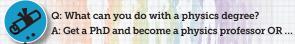
ATTENTION PHYSICS STUDENTS:

You Have Options



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.
- One-third graduate with a double major, many in math.3
- · One-tenth start at two-year colleges.4

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.5

- About half enter an engineering program; the rest enter programs in math, medicine, education, or another field.⁵
- As a group, physics majors score among the highest of all majors on medical school and law school admission tests (the MCAT and LSAT).6
- 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.5



~36% attend graduate school in physics or

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

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



42% enter the workforce.5

Common employment sectors include:

- · 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
- Those in private-sector STEM positions are well compensated, with a median starting salary of about \$50K.

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

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

· 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 formally follow the career paulos individuals, but we hear that they go on to

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



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

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

with graduate

· Some transfer to other insti-

tutions to earn a physics

· Many others transfer to pro-

as medical physics, atmo-

grams in related fields such

spheric science, and materials

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.

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

For US citizens, within one year of earning an exiting

• About two-thirds of those who earn exiting master's degrees

• A master's degree in physics usually takes about two years.

do so with a specific research focus.8

master's degree...

About half work in the private

sector, overwhelmingly in

The largest portion of exiting

sector are employed in the

Other common employment

sectors for exiting master's

include colleges and uni-

field of engineering.

the military

master's working in the private

STEM fields.



~2/3 accept a temporary position

(e.g. a postdoc), primarily at a university or

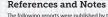


~1/3 accept a potentially permanent position.11

- The majority of new PhDs accepting potentially permanent positions are employed in the private sector.
- The highest-paid positions for new PhDs are in the private sector and at government labs, with median starting salaries of about \$90K and \$85K, respectively.



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



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 Raymound Chu, Physics Enrollments in Two-Year Colleges, April 2013.

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

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

7. Casey Langer 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

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

11. Garrett Anderson and Patrick Mulvey, Physics Doctorates Initial

*Estimate provided by the AIP Statistical Research Center, Summer 2014







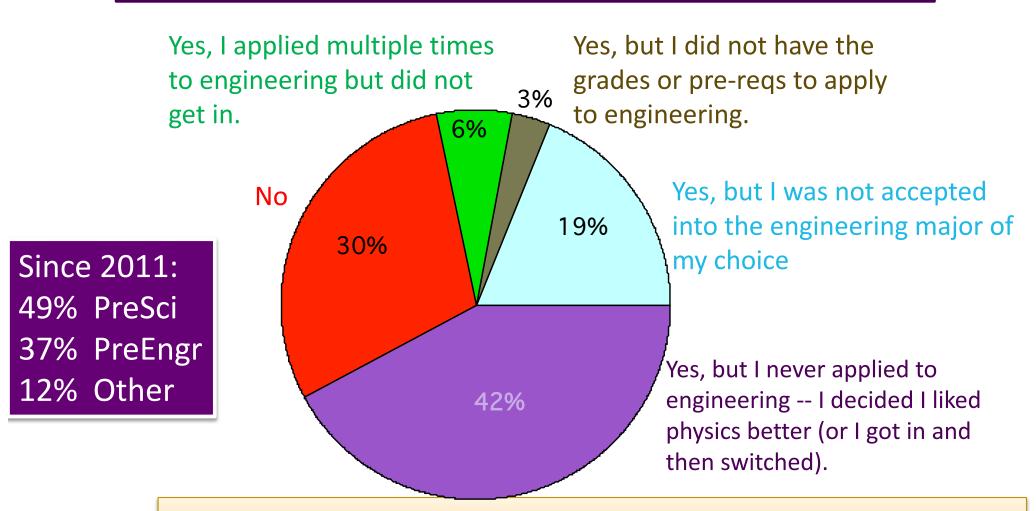






So you think you want to major in physics ...

Did you ever seriously consider majoring in engineering?



Cohort: Physics majors who applied to graduate in 2016-17

Why major in physics?

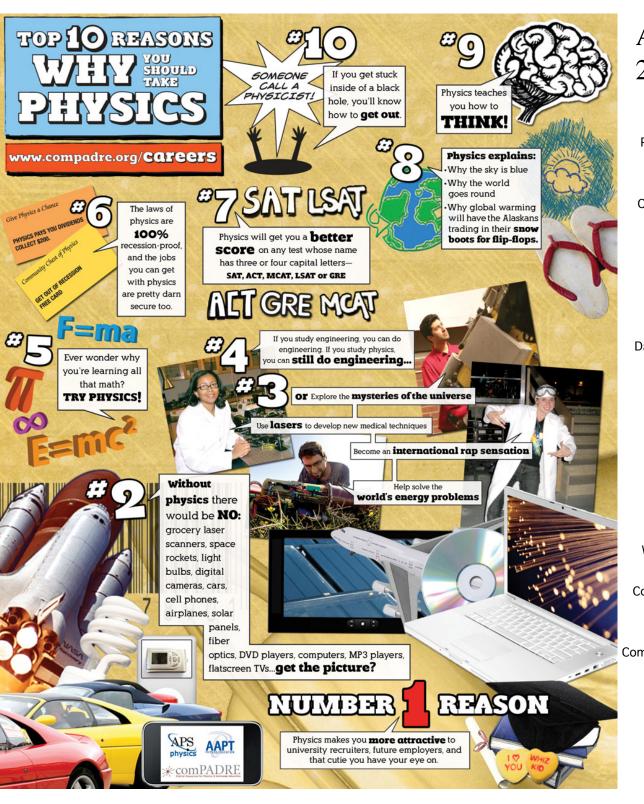
Reasons that tend not to work out well ...

