

The life of a physics graduate student, or what I do

- My undergraduate thesis was on ultra high energy neutrinos in Super-Kamiokande
- The summer after graduation, I looked at the capture rate of μ^- in MiniBooNE
- I spent 9 months in Japan working on K2K (hardware, modeling neutrino/nucleon cross sections)
- Now, I'm working on MiniBooNE and a future reactor experiment called Braidwood

Part II: Graduate school

- Graduate schools look for:
 - Students with good research potential!
 - Students who are able and likely to accomplish their program
- Do you **WANT** to go to graduate school?
 - Research is a big thing schools look for, and is a good way to see if you want to continue in physics
 - Do research in the summer (w/ professors, REU, national lab programs)

Applying to graduate school

- First, decide **WHEN** you want to go
 - Consider taking time off, if there's something you want to do (Peace Corps, travel, research)
 - I took off 9 months to do research and I'm very glad I did it
- **A word about deferment**
 - Some schools defer, many don't but will admit you a second time
 - Ask for recommendations now, when people remember you

Applying to graduate school (II)

- Next, decide **WHERE** you want to apply
 - Talk to your professors about who might be good to work with, and what schools they think are good
 - Surf the web, what work/experiments interest you?
 - Contact professors who do interesting work and talk to them about it (email, phone)
 - If possible, attend colloquiums to get a feel for what's out there.
 - Think about where you will be living as well

Applying to graduate school (III)

- **Apply to 5-8 schools** (pick 30-40% schools well known for for multiple branches of physics, and the remainder good schools in your field of interest)
- **If you find a professor you click with, apply there!** But apply to places that also have more than one topic of interest for you
- **Talk to graduate students**— are they happy with funding/health care/ life at their school? What is the average time to graduate, and how soon do students start research?
- Another way to gauge a school is by the other admittees— who might be your future classmates. **Are they likable?**

Fellowships

- Having a fellowship makes you attractive to graduate schools– they don't have to pay for you
- Search the web for graduate fellowships and ask your professors if they know of any
- Some to consider:
 - National Science Foundation (NSF)
 - Hertz
 - Department of Defense
 - Department of Energy

Application

- **Application parts**
 - Letters of recommendation
 - Grades
 - GRE scores (general and physics tests)
 - Personal statement
- Inconsistencies in application are a **red flag**
- Admissions are **subjective**
- If interested in experiment, say so
- Specific interest can help (if they want you) or hurt (if they don't have what you want to do)

Graduate school: the first two years

- Take classes
- Teaching assistantship/Research assistantship
 - All students are fully supported in Ph.D programs by the school or an outside fellowship
 - Tuition is waived/covered and stipend ~20,000\$
 - Not the case in Master's programs
- Research over the summer
 - Very important! Gives you a chance to try out a group and see if you like them

A word on qualifying exams

- Many schools have some kind of qualifying exam for the Ph.D program
 - Written tests on all you ever learned in physics
 - Oral exam (possibly on research interest)
 - Examples:
 - Princeton, really nasty test, no courses
 - Colorado no qualifying exam, only required courses
- It may seem scary, but don't worry!
 - You learn a lot, especially if you study in a group
 - Most schools want you to pass (look out for schools with mandatory fail rates or high failure rates)

Choosing a research group

- What do you want to research?
 - Theory or Experiment?
 - What area of physics are you interested in?
 - Do you prefer a large or small group/collaboration?
 - Is there travel or relocation involved?
- Be open minded, you may find a new interest
- You will be working for this group for a few years, so choose a group where you can work well.
 - Talk to the older students in the group about their experiences
- For the first few months of research, set up an orientation for you in your group (e.g. a regular meeting with a senior graduate student, a journal club)

Advisors

- **Choosing an advisor**
 - Find someone you are comfortable with
 - Find out what they expect out of student/advisor relationship and state your expectations
- **Once you find one...**
 - Set aside a fixed time each week to discuss your work
 - Ask them how they want you to contact them
 - Be honest: let them know if they are doing something well, or if you are dissatisfied

Full time research

- Starts when coursework is finished (spring semester or summer after)
- First year of research is mostly non thesis
 - Experiment: hardware or software, taking shifts
 - Theorists: lots of reading
- The next 2-3 years is working on a thesis topic
 - Professors usually have ideas of what you might do, and so you work with them to pick and develop it

Summary

- A degree in physics isn't just for physicists
 - Learn lots of useful skills (problem solving, presentation skills, computer skills, writing skills)
- When looking for a graduate school, keep an open mind, talk to lots of people, and find a school/research that fits you well

*Questions? Send me an email:
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Extra slides

List of schools (very! subjective)

- Check: US News & Reports ranking, and older site <http://www.phds.org/rankings>
- Competitive schools
 - Stanford, Berkley, Caltech, MIT, Harvard, UCSB, Princeton, Cornell, U Chicago, U Illinois-Urbana Champaign
 - Good schools: Columbia! Yale, UT Austin, U Michigan, U Wisconsin, U Penn, UC Santa Cruz, Colorado, Rutgers, U Washington

Tips on the GREs

- Tips for the general GRE:
 - It's not that hard, just spend some time memorizing words and getting familiar with the exam
 - I found the Princeton Review book and CD to be quite helpful
- Tips for the physics GRE:
 - It's a very different test than most people are used to taking, so take some time preparing
 - Best to studying using old GRE tests
 - Learn to eliminate wrong answers based on units, and to make educated guesses

Tips for letters of recommendations

- Talk to the professor you want to write face to face, and ask them what kind of recommendation they would write— you don't want a luke-warm recommendation
- Ask for the letters 6-8 weeks ahead of time, and give them stamped, addressed envelopes and any necessary forms
- Send them a reminder email 1 month ahead of time (and have them send a “sent in” email back to you). Check with the school to make sure all letters were received.

Tips on the personal statement

- Here's your chance to showcase yourself
 - Be concise, and specific about who you are and what you've done and your research interests (to be corroborated with your letters of recc)
 - Keep it to ½ a page ideally, and no more than a page
 - Have your mom/English teacher check it over for grammar, spelling errors
 - It's acceptable to attach publications or work you contributed to significantly

Women in Physics

- There are more out there than you think, and most are happy to talk about their experiences
 - Check out: <http://www.mentornet.net/>
 - Or just start talking to someone!
- The number of women in physics is increasing
- Advantages: different skill sets, and people remember you better
- Personally, I have not encountered any sort of problem as a woman

What can you do with a degree in physics?

- Academic research at a university or national lab
- Industrial research
- Scientific Journalism
- Finance, statistics
- Teaching (decent salaries too!)
- Scientific policy
- Medical physics
- Forensic physics (law enforcement and investigation)
- Scientific outreach and public education