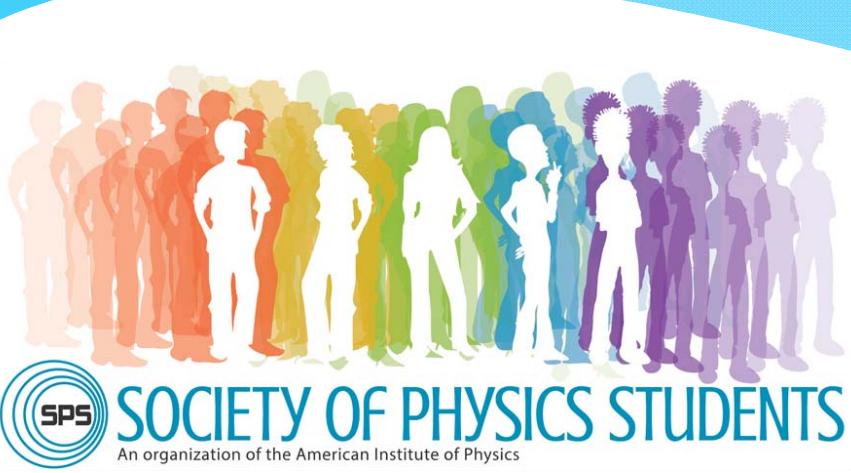


June 24, 2015

Putting Students to Work

The AIP Career Pathways Project

Kendra Redmond, SPS Programs Manager
American Institute of Physics



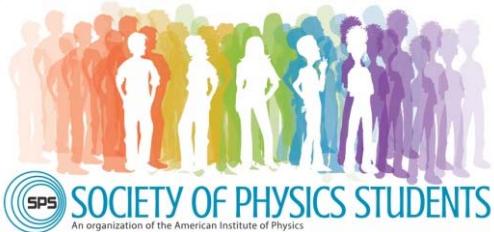
Project Investigators

Toni Sauncy, former director – SPS
Thomas Olsen, former assistant director – SPS
Roman Czujko, director – AIP Statistical Research Center
Kendra Redmond, programs manager – SPS

Student Contributors

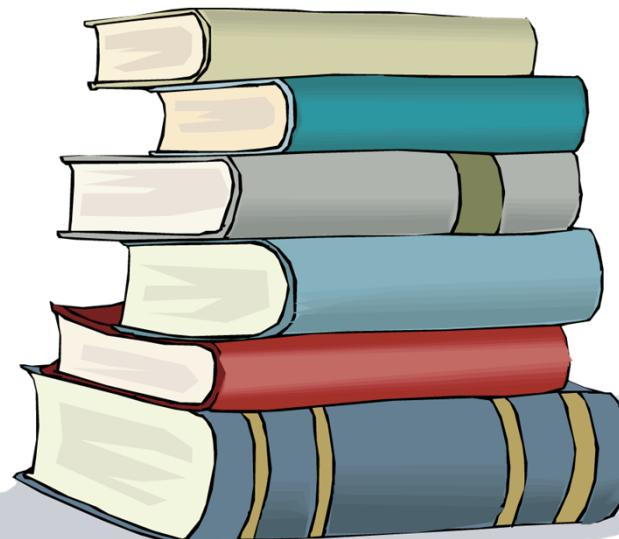
Amanda Palchak
Shouvik Bhattacharya
Jose "Ro" Avila





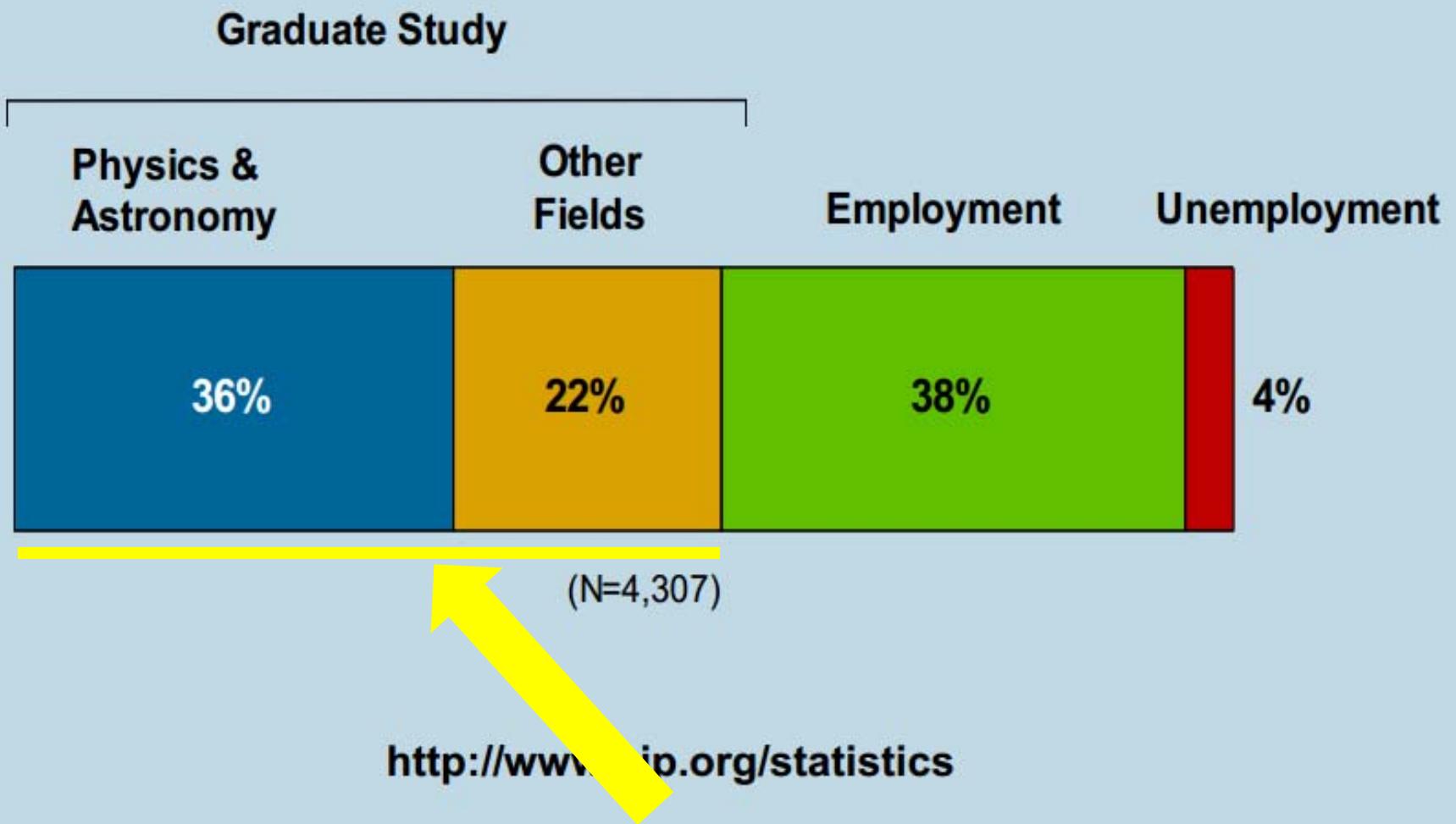
A QUESTION...

