

# NOVICE GUIDE TO A PHD IN THE BIOLOGICAL & BIOMEDICAL SCIENCES

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

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Office of Graduate Education (OGE)

*This guide was developed by the graduate student members of the Professional Development Committee for the UNC Initiative for Maximizing Student Diversity (IMSD). It includes a **PhD Glossary** of commonly used terms and answers to **Frequently Asked Questions (FAQs)**. The guide was written for someone who knows very little about science culture and graduate school so that grad students could share this with their family and friends.*

GOOD LUCK AND WELCOME TO SCIENCE!

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## FAQs

### **1. What is grad school like?**

While the research will vary student to student, the first year of grad school in the BBSP is spent taking core classes, developing communication and critical thinking skills, and doing three rotations (a sort of trial period to see which lab and research interests the student most). After completing these rotations each student selects a lab to join. In the second year, students complete remaining coursework, and delve into their research. Generally years 3+ are spent primarily conducting research, writing papers, and attending conferences. Graduate school is a training period that will teach students project management, communication skills, how to work as a team, among many other things. Although graduate students spend a lot of time doing research, that doesn't mean they are always doing the same thing. Students often have several different sub-projects going on at once, which means they are focusing on several different tasks. At times the student's research will be very difficult and trying but at other times it will be very rewarding. During difficult times, encourage your student to talk to their peers and to seek advice from others at the university. During successful times, encourage the student to celebrate their successes!

### **2. When are you going to graduate?**

Graduation depends on a lot of factors, many of which are out of your student's control. The average PhD for BBSP students at UNC takes 5.5 years and requires that students complete coursework, written and oral qualifying exams, and successfully complete research that significantly contributes to our society's scientific knowledge. Many, but not all departments, require that this research results in at least one first-author publication. Even after a student publishes a first author paper, his or her PI or committee may not feel that the student is ready to graduate and move on to a more independent position.

### **3. Do you have summers off?**

No, the stipend or salary that graduate students in BBSP receive is for working throughout the year, not just when class is in session at the university. Students may take vacations/time off and should work with their PI to schedule this time. However, research work is often not flexible and students may not be able to easily take off work.

### **4. If you are done with classes, does that mean you are about to graduate?**

No, graduate students usually finish classes in their first two years of graduate school but the average PhD for BBSP students at UNC takes 5.5 years. The years following completion of classes are spent focusing on research and professional development.

### **5. Do graduate students pay tuition?**

Tuition must be paid for graduate students as they are enrolled in the university, but students who enter graduate school through BBSP are not responsible for paying tuition. Tuition and student fees will be paid by BBSP the first year and the PI of the lab the graduate student joins after that.

### **6. Why are you getting paid to go to school?**

Graduate students in BBSP are paid to conduct research and at times assist in teach courses. While this research does contribute to the successful completion of the student's PhD, it is also work that is being done to further the scientific goals of the student's PI.

### **7. If this is like a job, do you have benefits?**

Yes, graduate students receive health insurance. Your student will receive more information on their plan that is provided through Blue Cross Blue Shield North Carolina and includes vision coverage.

### **8. I have this medical ailment, can you tell me what's wrong with me/what medicine to take?**

While your student may do research on a health related topic, they are not qualified to diagnose or treat the specific health topic they research. They are also not qualified to diagnose or treat other medical ailments. Graduate students do not take medical or pharmacy school classes. Although they have detailed knowledge about the specific diseases they study, they don't receive the broad-based medical training needed to assist someone with an ailment. Even though the research done by graduate students and other scientists is the source of very many advances in medicine, scientists are not geared toward treating individual people.

### **9. Why are you working at night and on the weekend?**

It can be difficult to predict the timing of various research projects that may require graduate students to work longer or different hours than they had originally planned. Working with living things including bacteria, human cell lines, flies, and mice can also require specific attention that cannot be confined to the 9 to 5, Monday to Friday traditional work hours and may prevent students from easily taking vacation. Students may also work at night and on the weekend because they are genuinely interested in solving the current research question. However, if your student is working unhealthy hours and not maintaining basic self hygiene and mental health, encourage them to take time off to rejuvenate so that they can work more efficiently.

### **10. I'm coming to town tomorrow, can you take off work?**

It is often not possible for students to take off from work without advance planning. Many experiments span several days and not completing the experiment because the student has taken the day off could waste hundreds of dollars.

