ASTR/PHYS Professional Development

Join faculty and graduate students from APS and Physics for a discussion on GRAD SCHOOL:
Should I go?
Where should I go?
How do I apply?
How do I get in?

starts at 4:45-6PM
Monday, October 9th 2023
Duane G130

Plus FREE PIZZA!

Slides posted on APS and PHYS websites
Recording available [here](https://cu-classcapture.colorado.edu/Mediasite/Channel/ed48e1ff92334c73bbc43354716ec555f/browse/null/most-recent/null/null)

Contact us with questions:
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Claire Savard, PHYS grad student
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2023-2024 Events – ASTR/PHYS Professional Development

Fall ’23 planned events:
• 9 Oct: Grad School
• 30 Oct: Getting involved in UG research (PHYS emphasis)
• 13 Nov: Careers in Heliophysics
• 5 Dec: Getting involved in UG research (ASTR emphasis)

Spring ’24 events under consideration
• Careers in Education and Outreach
• Careers in Telescopes/Observatories
• Careers in Industry, Aerospace
• Careers in Startups
• Applying for Jobs
• Your requests here!
# Grad School Discussion - Agenda

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<td>Welcome &amp; Overview: Nick Schneider</td>
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<td>Grad School in Physics: Kevin Stenson</td>
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<td>Grad School in Astrophysics &amp; Planetary Science: Paul Hayne</td>
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<td>Perspectives from an Astro/Planetary grad student: Autumn Stephens</td>
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<td>Closing comments: Nick Schneider &amp; Mike Dubson</td>
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<td>Nick Schneider, Mike Dubson</td>
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6pm Adjourn
Who’s here tonight…

- Physics Majors?
  - Engineering Physics
- Astrophysical & Planetary Sciences?
  - Astrophysics track
  - General Astronomy track
- Other?

- Graduating this year?
- Next year?
- Later?
- Any grad students?

- Wants to do research as a career?
- Join a research group?
- Lead a research group?
Interested in these career paths??

- Observatory staff (e.g., Apache Point, HST, JWST)
- Mission outreach, communication (LASP, JPL)
- Planetarium & Museum staff (anywhere), animation (e.g., Fiske; Disney)
- Mission systems engineer (e.g., Ball, Lockheed Martin)
- Satellite operations, Earth remote sensing (e.g., LASP, SwRI, Digital Globe)
- Science data analyst, scientific visualization
- Mission proposal development (e.g., Ball, Lockheed Martin)
- Mission hardware development & test, operations

No PhD required!
Interested in these career paths??

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Professional Development

This website is designed to offer resources and advice that will help you succeed in your career after graduating CU Boulder. Navigate with the following main sections:

Previous Events/Resources
Recordings and presentations of past events. Check out this page if you want to see the presentation from an event you missed!

Undergraduate Opportunities
Opportunities to build your career while you are pursuing your undergraduate degree at CU, including research, teaching, and campus programs.

Applying to Grad School
Resources for choosing graduate programs, writing entrance essays, taking standardized tests, conducting interviews and visits, and finding funding through fellowships/scholarships.

Careers
Advice and resources for using your APS/Physics degree to find a career.

Background
APS/PHYS Professional Development (previously "Beyond Boulder") was started in Fall 2008 by Makenzie Lystrup with support from a National Science Foundation Astronomy & Astrophysics Postdoctoral Research Fellowship. She ran the program through Spring 2011. Emily Levesque led the program from 2011-2014, and Mikki Osterloo of ICLASP from 2014-2016, and Nick Schneider of APS from 2016-2020. Meredith MacGregor has been the coordinator since Fall 2020.

https://www.colorado.edu/aps/undergraduate-studies/professional-development
Nick’s Closing Comments

• Think through whether your goals really require a PhD and if this is how you wish to spend the next 5+ years of your life.
  • Remember that applying after an interval of being in the “real world” is an option.

• Apply to many schools (10-12?) including a bunch that are less competitive
  • If you don’t get into your top choices, would you rather not go to grad school?
  • The best “safety school” is a smaller program with 1-2 researchers you’ve contacted

• Identify your recommendation letters writers early and establish relationships
  • Show them through your actions that you’re ready for grad school; seek their advice
  • Given them a concise list of schools with deadlines easy, a month in advance if possible

• Your personal statement should emphasize skills, projects, verbs, readiness

• If you’re applying next year, do everything possible to get research experience
  • Come to our next event on Tuesday, 5 December to hear many internship offers
Things to know about physics graduate school

Kevin Stenson

I am the Associate Chair for Graduate Studies for CU Physics. This also makes me the chair of the committee responsible for admitting students to the graduate program. What follows are my personal opinions on the topic. You should not take what I’m saying as the ultimate truth. I encourage you to talk to other professors, post-docs, graduate students, etc. before making your own decisions on graduate school. If you have any questions, feel free to send me email: kevin.stenson@colorado.edu
What is graduate school in physics like?

