

Reflections of Recent PhD's:
Advice to students wishing to pursue aquatic science careers
January, 2002 DIALOG Survey

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Advice to students can come from many sources, including parents, teachers, advisors, and fellow students. The advice below comes from aquatic science PhDs who took part in the first four DIALOG symposia. DIALOG, the Dissertations Initiative for the Advancement of Limnology and Oceanography, was founded to facilitate interdisciplinary understanding and interactions across the aquatic sciences, and to foster early career development among recent PhDs. Program information may be found at <http://aslo.org/phd.html>. Symposia have been held biennially, with roughly 40 grads participating in each. Participants are selected by committee based on the application materials submitted. These grads are employed in all the major career sectors, though most are employed within academia or are working for the government.

As part of the 2002 survey, past DIALOG symposium participants were asked "What advice would you give to students entering a PhD in your area of expertise?" The survey included 171 graduates who received aquatic science PhDs between January 1, 1992 - March 31, 2001 and who participated in the first four symposia. Their responses are given below. These have not been edited except for spelling and grammar.

There is room for new academic oceanographers but the field is very competitive- you need to be among the best to get the best jobs. The best way to break into the field is to excel, less than total commitment is not likely to get you far. Also the job market for 'non-traditional' careers- government, private sector, etc should be considered in addition to an academic career track. Nail your quantitative skills. If you do not have a passion for this work, go be a banker or finance expert or something like that. They make more money with similar skills. Remember you never stop learning, but you are now your primary teacher. You alone are responsible for your career. Find good mentors. Mentor does not necessarily mean brilliant scientist. Pick your battles. Prioritize. Be flexible. It will take time to get to the point where you will be able to work on exactly what you want. Working on other things not of your own choosing can be serendipitous. Learn how to discern what is societally relevant. Get used to red ink. Know that you will need to develop other skills, particularly business, time, communication, and people management skills. Do not (OK, at least entirely) put your life on hold to get a PhD or post-doc or permanent position. Life is too short not to live it. Regardless of whatever institution you are at, your perspective can always be broadened. Do not look down at the general populace. A PhD and a dollar will help you buy you a coke, especially the dollar.

It is a great field with lots of exciting opportunities but make sure that you are willing to put in the hours necessary to survive.

Do it if you want to be the boss. Get as many diverse experiences as you can without sacrificing your thesis and personal life. Use your unique experiences to make a cool dissertation. There are jobs out there, but not many so you have to be the best at what you do.

You must have a passion for the field.

Find anti-nausea drugs that work for you or else you will be very unhappy. Don't give up the rest of your life for your career. Exercise regularly.

Keep the big picture in mind at all time. Write early, write often. Apply for money as much as possible. Make sure that you really want a Ph.D.

Broaden your mind and expertise: do interdisciplinary research.

Persevere, balance career and other goals

When deciding on a specialty, make sure you understand the potential job prospects associated with that specialty. Some researchers are more employable than others...

Make sure you really need a PhD for what you want to do. There are so many PhDs and so few jobs where it is really required.

Remember this is a lifestyle, not career, choice. There are long hours, periods of significant frustration, and little fame or fortune compared to many other careers....and if done with the right attitude and commitment, it is one of the best lifestyles out there....

To be sure that they are making the right choice since in Germany there have been lots of changes lately which could be a problem to find permanent funding for more than 12 years including the PhD.

Make sure that you are prepared for lots of hard work and fun!

It is a very interdisciplinary field, but you need to have a focus!

First, if you have any inclination to travel, take time off, or try work in other areas, do so before you start your PhD. The PhD year are busy ones, and once you get your degree the "career clock" is running (and unforgiving of gaps). Second, be sure you know exactly why you are getting a PhD. Unlike a master's, the career paths it opens are very specific, and it is far too long to do for the "fun of it"!

Choose a research topic that is genuinely fun. If your research gets to the point where it is not fun (consistently), then get another job at which you will either do more good, or have more fun. If you're not having fun in research, you will certainly not be creative or original, and will probably not be productive, either.

General advice: Select carefully the supervisor and the Institution rather than the location.

Pick your topic well. Make sure it is interesting and fundamentally important. Solid work done on projects that interest few people will not get you anywhere.

Publish as much as possible during graduate school. When negotiating for jobs. Don't be afraid to ask for what you need. If they want you, they will spend the \$\$\$ to get you at their institution.

