

From: [retracted]

Sent: Monday, May 12, 2008 11:51 AM

To: Pawlik, Joseph

Subject: Post Graduate advice

Dear Dr. Pawlik,

I have just graduated and feel more or less as if the rug has been pulled out from under me. I am not in any position of desperation as far as finding a job for the summer or anything like that, however I do feel a little desperate in regards to whether or not I will be able to actively pursue a career in the field of marine biology. I have been offered practically no help in finding work post-grad especially when comparing the biology department to the business department, they practically assign each of the business students into internships from what I hear.

That being said, I am somewhat on the fence as to whether or not to pursue a masters program immediately or to try and gain some good practical experience to try and increase my chances. However, after discussions with my academic advisor and my parents I have decided to postpone my application for graduate school at this time. Instead I hope to obtain a position as a laboratory assistant in a lab whose research focus is marine realm. I believe the time spent in such a position will increase my exposure and therefore my skills with basic and hopefully advanced laboratory techniques, expand my understanding of the depth of the field and improve my academic standing for acceptance into a graduate program in the one to two years.

I understand that research positions are limited and that competition for the positions is most likely intense and that practical experience could mean the advantage. I have had field experience in conservational fisheries biology. Specifically, last summer I worked with the [retracted]. I was hoping that you might be able to point me in the right direction in regards to who to contact or to possibly offer me some advice as to what you might do in my situation.

I now know as I am finishing my undergraduate degree that this is the field in which I wish to continue my training and establish a career. I would welcome the opportunity to speak with you about my career goals, and the possibility of finding a research assistant position in a laboratory within the field. Thanks in advance for your help.

Sincerely,

[retracted]

# So, you want to be a Marine Biologist??

..... (or any other kind of scientist)

*The road to graduate school.*

**Joseph Pawlik**

**Professor, UNCW (1991-present)**

**Postdoctoral researcher, WHOI (1990-1992)**

**Postdoctoral researcher, FHL/U Wash (1988-1990)**

**PhD program, SIO/UC San Diego (1982-1988)**

**BS Biology, U Minnesota, Twin Cities (1978-1982)**



# Why are you here?

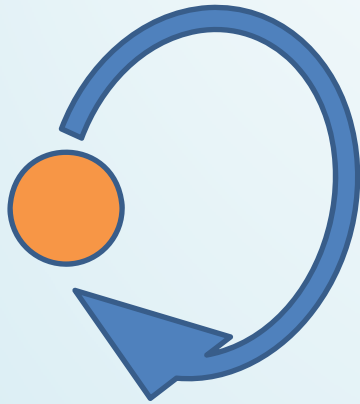
- extend my adolescence
- avoid work in the “real world”
- have a good time at college parties
- get professional training
- expand my knowledge base
- have my knowledge and abilities assessed



A “liberal arts” education is not training for a job!  
(that’s what vocational and professional schools are for).

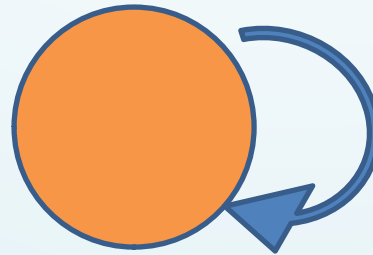
# Where are the jobs for Marine Biologists???

TURN-OVER



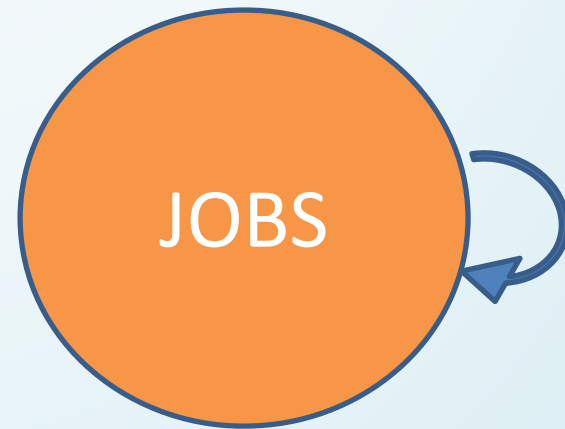
## **Private Sector**

- consulting
- benthic sorting
- data collection



## **Government**

- fed, state, local
- aquaria
- impact statements



## **Academics**

- professor, researcher
- university, college, institute
- teaching and research

# NOT AN EASY ROAD!

- limited job prospects
- highly competitive
- graduate degree required
  - MS, PhD, postdoctoral experience

Do it for love, not money.

Gotta have the ***talent*** (many components).

Expect to work very hard.