Where do physics students go after earning a bachelor's degree?

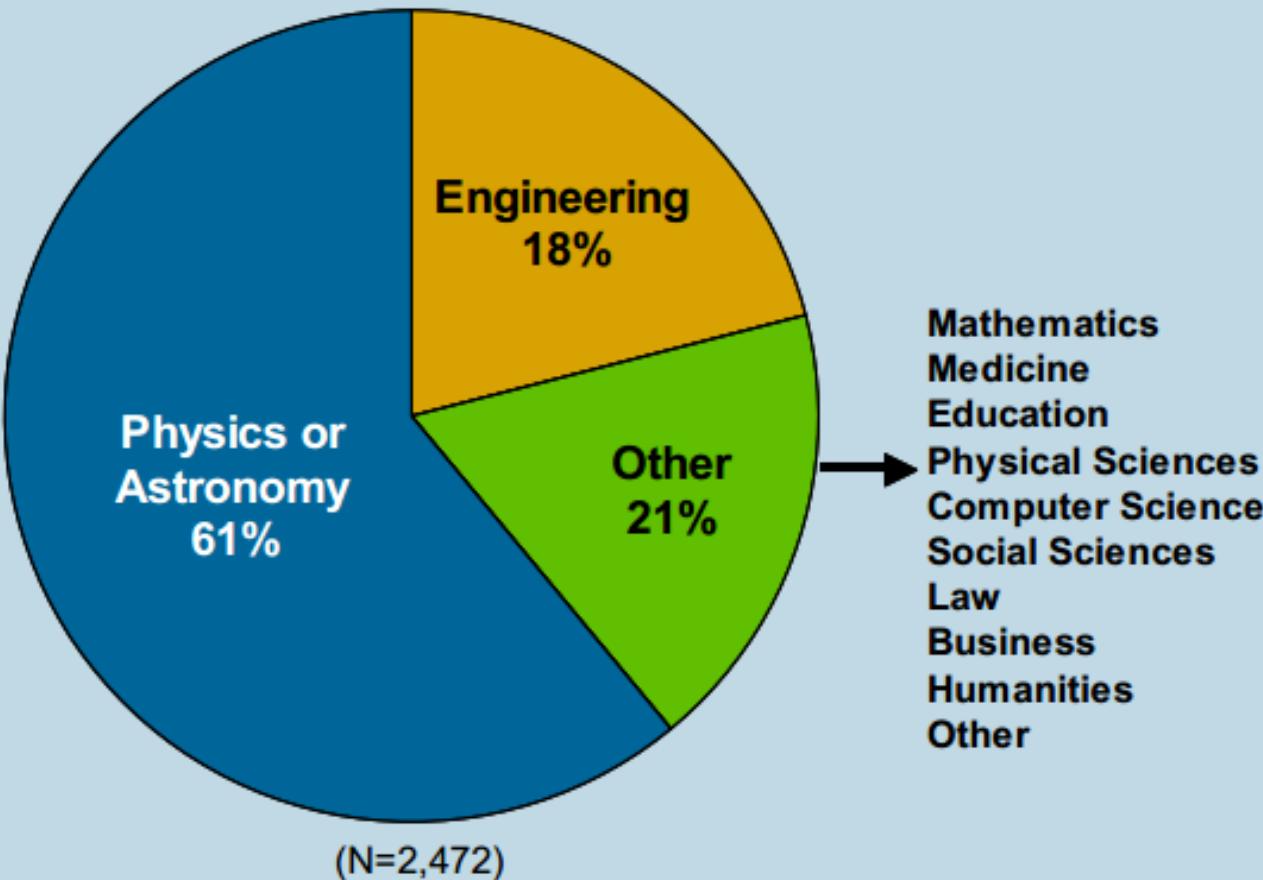


Hard Working Physics Student

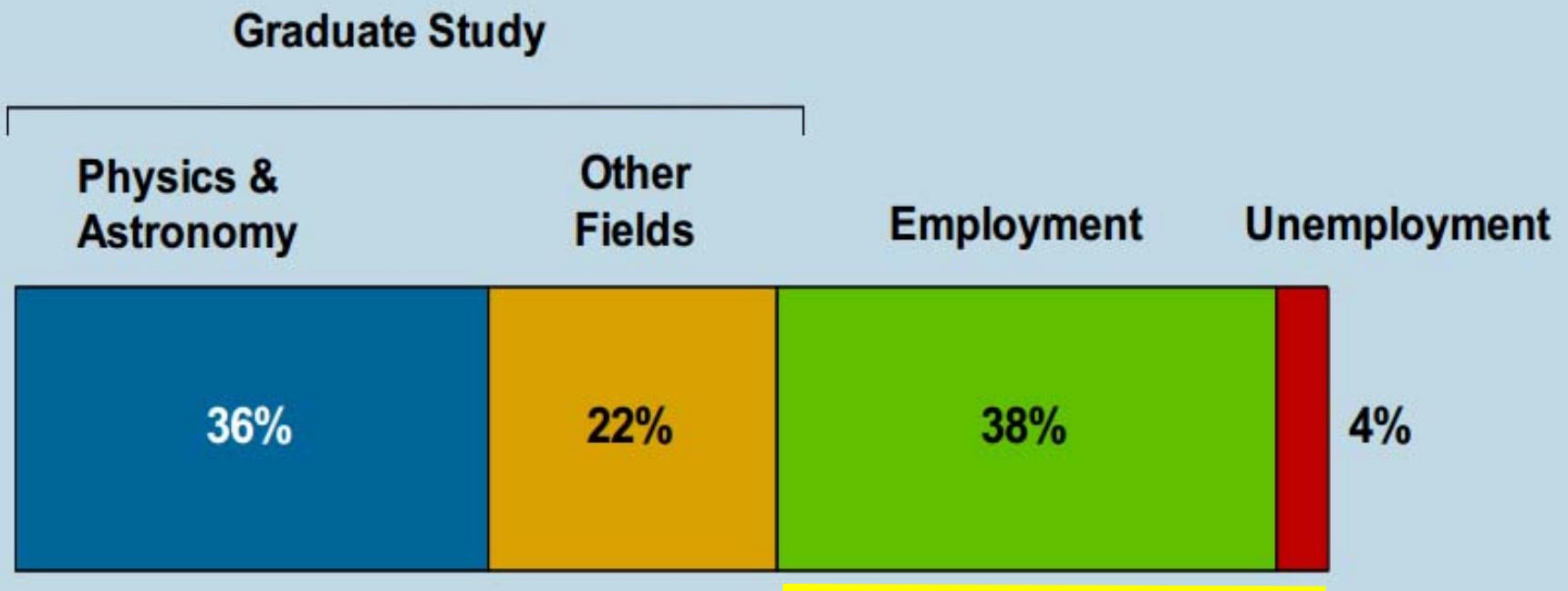
Status of Physics Bachelor's One Year After Degree, Classes of 2011 & 2012 Combined



Field of Graduate Study for Physics Bachelor's One Year After Degree, Classes of 2011 & 2012 Combined

