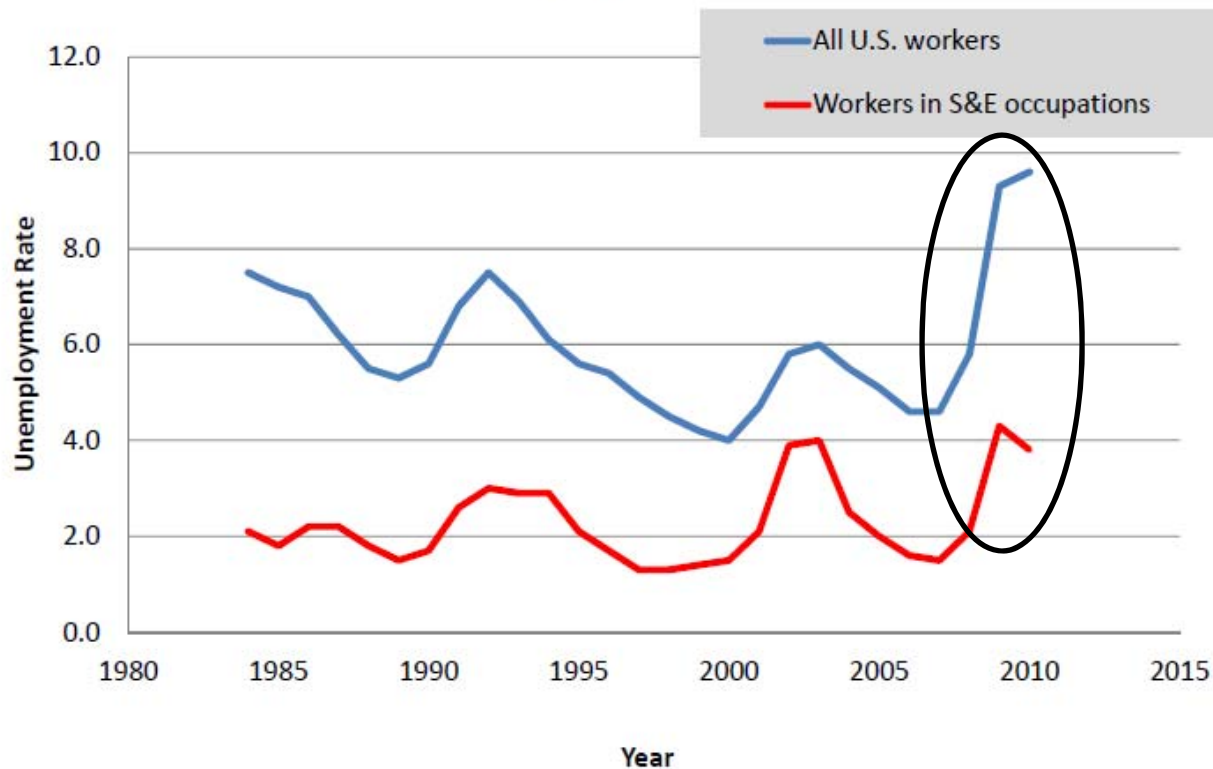
So, a physics bachelor's degree provides excellent training for careers in medicine and in law.

Source: Compiled by the Statistical Research Center based on data collected from the Law School Admission Council.

A Bigger Picture...

