Putting students to work:

Physics-based career opportunities education resources

The Careers Toolbox for Undergraduate Physics Students

The Career Pathways Project
American Institute of Physics
Education Division
The Career Pathways Project

The Project
Motivation
Research
Results

Overview of the Tools
How to set your own path

The Workshop
Getting started on the path
Project Investigators
Thomas Olsen, former Assistant Director – Society of Physics Students
Kendra Redmond, Programs Manager – Society of Physics Students
Roman Czujko, Director – AIP Statistical Research Center
Toni Sauncy, Director – Society of Physics Students and Sigma Pi Sigma

Student Contributors
Amanda Palchak, University of Southern Mississippi, SPS Summer Intern 2011
Shouvik Bhattacharya, Minnesota State University, SPS Summer Intern 2012
Jose “Ro” Avila, King College, SPS Summer Intern 2013

Work is 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*
The Project
Motivation
Research
Results
Intro to the Tools
How to set your own path
The Workshop
Getting started on the path
Sound research begins with a question.

Where do physics students go after graduation?
Research says…Group Activity

The Project
Motivation

Hard Working
Physics Student
The point of this exercise?

The Project
Motivation

Students need to know that they have OPTIONS.

Earning a degree in physics can lead to a wide range of career paths.
Physics BS/BA: One year later

The Project Research

The best advice for students about career options is based on statistical research.

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

http://www.aip.org/statistics
Employment options.

The Project Research

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

- Private Sector: 53%
- College & University: 13%
- High School: 11%
- Civilian Gov’t, National Lab: 10%
- Active Military: 8%
- Other: 5%

http://www.aip.org/statistics
Private Sector Details

The Project Research

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

- Engineering 32%
- Non-STEM 26%
- Computer or Information Systems 21%
- Other STEM 8%
- Other Natural Sciences 8%
- Physics or Astronomy 5%

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

http://www.aip.org/statistics
FACT: At graduation, physics bachelors students have OPTIONS.
FACT: Many physics students don't know this.
FACT: Many physics faculty members don't know this.
FACT: Many career services personnel don't know this.
FACT: You now know this.

FACT: Even though you now know that you have OPTIONS, you may not know how to effectively take advantage of them, for reasons cited above.
Goals of the work

1. Equip departments with the tools they need to better prepare students to enter the workforce.

2. Equip students with the tools they need to better prepare themselves throughout their undergraduate education.
Goals of the work

1. Equip departments with the tools they need to better prepare YOU to enter the workforce.

2. Equip students with the tools YOU need to better prepare yourselves.
Process / Methods

Identify characteristics of departments successfully graduating students that enter the STEM workforce within one year of earning a bachelor’s degree and are intentional about preparing students for careers.
Identified Common Features

The Project Results

Curricular

- Varied and high quality lab courses
- Research opportunities for undergraduates
- Curricular flexibility
- Communication skills as part of the physics curriculum

Extra-curricular

- Faculty and staff commitment to student success
- Strong community of students
- Connections with alumni
- Relationship with the Career Services Office
- Mentoring/advising in accordance with interests and goals

How’s your department doing?
The Career Pathways Project

The Project
Motivation
Research
Results

Intro to the Tools
How to set your own path

The Workshop
Getting started on the path
JOBS.

What kind of jobs do physics bachelor’s degree holders... hold?
List of Common Job Titles

**Engineering**
- Systems Engineer
- Electrical Engineer
- Design Engineer
- Mechanical Engineer
- Project Engineer
- Optical Engineer
- Manufacturing Engineer
- Manufacturing Technician
- Laser Engineer
- Associate Engineer
- Technical Services Engineer

**Application Engineer**
- Development Engineer
- Engineering Technician
- Field Engineer
- Process Engineer
- Process Technician
- Product Engineer
- Product Manager
- Research Engineer
- Test Engineer
- General Engineer

**Computer Hardware / Software**
- Software Engineer
- Programmer
- Web Developer
- IT Consultant
- Systems Analyst
- Technical Support Staff Analyst

**Education**
- High School Physics Teacher
- High School Science Teacher
- Middle School Science Teacher

**Research and Technical**
- Research Assistant
- Research Associate
- Research Technician
- Lab Technician
- Lab Assistant
- Accelerator Operator
- Physical Sciences Technician
JOBS.

How can I figure out which job might be best for me?
A new research project: what kind of job do I want?