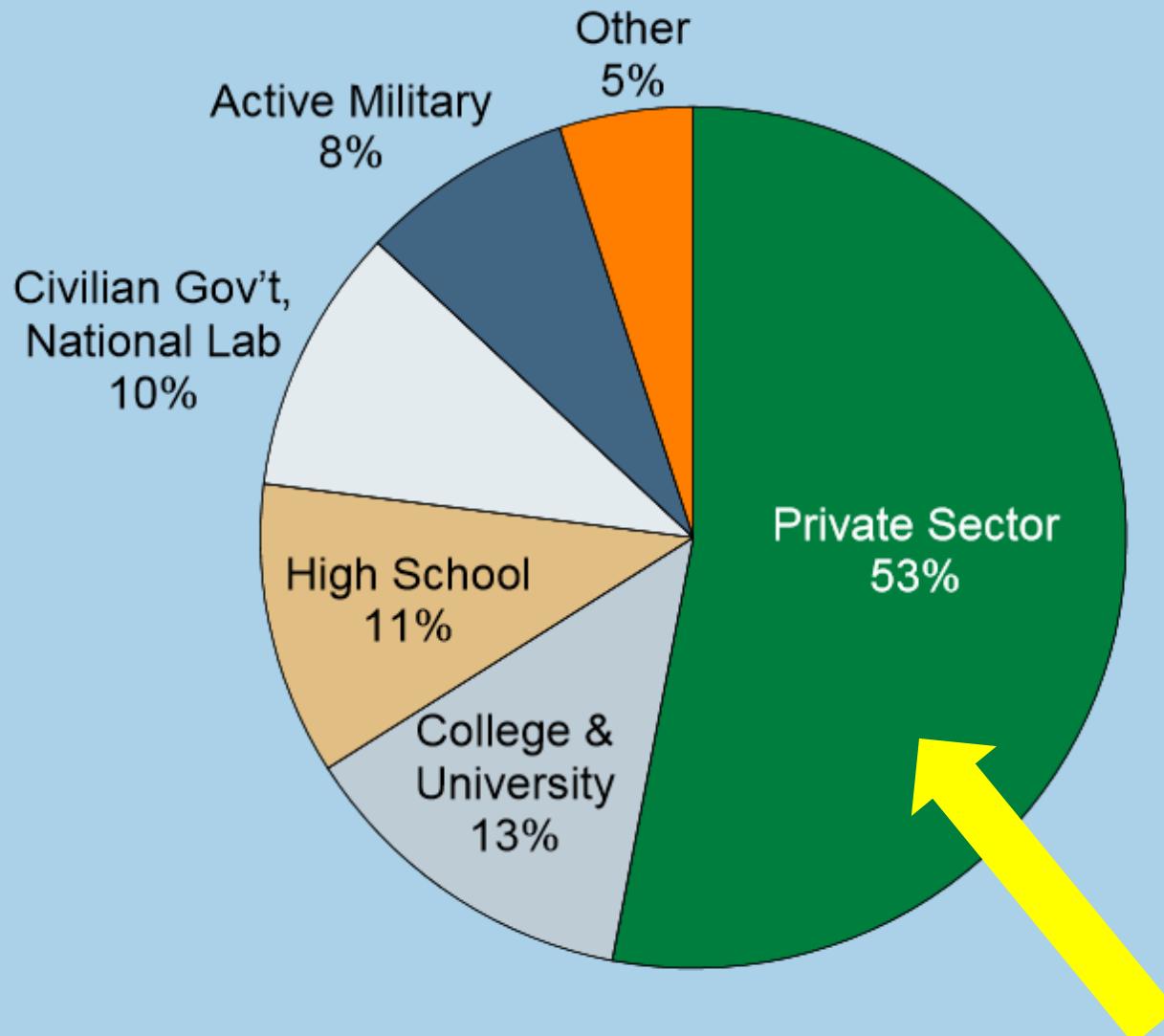


Status of Physics Bachelor's One Year After Degree, Classes of 2011 & 2012 Combined

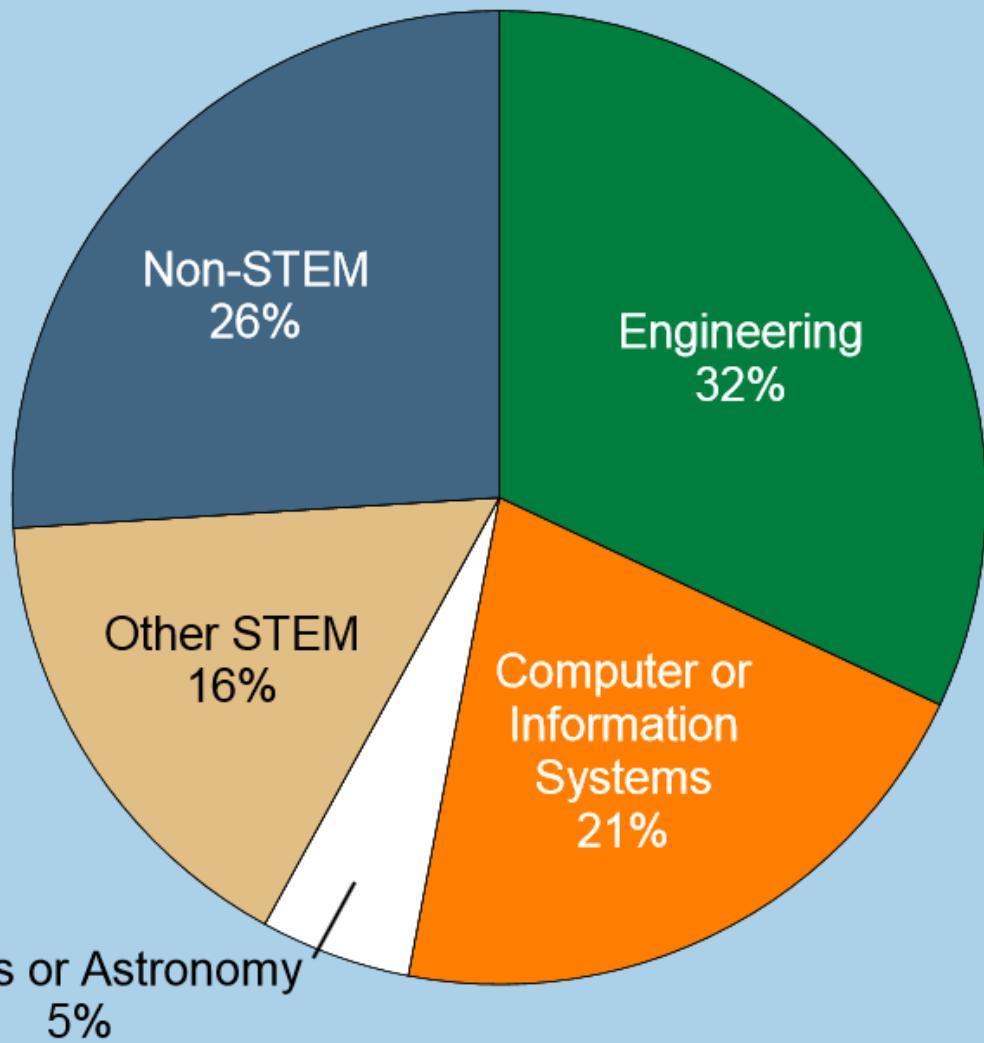


<http://www.aip.org/statistics>

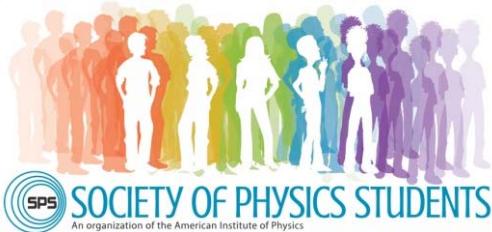
Initial Employment Sectors of Physics Bachelor's, Classes of 2009 & 2010 Combined



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



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



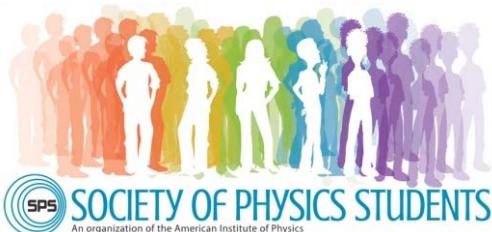
TWO MORE QUESTIONS...

