



# Breaking the Myth of the “Non-Traditional” Physicist

## The Real Story About Employment for Physics Graduates

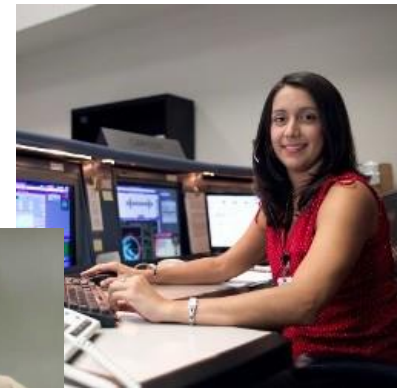
APS Division of Particles and Fields Meeting  
August 4 – 8, 2015  
Ann Arbor, MI

Crystal Bailey  
American Physical Society

# 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.

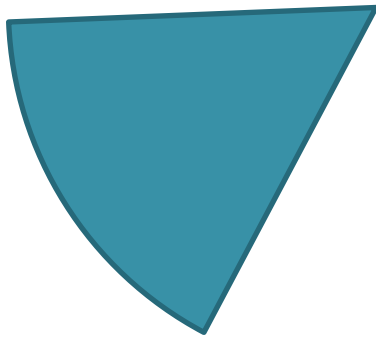
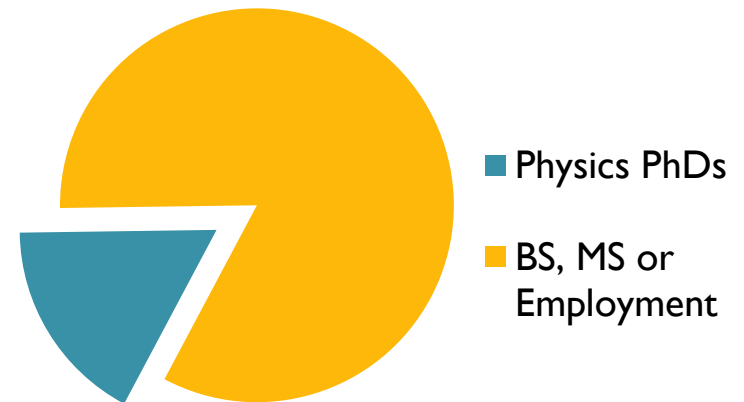
However, most importantly, even a basic Physics training imparts essential problem solving skills—“how to think”—which is the hallmark of a physicist.

# 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 6** physics bachelors will choose to finish a Physics PhD.



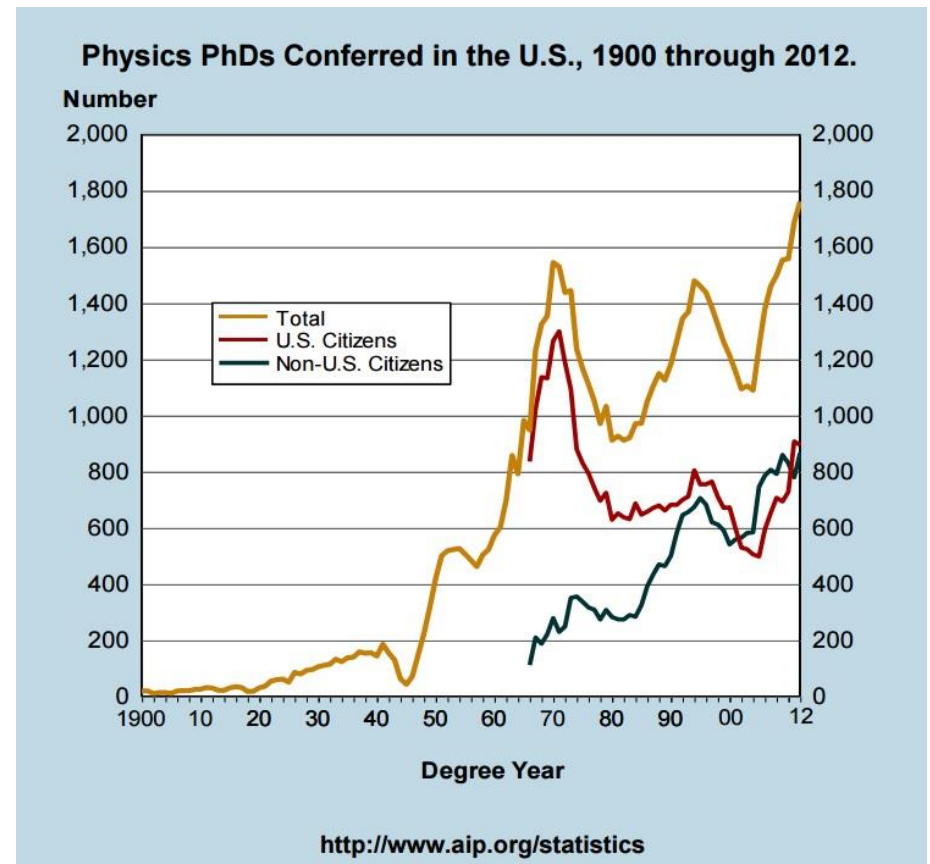
**So ~17% of all Physics Degree holders will actually become Physics PhDs—and by extension “traditional physicists.”**

# PhD Job Force: Supply

At the time of the 2014 report, the AIP Statistical Research center found the number of physics PhDs conferred in the US to be the highest in the past century: **1,762**.