- Generally take core courses (QM1+2, EM1+2, Classical Mechanics, Statistical Mechanics) plus some elective courses (mostly in physics).

- Core courses are much more difficult than undergraduate courses. 2–3 courses is the normal load, with 10+ hours of homework/week.

- You also need to balance course work with either TA or RA responsibilities (~20 hours/week for TA; RA could be more or less).

- By the end of your first year, should be doing research, along with classes.

- By the end of your second year, should be done with classes.

- A physics Ph.D. generally takes 6–6.5 years in total.

- The pay is pretty low: around $40,000 per year. But tuition is covered, so if you live frugally and are not supporting anyone else, you shouldn’t need to accumulate much debt (and any existing student loans are deferred while in grad school).

- **Grad school is tough!**
Is graduate school right for you?

- Are you truly passionate about physics?
- Are you happy to work long hours on physics?
- Are you willing to take another 2 years of very difficult classes?
- Are you OK getting paid very little for the next 6 or so years?
- Are you getting very good grades in your physics and math courses?
- Are you interested in becoming a professor, doing original research, and/or leading a research team?

If you answered yes to all of these questions, then physics graduate school may be for you.
What graduate school is best for you?

- The program size and quality are somewhat correlated, so large schools are generally high quality and have a diverse range of research areas.

- Smaller schools may admit a broader range of students but may not have as many research activities.


- While overall ranking is useful, the quality of your education and your future success depend much more on you and your research advisor. If you have a good idea of what physics you want to do, you should make sure the university is doing good, original research in that area.
How applications are evaluated at CU

- We basically ask two questions:
  - Does the student have the academic preparation and skills to pass the graduate coursework?
  - Does the student have the skills and temperament to pursue an independent research project through to completion of a Ph.D. dissertation?
- The academic preparation is generally evaluated by the applicant’s GPA and physics grades in upper division classes.
- The research aptitude is evaluated by recommendation letters (mainly) and the applicant’s personal statement.
Academic evaluation

- Having a high GPA is important. If there are extenuating circumstances that lowered your GPA, these should be addressed in the personal statement. You should have taken the full breadth of physics courses and math courses.
- Just a few years ago, the General and Physics GRE tests were required nearly everywhere. That is changing and I’m not sure of the best advice. Check the requirements of the programs you plan to apply to:
  - General test can be taken ~anytime by computer at testing center or at home. Shouldn’t need to study; just do 1–2 practice tests so you know what to expect.
  - Subject test is computerized and can be taken during three two-week periods (two in fall, one in spring) at testing centers or at home.
    - You should study for this test, at least by taking practice tests so you know what to expect. It is very easy to run out of time.
    - Should generally take this late so that you have had as many physics courses as possible. However, you may want to take it early in the fall so that if there is a problem, you can retake it later in the fall and still get it submitted in time.
Research aptitude evaluation

- CU requires a personal statement. This is your chance to talk about the research you have done and what fields of physics you are interested in.
  - Your past research description should be factually correct, describe your contributions, and show that you took initiative and were involved intellectually.
  - Your plans for future physics should be well thought out and if there are professors you are interested in working for, you should mention them and what you want to do.
- CU requires 3 recommendation letters. These should be from physics professors who know you well. You can submit more than 3 but you should only do so if they will be good additional letters.
  - The best letters are from professors (preferably physics) who supervised your research (or know you well from discussions, lab courses, etc.).
  - The less useful letters are from professors who only taught courses you were in. Generally, there is not much they can say that we don’t know from the transcript. If you had lots of deep physics discussions with them during office hours, that can be helpful.
  - The least useful letters are from coaches or supervisors at non-physics jobs as they don’t really know what is required for a physics Ph.D.
Random tips on applying

- Don’t be afraid to ask for advice (from professors, post-docs, grad students, etc. about where and how to apply). Have someone (ideally a professor) read your research statement.

- Apply before the deadline.

- Provide your letter writers with information about you to ensure they don’t forget anything. You can send them information about research you have done, awards you have received, etc.

- Apply to a variety of universities so that you have choices.

- If you know what area(s) of physics interest you, include this information. If you are unsure, make it clear that you are exploring and not that you are aimlessly floating.