# WHAT IS GRADUATE SCHOOL?

- Term is 2-3 yrs (MS), 4-7 yrs (PhD)
- Independent research, very few courses
- Research is done under a faculty mentor
- Usually supported (paid!!) on a stipend (TA or RA)
  - \$10,000 / 9 months for MS students (UNCW)
  - \$18,000 / 9 months for PhD students
- Outcome is production of a written body of scholarly work (dissertation or thesis), along with a public presentation (defense)

## **THE ROAD: If EVERYTHING goes perfectly:**

### Freshman to Junior years:

- Keep GPA high (>3.5)
- Full sequence of organic chemistry, calculus-based physics
- Avoid double-majors, minors
- Aim to finish in 4 years, with extra time in your Senior year
- Be a full-time student (max credits, don't work on the side)
- Start Honors project (departmental or college) with UNCW faculty

### Beginning Sophomore summer:

- Take marine science courses or REU internship outside UNCW
  - exposure to research by summer investigators
  - get credit – as DIS at UNCW
  - begin research projects

### Senior year:

- Finish Honors project – give talk at symposium, publish??
- Study for and take GRE exams (general, maybe Biology subject)
- Identify and secure sources of reference letters
- Visit potential graduate mentors
- Apply to Graduate Schools
- Apply for NSF graduate fellowship, others

## ANNUAL undergrad costs at UNCW for 2008-2009:

Tuition	\$2,459	[for out-of-state, \$12,626]
Fees	2,068	
Room & Board	7,280	
Miscellaneous	<u>3,339</u>	(includes books, supplies, transportation, etc.)
Total	<b>\$15,146</b>	

***(Institution) is a publicly supported institution. Tuition payments and other required student fees meet only a part of the total cost of the education of students enrolled. On the average, for each full-time student enrolled in an institution of The University of North Carolina, the State of North Carolina appropriated \$12,897 per year in public funds to support the educational programs offered.***

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## Summer courses in Marine Biology and Marine Science

- 2-10 week intensive courses, specific practical, lab and field experience
- EXPENSIVE, but career-defining!

Examples:

Friday Harbor Labs, University of Washington

BIOS: Bermuda Institute for Ocean Sciences

Oregon Institute of Marine Biology

Duke University Marine Lab

Isle of Shoals Marine Lab (Cornell Univ)

Gulf Coast Research Laboratory

**-OR-**

Summer internship in marine science (REU programs)

College of Charleston, Bodega Marine Lab, U. Florida, U. Maryland

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# How do I choose a Graduate School?

**DON'T !!**

## **Choose a graduate mentor.**

- match your research interests with a faculty member
- do they have a graduate program? MS, PhD?
- do they have funding to support a student?
- go visit faculty members, talk to their students
- apply for NSF grad fellowship to work with favorite (Nov)
- apply to grad schools of several faculty to increase odds (Jan-Mar)

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## Getting accepted:

2 part mechanism:

- Departmental score: GRE, GPA, letters, experience
- Faculty interest (funding and space)

Notification March-July for programs starting Aug-Sep

Usually supported on RA or TA (can't offer to pay themselves)

Out-of-state tuition may apply

## What if I don't get in?

- try again, retake GREs, try to raise scores, find new mentors
- relocate and volunteer or work in lab, become indispensable
- aim for a MS rather than a PhD

-OR-

get an MBA, start your own business, make a ton of \$\$\$, retire early and spend the rest of your life touring exotic places and diving from your private yacht.



Want this talk as a PDF for reference?  
(also an article that details much of what was said.)

- Google “The Pawlik Lab”
- Click on the first link that comes up
- Drop to the bottom of the page and click on:

[HOW TO GET INTO GRADUATE SCHOOL IN MARINE BIOLOGY](#)

[This document is about 10 years old, but still very relevant. I helped Claudia research it originally, and have made some edits to update it.

-Dr. Pawlik – 9 Feb 2009]

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

Claudia Stack, M.Ed.

### **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 of this hand-out.

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, has scored well on the Graduate Record Exam (GRE), and has found a graduate advisor, that student can usually expect financial support for his/her 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 for furthering his/her research.

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 who are seeking to go directly into Ph.D. programs can apply for predoctoral 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/December, and require both the General and Biology GRE scores. 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/her prospective graduate advisor or another professor to develop and submit a proposal.

- 1) National Science Foundation Graduate Research Fellowships
- 2) Office of Naval Research Predoctoral Fellowships  
(oceanography and related fields)

["google" these – not sure the 2<sup>nd</sup> one still exists]

A prospective graduate student competes not only to be admitted to a program, but also for financial support. Since this is true, 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 to graduate school, with most successful students having a much better record than that.

It is the responsibility of the student to research his/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/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/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. **[Use the web!!!]** Books such as The Peterson's Guide to Graduate Programs, usually available in college libraries, can also help. 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 hand-out for addresses of selected marine laboratories where such summer courses are offered.

Once a student has a list of prospective graduate advisors, s/he 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 \$20-50 application fee [more now]), it is important for students to narrow their choices down. Most students apply to three to five graduate programs.

One courteous way to go about contacting professors is to write to [email] them, and then to follow up the letters with phone calls about two weeks later. An introductory letter should briefly describe a student's background and interests, and also provide the professor with his/her GPA and GRE scores (if available). Formal transcripts and GRE score reports are **NOT** necessary at this point, however.