Based on current enrollments, we should expect PhD degree production to level off at around **1,700/year** in the next four years.

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



# What are PhDs doing with their degrees?

**Employment Type of Physics PhDs by Employment Sector One Year After Degree, Classes of 2011 & 2012 Combined**

Sector of Employment	Postdoc %	Potentially Permanent %	Other Temporary %	Overall %
Academic*	74	22	78	57
Private	1	64	14	23
Government	21	11	4	16
Other	4	3	4	4
	100%	100%	100%	100%
Number of resp.	859	485	140	1,484

Note: Data only include US-educated physics PhDs who remained in the US 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 the vast majority of permanent jobs were in the private sector.**

# PhD Job Force: Demand

The majority (88%) of graduates who initially go into the academic sector are postdocs or temporary faculty.

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

Postdocs From the Classes of 2011 & 2012: "What Was the Most Important Reason for Taking This Temporary Position?"

	Percent
Necessary step to get desired future position	32
To obtain research experience in my field	26
To work with a particular scientist or research group	17
Could not obtain a suitable permanent position	12
To switch to a different field	5
Personal or family-related reasons	5
Visa restrictions limited my options	2
Other	1
N = 552	

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

<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

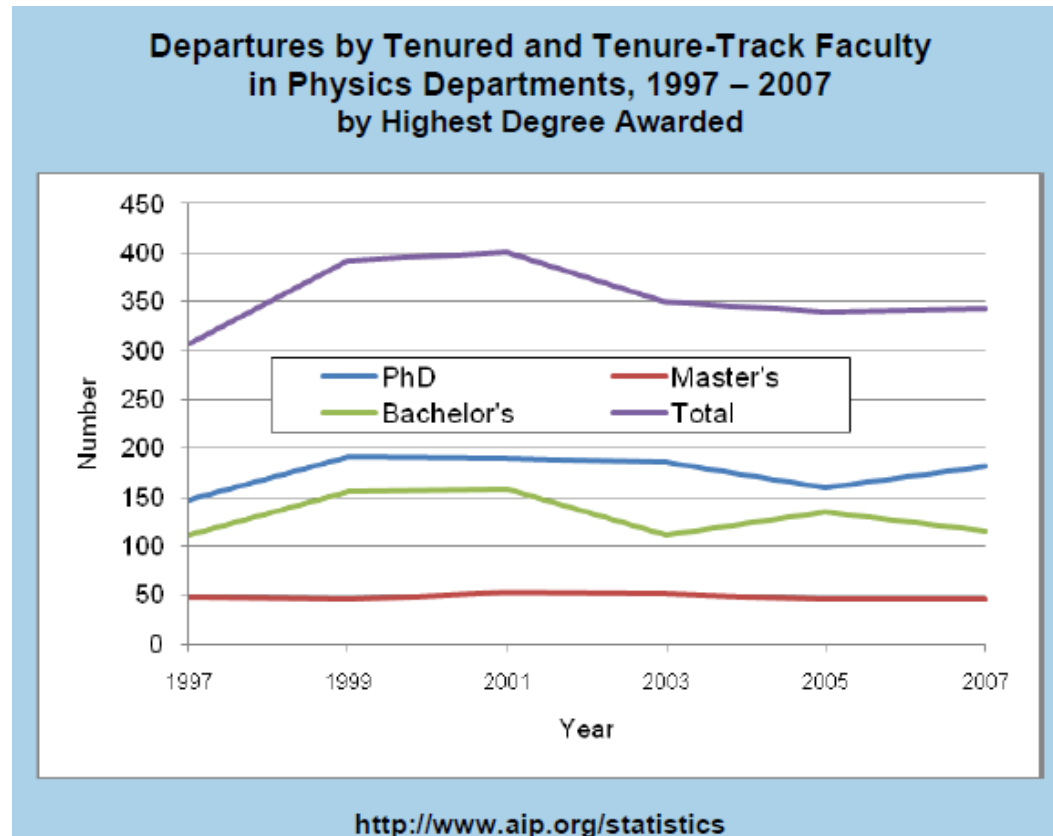
\*Includes permanent non-tenured faculty at schools without tenure. (Only the 5 most common categories of previous position are shown.)

