Is grad school right for me?  
If so, how do I get there?

UW Physics Doctoral Student Panel
• Eric Lester (1st year, Condensed Matter Physics)
• Tharindu Fernando (2nd year, Materials Science)
• Charlotte Zimmerman (3rd year, Physics Education)

Why (or why not) get a PhD in physics?

What is required to be admitted to physics grad school?

General Discussion

Prof. Olmstead: ufaphys@uw.edu November 2020
Is grad school right for me?  
If so, how do I get there?

Prof. Marjorie Olmstead

Associate Chair for Undergraduate Affairs  
Undergraduate Faculty Advisor  
UW Department of Physics

ufaphys@uw.edu  
November 2019
A masters in physics is generally:

- Something you acquire en route to a PhD, especially if you change schools or drop out
- Something acquired by someone who did not major in physics as an undergrad
- Something that does not open many career opportunities for a physics bachelors

A masters in Engineering, Data or Computer Science, Business, etc., is a common path for physics bachelors

- You should check with those departments on what they recommend as preparation
What is a PhD?

- Take some piece of knowledge about the universe from (frontier – \( \varepsilon \)) to (frontier + \( \varepsilon \))

- Start out knowing nothing about a topic, and four years later you are the world expert

- “License to think” – allows you to direct research projects, teach @ college/univ, write grants
Why Go to Grad School?

- Participate in the excitement of the intellectual frontier
- Deeper understanding of a subject
- Better/different job prospects
- DON’T Drift into graduate school

You are here ➔ Grad School ➔ GOALS
What else could I do?

Trends in initial outcomes of physics bachelor’s Classes of 1996 to 2018 (1 year post degree)

**2017/18**
- 48% job
- 28% P/A grad
- 19% other grad
- 5% seeking

**Field of Employment**
- **Engr.**
- **Phys/Astr**
- **Tech**
- **Non-STEM**
- **CS/Info.**

http://www.aip.org/statistics
NSF Data on Phys Sci B.S. Careers

NSF Table S3-2. Scientists and engineers, by occupation and degree field: 2017

Occupation of Physical Science Degree Holders

- Chem
- Arts & Hum. Sales
- Business/Soc. Sci
- Non S&E Manager
- S&E Manager
- K-12 Teachers
- Health Life Sci
- Engineers
- Technicians
- CS/IT/Math
- Teach/Other Phys Sci
- Phys/Astr
- ESS
- Other non-S&E

STEM: 45%
STEM-related: 20%
Non-STEM: 35%

Chemists, except biochemists
Earth scientists, geologists, and oceanographers
Physicists and astronomers
Other physical and related scientists
What might I earn?

**What Do New Bachelors Earn?**
Starting Salaries for the Class of 2018

<table>
<thead>
<tr>
<th>Field</th>
<th>1 yr post B.S. (2016/7)</th>
<th>1 yr post Ph.D. (2016/7)</th>
<th>10 yr post PhD (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>$70k</td>
<td>$100k</td>
<td>$100k</td>
</tr>
<tr>
<td>Engineering</td>
<td>$40k</td>
<td>$70k</td>
<td>$100k</td>
</tr>
<tr>
<td>Mathematics</td>
<td>$40k</td>
<td>$70k</td>
<td>$100k</td>
</tr>
<tr>
<td>Physics</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Registered Nursing</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Economics</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Finance</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Accounting</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Business Admin/Mgmt</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Architecture</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Marketing</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Chemistry</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Sociology</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Biology</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Psychology</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Civilian Gov't</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>Active Military</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>HS Teacher</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
<tr>
<td>College or Univ</td>
<td>$40k</td>
<td>$70k</td>
<td>$120k</td>
</tr>
</tbody>
</table>

Bars represent the middle 50% of salaries, i.e. between the 25th and the 75th percentiles.
Reprinted from the Summer 2019 Salary Survey, with permission of the National Association of Colleges and Employers, copyright holder.
Who gets a physics PhD?

Physics PhD’s—2017 data N=1865

- 56% US Citizens
- 17% Female
- 27% of US citizens are non-white

UW now produces >2% of Physics B.S.

Scale Ratio 3:1 (but ~ half of PhD got B.S. abroad)

UW BS * 50
Newly Hired Faculty Growth < PhD

Jobs like mine: \( <10\% \)
General Academic: \( \sim 30\% \)

Total # Departments ~ Same

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2013</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelors</td>
<td>509</td>
<td>497</td>
<td>503</td>
</tr>
<tr>
<td>Masters</td>
<td>64</td>
<td>57</td>
<td>57</td>
</tr>
<tr>
<td>PhD</td>
<td>189</td>
<td>198</td>
<td>201</td>
</tr>
<tr>
<td>Total</td>
<td>762</td>
<td>752</td>
<td>761</td>
</tr>
</tbody>
</table>
What else can I do with a PhD?

Classes of 1996-7 and 2000-2001 Pollled by AIP in 2011

- 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
Keys to PhD Career Success

- Hard work
- Problem-solving skills
- Interpersonal skills
- Persistence
- Education experience
- Supportive mentors
- Previous experience in certain fields
- Supportive colleagues and collaborations
- Flexibility in job fields, positions, or tasks
- Passion for work
So if I do go to grad school …

- What happens?
- How long does it take?
- How do I finance it?
- How do I figure out where to go?
- What are grad schools looking for?
“Standard Path” to the Ph.D.