### **11. Can you get sick from the bacteria/virus/animal you work with?**

Strict health and safety guidelines are in place in all labs at UNC. Most substances that students work with are not infections so students cannot get sick from them. If a student is working with a potentially dangerous substance, they will be fully trained in the safety procedures and will be safe if they follow those procedures at all times. If a student does become sick or get injured while working in the lab, employee health will cover their treatment.

### **Additional Resources**

[Things I Tell My Mom](#) blog

## PHD GLOSSARY

**Abstract** - A short summary of all the work and findings/discoveries in a research paper.

**Advance to Candidacy** - Having completed the required coursework and exams such as comprehensive or oral exams, leaving only research work until the student completes their PhD. However, this does not mean the student has any a set timeline for when they will be prepared to graduate.

**BBSP** - Biological and Biomedical Sciences Program. Graduate students enter graduate school through this program, which encompasses all graduate departments, and choose the graduate department and research lab they will work in for the remainder of their graduate training by May of their 1<sup>st</sup> year.

**Become a Doctoral Candidate** - Similar to “advance to candidacy.” When a graduate student has completed all academic prerequisites in their chosen graduate program, including coursework, teaching assistantships, and passed their comprehensive/oral exams; however, the research has not been completed. This is generally considered Masters degree qualifications.

**Biochemistry** - the study of chemical processes within and relating to living organisms.

**Bioinformatics** - an interdisciplinary field (biology + computer science) that develops methods and software tools for understanding biological data.

**Biology** - the study of life and living organisms, including their structure, function, growth, evolution, distribution, and classification.

**Biophysics** - an interdisciplinary field (biology + physics) aimed at understanding the interactions between various systems of a cell, including interactions between DNA, RNA, protein, and how these interactions are regulated.

**Cell, Nature, Science Journals** - Considered by many to be the most prestigious places for publication of completed research. Having research published in one of these journals (like a magazine) can look very good when applying for a job.

**Cell Biology** – a branch of biology that studies cells – their physiological properties, structure, organelles, interactions with their environment, their life cycle, division, death, and function.

**Chemistry** – a branch of physical science that studies the composition, structure, properties and change of matter.

**Collaborator** - Another researcher who the student or entire research lab works closely with to complete research. The collaborator often uses a very different method to study the same thing.

**Thesis Committee** - A committee of faculty members usually chosen by the graduate student from his or her department or closely related departments. This committee reviews the student’s work throughout their time in graduate school, helps lay out a plan for his or her thesis/dissertation, and determines when the student’s work is sufficient for graduation.

**Committee Chair** - The chair of a student’s thesis committee is a faculty member in the same department as the student. Some departments allow the student to choose their chair while others

assign the chair from the faculty members the student has chosen for their committee. The committee chair can act as an academic advisor and should insure the student's research is proceeding in such a way as to guarantee the student's graduation and to contribute to the great scientific knowledge base.

**Committee Meeting** - A meeting with a graduate student's committee to review his or her research progress. A positive committee meeting can move a graduate student closer to graduation. Graduate students are expected to have a committee meeting at least once a year.

**Comprehensive Exam (Comps)** - See also qualifying exam, preliminary exams. Exams usually taken sometime between the end of the student's first year through his or her third year. The format of the exam varies by department but usually tests the student's knowledge over a larger body of scientific research. This ensures that the student has been exposed to a broader scientific base than just their research topic. Students must successfully pass the exam in order to progress towards becoming a doctoral candidate.

**Computational Biology** – the development and application of data analysis and theoretical methods, mathematical modeling, and computational simulation techniques to the study of biological systems.

**Conference** - A meeting attended by other researchers who work on similar research questions. A conference can be held locally, to highlight work from across different UNC departments, or nationally to bring together researchers from different universities. See more information on what a conference is like at <http://thingsitellmymom.com/scientific-meeting/>

**CV or Curriculum Vitae** - Similar to a resume but may include your entire life's work, including dissertation titles, publications, awards, research funding, etc.

**Defend** - To publically present your thesis work to your committee, peers, and anyone else who is interested in attending. Successfully defending your thesis is the last step in completing a PhD.

**Defense** - The event at which a student presents and defends his/her thesis work. This event represents the final requirement before being awarded a PhD. A student's defense is often more important and a bigger accomplishment to them than the actual graduation ceremony.