During the initial conversation with the professor, a student should politely ask whether s/he will be taking any new students. It is also appropriate to ask whether there are funds available for 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/her institution. It is a chance for the student to talk with the professor, and also with graduate students who are already enrolled there. A student will want to assess a professor's working style, and the demands that s/he 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, s/he 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 s/he 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/her scores on the Graduate Record Exam (usually, both the General GRE and the Biology GRE), letters of recommendation, and a "statement of intent" that describes the student's research interest(s). 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 does **NOT** necessarily boost one's chances of being admitted to graduate school. On the other hand, building a secondary strength during one's undergraduate years is advisable. Some examples of areas that can complement a primary degree in Biology or Marine Biology are: Chemistry, Computer Science, Environmental Studies, and English (especially technical writing courses). 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, and directed independent study. 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). This exam is made up of three parts, the Quantitative, Verbal and Analytical sections [this has changed]. Graduate schools may choose to disregard one or more parts of the test, or to weight one part more heavily. In addition, many graduate programs in both Biology and Marine Biology require the Subject GRE in Biology [no longer—and many schools no longer require the subject test, but you should check carefully!]. This exam is also composed of three sections: 1) Cellular and Molecular Biology, 2) Organismal Biology, and 3) Ecology, Evolution and Population Biology.

Students can take the GRE's 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, or by mail within seven days of taking the exam. In either case the cancellation will be made **BEFORE** the test-taker is notified of his/her score. It is expensive to take the GRE, and score reports aren't made until approximately six weeks after the exam. Although most graduate programs will use only the best scores that a student earned when considering him/her for admission, it is probably **NOT** advisable for students to take the GRE's many times over 'for practice.' It is far better to prepare well for the General and Biology GRE's, take them once or twice, and score as well as possible.

1 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 GRE preparation books containing old exams and tips on taking the test. An order form for the preparation books published by ETS can be found in the GRE registration bulletin. Most large bookstores carry preparation books from

other publishers for the General GRE, although students will probably find that they have to special order similar books for the Biology GRE.

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 (see first paragraph above) that are on that exam. The student will also want to make sure that s/he 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 s/he 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/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/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, s/he will often write a separate letter of recommendation on official letterhead.

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/her chosen field appear frivolous.

Professors have many demands on their time, so students should organize packets to simplify the reference writing process. Students should include in each packet: **ALL** of the reference forms the person is to fill out, a copy of the student's statement of intent, and a note reminding the professor of what course(s) s/he 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/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. (Applicants who have been out of college and working for some time may also wish to enclose a resume with their graduate school applications.)

It is advisable for a student to have a professor critique a draft of his/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/her complete control. Students should seize this opportunity to make a positive impression by submitting a thoughtful, well-written statement of one to three pages.

### **Suggested Timetable**

#### **Freshman & Sophomore Years**

- \*Get on track with first major classes
- \*Earn best possible GPA
- \*Investigate opportunities for work (paid or not) in field or lab

#### **Junior Year**

- \*Maintain high GPA
- \*Take initiative in upper level classes and talk with professors
- \*Plan for related volunteer work, directed independent study, internship or special summer courses in area of interest
- \*Spring: Study for General GRE and take the exam; take Biology GRE for practice if desired
- \*Spring & Summer: Begin researching graduate programs and potential advisors
- \*Summer: Assess preparedness for Biology GRE using scores on old test (printed in GRE preparation books) or using one's actual Biology GRE score (if taken in Spring); focus study accordingly

#### **Senior Year**

- \*Maintain high GPA
- \*August/September: Obtain applications from graduate schools; students hoping to be admitted to Ph.D. programs can apply for predoctoral fellowships from the National Science Foundation
- \*September/October: Contact potential graduate advisors, continue reviewing for Biology GRE, begin writing statement of intent
- \*October/November: Take Biology GRE, visit selected graduate institutions, organize references
- \*November/December: Confirm that chosen graduate programs have received all necessary application materials
- \*Spring: Make a decision, notify programs of plans

## Appendix

### Selected Marine Laboratories that Offer Summer Courses

Contact for current information: [these addresses are old – SEARCH THE WEB!]

Bermuda Institute of Ocean Science  
Ferry Reach GE 01  
BERMUDA           Tel: (809)297-1880 or (809)297-8143

Duke University Marine Laboratory  
Beaufort, NC 28156           Tel: (919)728-2111

Friday Harbor Laboratories  
620 University Rd.  
Friday Harbor, WA 98250   Tel: (206)543-1484 or (206)378-2165

Gulf Coast Research Laboratory  
P.O. Box 7000  
Ocean Springs, MS 39564   Tel: (601)872-4201

Shoals Marine Laboratory  
G-14A Stimson Hall  
Cornell University  
Ithaca, NY 14853           Tel: (607)255-3717

Summer Course Coordinator  
Division of Marine Sciences  
Harbor Branch Oceanographic Institution, Inc.  
5600 Old Dixie Highway  
Fort Pierce, FL 34946       Tel: (407)465-2400 (ext.321)

[Also: search the web for REU (Research Experiences for Undergraduates) programs in marine biology and marine science – these are excellent experiences that often come with a stipend!]