<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.

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

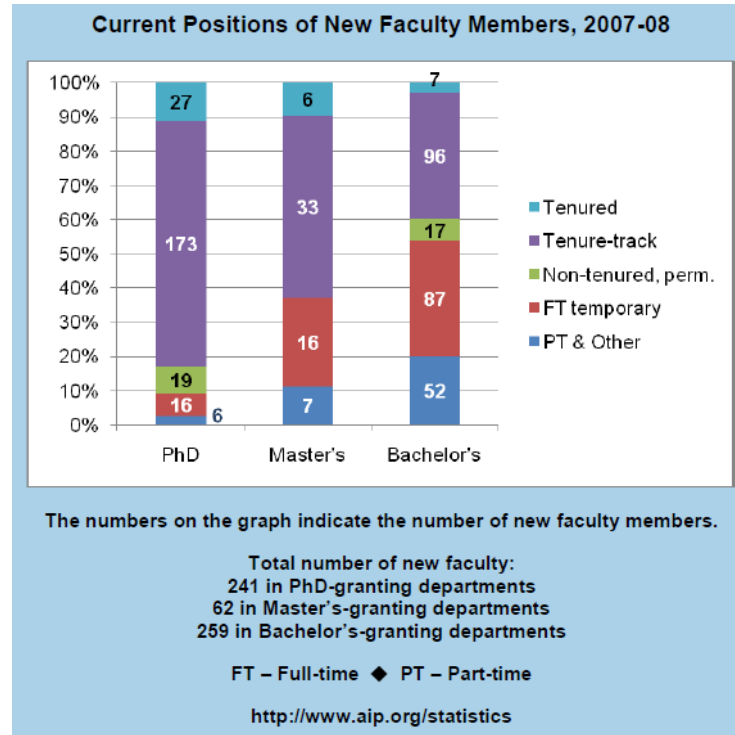


“While there were about 350 departures by tenured and tenure-track faculty during the 2006-2007 academic year...there were 475 recruitments for the same time frame, with 342 tenured and tenure-track faculty members hired in 2007-2008; this... is consistent with what we have seen in prior years.”

*--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.



**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 over 1,700 PhDs/yr, 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

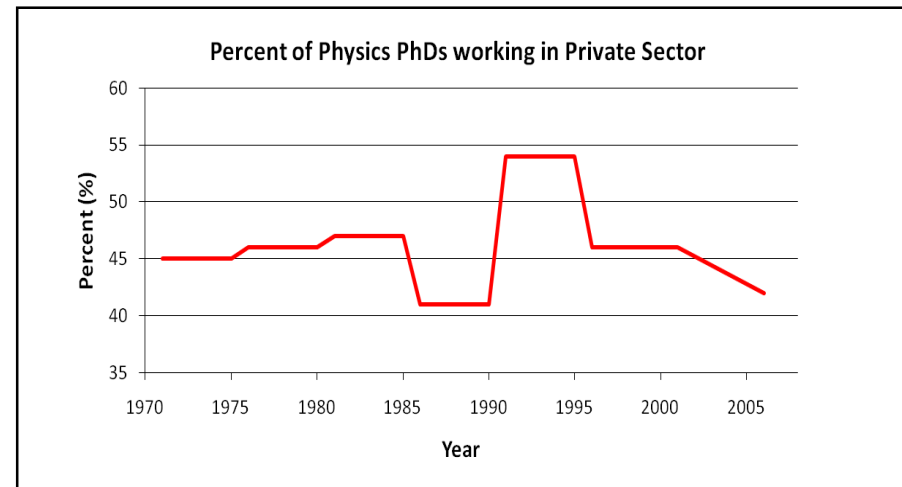
Recall that the majority (64%) of graduates who initially went into permanent employment positions were in the private sector.

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 PhDs<sup>1</sup>...

...and was also true in 1993, when the private sector again employed 46% of Physics PhDs<sup>2</sup>.

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



<sup>1</sup>NSF Survey of Doctoral Recipients, 2001

<sup>2</sup>NSF 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 median starting salary over **\$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.**

[www.aps.org/careers](http://www.aps.org/careers)

## Starting Salaries for Physics PhDs, Classes of 2011 & 2012 Combined

### Potentially Permanent Positions

Government Lab  
(N=17)