- Plan to visit at least 2 universities where you get admitted in the spring. They will usually have particular days set aside for visits and it is best to attend at those times (but they will welcome you at any time). You may want to avoid planning a big spring break trip to Cancun.

- During visits, find out if the current graduate students are happy and if there is a place for you doing the research you like with an advisor you like.
Some statistics on CU admissions

- Last year we received 1006 applications
- We admitted 206 students, with 53 accepting our offer.
- Of the students that were admitted last year, the average GPA was 3.86 with a standard deviation of 0.16
- Overall about 10% of students submitted GRE General and 10% submitted GRE Physics scores (same percentage for admitted students). But about 20% of admitted students in theory submitted GRE Physics scores (while only 10% all students in theory submitted GRE Physics scores).
- The AIP provides lots of useful information on physics graduate programs here: [https://www.gradschoolshopper.com/](https://www.gradschoolshopper.com/)
Grad School in the Astrophysical & Planetary Sciences

ASTR/PHYS Professional Development – Fall 2023

Paul Hayne (APS faculty)
Topics:

• What should I expect in astro/planetary grad school?
• How can I get into grad school?
What can I expect in astro/planetary grad school?

• APS offers PhD admission only (no “terminal” masters)
• Coursework: first 3 semesters mostly occupied with coursework and “learning the ropes”
• Finding a research mentor: during or before first year; requires initiative! (Nobody goes without a research mentor/project)
• Comprehensive exam:
  • Fall of third year
  • Research presentation and paper on short project relevant to subfield
  • Usually, but not necessarily related to eventual thesis
• Thesis research:
  • 2-3 years “post-comps”
  • Become the world expert in chosen subfield and topic of research
  • Learn to become an independent scientist and publish
How do grad programs in APS research areas differ?

• Astrophysics programs are most similar to physics programs, expecting similar preparation. Some programs are within PHYS depts.
  • [https://gradschoolshopper.com](https://gradschoolshopper.com) from API
  • [https://aas.org/learn/college-departments-offering-astronomy-related-degrees](https://aas.org/learn/college-departments-offering-astronomy-related-degrees)

• Planetary programs are all different, occasionally “stand-alone” but often joint with astrophysics, earth science or atmospheric science. Sometimes not a “program”
  • [https://dps.aas.org/education/graduate-schools](https://dps.aas.org/education/graduate-schools) for planetary programs
  • open positions at [https://docs.google.com/spreadsheets/d/12yRS2c9-eW4DGLcb3cPgZU759glI_QZjnDk-pth3k4/](https://docs.google.com/spreadsheets/d/12yRS2c9-eW4DGLcb3cPgZU759glI_QZjnDk-pth3k4/)

• Solar & space physics programs are rare but worth checking out
  • [https://docs.google.com/spreadsheets/d/19cTA9vtAokPT9gLQdnyT3PsVdCdjeT-Xeuj696TAthA](https://docs.google.com/spreadsheets/d/19cTA9vtAokPT9gLQdnyT3PsVdCdjeT-Xeuj696TAthA)

➢ “Terminal Masters” degrees in these fields are very rare and very expensive
How can I get into grad school?

• Application process starts in the late summer/early fall
  • Need to identify letter writers (faculty/research mentors) ASAP in fall
  • Start drafting the "personal statement" during the summer/early fall, give time to faculty mentors to read it and provide feedback

• Typical application deadline is around December 1 each year

• Acceptance rates range from ~1% to 25% depending on program and subfield

• Admissions process is done very differently depending on the program/department
How can I get into grad school?

• Qualities sought in applicants/admits are those that signify likelihood of success in the PhD program:
  • Fundamental knowledge (and success in) physics, math, and related coursework
  • Ability to perform (independent) research
  • Creativity
  • Perseverance
  • Professionalism
How can I get into grad school?

• Fundamental knowledge (and success in) physics, math, and related coursework
  • Generally A’s and B’s in these subjects (a ‘C’ is not a deal-breaker, though)
  • Upward trend looks good
  • Explain any particularly poor performance in the personal statement as appropriate
How can I get into grad school?

• Ability to perform (independent) research
  • Summer REU or similar
  • Part-time research during academic year w/ faculty mentor
  • Honors thesis
  • Class project!
  • Intensive technically oriented hobbies
How can I get into grad school?

• Creativity & Perseverance
  • Personal statement should tell a story about these as appropriate

• Professionalism
  • Letters of recommendation should vouch for you
  • Personal statement should show clear commitment and understanding of what a PhD means for short- and long-term career plans/aspirations
What if I decide grad school isn’t for me?
(And that’s Ok!)