- ➤ Because you decided to do so in middle school
- ➤ Because engineering turned you down
- ➤ Because mom and dad said to

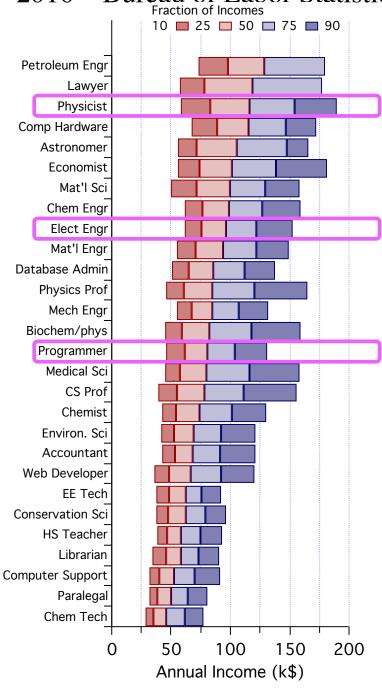
GOOD reasons

- ➤ Because you REALLY want to WHY the world works
- ➤ Because the list of courses you REALLY want to take at UW gets you a physics degree (or at least close to one)
- ➤ Because you checked out a number of other options, and you like physics the best

UW offers 606 degree options across 314 programs

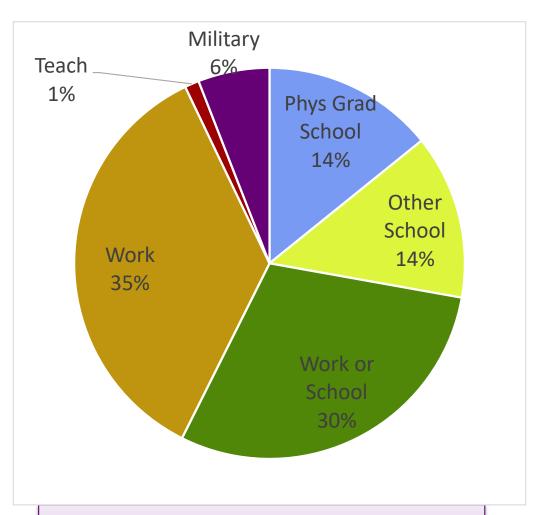


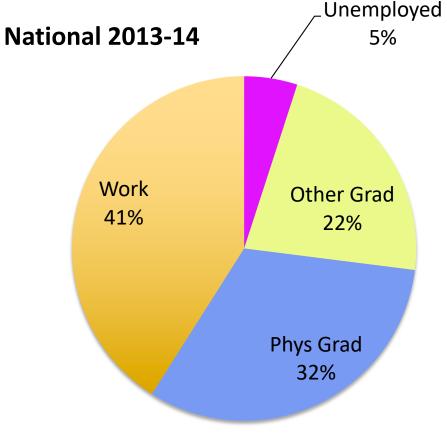
Annual Salary Distribution 2016 – Bureau of Labor Statistics Fraction of Incomes



http://www.bls.gov

Post-Graduation Physics BS



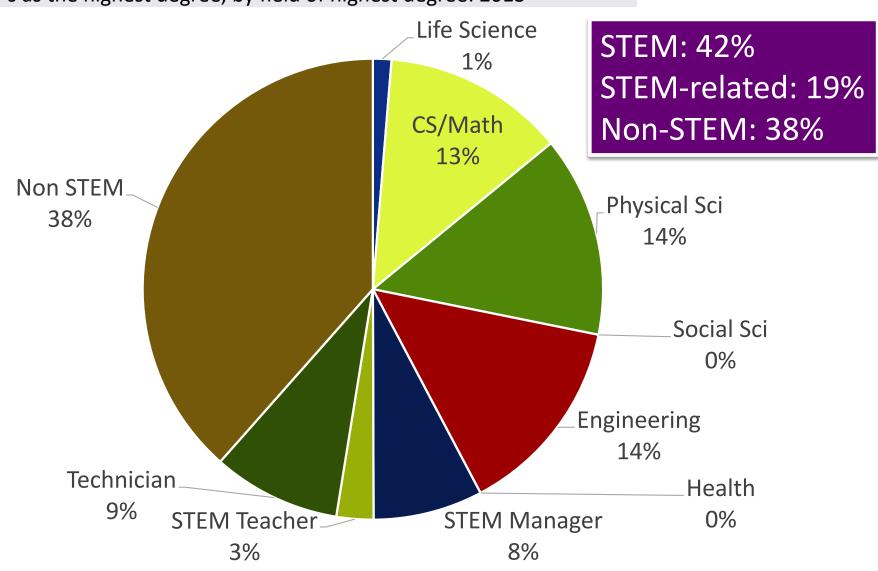


UW Physics 2016-17 Grads [On Grad Application (N=169)]