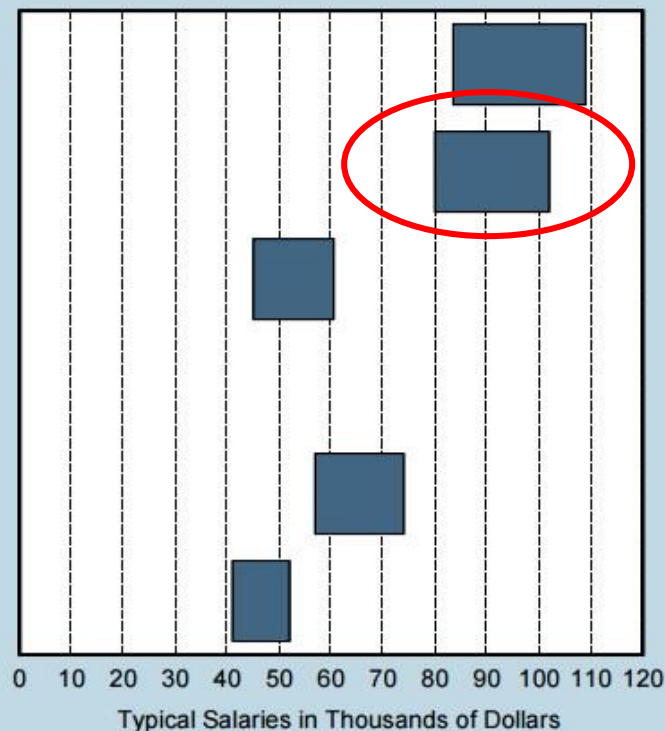
Private Sector  
(N=127)

University &  
4-year College  
(N=42)

### Postdocs

Government Lab  
(N=86)

University  
& UARI  
(N=386)



Data only include US-educated PhDs who remained in the US after earning their degrees. The ranges of salaries represent the middle 50% i.e. between the 25<sup>th</sup> and 75<sup>th</sup> percentiles. Government Lab includes Federally Funded Research and Development Centers, e.g. Los Alamos National Laboratory. UARI is University Affiliated Research Institute. The data for PhDs holding potentially permanent positions in academia include salaries based on the 9-10 and 11-12 month commitments. "N" represents the number of individuals who were full-time employed and provided salary data.

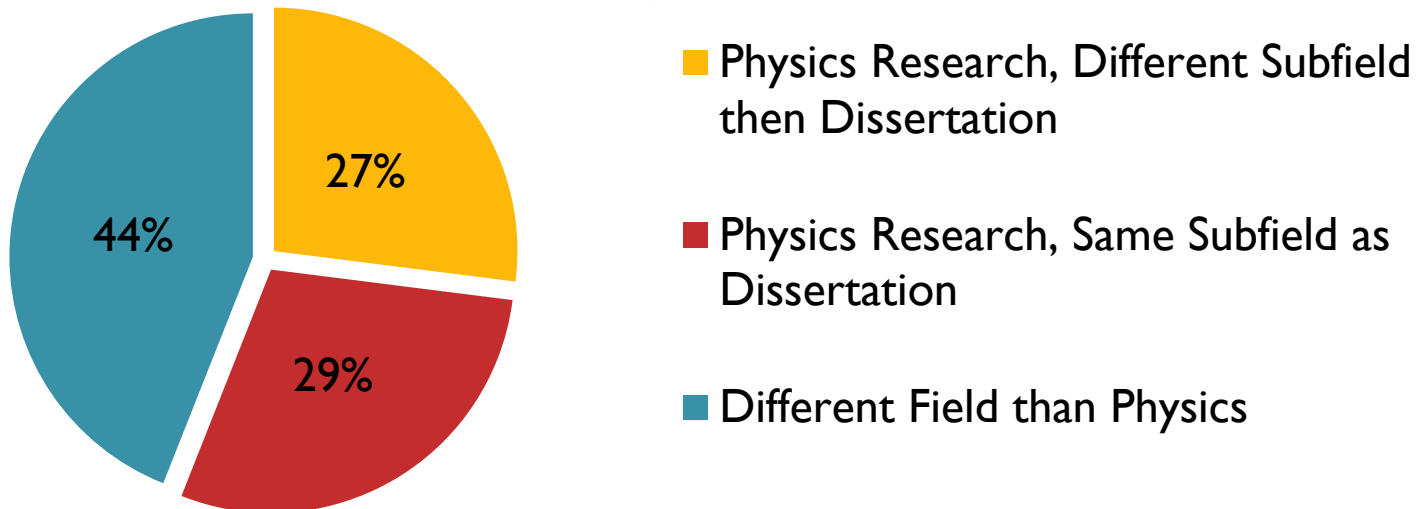
<http://www.aip.org/statistics>

[bailey@aps.org](mailto:bailey@aps.org)

