

UNCW Department of Biology and Marine Biology

INFORMATION AND SUGGESTIONS FOR STUDENTS WHO ARE CONSIDERING GRADUATE SCHOOL IN THE BIOLOGICAL SCIENCES

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Another excellent document on this topic by Walter Carson dated 10/1999 can be found at:

http://www.esa.org/education_diversity/webDocs/articlesPrimer.php

Overview of Some Important Facts about Graduate School

There are key structural differences between undergraduate and graduate programs. Graduate school is not simply a continuation of college, only with more advanced courses. Graduate programs do require some coursework. A central part of most graduate degrees in the sciences, however, is an extended original research project that each graduate student must plan and execute. This research is performed under the guidance of the student's graduate advisor. The graduate advisor, also sometimes called the student's "major professor", is a member of the faculty in the graduate school. Finding an appropriate graduate advisor is critical to one's success as a graduate student. The match between student and advisor should be a deciding factor in choosing a graduate program, not simply the reputation of the graduate school as a whole. Some guidelines on finding and contacting prospective graduate advisors are presented in the next section.

When a student is accepted into a graduate school, it means that the graduate faculty there think the student has potential as a scientist. Attending graduate school should be viewed as a privilege, not the right of anyone who has finished an undergraduate degree. Graduate students are expected to show focus, dedication, and initiative.

The two basic kinds of degree programs that are offered in the natural sciences are the Master of Science (M.S.) and the Doctorate of Philosophy in Science (Ph.D.). There are many career opportunities at the Master's level, but some careers require a Ph.D. Becoming a tenure-track professor at a university is one example of a career path that requires a Ph.D. Some people who wish to obtain a Ph.D. earn an M.S. degree first, but highly qualified students can be accepted directly into Ph.D. programs from their undergraduate institutions.

The time it takes to earn a graduate degree can vary widely, but as a general guideline one can assume that it will take two to three years to earn an M.S. and four to six years to earn a Ph.D. The write-up of one's research at the Master's level is called the Master's Thesis, and at the Ph.D. level it is called the Doctoral Dissertation.

Many students mistakenly think they must put graduate school off in order to save money for the tuition and other expenses. Yet if a student has earned excellent grades in college, significant research experience (in summers or as an honors project), has scored well on the Graduate Record Exam (GRE), and has found a graduate advisor who is supported with grant funding, that student can usually expect financial support for graduate studies. This support might come in the form of a teaching assistantship (TA) that is paid by the institution. For example, graduate students frequently teach lab sections of undergraduate classes. Financial support might also come in exchange for working on the professor's research projects. This kind of financial support is called a research assistantship (RA), and is paid out of grant money awarded to the professor.

The life of a graduate student is far from luxurious, but the support students receive usually allows them to cover tuition and defray at least some of their living expenses. Awards vary widely, but

might range anywhere from \$10,000 to \$30,000 per year. Support is usually awarded to incoming graduate students on a competitive basis, with those who have the best records receiving first priority.

Additionally, highly qualified students can apply for graduate fellowships. Two sources of such fellowships are listed below. Students who are awarded these prestigious fellowships effectively bring their own funding to graduate school, and for this reason they may even be actively recruited by graduate programs. But rising Seniors must be very well prepared to apply: Applications are due in November. Writing the application in the format of a grant proposal may increase one's chances of receiving a fellowship. A student who is applying should consult with his or her prospective graduate advisor or another professor to develop and submit a properly developed proposal.

- 1) NSF Graduate Research Fellowships: <http://www.nsfgrfp.org/>
- 2) STAR Fellowship: <http://www.epa.gov/ncer/fellow/>

A prospective graduate student competes not only to be admitted to a program, but also for financial support. Therefore, achieving an excellent undergraduate record can be viewed as a long-term investment. Most scientific fields are extremely competitive, and there isn't much room for the students who wait until the last few semesters of college to focus and work hard. There are exceptions to every rule, but a GPA of 3.0 is usually the minimum to be accepted into graduate school, with most successful students having a much better record than that.

It is also essential to have serious research experience. Research internships in the summer and completion of an honors thesis demonstrate your aptitude and ability to work independently. Paid, prestigious summer research internships have application deadlines early in the year (in November/December), so you must plan ahead. Successful students not only get research experience as undergraduates, they may even present their research at national scientific conferences or publish their research in a scientific journal.

It is the responsibility of the student to research his or her desired career goal and then decide whether graduate school is the appropriate route to take. If it is, then it is up to the student to identify potential graduate advisors and make the strongest possible application. A student's undergraduate faculty advisor is a good resource in this process and can help him or her make these important decisions. Attending graduate school is a serious commitment. It requires maturity and self-motivation. Above all, it requires thousands of hours of hard work.