What is an “informational interview”?
How do I do this?
Who should I contact?
What do I say?
PROFESSIONAL NETWORK.

How do I build mine?
Networking:
Not just for business majors.

Where/when/how to network
How to build your list of professional contacts
Putting together YOUR Elevator Speech
KEY TO SUCCESS.

Careful consideration of your skills.
The Missing Link

Careful assessment

Assessing and Articulating YOUR knowledge and skills

*The single most important tool*

Translation of what *you know* into language that describes desirable and marketable SKILLS
SEARCHING.

Finding your opportunity.
Effective Job Searching

Using powerful online resources
Efficient use of time to match YOUR SKILLS
with a JOB YOU WANT
THE RESUME.

Putting you on paper.
What is the goal of the resume?

How to write a resume that achieves the goal of getting an interview
What to include (and what not to include)
Customize resume to job application!
INTRODUCING YOU.

Writing a cover letter that carries impact.
The cover letter.

Putting it together
A formal introduction of yourself...on paper
Format, content, how to make sure you stand out as a candidate for the position you want and are qualified to have!
PRESENCE.
Making the most of an interview opportunity.
Interviewing with confidence.

Making the interview count!
Face-to-face or on the phone

Another opportunity to demonstrate your knowledge and skills
The Student Piece: an Interactive Workshop

The Project
Motivation
Research
Results

Intro to the Tools
How to set your own path

The Workshop
Getting started on your path

American Institute of Physics Career Pathways Project
AIP Statistical Research Center
Society of Physics Students
www.spsnational.org/cup/careerpathways/

NSF Award Number: 1011829

AIP Careers Toolbox for Undergraduate Physics Students: Introduction and Mini-workshop for Physics Department Chairs Conference June 2014
SHAPING YOUR KEY.

Knowledge and skills assessment.
Carefully examine your experiences. Identify one of the commonly used skills that appears in your experiences.

Write this skill at the top of the “Identifying My Skills” page:

- working with laboratory equipment
- conducting research
- communicating complex ideas
- proficiency with computer hardware and software
- analysis and quantitative thinking
- working with others
- problem solving
- critical thinking
BRAINSTORMING

My classes/training

My leadership experiences/
group activities/
professional associations

My job/research

My hobbies/other

experiences/internships

Consider this a giant brainstorm
of your cumulative life experience!

Put it ALL down on paper!
My classes / training
- Math double major (through advance calc)
- Intro Physics (made B’s)
- AFM, SEM training
- Labview Tutorial
- Advanced Lab – Experimental techniques/Error analysis training
- Certified Camp counselor
- CPR certified
- Machine Shop safety training
- Cryogenics handling safety training
- Advanced Physics classes (thermal, EM, Quantum, Mechanics)
- Cs & B’s

My leadership experiences / group activities / professional associations
- Learning assistant (1yr)
- Drum major – marching band (2 yrs)
- Tutor for freshman physics (2 yrs)
- SPS member-outreach presenter
- Tutor in language lab (spanish)
- Helped organize campus research symposium
- International Student Union-member

My jobs / research experiences / internships
- Worked in research lab as a sophomore (mostly data reduction)
- Part time cashier at Lowe’s
- Paid tutor at the YMCA after school program
- Workshop on gravitational wave astronomy
- Summer research assistant in professor’s lab (responsible for interfacing spectrometer)

My hobbies / others
- Accomplished knitter
- Sing in community choir
- Attended comicon
Find a skill that appears in several of your experiences.

Back to the brainstormed list of experiences.

⇒ Now, regroup.
⇒ Use your list to write down all your experiences related to the skill. Include all the experiences that contribute to the development of this skill.
⇒ Consider classes, REU or internship experiences, summer jobs, teaching or research assistant experiences, club activities, outreach experiences, related hobbies.
## Physics – Common skills