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

## NO!

### Types of Positions Accepted by Private Sector Hires, 2011-2012



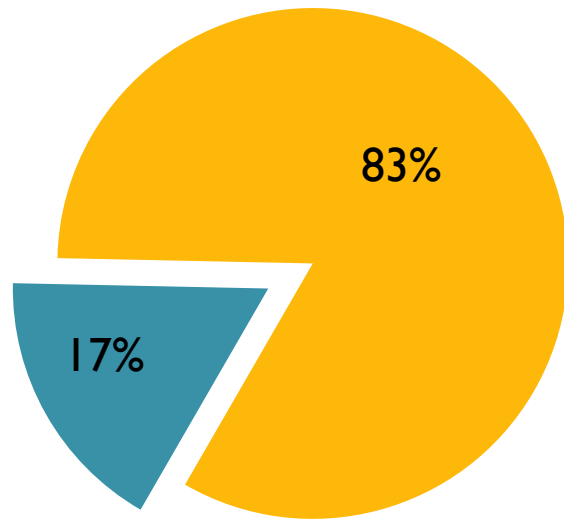
Source: AIP Statistical Research Center, *Physics Doctorates Initial Employment Report*, July 2012

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.

# What about the non-PhD physicists?

According to the AIP Statistical Research Center, 83% 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.

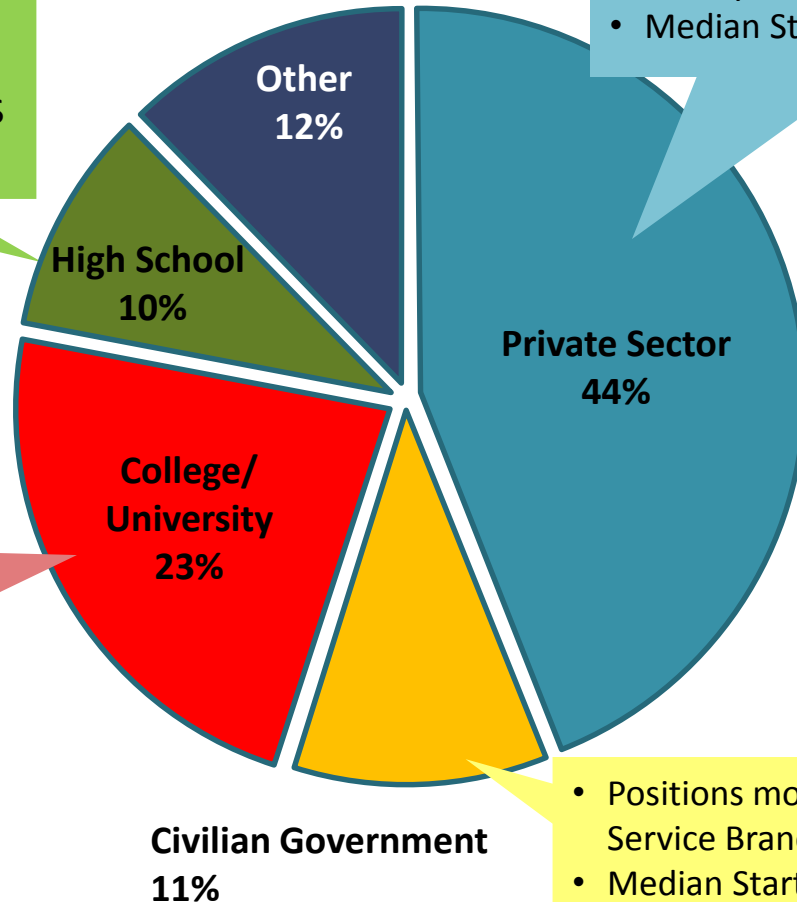
**What types of employment are possible for these degree paths?**

# Master's Degrees

Between 2009-2011, about 50% 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: \$60,000



- Typical titles include adjunct faculty (2 yr. colleges), lab manager, and research assoc.
- Median Starting Salary: \$38,500

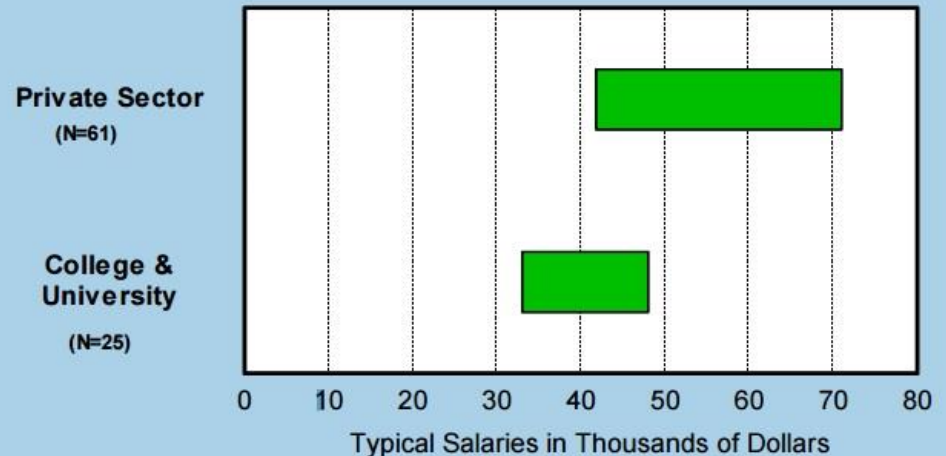
- Positions mostly at National Labs, Armed Service Branches, or Trademark Office
- Median Starting Salary: \$57,000

Not surprisingly, physics master's degree holders working in the private sector earned considerable more than their colleagues at colleges and universities.