National Data 2013-14 Grads (aip.org/statistics)

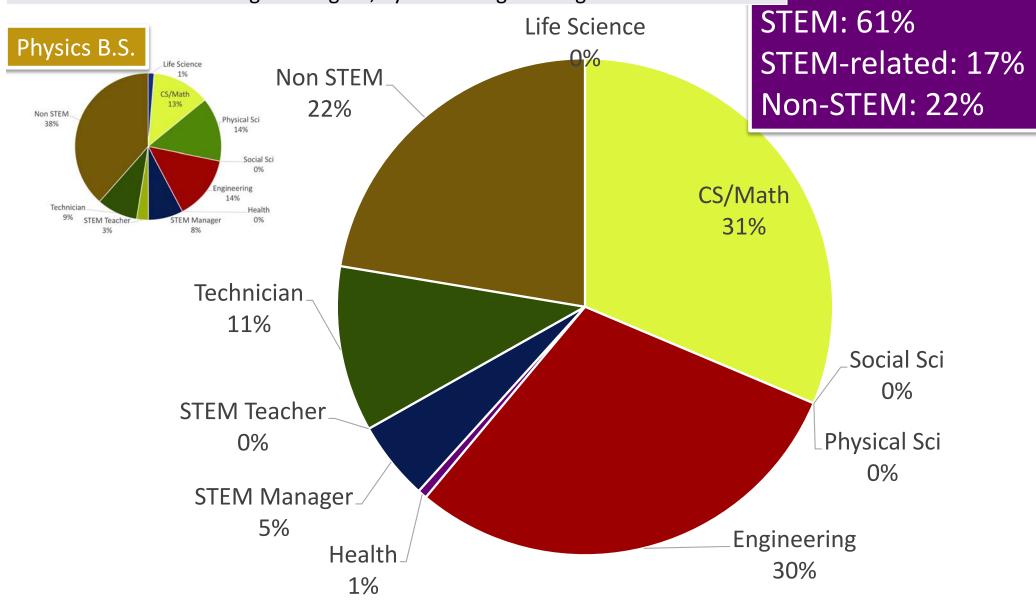
Where do Physics B.S. end up?

NSF Table 3-2. Broad occupation category of employed U.S. scientists and engineers with a bachelor's as the highest degree, by field of highest degree: 2013

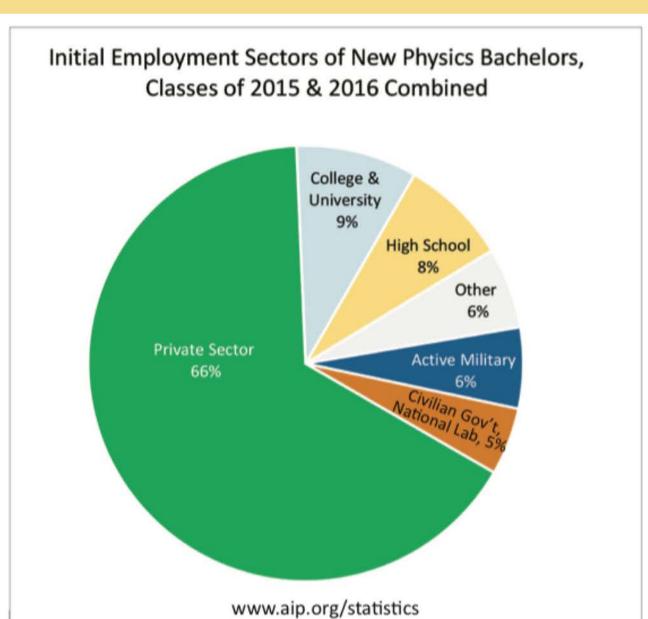


Engineering B.S. Career Paths

NSF Table 3-2. Broad occupation category of employed U.S. scientists and engineers with a bachelor's as the highest degree, by field of highest degree: 2013



Physics jobs span the economy



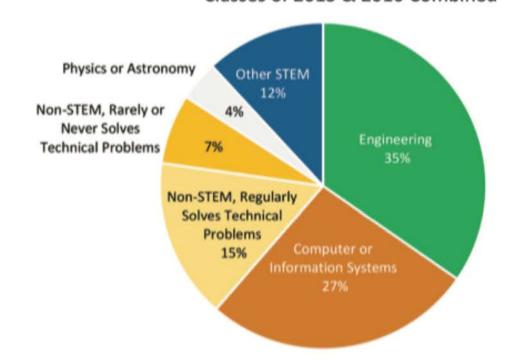
Note: 47% of new physics bachelors were employed in the winter following the year in which they received their degree.

29% Phys/Astro grad 10% Engineering grad 10% other schooling 4% Unemployed

Figure 2. Initial employment of physics's bachelor's degree recipients for the combined classes of 2015 & 2016

Private Sector Job Areas — 1 Yr Post B.S.