**Department** - An administrative group within the university made up of faculty interested in similar research and scientific topics. The department a student joins often dictates the subject area that the student's PhD will be in; for example, a student in the Department of Chemistry will receive a PhD in Chemistry.

**Developmental Biology** – the study of the process by which animals and plants grow and develop.

**Dissertation** - The independent research project conducted and completed by a graduate student. This can refer to the entire body of work a student has produced or the specific written document. Often used interchangeably with thesis.

**Fellowship** - An award granted to a graduate student by a source outside the student's university that helps cover the student's stipend (salary), tuition, research costs, or travel to conferences.

**First Author** - When research is published in the biomedical sciences, everyone who contributed

to the work is listed as an author of the paper. Those authors are listed in order where the first author is the person who made the most significant contribution to the work and the last author is the person that funded the project, usually the PI. Therefore, being a first author on a publication means that a student successfully did a significant amount of work.

**Genetics** – the study of genes, heredity, and genetic variation in living organisms.

**Graduate Student** - Any student taking courses and receiving training towards completion of a Masters or PhD degree.

**Grant** – (1) The written document describing a proposed research project submitted to a funding agency including governmental departments and non-profit organizations in order to gain funding to conduct the proposed research. Also called a grant proposal. These proposals may or may not be funded by the agency following submission. (2) The money awarded after submission of a successful grant proposal.

**Group/Lab Meeting** - A meeting, usually held weekly, of all undergraduate students, graduate students, postdocs and research scientists working in the same lab and/or for the same PI/boss.

**High Pass/Pass/Low Pass/Fail** - Grades given for graduate classes. High Pass means the student did above and beyond what was expected from students in the class. High Passes are not frequently given. Pass is the minimum evaluation needed for the class to be considered completed and to count towards the student's degree requirements. Low Pass and Fail mean the course was not satisfactorily completed and must be retaken to count towards the student's degree requirements.

**Immunology** – the study of all aspects of the immune system.

**Joining a Lab** - Students entering graduate school through BBSP are required to do rotations in a minimum of three different labs during their first year. Through a mutual selection process, the student then joins one of those three (or more) labs in which to conduct their dissertation research. Joining a lab is exciting because it means the student has a better idea of what their research will focus on for the coming years and the people they will be working with.

**Journal** - A collection of publically disclosed research. Journals were traditionally distributed like magazines but now are primarily online. Research published in journals is peer reviewed.

**Lab** – (1) The physical space in which a student conducts research. Unless the student works exclusively on the computer, the lab will house all the machines and materials needed to conduct research and will likely have an adjacent office space. (2) The collection of people who work on similar research and for the same PI/boss as the student.

**Lab Meeting** - See Group Meeting

**Meeting (as in a national meeting)** - See conference.

**Mentor** - A trusted adviser. Graduate students may refer to their PI as their mentor or may refer to other professors, university staff, or individuals outside the university who give them advise on their career as their mentor.

**Microbiology (including bacteriology and virology)** – the study of microscopic organisms

(single cell, multicellular, and acellular), including the sub-disciplines virology, mycology, parasitology, and bacteriology.

**Molecular Biology** – the study of molecular basis of biological activity between the various systems of a cell including DNA, RNA, proteins, and their biosynthesis, and how these interactions are regulated.

**Neurobiology (neuroscience)** - the study of all aspects of the nervous system.

**Nutritional Biochemistry** - an interdisciplinary field (biochemistry + molecular biology) aimed at understanding the clinical relevance of molecular metabolism and the role nutrition plays in cellular differentiation, tumor growth, chronic disease, gene regulation, and cognitive development.

**Oral Biology** - the study of the growth, development, and pathologies of the craniofacial complex, oral cavity, and associated physiological structures, and the disease and healing mechanisms related to these structures.

**Oral Exam** - An exam in which the student presents over a scientific topic to his or her committee and the committee asks oral questions over the presentation. The subject of the presentation varies between departments and the exam may be taken between the end of the student's first year through his or her third year depending on his or her department's requirements.

**Paper** - The organized and written summary of completed research published in a journal following peer review. What does this look like? Find out at <http://thingsitellmymom.com/scientific-paper/>

**Pathology** - the study of the causes and effects of disease.

**Peer Review (Review for short)** - The process in which a small number of scientists (usually three) evaluate the research of another scientist or group of scientists in order to ensure the research was properly conducted and is adequately described.