MS grads who earned their degree while working in the private sector earned considerably more (~\$83K).

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

**Typical Starting Salaries of Exiting Physics Master's One Year After Degree, Classes 2009, 2010, & 2011 Combined.**



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

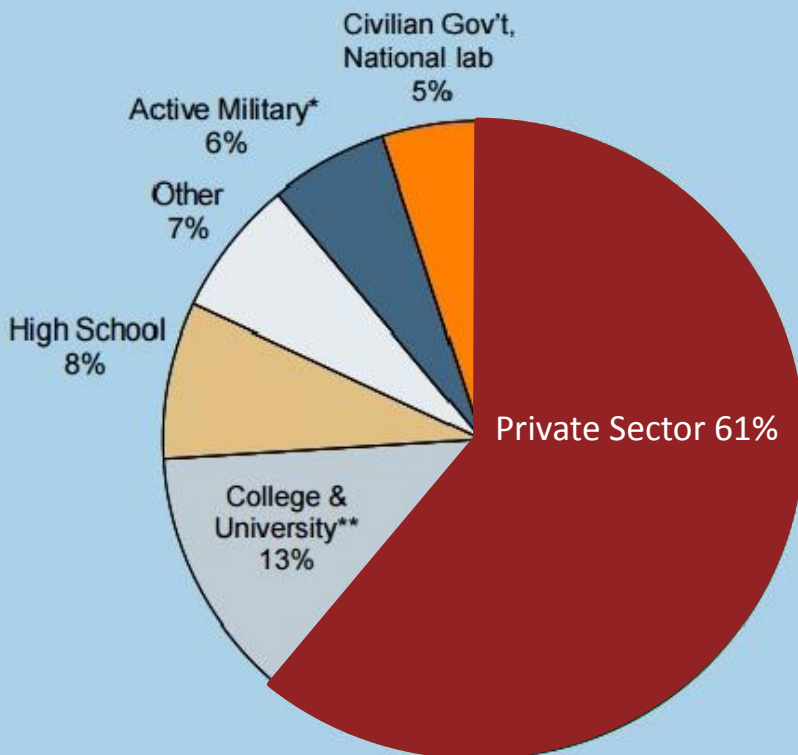
The graphic represents the middle 50% of reported salaries, i.e., between the 25th and 75th percentiles. Figure does not include salaries for master's holding part-time positions or salaries for respondents who reported starting their employment more than a year prior to earning their master's degree. The College & University category includes two-year colleges, four-year colleges, universities, and university affiliated research institutes.

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



# Initial Employment of Physics Bachelors

## Initial Employment Sectors of Physics Bachelor's, Classes of 2011 & 2012 Combined.



\*Data does not include degree recipients from the three military academies (US Naval Academy, US Military Academy, US Air Force Academy).

\*\* Data include two- and four-year colleges, universities, and university affiliated research institutes.

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.

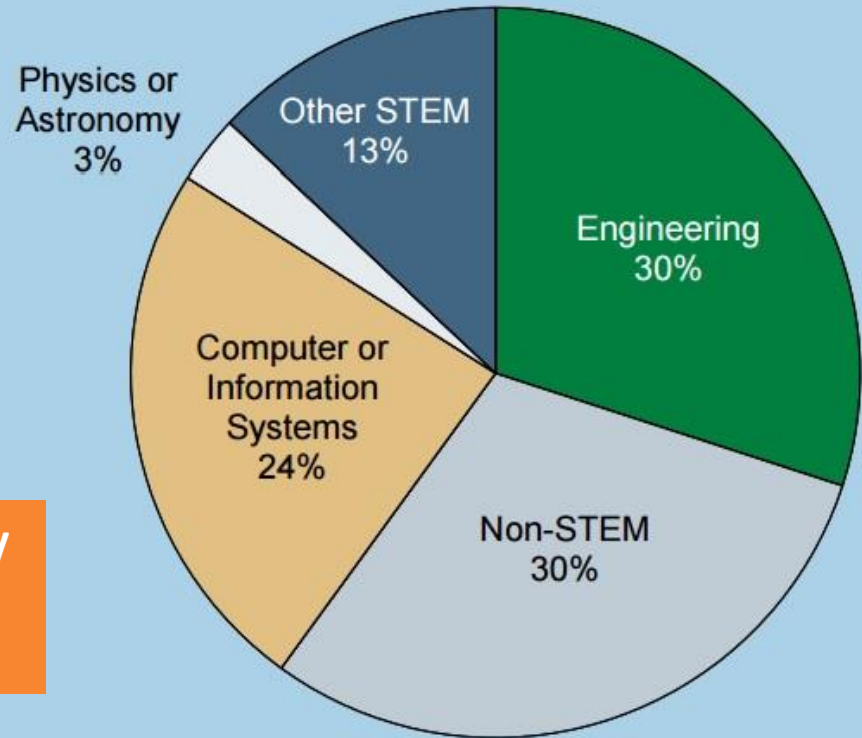
# Physics Bachelors in the Private Sector

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.