Identifying and Contacting Prospective Graduate Advisors

One way for a student to find a graduate advisor is for an undergraduate professor to recommend him or her to a colleague at another institution. Investigating who is active in the student's preferred areas of research is a more typical way of identifying prospective graduate advisors, however. Skimming current scientific journals, magazines and books is one good way to find out who is active in different areas of research. Searching in "Google Scholar" is a good way to start. For aspiring marine biologists, taking summer courses at marine research laboratories is an excellent way to meet graduate faculty from many different institutions. See the appendix at the end of this document for a list of selected marine laboratories where summer field courses are offered.

Once a student has a list of prospective graduate advisors, he or she should contact those professors. This is common practice and students do not need to feel self-conscious about it. Because the application process is time-consuming and expensive (most graduate schools have a \$50-100 application fee), it is important for students to narrow their choices down. It is unlikely that professors will accept students from just an application—prior correspondence with the professor is key. Most students apply to 3-5 graduate programs.

One courteous way to go about contacting professors is to write to them, and then to follow up about two weeks later if there is no response. An introductory e-mail letter should briefly describe a student's background and interests. This letter must be very professional. You need to explain why you are interested in the professor's work. It is usually not enough to just look over their web page; you will need to read and understand their papers, and explain how your background and interests mesh with theirs. The student should politely ask whether the professor will be taking any new students. It is also appropriate to ask whether there are funds available for student support. If this conversation goes well and the match seems like a real possibility, the student should make every effort to visit the professor at his or her institution. This provides a chance for the student to speak with the professor and with the professor's graduate students who are already enrolled there. A student will want to assess a professor's working style, and the demands that he or she places on graduate students. A reasonable fit between personalities, as well as intellectual interests, is important for the student-advisor relationship to be as productive as possible.

The Admissions Process

Typically, there are two stages to the admissions process once a completed application has been received by a graduate school. In the first stage of consideration, the applicant's record will be compared with some general criteria that the program has established. If the applicant does not meet the minimum established criteria, he or she will most likely be "rejected on standards."

If the applicant has met or exceeded the general criteria, however, then the application will be available for the graduate faculty to review. In many programs, a student is only accepted if a member of the graduate faculty decides that he or she would be willing to act as a graduate advisor to that student. It is therefore perfectly possible for a student to meet the general criteria for admission to a program, yet still be rejected for lack of a graduate advisor. Such a student is said to be rejected "for space considerations." This is why it is so important to contact graduate faculty ahead of time.

The completed graduate school application reflects the student's efforts in a number of different areas. Not every applicant will be outstanding in every area, but it is important to be strong in as many areas as possible. The most common components of a graduate school application are: The student's undergraduate records, his or her scores on the Graduate Record Exam (the General GRE and sometimes the Biology GRE), letters of recommendation, and a "statement of intent" that describes the student's research interests. Each of these factors is discussed in more detail below.

Undergraduate Record

Ideally, the prospective graduate student's transcript will display both excellent grades and a selection of challenging courses. A double major or minor does **NOT** necessarily boost one's chances of being admitted to graduate school, but graduation with Honors will. Some graduate programs require completion of full sequences of calculus, calculus based Physics, and Organic Chemistry. A course in Statistics is strongly advised. As noted above, an overall GPA of 3.0 on a 4.0 scale (a "B" average) is usually the minimum undergraduate average that a graduate school will accept. Many programs pay particular attention to the student's grades in the final 60 credit hours, on the assumption that most of the student's major courses were taken in that period.

Other components of a student's undergraduate experience that may be important include related work (either volunteer or paid), internships, special summer programs or courses, directed independent study, or research experiences that resulted in presentations or publications. Any serious undertaking related to one's chosen field can be impressive. While extra-curricular activities are valuable, however, they will not take the place of a good academic record.

Graduate Record Exam

The application packet from a graduate school will indicate what exams are required. Most graduate programs require that applicants take the General Graduate Record Exam (GRE). Graduate schools may choose to disregard one or more parts of the test, or to weight one part more heavily. In addition, some graduate programs in both Biology and Marine Biology require the Subject GRE in Biology. More on the GREs can be found here: <http://www.ets.org/gre/>

Students can take the GREs as many times as they wish to pay for them, but cannot choose to omit scores from the reports that are sent. The only way that a score will not be recorded is if the student cancels it at the test site. Although most graduate programs will use only the best scores that a student earned when considering him or her for admission, it is probably **NOT** advisable for students to take the GREs many times over 'for practice.' It is far better to prepare well for the General and Biology GREs, take them once or twice, and score as well as possible.

One of the best ways to prepare for both the General and Biology GRE is to practice answering old exam questions. Several different companies, including the Educational Testing Service (ETS) that administers the exam, publish preparation books and have online courses of study for preparing for the exams. For example, see: <http://www.kaptest.com/GRE/Home/index.html>

The timing of the exams is important. Rising Seniors should take the General GRE anytime they feel prepared. In preparing for the Biology GRE, it is important to have completed basic courses in each of the areas that are on that exam. The student will also want to make sure that he or she takes both exams in time for the score to be reported by the application deadline.