Where will **your** students go after earning a bachelor's degree?

What is your role in preparing students for careers?



Hard Working Physics Student



About the Project

WHY PAY ATTENTION TO CAREER PREPARATION?

- **Recruitment**

Students choose (or don't choose) particular majors for a variety of reasons.

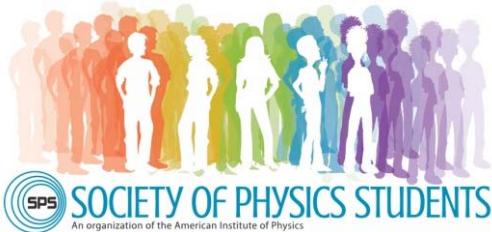
- **Retention**

Physics is good preparation for a variety of career paths.

- **Relevance**

Students should be (and want to be) equipped for the path they choose.





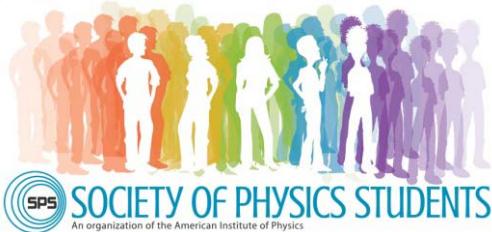
About the Project

GOAL

Increase the **number** and **diversity** of physics graduates joining the STEM workforce after the bachelor's degree by

- Equipping physics departments with tools for better preparing physics undergraduates for the STEM workforce
- Equipping students with tools to better prepare themselves to enter the STEM workforce





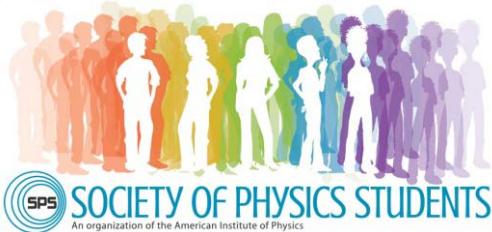
About the Project

APPROACH (Inspired by SPIN-UP)

- Identify diverse physics departments graduating students that enter the STEM workforce and are intentional about career preparation
- Discern effective practices for career preparation through site visits of the departments
- Compile and synthesize data to determine trends and common practices
- Disseminate findings through national meetings, regional workshops, online resources

SITE VISITS

- ◆ Carthage College
- ◆ College of Charleston
- ◆ Gettysburg College
- ◆ Miami Univ. (Ohio)
- ◆ Univ. of California at Davis
- ◆ Univ. of Washington
- ◆ Univ. of Wisconsin Eau Claire
- ◆ Univ. of Wisconsin La Crosse

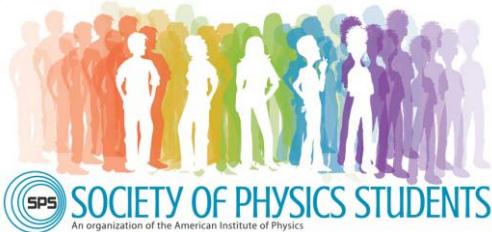


Findings

COMMON FEATURES: CURRICULAR

Note: Common features can look very different in different departments.

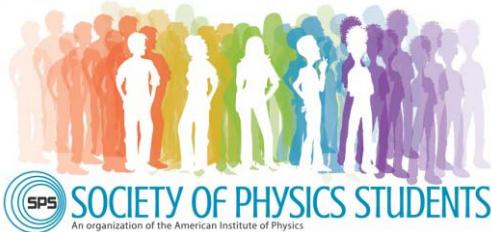
- Varied and high-quality lab courses
 - Varied in terms of topic, structure, equipment, interfaces
- Research opportunities readily available
 - May be on or off campus, required or not required
- Curricular flexibility
 - Options include multiple degree offerings, majors, minors, concentrations
- Building communication skills incorporated in undergraduate physics experience
 - Includes verbal and written exercises for different



Findings

COMMON FEATURES: EXTRACURRICULAR

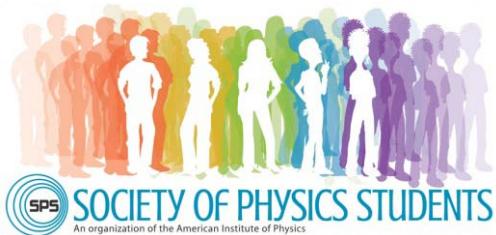
- Faculty and staff commitment to the success of **all students**
 - Regardless of career ambition or level of academic achievement
- Strong community of students
 - Where information is passed down and students feel valued
- Opportunities for physics majors to be involved in outreach activities
 - Strengthens connections, communication skills, leadership, team work, 21st century skills
- Connections with alumni
 - Who become a source of information and feedback for faculty members and students
- Relationship with career services professionals
 - Who become a source of information and expertise for faculty members and students
- Mentoring and advising of physics majors in accordance with their interests and goals
 - Addresses retention and recruitment and increases self knowledge of skills and opportunities



Findings

SOME OBSERVATIONS

- Physics students have a particularly difficult time assessing their employable skills and need to learn how to identify and articulate them.
- Students encounter obstacles when searching for jobs, but these can be directly addressed and overcome.
- Optimal progress in career preparation efforts involves faculty and staff members, administrators, students, and career services personnel, but positive results can be obtained with just a few champions.