1. Undergrad education include an appreciation of science as a way of knowing, content of biological knowledge is not critical. 2. Knowledge of probability theory and an ability to learn statistics is critical (more important than biological knowledge)

A multidisciplinary approach and a flexible research program is essential for success in this highly competitive environment. Do not expect to see tangible rewards for your efforts granted on a regular basis. Largely, the satisfaction for all of your hard work is largely intellectual (and certainly not financial!).

You need a solid base in both "traditional" microbiological techniques and molecular biological approaches. The job market is quite good for people with these capabilities- options include industry, government agencies, non-profit research organizations, and academic institutions.

Select your advisor carefully. Excellence in science is not enough to ensure your professional success.

Plan to spend a lot of time writing proposals Must be able to multi-task Need to develop skills outside of research (i.e., communication, politics, writing, presentations, etc.)

I would encourage anyone interested in nature to get a Ph D in this area. Problems associated with molecular biology, global climate change, environmental issues, and others like biotechnology seem to be important now. Start young with a PhD, and have children after having a tenure position is an ideal. Your partner should be thinking the same as you, so it must be from the same area or at least be involved in the academia.

Make sure this is really what you want.

Play hard and work even harder. Even if your research is predominantly theoretical and esoteric, think about how your research can be applied and how it may inform policy decisions - you owe this much to society.

Go for it. Make sure that in the first two years you follow one or two good courses. Get involved in co-organising symposia and other activities that are not directly related to your PhD. Work on your presentational skills.

Do your work at the best schools and with the best people. Network. When you are a postdoc, make sure you can be at least a co-PI on any grants you write.

Try to incorporate more molecular techniques.

Interdisciplinary relations are so important particularly in our field of Marine Sciences.

Find a good advisor and a good doctoral committee

Make sure you want it and realize the amount of work it will take, - carefully evaluate what it is you want to achieve with your PhD. It's tough competition out there if you're not ready to slug it out, spend your time doing other things. The pot of gold at the end is there, but it's in a currency you still need to convert.

In the Netherlands I see many university graduates opting for a business career. My advice would be to seriously consider a PhD as start of a scientific career. Despite all the drawbacks (salary, temporary contracts etc.), I believe it is ultimately one of the most rewarding careers (pursuit of curiosity, international contacts etc.). Furthermore I would advise students to train themselves in bioinformatics / genomics. These techniques are already revolutionising ecology / evolutionary studies - and will continue to do so for many years.

Take it easy. If you like and love it do it, otherwise forget about any PhD. A PhD is not something to do just to survive, it is to obtain knowledge.

Stay very open to the potential to collaborate at a very diverse range of scales!

Don't do it. I feel very limited in job opportunities because I have a PhD. In fact, I feel that I would have been more successful at landing a permanent, high-paying job in my field (fisheries), if I had stopped with a Master's degree.

I would recommend that students take as many statistics courses as possible, as well as a computer programming course. In addition, I suggest that students work as a technician in a lab, so that they can see what ecological research is all about (i.e., lots of hours behind a computer, lots of data analysis, lots of writing, and some time outdoors).

Do not get a PhD unless you are willing to work 60-80 h per week for the same salary earned by many secretarial assistants in the private sector.

Find the field that you are really interested in, look for support

Fashion a Ph.D around some aspect of science that can be applied to the "real world" It does not matter how smart you are if you can't find a job.

Make a personal decision about your future career plans as early as possible in your life; it is very difficult to get a permanent position and competition is a tough part of this field; take into consideration that you might have to sacrifice essential parts of your personal life; however, it's incredibly exciting to be in science!

Take advantage of the courses available...especially math, statistics, and computers. Find something you are really interested in, and contact (directly) people in that field to discuss opportunities.

The science is exciting and wonderful, so enjoy it while you can! Getting a PhD is the most fun you can have at university. Things are somewhat different on the other side of the fence as a faculty member. Most of my colleagues, although I truly enjoy them as individuals and respect them intellectually, are more or less jaded due to the ever-increasing demands of academic job. I do not sense this to be a healthy trend ultimately. I strongly sense that, as academics, we are gradually becoming managers of small-business enterprises -selling research results- and less and less intellectually and pedagogically oriented, in the long run. Of course, we do it to ourselves, as I am surrounded by young scientists who are all too willing to work 16 hour days, 7 days a week. Obviously, university administrations are delighted with such situations, because they can sequester the most for the least from their academics. But the lines between genuine motivation, self-imposed stress, and fears of failure are fine indeed. Our university administration sees it as an opportunity to pressure young academics even further, and I think this is covert exploitation. Find out what you like to do. Going to sea. Working from small boats. Working on the computer. Get a lot of varied experience so you can find out what you like. Try to create opportunities for yourself. Write good papers. Talk to people in the discipline. If you want an academic career. Go work with a big name. Right or wrong it makes a huge difference.