- **Take Classes**
- **Dream New Ideas**
- **Analyse Results**
- **Take Data/Calculate**
- **Present work**
- **Read other people’s ideas, get trained**
- **Publish results**
- **GRADUATE**
“Standard Path” to the Ph.D.

1. Take Classes
   - 2-3 years
2. Read other people’s ideas, get trained
3. Dream New Ideas
4. Take Data
   - 2-4 years
5. Analyze Data
6. Present work
7. Publish results
8. GRADUATE
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![Chart showing years of study with the following distribution: 4 years: 4%, 5 years: 21%, 6 years: 34%, 7 years: 22%, 8 years: 11%, 9+ years: 8%]
You get PAID to go to grad school!!

PLUS: Your tuition gets paid & you don’t have to pay off student loans until you graduate.

You don’t add to your savings, but you don’t deplete them, either.

Current UW Rates: $27-31k/yr
Current NSF Fellowship: $34 k/yr

Roommates
Used Car, New Computer

* NSF deadline is late October
So if I do go to grad school …

- What happens?
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- What are grad schools looking for?
Find your graduate program in the physical sciences.

Get the most out of your searches!

Take a guided tour

- Search schools by region or state
- Save and compare schools
- Create a free account and save schools that match your interests and requirements.

Download User Guide
Top Tier? Big? Close to home?

- **Ranking**
  - Rankings are out of date – new hires make a big difference
  - Top tier hire each other’s grads
  - Next tier = schools like UW
  - Lower tiers often have pockets of top-ranked subfields

- **Size**
  - Large comprehensive department lets you change sub-fields
  - Small lets you be a bigger fish in a smaller pond
  - Your professional network = your grad school contacts

- **Interdisciplinary Connections**

- **Geography**

- **Department Climate – Visit!!**
So if I do go to grad school …

- What happens?
- How long does it take?
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- How do I figure out where to go?
- What are grad schools looking for?
Selection Criteria

Probable success depends on traits such as:
- Commitment
- Creativity
- Maturity
- Confidence
- Leadership
- Communication Skills

Good match between your goals and research in the department (and not too many in one area)
- Successful research (or independent) experience
- Your UG academic performance and GRE
- Meet all deadlines; essay spelling and grammar
UW Admission Statistics

- 700 Apply ⇒ 90 – 100 Admit ⇒ 25-30 Enroll
- Physics GRE of US Admits [NOTE: not this year!]
  - Average in the low 800’s (out of 990)
  - Admission rare below the mid 600’s
- Undergrad GPA:
  - Average GPA = 3.8
  - Admission rare below ~ 3.5
- Research Experience
  - Expected: Almost everyone has some

UW’s current US News ranking is about 20
What do they know about me?

**GRADES**

**GRE**
Physics + General

**Letter of Rec 1**

**Letter of Rec 2**

**Letter of Rec 3**

**Personal Statement + Cover Letter**

Study for the GRE!
- Very different from classroom exams
- Balance Speed vs. Silly Mistakes
- Get the book “Conquering the Physics GRE”
Personal Statement

- Be honest and sincere
  - Show, don’t tell

- Speak to your strengths and goals
  - OK not to know your specialty, but don’t sound wishy-washy

- Tailor and connect to the target department
  - Mention specific research areas, faculty

- Address any irregularities in your record
  - OK for this to be in letters of reference

- EDIT for grammar, spelling, coherence
  - Have someone read your essay

- Give a copy to your references
Letters of Recommendation

- You need 3 letters from people with a PhD who know you well outside the classroom
  - Thank them if they say you should find someone else
- At least one should be from someone with whom you have done research (either at UW or elsewhere)
  - Summer REU, Local project with results by Autumn Sr Year
- Provide background information
  - Aspects you want them to cover in their letter
- Give plenty of time
  - Send email with a list, including deadlines and links
  - Gently verify/remind as deadline approaches
Checkboxes for Recommenders

- Intellectual Potential
- Intellectual Depth
- Intellectual Independence
- Intellectual Curiosity
- Critical Thinking
- Analyze a Problem and Formulate a Solution
- Creativity and Imagination
- Academic Performance
- Research Aptitude & Potential
- Lab Skills & Techniques
- Potential for Teaching
- Potential for career advancement

- Motivation
- Maturity
- Self-confidence
- Resilience
- Concern for others
- Social Skills
- Ability to Work with Others
- Ethics and Integrity
- Facility with English Language
- Oral Communication
- Written Communication
- Planning and organization

Relative to other students at the same level, is this student: Top 5%, 10%, 25%, above average, other, unable to judge.
Overall Advice

- Do research summer after junior year
  - Form a GRE study group wherever you are
- Don’t overload your schedule senior year
  - Applications and visiting weekends = extra half class
- Apply to 7–10 places
  - 2-3 “Reach”, 2-3 “Safety”
  - Don’t apply anywhere you aren’t willing to go
- Stand out from the rest
  - Apply WELL BEFORE the deadline
  - Visit, call and/or email someone you want to work with
    - (but don’t bug them too much....)
- Check that file is complete
  - Contact Grad Assistant by email
  - Follow up on late letters, transcripts, etc.
It’s not for everyone, but ...

- Grad study in Physics can be a grand adventure.
- A Physics PhD prepares you for a wide variety of careers and life experiences.
- If this is what you want, and you are willing to work towards it at subsistence wages for 6 years,

**GO FOR IT!**