Resources

AIP CAREER PATHWAYS PROJECT RESOURCES

Faculty and Administrators

CAREER PATHWAYS
UNDERGRADUATE PHYSICS PROGRAMS

Equipping Physics Majors for the STEM Workforce

Roman Czujko, Kendra Redmond, Toni Sauney, and Thomas Olsen
December 2014

American Institute of Physics Career Pathways Project
AIP Statistical Research Center
Society of Physics Students

AIP SPS NIST

Students

Careers Toolbox
for Undergraduate Physics Students & their Mentors

American Institute of Physics Career Pathways Project
AIP Statistical Research Center
Society of Physics Students
www.spsnational.org/careerpathways/
NSF Award Number 1011829

AIP SPS NIST

Career Professionals

FACT SHEET
Connecting Physics Students To Career Opportunities

TIPS FOR HELPING PHYSICS STUDENTS FIND MEANINGFUL EMPLOYMENT

overview & purpose
As the number of students receiving physics bachelor's degrees continues to rise, university career services staff are increasingly asked to help physics majors find meaningful employment opportunities. This fact sheet provides guidance for the baccalaureate level. Students completing the bachelor's degree in physics are uniquely prepared for a wide range of employment opportunities.

As a fundamental science, physics prepares graduates with a wide variety of skills and knowledge. The career options for these students are broad but are not widely known, even by the students themselves. This fact sheet has been created to serve as a quick reference for career services practitioners working with physics departments and undergraduate students.

what happens after the physics bachelor's degree?

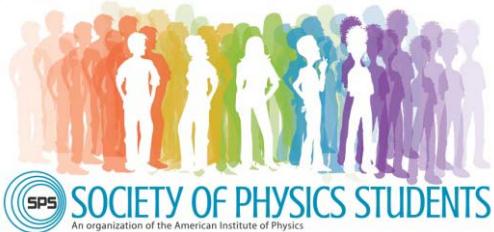
About 40% of graduates go directly into the workforce. Of those, more than half go into the private sector and nearly three-quarters work in fields related to physics or engineering. For more information on job titles, see the AIP 2010 *Physics, Science, Technology, Engineering, and Mathematics*. [bulletin](http://www.aip.org/bulletin).

Trends in Status One Year After Earning a Physics Bachelor's Degree 1995-2010

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

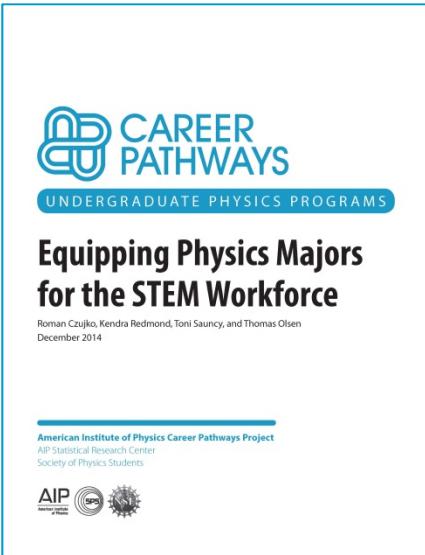
Field of Employment for Physics Bachelor's in the Private Sector

Sector	Percentage
Manufacturing	35%
Professional Services	25%
Education	15%
Healthcare	10%
Government	5%
Other Fields	10%



Resources

FACULTY REPORT

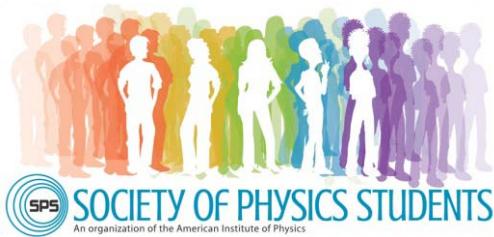


Speaks to...

- The spectrum of activities included in each common feature
- Why those activities may affect success in preparing students for the STEM workforce
- Specific activities that faculty members may want to consider initiating or expanding

Opportunities for faculty

- Use findings as a foundation for recruiting, retention, and mentoring
- Provide ideas for departmental initiatives



Resources

STUDENT TOOLBOX

Careers Toolbox
for Undergraduate Physics Students & their Mentors

Welcome Explore Data Explore Options The Missing Link Get to Work Resources

American Institute of Physics Career Pathways Project
AIP Statistical Center
Society of Physics Students
www.aip.org/careerpathways/
NSF Award Number: 1311829

Solving difficult theoretical constructs, mastering hands-on experimental techniques, managing data acquisition and analysis, and developing skills in error analysis, technical writing, and presentation are just some of the skills physics students learn during their education. These skills and abilities make physics students excellent candidates for a wide variety of jobs. If you are considering entering the workforce after earning a bachelors degree in physics, the Careers Toolbox can help you discover your options and prepare for success.

Careers Toolbox
for Undergraduate Physics Students*

*Note: This Careers Toolbox is for undergraduate physics students entering the workforce after graduation. For even students who choose to go to graduate school will eventually be looking for a job! Many of these tools can be applied to finding internships, research positions, or even entrance into graduate programs.

Speaks to...

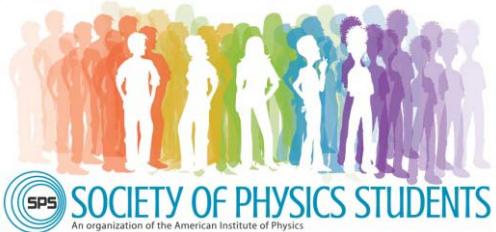
- Exploring Options, Finding Opportunities
 - Common Job Titles • Informational Interviews
- The Missing Link
 - Knowing and Articulating Your Skills
- Getting to Work
 - Effective Job Searching • The Resume • Writing an Effective Cover Letter • Acing the Interview

How it is being used...