**Field of Employment for Physics Bachelor's in the Private Sector, Classes of 2011 & 2012 Combined.**



STEM refers to natural science, technology, engineering, and mathematics.

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



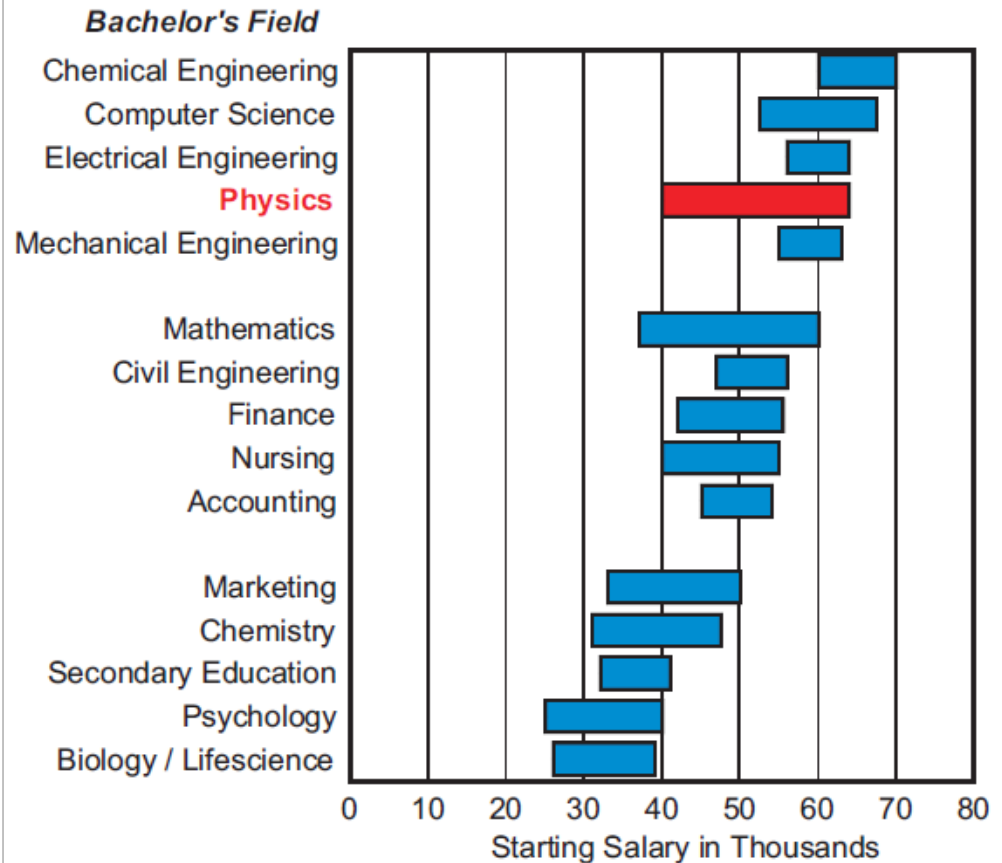
In fact...

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.

# Physics Workforce: Summary

- 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 will not be a straight line...

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

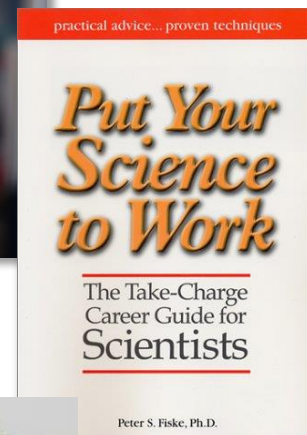
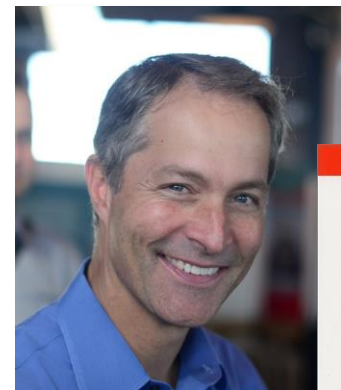
**There is a lot of great science to be done—and opportunities to be found—in a lot of places!**

# APS Can Help You Discover Your Path

## APS Online Professional Development Guide

- Features 5-minute “webinette” clips from the top APS careers webinars.
  - APS webinar “*Putting Your Science to Work*,” with Peter Fiske
  - APS webinar “*Career Self-Advocacy: How I Got A Six Figure Job in the Private Sector*,” with Meghan Anzelc
  - APS Webinar “*Networking at APS Meetings*”
- Topics include self-assessment, networking, interviewing and negotiation strategies, and more.