<table>
<thead>
<tr>
<th>Working with laboratory instruments</th>
<th>Computer hardware and software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducting research</td>
<td>Analysis and quantitative thinking</td>
</tr>
<tr>
<td>Communicating complex ideas</td>
<td>Working with others</td>
</tr>
<tr>
<td>Problem solving and critical thinking</td>
<td>Others??</td>
</tr>
<tr>
<td>My classes / training</td>
<td>My leadership experiences / group activities / professional associations</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Math double major</td>
<td>- Int. Student Government</td>
</tr>
<tr>
<td>Advanced calc</td>
<td>- CPR certified</td>
</tr>
<tr>
<td>W.R.O.</td>
<td>- Machine Shop safety training</td>
</tr>
<tr>
<td>Intro Physics</td>
<td>- Certified Camp counselor</td>
</tr>
<tr>
<td>Labview Tutorial</td>
<td>- Advanced Lab – Experimental techniques/Error analysis training</td>
</tr>
<tr>
<td>Advanced Lab</td>
<td>- Tutor for freshman physics (2 yrs)</td>
</tr>
<tr>
<td>Part time cashier at</td>
<td>- Helped organize campus research symposium</td>
</tr>
<tr>
<td>Lowe's</td>
<td>- Tutor in language lab (Spanish)</td>
</tr>
<tr>
<td>Paid tutor at the YMCA</td>
<td></td>
</tr>
</tbody>
</table>
Working with others

My classes / training
- Math double major
- through advance calc
- LaTEX training class
- Certified Camp counselor
- Intro Physics (made B's)
- AFM, SEM training
- CPR certified
- Machine Shop safety training
- Laboratory safety training
- Cryogenics handling
- Labview
- Advanced Lab – Experimental techniques/Error analysis training

My leadership experiences / group activities / professional associations
- My leadership experiences / group activities / professional associations
- Learning assistant (1yr) – marching band (2 yrs)
- Drum major
- Tutor for freshman physics (2yrs)
- Learning assistant (1yr) – marching band (2 yrs)
- Drum major
- Tutor for freshman physics (2yrs)

Working in research lab as a sophomore (mostly data reduction)
- Part time cashier at Lowe's
- Paid tutor at the YMCA after school program
- Workshop on gravitational wave astronomy
- Workshop on gravitational wave astronomy
- Summer research assistant in professor’s lab – part of group - (responsible for interfacing spectrometer)
- Attended comicon
- Sing in community choir

Tutor in language lab (Spanish)
3. Narrow it down. Draft a bullet point related to this skill like one you might use on a resume. Keep this short and to the point.

4. Refine the language. Refine your bullet point, focusing on what you know how to do and how well you know how to do it. You may want to do a few drafts and get feedback from others on which is most clear, concise, and meaningful.

5. Tell it. Write down a few specific anecdotes that demonstrate your experiences related to this skill.
Assessing My Skills

Skill category: ________________________

Brainstorming: My experiences related to this skill category

Tell it: Draft a bullet point related to this skill

Refine the language: Refine your bullet point, focusing on *what you know how to do* and *how well you know how to do it*

Show it: Write down a few anecdotes that demonstrate your experiences related to this skill
<table>
<thead>
<tr>
<th>Skill category:</th>
<th>Working with others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brainstorming: My experiences related to this skill category</td>
<td>Camp counselor, tutor (in Spanish and in freshman physics, and for math at YMCA), learning assistant, working with lab group (research), sing in choir and helped organize a research conference for my peers</td>
</tr>
<tr>
<td>Tell it: Draft a bullet point related to this skill</td>
<td>Good at working in teams and cooperating in group situations</td>
</tr>
<tr>
<td>Refine the language: Refine your bullet point, focusing on what you know how to do and how well you know how to do it</td>
<td></td>
</tr>
<tr>
<td>Show it: Write down a few anecdotes that demonstrate your experiences related to this skill</td>
<td></td>
</tr>
</tbody>
</table>
Team work and group skills
– really good at it.
Strong teamwork skills; demonstrated comfort in a variety of group dynamics.

Show it: Write down a few anecdotes that demonstrate your experiences related to this skill
Your set of strengths.
YOUR skills

- Aim for about 5-10 skill sheets

- Should be revised regularly as your experiences grow and change

- Practice on-going self assessment to continuously update skills/knowledge list

<table>
<thead>
<tr>
<th>List your “Tell it” bullet points below</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Hard work DONE.

<table>
<thead>
<tr>
<th>List your “Show it” stories below</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Practice
Now its up to you!

Use the binder – DO YOUR HOMEWORK

This homework impacts the rest of your life!

Revisit your knowledge and skills assessment

Maybe at the end of each semester

Start (or continue) your networking

Consider scheduling some informational interviews

Begin investigating job advertisements.

Your career pathway is up to you!
Adding a Careers Training component to your program

Should you?
Would you?
Could you?
make the Toolbox part of your undergraduate program?

Will it help my students become super stars?

And —will it grow my two “big R’s”?