It is best to take the General GRE and Biology GRE on different days. Although it is possible to take them on the same day, it would mean concentrating on difficult exam questions for six hours or longer. Fatigue might cause a student to score lower than he or she otherwise normally would.

Letters of Recommendation

Most graduate institutions request three references and include standard forms for this purpose in their application packets. These forms usually ask the person evaluating the student to rate him or her in categories such as intellectual talent, perseverance, and academic achievement. A student should request references from those faculty members who have had an opportunity to get to know him or her, for instance, perhaps the student participated in a small class or worked (either as a volunteer or for pay) in that professor's lab. In addition, the forms usually have a small space for writing further comments about the students. If a professor knows a student well, however, he or she will often write a separate letter of recommendation on official letterhead. A detailed letter from a professor can be an important factor in getting accepted into a program and getting a fellowship or other financial award. A good letter is not likely to arise solely from being in a class with a particular professor.

As a general rule, at least two of the three reference writers should be professors in the student's major area of study. The third can be a professor in a related area of study, or a supervisor from related internship experience, employment or volunteer work. It is also sometimes appropriate to have additional letters of support written by others. Additional letters can testify to the depth of a student's experience or commitment to a given field, but they should be used sparingly. Letters of reference written by people who have no basis for judging a student's potential in his or her chosen field appear frivolous. It is also not recommended that you ask for letters from someone with whom you have had little or no contact with in the last 2-3 years.

Professors have many demands on their time, so students should be organized to simplify the reference writing process. Students should include in each request **ALL** of the needed reference information as well as a copy of the student's statement of intent and a note reminding the professor of what course(s) he or she was enrolled in that were taught by the professor (include dates and final

grades). These things should be included so that the reference writer can write accurately about the student without having to dig up the old records or strain to remember details of conversations with him or her. Students should also remember to thank faculty and others who have taken time to write references.

Statement of Intent

Also sometimes called a "statement of interest," the statement of intent is an opportunity for the applicant to play up individual strengths. It is a chance to mention any relevant extra-curricular experience, especially if the experience has shaped the student's current interests.

It is advisable for a student to have a professor critique a draft of his or her statement of intent. A good statement strikes a balance: It indicates that the student has identified some possible areas of research without being too broad (e.g. "I love the ocean and I want to study all marine life") or too narrow (e.g. "The only topic I will consider researching is the morphology of the collagen fiber lining of the frontal nasal sac found in the echolocating system of the North Atlantic harbor porpoise").

The statement of intent is the one factor in the entire graduate application that is under his or her complete control. Students should seize this opportunity to make a positive impression by submitting a thoughtful, well-written statement of 1-3 pages.

Suggested Timetable

Freshman & Sophomore Years

- *Get on track with first classes in your major
- *Earn best possible GPA
- *Apply for work/internships (paid or not) in field or lab, both during the academic year and full-time in summer
- *Volunteer to work with a professor in the lab or field (see <http://www.uncw.edu/bio/biomer.html> for specific suggestions on how to do this)

Junior Year

- *Maintain high GPA
- *Take initiative in upper level classes and talk with professors
- *Do additional volunteer work, directed independent study, internship or special summer courses in area of interest
- *Focus on undergraduate research or honors project, present findings at local or national scientific meeting, work toward a publication in a scientific journal
- **Spring & Summer: Study for GRE exams, begin researching graduate programs and potential advisors

Senior Year

- *Maintain high GPA
- *Fall: Obtain applications from graduate schools; start contacting potential faculty advisors take GRE exams,, visit selected graduate institutions, organize references, prepare Graduate Fellowship applications
- *Spring: Make a decision, notify programs of plans

APPENDIX

Selected Marine Laboratories that Offer Summer Courses:

Bermuda Institute of Ocean Science -- Bermuda
http://www.bios.edu/education/summer_courses.html

Duke University Marine Laboratory – Beaufort, NC
<http://www.nicholas.duke.edu/marinelab/programs/undergraduate/>

Friday Harbor Laboratories -- Friday Harbor, WA
<http://depts.washington.edu/fhl/>

Gulf Coast Research Laboratory -- Ocean Springs, MS
http://www.usm.edu/gcrl/summer_field/index.php

Oregon Institute of Marine Biology -- Charleston, OR
<http://www.uoregon.edu/~oimb/>

Shoals Marine Laboratory -- Appledore Island, ME
<http://www.sml.cornell.edu/>

REU (Research Experiences for Undergraduates) Programs in Marine Sciences:

NSF list of all REU sites in the Biological Sciences:
http://www.nsf.gov/crssprgm/reu/list_result.cfm?unitid=5047

National Science Foundation Graduate Research Fellowship Program
<http://www.nsfgrfp.org/>