Field of Employment for New Physics Bachelors Employed in the Private Sector,
Classes of 2015 & 2016 Combined



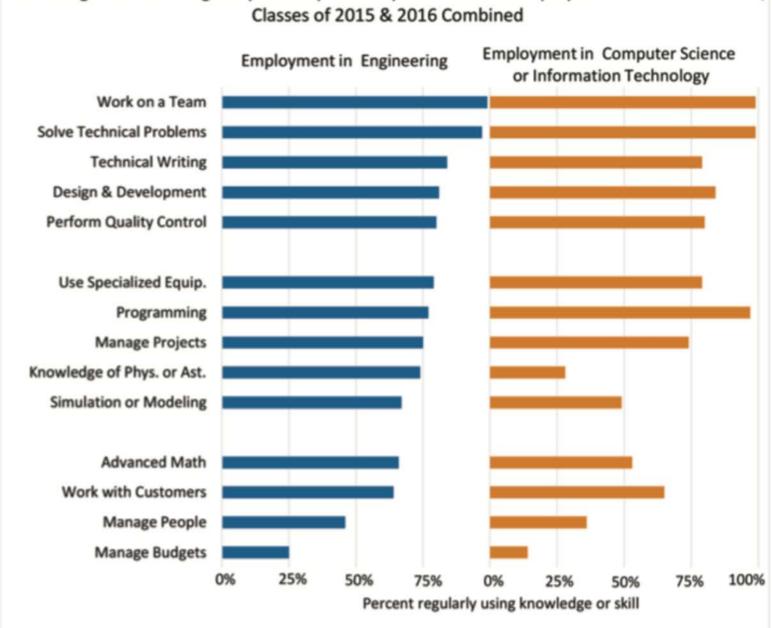
www.aip.org/statistics

STEM refers to natural science, technology, engineering and mathematics. Regularly solving technical problems refers to respondents who selected "Daily", "Weekly", or "Monthly" on a four-point scale that also included "Rarely or Never".

Figure 3. Employment data for physics bachelor's degree recipients in the private sector. Note that Engineering and Computer Systems comprise 62% of the employment fields for bachelor's working in the private sector.

Typical Job Skills Utilized

Knowledge and Skills Regularly Used by New Physics Bachelors Employed in the Private Sector, Classes of 2015 & 2016 Combined



Why Go to Grad School?

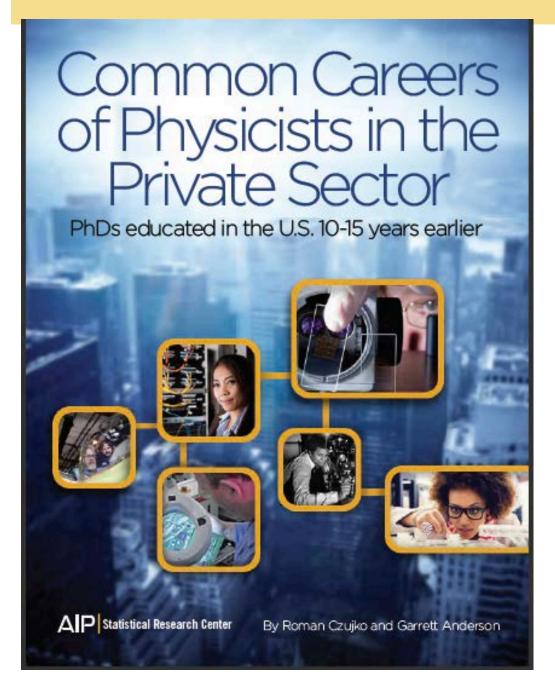


- Deeper understanding of a subject
- Better/different job prospects
- Participate in the excitement of the intellectual frontier
- ❖ DON' T
 - >Assume automatic faculty position
 - Drift into graduate school

Grad School FAQ

- **❖**How long?
 - >5 7 yr to PhD; 2 yr to M.S.
- **❖** Cost?
 - ➤ You get paid (and your tuition does, too)
- *Requirements?
 - ➤ Comprehensive track PLUS more electives
 - ➤ Physics GPA >~3.5
 - UW Physics PhD Admits: average = 3.85; none below 3.4
 - > 3 Excellent letters of recommendation
 - ➤ Research experience

What can I do with a PhD other than Profess?



- Self-employed
- Finance
- Gov't Contractors
- Health & Medicine
- Industry
 - Engineering
 - Computer Science
 - Physics
 - Other STEM
 - Non-STEM

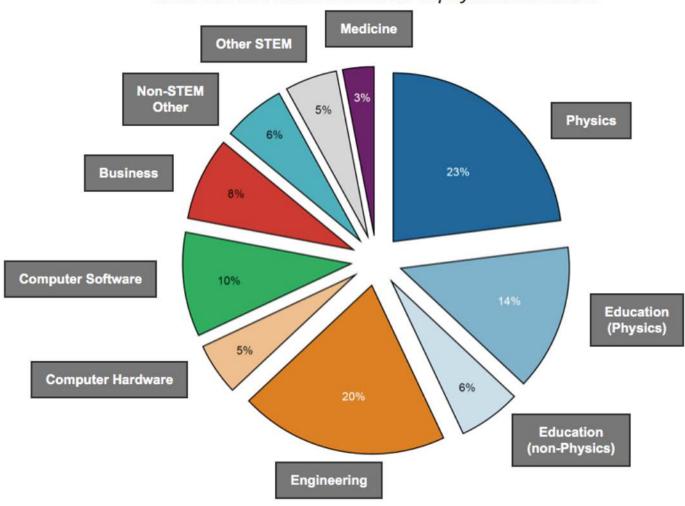
Most Common Activities:

- solving complex problems
- managing projects
- writing for a technical audience

Physics PhD Job Categories

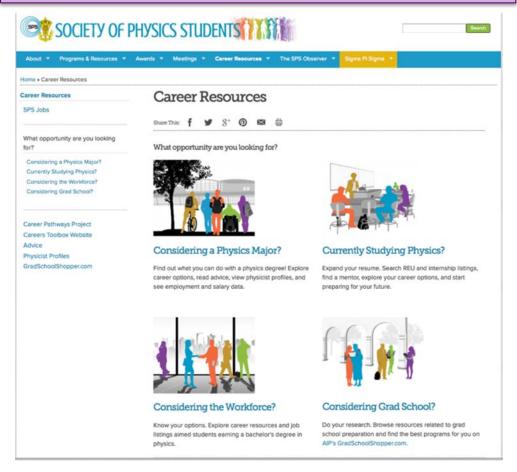
Employment fields for new physics PhD recipients in potentially permanent positions, classes of 2009 through 2014

Hover over field names to see more employment information

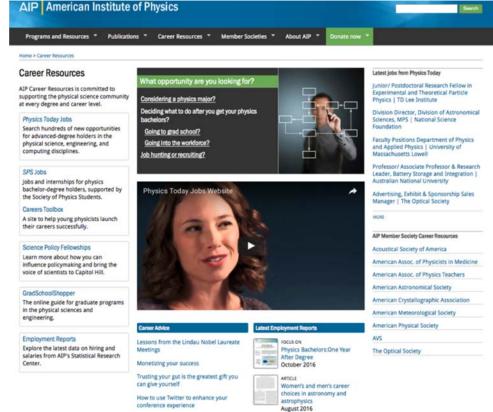


Resources for More Information

https://www.spsnational.org/career-resources



https://www.aip.org/career-resources



UW Physics Major Options

Comprehensive

- Graduate school in physics or astronomy
- > Full range of physics and math

Applied

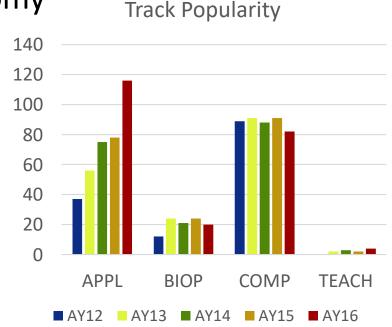
- ➤ Technical job at B.S. level or M.S. in engineering
- ➤ More flexibility in electives

Teaching

- Communicate science to HS or general audience
- Physics by Inquiry sequence

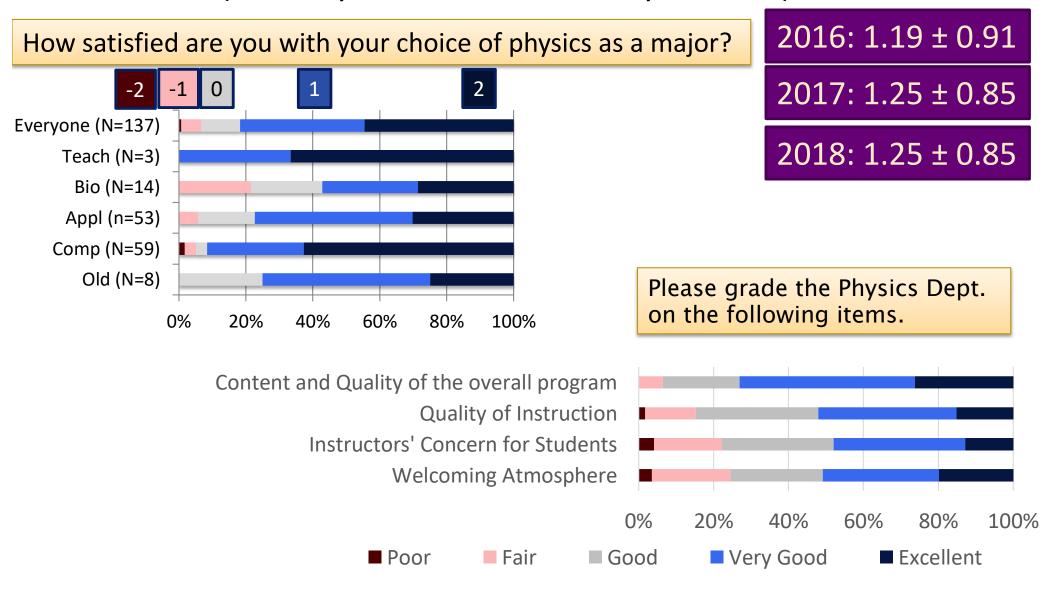
Biological

- ➤ Medical school or grad school in biophysics
- > 7 quarters of biology and chemistry in addition to physics core