- SPS-led workshops
- Physics departments seminars

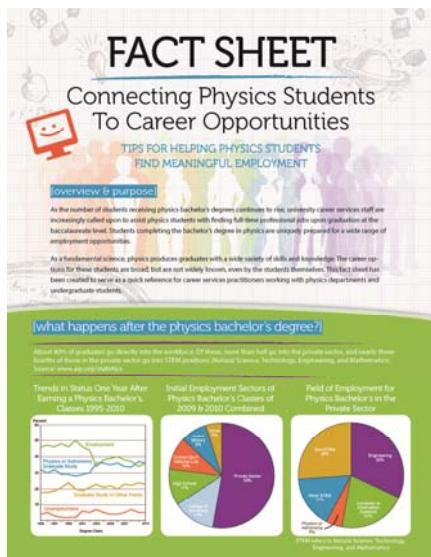
Opportunities for faculty

- Source of curricular material for seminar classes
- Source of activities for SPS chapters / departments
- Reference for students seeking help and advice



Resources

CAREER SERVICES FACT SHEET



Speaks to...

- What happens after the physics degree
- What physics graduates are qualified to do
- Challenges faced in the job search
- Tips for overcoming these challenges

How it is being used...

- Reference material for career offices, advisors, students, parents

Opportunities for faculty

- Reason to meet career services staff
- Reference to provide parents and students

Career Options for Physicists

ATTENTION PHYSICS STUDENTS:

You Have Options



Q: What can you do with a physics degree?

A: Get a PhD and become a physics professor OR ...

What comes after the "or" is not widely known in many physics departments, even though data show that only about a third of physics bachelor's degree recipients enroll in a physics or astronomy graduate program within one year of graduating. People with undergraduate degrees in physics pursue a variety of fascinating, fulfilling, and well-paying careers. This is evidenced by decades of data collected by the Statistics Research Center at the American Institute of Physics. Illustrated below are the common paths of physics bachelor's recipients based on the most recent data. Unless otherwise indicated, all data are for graduates of US physics programs who remain in the United States.



Over 7,300 physics bachelor's degrees were awarded in the class of 2012–13.

A record high! Typically...

- Three-fourths of those who earn physics bachelor's degrees have **research experience**.¹
- One-third graduate with a **double major**, many in math.²
- One-tenth start at **two-year colleges**.

Within one year of earning a physics bachelor's degree...



~22% enroll in professional degree programs or attend graduate school NOT in physics or astronomy.³

- About half enter an **engineering** program; the rest enter programs in math, medicine, education, or another field.⁴
- As a group, physics majors score among the highest of all majors on medical school and law school admission tests (the **MCAT** and **LSAT**).⁵
- Students in professional degree programs are more likely to be **self-funded** than students in research-based graduate programs, who usually have teaching assistantships, research assistantships, or fellowships.⁶

~36% attend graduate school in physics or astronomy.⁵

- About 80% enroll in a **PhD program**; the remainder choose a master's degree program.⁷
- Most are **fully supported** by teaching assistantships, research assistantships, or fellowships.

Of those who start graduate school in physics or astronomy...

~42% enter the workforce.⁸

Common employment sectors include:

Private sector⁹

- Typically, **half** of those who enter the workforce take jobs in the private sector.
- Of those that enter the private sector, the majority hold science, technology, engineering, and math (STEM) positions.
- Those in private-sector STEM positions are well compensated, with a median starting salary of about \$50K.

Colleges or universities?

- More than half of the students in these positions initially work at the same institution they graduated from. Many work in research or IT.
- **Civilian government?**

- The civilian government sector includes national labs. The vast majority of these positions are in STEM fields, many related to defense or energy.
- **Active military?**

- Physics bachelor's work across all branches of the armed forces. Many work in aviation or nuclear power.
- **High school teaching?**

The Statistical Research Center does not formally follow the career paths of these individuals, but we hear that they go on to successful careers in engineering, management, education, law, medicine, business, and a variety of other areas.



Add to the mix:

Foreign citizens coming to the United States for a graduate degree, students who earned bachelor's degrees in another field but want a graduate degree in physics, and students who earned a physics bachelor's degree in previous academic years.

~1 out of 6 US physics bachelor's receive a physics or astronomy PhD.¹⁰

- A doctorate in physics takes an average of 6–7 years.¹¹
- Most PhD students are **fully supported** by teaching or research assistantships or fellowships.

Within one year of earning a physics PhD...



~1 out of 12 US physics bachelor's receive an exiting physics or astronomy master's degree.¹²

Exiting master's degree recipients are individuals who leave their current department upon receiving a master's degree. Many other students earn an en route master's degree, continuing on to a physics PhD in the same department.

- About two-thirds of those who earn exiting master's degrees do so with a **specific research focus**.
- A master's degree in physics usually takes about **two years**.

For US citizens, within one year of earning an exiting master's degree...



~2/3 enter the workforce.⁹

- About half work in the **private sector**, overwhelmingly in STEM fields.
- The largest portion of exiting master's working in the private sector are employed in the field of **engineering**.
- Other common employment sectors for exiting master's include **colleges and universities**, **high schools**, **civilian government**, and the **military**.



~1/3 continue with graduate studies.⁹

- Some transfer to other institutions to earn a **physics PhD**.
- Many others transfer to programs in **related fields** such as medical physics, atmospheric science, and materials science.



~2/3 accept a temporary position
(e.g. a postdoc), primarily at a university or with the government.¹¹



~1/3 accept a potentially permanent position.¹¹



The approximate breakdown by employment sector for all employed physics PhDs
(not just new ones), is given below:¹³

- 45–49% Private sector
- 29–33% Academe
- 14–17% Government
- 5–7% Other

References and Notes

The following reports were published by the Statistical Research Center of the American Institute of Physics and are available online at www.aip.org/statistics.

