

Things to know about physics graduate school

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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 like?

- Generally take ~6 core courses (QM1+2, EM1+2, Classical Mechanics, Statistical Mechanics) plus some elective courses (mostly in physics).
- The core courses are much more difficult than undergraduate courses. Two–three courses is the normal load, with 10+ hours of homework per week for the core courses.
- You will 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, you will be doing research, along with classes.
- By the end of your second year, you will be done with classes.
- A physics Ph.D. generally takes 6–6.5 years in total.
- The pay is pretty low: around \$25,000–\$30,000 per year. But tuition is covered so if you live frugally and are not supporting anyone else, you don't need to go into 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 often pretty well correlated so large schools generally have pretty high quality and they also offer a diverse range of research areas.
- Smaller schools may admit a broader range of students but may not have as many research activities.
- To evaluate schools, can start with U.S. News & World Report: grad-schools.usnews.rankingsandreviews.com/best-graduate-schools/search?program=top-physics-schools&sort=program_rank&sortdir=asc or the National Research Council data: chronicle.com/article/NRC-Rankings-Overview-Physics/124754/ and www.phds.org/rankings/physics
- Colorado is generally around #20 overall and #1 for AMO so keep that in mind when considering the statistics that follow. It is likely that higher ranked institutions are harder to get into and lower ranked institutions are easier to get into.
- While overall ranking is useful, the quality of your education and your future success will 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

- On deciding whether to admit students we are basically asking 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 GPA and scores on standardized tests (GRE General and Physics) plus transcript.
- The research aptitude is evaluated by recommendation letters (mainly) and the applicant's personal statement.

Academic evaluation

- Nearly all schools will require GRE General and Physics subject test scores:
- The general test can be taken ~anytime by computer or on 2 dates in the fall (and one in the spring) on paper. You can probably take this any time after your junior year. Shouldn't need to study but you should do a practice test so you know what to expect.
- The subject test is offered twice in the fall (and once in spring) by paper only.
 - 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.
- 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.

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 particular professors who 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.
 - 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, then it could be OK.
 - The least useful letters are from coaches or supervisors at non-physics jobs as they cannot provide meaningful comparisons.

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).
- Apply before the deadline
- Provide your letter writers with information about you to make sure that they don't forget anything. You can send them bullet points about what research you have done, what awards you have received, etc. and let them decide what to include.
- Unlike college admissions, we are not too interested in extra-curricular activities. We want to know that you are 100% devoted to physics. Saying you are an avid skier and that's why you want to come to Colorado will NOT help your case.
- Apply to a variety of universities so that you have choices.
- If you know what area(s) of physics interest you, be sure to include this information. If you are unsure, you want to make it clear that you are still 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.

Some statistics on CU admissions

- Last year we received 750 applications
- We admitted 185 students and end up with ~53 matriculating.
- Of the students that were **admitted** last year we have the following statistics related to academics:

	Average	Std Dev	Low	High
GPA	3.8	0.2	2.8	4.00
GRE Physics	882	100	540	990
GRE Quant	166	4	148	170
GRE Verbal	161	6	146	170
GRE Writing	4.3	0.8	2.5	6.0

- Being on the low end of these ranges will require superb research credentials to be admitted.