UW Physics Majors are Satisfied

(-2 = very dissatisfied, +2 = very satisfied)



Topics after Panel

- Physics Student Services Resources
- Declaring a Major
 - ➤ Background for change
 - >Transcript-based admission
 - > Petition-based admission
- Choosing a Degree Option
 - >Applied, Comprehensive, Teaching, Biological
- Degree requirements
- Send email to uwspsofficers@uw.edu

Physics Student Services: C139/C141

Staff Advisors

- ➤ Margot Nims
 - All undergraduate issues
- > Catherine Provost
 - All graduate issues
 - Grad school-related UG issues

Faculty Advisor

- Prof. Marjorie Olmstead
 - advice from a faculty member
 - petition admission to major
 - waivers and substitutions; transfer credit equivalency

Program Assistant

Paula Newcomer

Declaring a Physics Major

Transcript-Based Admission

- > Minimum criteria
- ➤ Not competitive
- ➤ No cap on number of majors

Petition-Based Admission

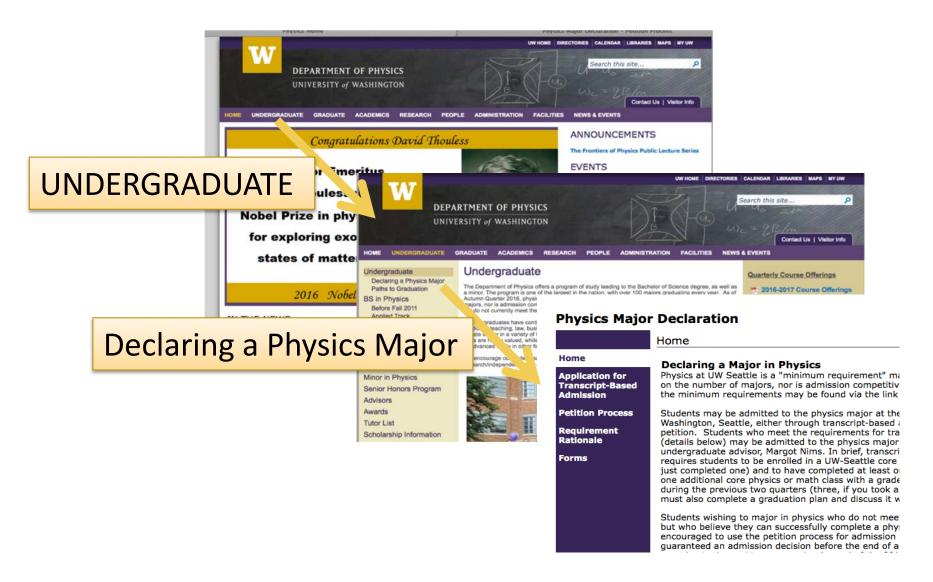
> Route if do not meet minimum criteria

Goal of admissions criteria

- ➤ Students are prepared for major
- ➤ Students actively choose major
- > Fewer students who leave UW without a degree

How to Declare a Major

www.phys.washington.edu



Transcript-Based (Minimum Criteria)

- ❖ During the qualifying quarters, a student must have received a grade of at least 2.6 in both one qualifying course from List 1 and at least one additional qualifying course from either List 1 or List 2. A student must also either be enrolled in a List 1 course at UW Seattle during the quarter in which the application is submitted, or have completed a List 1 class at UW Seattle during the previous quarter.
- Students must prepare a quarter-by-quarter, realistic course schedule that will result in a physics degree in their chosen degree option (Applied, Comprehensive, Biological or Teaching) in a reasonable period of time. Students will discuss they graduation plan with the Undergraduate Advisor when declaring a physics major.
 - List 1: Core Physics Lecture Classes
 Physics 121, 122, 123, 224, 225, 226, 227, 228
 Physics 321, 322, 323, 324, 325, 328, 329 and Astronomy 321,322,323
 - List 2: Core Math Classes
 Math 124, 125, 126, 134, 135, 136, 307, 308, 309, 324
 Applied Math 301, 351, 352, 353, 401
 - Qualifying quarters: Admission will be based on the two quarters immediately preceding the student's application to the major. If a student was not enrolled during one of those two quarters (e.g., summer, internship or study abroad), then it will be based on the three immediately preceding quarters. These courses need not have been at UW.

Catalyst Form for Admission

- 1. Name, Email, Student Number
- 2. Degree option and planned graduation date
- 3. List 1 physics course you are currently taking
- 4. Highest List 1 grade in prev. 2[†] qtrs
- 5. (Next) highest List 1/List 2 grade in prev 2[†] qtrs
- 6. Enter plan into MyPlan and go see Margot Nims

If any of:

- 3 is blank
- 4 is < 2.6 or blank
- 5 is < 2.6 or blank

PETITION or WAIT

(and come in for advising)

List 1 = Physics n2x

List 2 = Math/AMath requirement

[†]3, if took qtr off

Petition-based Admission

- At least one List 1/2 course should have been completed at UW Seattle during a qualifying quarter. Proposed exceptions to this criterion (e.g., you are currently enrolled in, but have not completed, any qualifying courses) must be strongly supported in your personal statement.
- Personal Statement. Address goals and objectives, past academic performance, successes not on your transcript and support network.
- Graduation Plan. Complete a quarter-by-quarter, realistic course schedule that will result in a physics B.S in a reasonable period of time.
- Interview. Meet to discuss your Personal Statement and Graduation Plan with the Undergraduate Faculty Advisor
- Rejected students may reapply after passing an additional qualifying course.