Job Security

Unemployment rates for Science and Engineering Fields, vs. the General Public

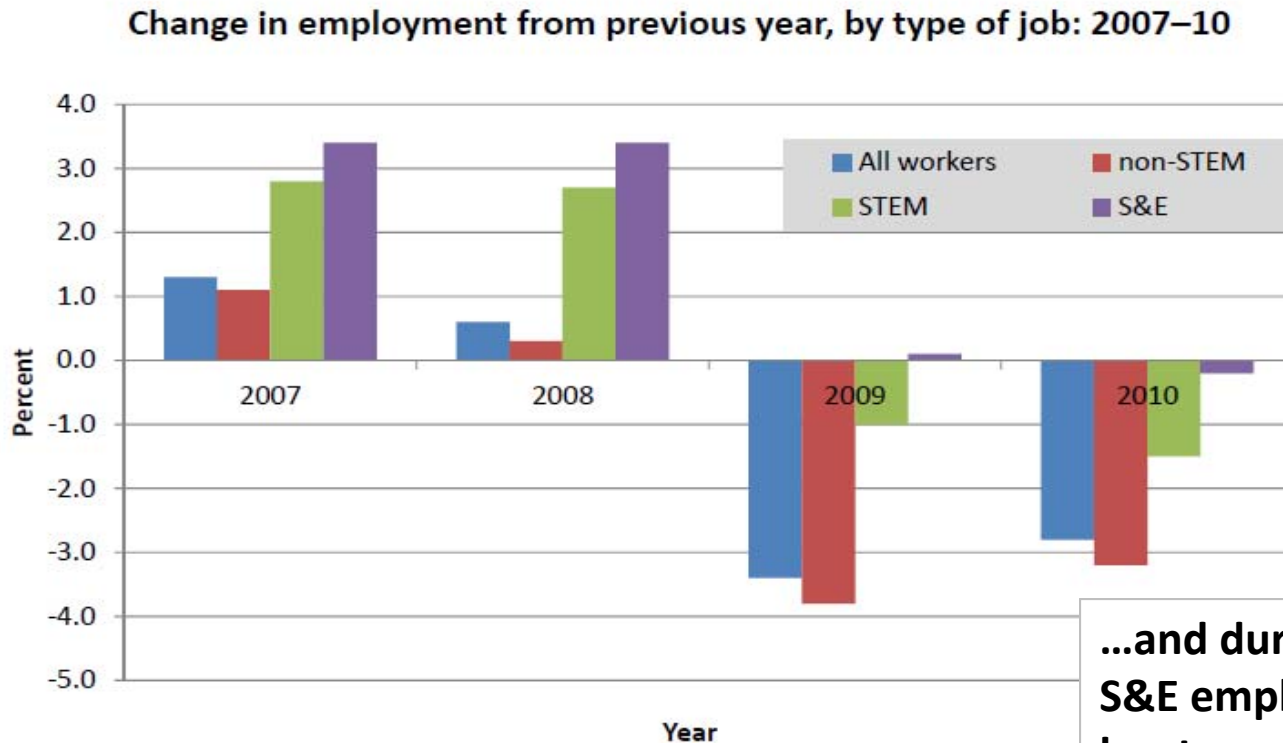


Source: NSF Science and Engineering Indicators, 2012

Unemployment rates in science and engineering fields have trended lower than that of all US workers for decades.

During the 2008 recession, they remained even lower, proportionally.

During the two years before the recession, S&E employment grew the fastest....



Source: NSF Science and Engineering Indicators, 2012

...and during the recession, S&E employment suffered the least.

Given that in the same timeframe, 58% of Physics Bachelors, 87% of Physics Masters, and 82% of Physics PhDs were employed in S&E fields, we can conclude that a physics training benefitted these students—and the US workforce—in palpable ways.

In Conclusion

- The US produces about ~1600 physics PhDs a year—and is likely to continue producing physicists at this rate over the next several years
- At the same time, there are approximately ~350 new faculty hires per year.
- A faculty hire of a recent physics PhD graduate (without a postdoc or other prior teaching experience) is very small.
- Industry is the largest employment base for Physics PhDs...
...and for Physics Masters
....and Physics Bachelors.
- Physics working in the private sector are:
 - Engineers
 - Computer Scientists
 - Project Mangers
 - Research Scientists
 - Patent Lawyers
 - Wall Street Financiers...

Why call what most Physicists actually do
“non-traditional”?

Other Ways APS Can Help

APS Job Board and Job Fairs



Shared database (Physics Today, IEEE Computing, AVS, and others) means that there are hundreds of jobs available on the site right now.

Job Seekers can:

- Search for jobs on the Job Center (totally free).
- Store your resume, cover letters, and other materials in your profile on the site.
- Apply for positions directly through the Job Center.

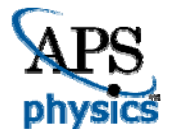


Panels and Networking Opportunities at APS Meetings

- Career Workshops
- Industrial Careers Workshop at APS March 2013 Meeting
- Graduate Student “Lunch with the Experts”
- Career Panel and Networking Reception

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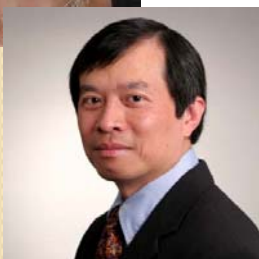
APS Webinars

APS webinars are designed to connect students with information on physics careers, educational programs, and professional development for students, working physicists, and educators.

Monthly broadcasts are free and open to the public.