1. Starr Nicholson and Patrick J. Mulvey, *Roster of Physics Departments with Enrollment and Degree Data*, 2013, August 2014.

2. AIP Statistical Research Center, *AIP Physics Trends: Research Experiences of Physics Undergraduates*, Fall 2009.

3. AIP Statistical Research Center, *AIP Physics Trends: Physics Students Have Broad Interests*, Spring 2011.

4. Susan White and Raymond Chu, *Physics Enrollments in Two-Year Colleges*, April 2013.

5. Casey Lange Tesfaye and Patrick Mulvey, *Physics Bachelor's One Year After Degree*, September 2014.

6. Casey Lange Tesfaye and Patrick Mulvey, *MCAT LSAT and Physics Bachelor's December 2013*.

7. Casey Lange Tesfaye and Patrick Mulvey, *Physics Bachelor's Initial Employment*, September 2012.

8. Patrick J. Mulvey and Starr Nicholson, *Trends in Exiting Physics Master's*, March 2014.

9. Patrick Mulvey and Brandon Shindel, *Physics & Astronomy Master's Initial Employment*, April 2011.

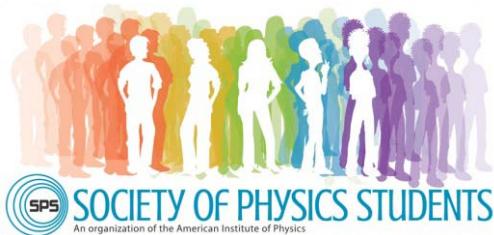
10. Patrick J. Mulvey and Starr Nicholson, *Trends in Physics PhDs*, February 2014.

11. Garrett Anderson and Patrick Mulvey, *Physics Doctorates Initial Employment*, July 2012.

12. Estimate provided by the AIP Statistical Research Center Summer 2014.

Learn more at the Careers Toolbox website:
www.spsnational.org/careerstoolbox





Charge

Put these on your shelf...

Faculty and Administrators

CAREER PATHWAYS
UNDERGRADUATE PHYSICS PROGRAMS

Equipping Physics Majors for the STEM Workforce

Roman Czujko, Kendra Redmond, Toni Sauney, and Thomas Olsen
December 2014

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Students

Careers Toolbox
for Undergraduate Physics Students & their Mentors

American Institute of Physics Career Pathways Project
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www.spsnational.org/careerpathways/
NSF Award Number: 1011829

AIP

Career Professionals

FACT SHEET
Connecting Physics Students To Career Opportunities

TIPS FOR HELPING PHYSICS STUDENTS FIND MEANINGFUL EMPLOYMENT

Overview & purpose:
As the number of students receiving physics bachelor's degrees continues to rise, university career services staff are increasingly called upon to assist physics students with finding full-time professional jobs upon graduation at the baccalaureate level. After completing the bachelor's degree in physics are students prepared for a wide range of employment opportunities?

As a fundamental science, physics produce graduates with a wide variety of skills and knowledge. The career options for these students are broad, but are not widely known, even by the students themselves. This fact sheet has been created to serve as a quick reference for career services practitioners working with physics departments and undergraduate students.

(what happens after the physics bachelor's degree?)

About 40% of physics go directly into the workforce. Of those, more than half go into the private sector, and nearly three-fourths of those in the private sector go into STEM professions: Physical Sciences, Technology, Engineering, and Mathematics in combined fields.

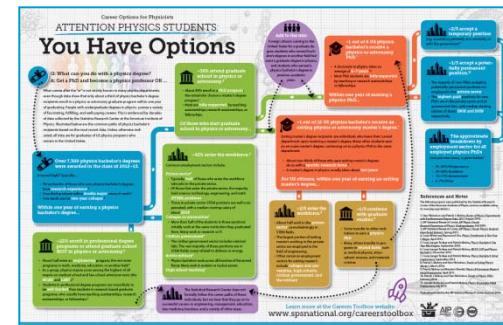
Trends in Status One Year After Earning a Bachelor's Degree 1995-2010
Earnings in All Fields
Physics in All Fields
Physics in Other Fields

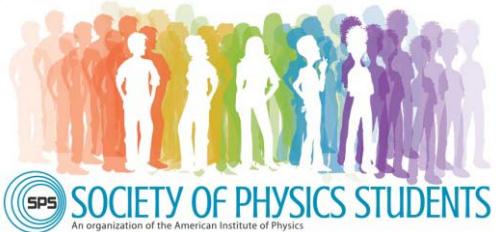
Initial Employment Sectors of Physics Bachelor's Classes of 2009 & 2010 Combined

Field of Employment for Physics Bachelor's in the Private Sector

Field	Percentage
Healthcare	35%
Engineering	25%
Information Technology	15%
Finance	10%
Other	10%

Put and this on your wall...





Charge

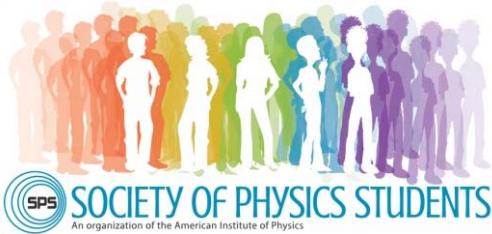
And remember...

Look at the data. More than half of your students will not go on to graduate school in physics or astronomy.

Don't discount the value of a student who comes in and wants to do something else. Physics-trained students contribute in really valuable ways to the wider community.

We have resources for you!

www.spsnational.org/cup/careerpathways/



AIP Career Pathways Project



www.spsnational.org/cup/careerpathways/

Supported by the National Science Foundation under Project No. 1011829, *Expanding the STEM Workforce by Equipping Physics Bachelors Degree Recipients and their Departments to Address the Full Range of Career Options*.