Personal Statement

- **Goals and objectives:** Why do you want to major in physics?
- ❖ Past academic performance: What has gone well for you? What has not? What is your assessment of what makes a difference? Were you hampered by inadequate high school preparation? Did you have significant non-academic time commitments?
- Successes not on your transcript: What leadership, family, volunteer, or work accomplishments are you proud of?
- * Support network: What academic and social resources will you use to support your future success in the physics major?

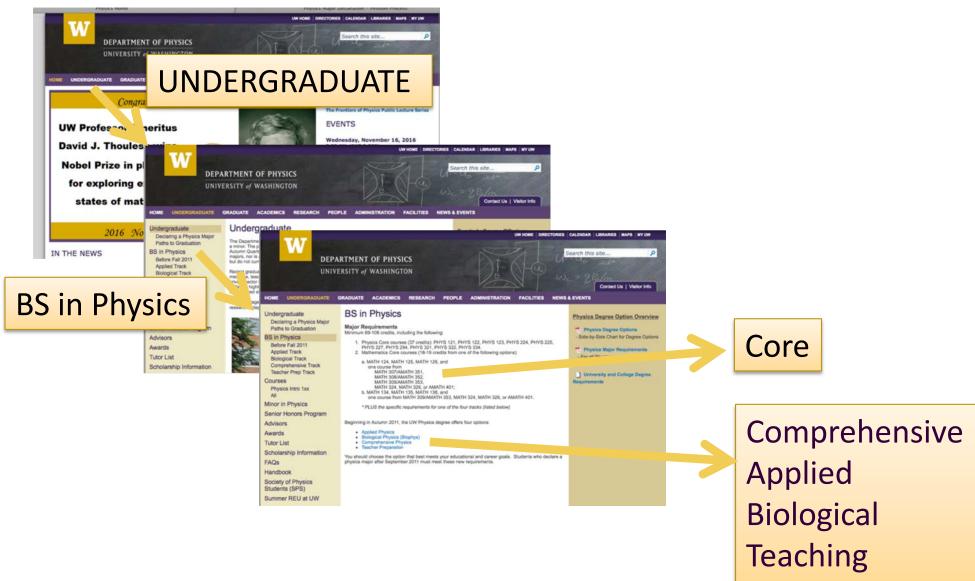
 All of you should think about these items, whether or not you are petitioning!

Questions on Process?

Next: Navigating the Major

What do I have to do to graduate?

