

What is graduate student anyways and what do you do all day?

Notes from a talk for San Fernando High School Students on 11/15/06

What is a graduate student?

Hi. My name is Amy. I am a graduate student here at USC. This means I already went to college and have a bachelor's degree. Now I'm working towards a PhD in physics. This is my fourth year here. The goal is to finish in five years. Some people do, but six years is also typical. Five or six years may sound like a long time, but it goes by quickly.

Being a graduate student is different than being an undergraduate student. The first major difference is that you get paid. Well, not exactly for being a student. If you are lucky and get a fellowship then someone else pays your tuition plus living expenses so that you can study and do research without having to worry about money. If you are not so lucky then you have to work for your money, either as a teaching assistant or a research assistant. As a teaching assistant you might run a lab or discussion section for the undergraduate students or grade homework or exams. It can be a lot of fun. (Homework grading is not so exciting)

As a research assistant you are working on a research project with a professor

So you probably get the idea that you do a lot more than take classes. Normally you finish most of your coursework in the first two years. The rest of your five to six years you are learning to be an independent researcher.

Why should I get a PhD and what can I do with it?

The primary purpose of a PhD is to train a student to be an independent researcher. A PhD program is like an apprenticeship. You work with a professor who is your "advisor" and oversees your research project.

Main job as a scientist:

1. Become familiar with the work that other people have done
2. Identify interesting and unanswered questions
3. Devise a way to answer the question
4. Carry out your experiment: get results
5. Share your results with others

One of the most exciting aspects of being a scientist is that you get to work on something that no one else has ever done before.

What does a typical day look like?

I can't say that I have a typical day, which is one of the nice things about being a graduate student. Typical activities include:

- Reading journal articles.
- Talking with your advisor and other students about what you are working on
- Going to listen to other scientists talk about the work they have done
- Working on my research project. What that looks like depends on what you are working on and who you are working with.

One of the major distinctions in physics is between theorist and experimentalist. If you are an experimentalist you are working on an actual experiment. You work in a lab. You have to set up and maintain the equipment. You take data and make measurements and build devices. You might make measurements that no one has done before or devise new ways to take measurements. Often things don't go exactly the way you plan so there is a lot of problem solving involved.

I'm a theorist, which means I spend most of my time or working at my desk or on the computer. This means I don't wear a lab coat. I might make some calculations with paper and pencil, write a computer program that does some complicated calculations or simulates some system that I'm studying.

For both theorists and experimentalists you have a question you are trying to answer. You study this question and you come up with some results. Once you have these results you need to share them with the rest of the scientific community. It's not good enough to find something new, you need to let other people know about it. The first way to do this is by writing up your results and publishing it in a scientific journal. Before your work is published it is read by other scientists who evaluate what you have done and give feedback. Then you go to conferences where you can give a talk about your results and listen to others or you might go visit another universities or lab to present your work.

Why should I be a graduate student?

Besides getting paid to learn and besides working on some question that no one else has worked on, there are some really great aspects of being a graduate student. One is that you often have a lot more flexibility in when you work and what you do than in a typical job. This may also depend on who you work with. Compared to having a "real" job you have a lot more independence in how you structure your time.

Another is that you get to work with some really exciting and interesting people. Science is an international collaboration. You get to work with people from all other the world and often you even get to travel to other parts of the country and world.

How do I become a graduate student (in physics)?

Go to college and study physics or another science. Get involved with research as an undergraduate student during the school year or over the summer. In your final year you take some tests, write some essays and apply for graduate school. But you don't have to wait until then. Now you can take math and science courses, stay curious about the world around you and look for summer research opportunities for high school students.