Topics have included:

- Career Self-Advocacy: How I Got My Six-Figure Salary in the Private Sector (Meghan Anzelc, CNA Insurance)
- Putting your Science to Work (with celebrated career coach Peter Fiske)
- Choosing a Graduate School (with physics professor Peter Collings)
- Careers in Patent Law (with physicist and patent attorney Hey Yeung Cheung)



Visit: go.aps.org/apswebinars



WEBINARS

Career Information for Physicists

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APS Units and Committees You Should Know About

Forum on Graduate Student Affairs (FGSA)

FGSA is led by graduate students, who are amazingly proactive about advocating for graduate students in physics, including careers and professional development activities, information on science policy, and much more

<http://www.aps.org/units/fgsa/>

Forum on Industrial and Applied Physics (FIAP)

APS Forum representing the Industrial and Applied Physics Community. Also very engaged with FGSA and CCPD to bring more information on these career paths to students and early career physicists.

<http://www.aps.org/units/fiap/>

Committee on Careers and Professional Development (CCPD)

APS Committee dedicated to developing career information and professional development support to all APS Members and the general physics community.

<http://www.aps.org/about/governance/committees/ccpd/>

APS Careers Website

The APS Career Website is the gateway to physics career resources. Here you can find links to the APS Job Center, Webinars, information on upcoming workshops and meetings, career advice, and other career and job related resources.

www.aps.org/careers

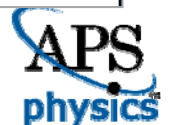
A screenshot of the APS Careers website home page. The top navigation bar includes 'American Physical Society Sites', 'APS', 'Journals', 'PhysicsCentral', and 'Physics'. Below this is a search bar and a 'Search' button. A secondary navigation bar contains 'Publications', 'Meetings & Events', 'Programs', 'Membership', 'Policy & Advocacy', 'Careers in Physics', and 'About APS'. The main content area features a 'Careers in Physics' sidebar with links to 'Physics Jobs', 'Becoming a Physicist', 'Career Guidance', 'Webinars for Physicists', and 'Tools for Career Advisors'. The main content area displays a featured article titled 'Applying to Graduate Programs in the United States: Strategies for Success' with a 'Free to the Public' tag. Below the article are three headshots of speakers: Amber Annet, Ulf-Peter, and Alfredo Funes. A 'Pages For:' dropdown menu is set to 'Physicists/Scientists'.

A screenshot of the 'physics careers & jobs' blog page, hosted by the APS Committee on Careers and Professional Development. The page has a header with 'HOME', 'ABOUT THIS BLOG', and 'EDITORIAL POLICIES'. Below the header is a large image of colorful, abstract particles. The main content area features a 'Job Interviews' section with a question: 'Q. What is a typical interview like for an academic job? For an industrial job? How can I succeed?' followed by an answer 'A. The typical academic interview includes a research talk or a sample class lecture (or both), depending on the type of institution, plus meetings with faculty, groups of faculty and administrators. In addition there are sometimes social events - which, make no mistake, are also opportunities for evaluating candidates. The interviewers will ask directly or indirectly questions that are also implied in their job advertisement (so reread the advertisement before the interview, and...'. To the right is an 'ARCHIVES' section with a list of dates from January 2010 to November 2008. At the bottom, there is a search bar and a 'FLICKR PHOTOS' section.

A screenshot of the APS Careers website 'Physicists Profiles' page. The top navigation bar is identical to the previous screenshot. The main content area is titled 'Physicists Profiles' and 'What You Can Do With Physics'. It includes a list of categories: 'Middle/High School Students', 'Undergraduate Students', and 'Physicists Profiles'. Below this is a 'Career Guidance' section with the text: 'A physics degree will qualify you for a variety of careers from inventing to analyzing to improving. Find out the diversity of physics by exploring the jobs of these physicists.' The page features three profile cards: 1) Albin Gonzalez, a medical physicist from Panama working at Mercy Cancer Center in Elyria, Ohio; 2) Alejandro Rodriguez, who enjoys salsa dancing, watching movies, and studying micro machines; 3) Alicia Soderberg, who once wanted to be an environmental scientist but fell in love with looking at the stars in the night's sky. Each profile card includes a headshot and a 'Find Out More!' link. A 'Pages For:' dropdown menu is set to 'Physicists/Scientist'.

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Remember:

A limited number of *faculty* jobs does **not** translate to “a limited number of *jobs*.”

Success Means Planning Effectively by Broadening Your Focus...

- Examine your skills and interests, as well as your lifestyle goals.
 - Learn as much as you can about different career paths.
- Build your network to maximize the effectiveness of your search.
- Seek out experiences that will give you marketable skills in your fields of interest.

...and by starting the process *early!*

Questions? Comments?

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