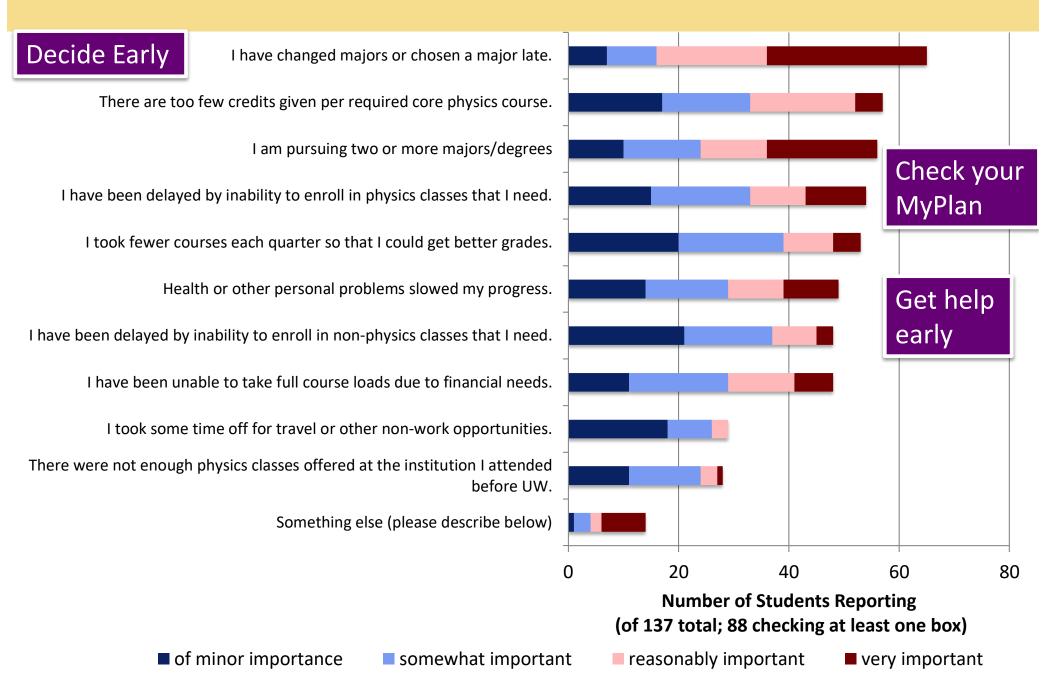
www.phys.washington.edu



There is no such thing as a standard path

Coro Dhysics Lastura Daguiramants			Yr	Aut	Win	Spr
Core Physics Lecture Requirements			1	Mechanics	E&M	Waves
Cohort: Graduates A10 to Sp15 who completed Phys 227 by A09			2	Thermal Math Phys 1	Quantum 2 Electronics	
N	%	Category	3	E&M 1	E&M 2	Elective
331	100	Physics B.S. A10 to Sp15, 227 by A09	4	Elective 4xx	Elective	Elective
249	75	Completed Mechanics by end of 1 st yr at UW				
222	67	Took Full Intro sequence at UW				
146	44	Took Mechanics first year at UW				
97	29	Took Waves in first year at UW				
46	14	Took Mechanics first quarter at UW				
38	11	Mechanics 1 st qtr, Waves 3 rd Qtr at UW				
21	6				" here didn't	
16	5	$100k$ Thermal Phys that $\Delta ut X_i ()N/I_1 N/inter *$			students. udents also	
11	3				-2 and QM-2	
6	2	Graduated in 3.75 yrs (only 1 took Electronics in sequence)				
2	<1 Took at least 1 400-level (non-lab) physics elective					

What delays students?



Physics Core Courses

Core Classes (55 cr)	
Phys: 121, 122, 123	Mechanics, Elect. & Mag., Waves,
224, 225	Thermo, Modern I
294	Intro to Research
Math 124, 125, 126	Differential, Integral, Multivar. Calc
1 from math menu:	1 from:
Math 307, 308, 309, 324;	Linear Alg., Diff. Eq., Vector Calc,
Amath 351, 352, 353, 401	Complex Anal, Partial Diff. Eq.
227 321, 322 334	Mathematical Physics Electricity and Magnetism I&II Electronics Laboratory

UW Physics Major Options

Comprehensive

- Graduate school in physics or astronomy
- Full range of physics and math

Applied

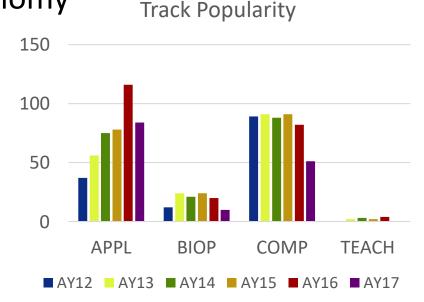
- ➤ Technical job at B.S. level or M.S. in engineering
- ➤ More flexibility in electives

Teaching

- > Communicate science to HS or general audience
- Physics by Inquiry sequence

Biological

- ➤ Medical school or grad school in biophysics
- > 7 quarters of biology and chemistry in addition to physics core



Physics Option Requirements

	Comprehensive (+38-41 cr)	Applied (+34-39 cr)	Teaching (+38-41 cr)	Biological (+51-55 cr)
Math	Phys 228 (Math Phys) + 1 MM	AMATH 301 (MatLab) +2 of {Phys 228 +MM}	Phys 228 + 1 MM	Phys 228
32x	226, 324 (Part; QM2) 3 of junior level E&M, QM, Astro, Classical Mech, Stat Mech	One from 226, 323, 324, 328, 329 (Part., E&M3, QM2, Stat Mech, Classical)	226, 324 (Part; QM2) One from E&M, QM, Mechanics	324 (QM2) 328 (Statistical) One from 226, 323, 325, 329
Lab	Two advanced labs	231 (intermediate lab) Two advanced labs	One advanced lab	(in bio/chem)
Capstone	3 cr Research or Sem	3 cr Research or Sem	3 cr teaching/PER	3 cr in bio-related research
UD Elect	2 additional Phys/Cognate Class	3 additional 32x, Phys/Cognate (≥ 1 UD lecture; may include 1 lab; 1 intro sci)	(≥ 1 UD future teachers)	
Other Sci				3 chem classes 2 bio 2 additional bio/chem

Physics Minor

Core			
Phys: 121, 122, 123 224, 225 (or 248)	Mechanics, Elect. & Mag., Waves, Thermo, Quantum I		
Specialization (Pick 1)			
Physics Education	Physics by Inquiry Series Phys 407-408-409		
Experimental Physics	Intro Laboratory Analysis: Phys 231 Electronics: Phys 334 Additional Advanced Lab		
Mathematical Physics	Math Physics I and II: Phys 227, 228 Either Electricity & Magnetism (321) or Quantum Mechanics (324)		

To find these slides (in a day or two) and info about the physics major, go to www.phys.washington.edu & click on "UNDERGRADUATE".

Prof. Marjorie Olmstead *ufaphys@uw.edu*PAT C141

So now do you think you want to major in physics ...?

Spring Quarter Office Hours
PAT C141

Tues: 12:00 pm - 2:00 pm

Wed: 10:30 am - 12:30 pm

Thu: 8:30 am - 10:30 am

Fri: 3:00 pm - 5:00 pm