<http://go.aps.org/physicspdguide>



# APS Careers Website

- Library of Physicist Profiles
  - Advice from physicists representing a diversity of degree paths and careers.
- Job Prospects Pages
  - Profiles feature the most common career paths for physicists.
  - Include descriptions of day to day activities, additional skills and training needed, salary information, job outlooks, and links to other relevant resources.

**Physicist in a Government Funded Laboratory**  
Career Profile

	<b>Education</b> BS, MS, or PhD in physics or in a related field		<b>Additional Training</b> BS level - prior research PhD - prior research or postdoctoral appointment
	<b>Salary</b> BS \$35,000 - \$57,000 PhD \$70,000 - \$95,000		<b>Outlook</b> BS init. employment: 10% PhDs init. employment: 16%


**What They Do**  
National laboratories employ physicists from a variety of degree paths—BS, MS, or PhDs. Some examples of activities of physics bachelors working in national labs include:


- Serving as an interface between physicists and engineers.
- Turning prototype systems into field-deployable units.
- Testing off-the-shelf or laboratory developed equipment to determine if it meets experimental requirements.
- Evaluating engineering designs and parts.
- Performing computer simulations.

Physicists masters and PhDs working in national labs often find themselves managing resources and people, in addition to doing research. Activities of these physicists in national labs can include:

- Seeking clients and funding for research, either alone or with a team of other scientists. Clients are usually government agencies.
- Researching issues of interest to clients. Research may be performed experimentally in a laboratory or through computer modeling and simulation. Research areas may be classified or sensitive.
- Traveling to field sites to test equipment developed in a laboratory in an actual working environment.
- Interfacing with clients, laboratory staff, and management to report research progress and challenges.
- Developing financial plans to stay within program cost and

**Physicist Profiles**

  
**Claudia Alexander**  
Claudia lives to write science fiction and ride horses when she's not studying comets and moons.

  
**Dr. Siva Sivanathan**  
Regents' Prof. of Physics Georgia State Univ.

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- Career Resources

Statistical Data

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Pages For: Physicists/Scientists Go

**The Road from Research to Commercialization**  
**Free to the Public**

Tuesday, December 3, 2013  
4:30 - 5:30 pm IST (India/Sri Lanka)  
6:00 - 7:00 am EST (Eastern US)

**About the Webinar**

In this webinar, distinguished professor and CEO Siva Sivanathan discusses the many pitfalls, challenges, and accomplishments he experienced while becoming a world-renowned physicist and entrepreneur. He also shares advice for scientists who are looking to commercialize their work.

Unil Perera, Regents' Professor of Physics at Georgia State University, moderates the discussion

**Webinar Slides**

► Slides of Presentation

**Webinar Video**

► The Road from Research to Commercialization  
Users who have not yet registered for the webinar will be asked to register to access the video.

  
Dr. Siva Sivanathan  
Dist. Professor, USC  
CEO and Founder,  
EPIR Tech. Inc.

  
Dr. Unil Perera  
Regents' Prof. of Physics  
Georgia State Univ.

- Physics Employment and Salary Information
  - Clearing house for most recent physics employment data from AIP SRC
  - Thumbnails and links to full reports for more information
- APS Webinars Archive
  - On-demand viewing for all webinar presentations

# APS Local Links

- Locally based, grassroots gatherings of students and physicists.
- Focus on students and physicists working in academia, industry, and national labs.
- Groups meet about every 6-8 weeks, usually in a pub or restaurant (“neutral ground”).
- Goal is to build mutually beneficial relationships, raise awareness of non-academic careers, and promote recruitment of student and postdocs into industries.
- Current sites include:
  - Austin
  - Boston
  - DC - Baltimore
  - Denver - Boulder
  - Silicon Valley
  - St. Louis
  - Tampa Bay - Orlando



[http://go.aps.org/local\\_links](http://go.aps.org/local_links)



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 2015 Meeting
- Graduate Student “Lunch with the Experts”
- Career Panel and Networking Reception





## Remember:

- Academic Physics is not the most common path!
  - *Most* physics grads at all degree levels go into the private sector.
  - Many of those who do (especially at the PhD level) will do scientific research.
- Plan Effectively by Broadening Your Focus
  - Use your resources to learn about career paths outside of academic physics.

Visit the APS Online Professional Development Guide  
and the Careers Website

Questions? Comments?  
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