**Pharmaceutical Sciences** - an interdisciplinary field concerned with the design, action, delivery, and disposition of drugs.

**Pharmacology** - the study of the interactions between living organisms and chemicals that affect their function.

**Physiology** - the study of the normal function of living systems.

**Prospectus** - Also called a thesis proposal. A paper, varying in length depending on department, putting forth a proposal for what the graduate student will work on for the remainder of their time in graduate school. It will present a proposed thesis/dissertation topic with details on how the student will explore that topic and what the goals for discovering new scientific knowledge are. The prospectus must be approved by the student's thesis committee.

**PI** - Stands for principal investigator. The scientist employed by the university and awarded money to conduct research and lead a lab. A student's PI is their direct superior or boss.

**Postdoctoral "Postdoc" Position** - A temporary position, usually in research, taken after completing a PhD to gain additional experience.

**Poster** - A large, printed display of a student's research. Posters are often presented at conferences.

**Preliminary Exam (Prelim)** - See also **comprehensive exam, qualifying exam**. Exams usually taken sometime between the end of the student's first year through his or her third year. The format of the exam varies by department but usually tests the student's knowledge over a larger body of scientific research. This ensures that the student has been exposed to a broader scientific base than just their research topic. Students must successfully pass the exam in order to progress towards becoming a doctoral candidate.

**Publication** - See paper. Publication denotes that the paper has been peer reviewed and published rather than just written.

**Qualifying Exam (Quals)** - See comprehensive exam, preliminary exams. Exams usually taken sometime between the end of the student's first year through his or her third year. The format of the exam varies by department but usually tests the student's knowledge over a larger body of scientific research. This ensures that the student has been exposed to a broader scientific base than just their research topic. Students must successfully pass the exam in order to progress towards becoming a doctoral candidate.

**Research Assistant (RA)** - Your student's official employment title. This is a form of financial aid in which the graduate student is paid for the research work they do. Students may also serve as a teaching assistant to cover their salary although this is not required for all programs.

**Review** - 1. To evaluate a paper written by a group of scientists unrelated to the student. See peer review for more information. 2. A type of publication or paper that summarizes the previously published research on a specific topic but often does not present any new information.

**Rotation** - 12-week period during which a student works in a lab on a trial basis. Students in BBSP are required to do a rotation in three different lab during their first year before choosing the lab they will do their dissertation research in.

**Scientific Society** - A group of scientists who have similar interests in research topics and/or social issues. This group of scientists can be local or from across the country or world. Membership in a scientific society often requires payment of yearly dues which entitles the student to attend conferences hosted by the society at a reduced rate and gives the student access to resources put together by society members. Learn more at <http://thingsitellmymom.com/what-is-a-scientific-society/>

**Seminar** - A regularly scheduled meeting of a university department or other like minded group of scientists during which one scientist gives an oral presentation of their work. Students are often required to present at their department seminar at least once during their graduate training.

**Stipend** - The money a graduate student is paid beyond tuition and fees. This is considered a salary paid to the student for their work in the research lab.

**Symposium** - Similar to a conferences or national meeting but only one day or shorter in length.

**Teaching Assistant (TA)** - This is a form of financial aid in which the graduate student teaches or assists in teaching a class or grading in order to earn a portion of their salary or stipend.

**Thesis** - The independent research project conducted and completed by a graduate student. This can refer to the entire body of work a student has produced or the specific written document. Often used interchangeably with dissertation.

**Thesis Committee** - See committee.

**Thesis Proposal** - Also called a prospectus. A paper, varying in length depending on department, putting forth a proposal for what the graduate student will work on for the remainder of their time in graduate school. It will present a proposed thesis/dissertation topic with details on how the student will explore that topic and what the goals for discovering new scientific knowledge are. The proposal must be approved by the student's thesis committee.

**Toxicology** - an interdisciplinary field (biology + chemistry + medicine) concerned with studying the adverse effects of chemicals on living organisms.

**Training Award** - Similar to a fellowship but often from a source within the student's university and awarded for a shorter time, often one year.

## **SOURCES**

- <http://bbbsp.unc.edu>
- Wikipedia