Think carefully about what you really want to do with yourself, and persevere.

Do something you enjoy and are passionate about!!

You better know it is what you want to do with your life, because even though it is not a permanent decision, it is a lot of work for relatively little recognition, especially outside your own scientific discipline.

Decide on specific career path as early as possible- do you want to work at a research university, a teaching college, or an agency? This decision will affect how you approach graduate school. If you love the research, stay a graduate student/technician/postdoc as long as you can. They are the only ones who really get to do the science. Once you become a professor, you become a manager rather than a scientist.

It's a very exciting field. Choose a good lab with a stimulating set of people and good national/international collaborations. Must be willing to travel. Choose your adviser, do not be chosen! Location is also important for PhD students to ensure that hobbies can be continued. Find a good advisor with a good project. To find this out is difficult, but the best way is to talk to her/his other students, and other students in the Department.

If you are interested in teaching as a profession - **GET EXPERIENCE IN GRAD SCHOOL!** Advice would depend greatly on the individual student and that student's expectations of a career and intellectual maturity. Generally, I would advise students to seek some research experience in a master's or a paid position outside of the Ph.D. **BEFORE** making a decision to go into a Ph.D. program. I would give them access to as many resources as possible for obtaining good financial support to complete a Ph.D., provide them with a checklist/networking for finding a good match for advisor and program. I would also give them a realistic picture of some difficulties after getting a PhD - relatively long tenure in school (5 years), potential difficulty in finding a permanent position

in one's field of expertise when finished, and often an extremely modest or inadequate salary considering the workload and expectation.

Consider the person you're working with, the contacts you'll make, and the institution first. Consider the project (assuming you're interested in it) second.

Make sure that you study something that you're passionately interested in. It takes many hours of work to accomplish results and so long as you're interested in the results, it will be enjoyable work. Also, publish your work. It is so important to have those peer-reviewed publications out there so that granting agencies know that you are productive. Graduate students will find out about you and your work, if you publish it.

You won't be making lots of money and you're going to work hard, so you better enjoy it :).

Make contacts and publish as early as you can without compromising the quality of your work. Attend meetings regularly. Make sure you have a strong balance of personal life with your career to ensure long-lasting happiness :).

Work with a productive professor, work hard, publish early and often.

Be prepared to do some very applied issues.

Think about what general areas are likely to expand in the next 10 years, and ask faculty and postdocs at your Masters and/or undergraduate institutions what they think those areas are. Be independent and make your own connections. Be proactive. Love your work. Don't do it for the money but if you are patient and good at what you do then your chances of eventually finding a job that you really enjoy are pretty good.

Find the field that stimulates your intellectual curiosity

Only do it if you love it and it is a part of your life. You can't make a go of it if you think of it as just a job.

Be persistent.

PhD not crucial unless you want to be in academia.

Work hard and listen to others w/ experience. Prepare to sacrifice!

Be prepared (especially flexible) for a long journey whose precise outcome is unclear

Make sure you are as interested in the field as you think because it will be required to see things through to completion and to perform at a level necessary to find employment when you are finished.

Ponder whether career goals truly match Ph.D. training. Take on tons of related and semi-related experience to broaden the education process.

If you decide to do a PhD, do it because you are interested in it not because there may be a high paying job at the end of it.

Go to the best graduate school you can and work as hard as you can, everything else will follow.

Only to study for it if they love their subject - the only reason to be in this field is for the love of it.

Be sure that you want to stay in science, do not use a PhD as a waiting room for a real other job

Take more math and statistics!

Be very careful choosing a university and adviser, talk with previous students and graduates about their experience. I had a wonderful MS adviser, largely through sheer luck, and received my PhD in spite of my PhD adviser.

Prior to starting on a course of study carefully and completely evaluate the career options and make sure you are satisfied that a career interest is possible for you.

It's not for the faint-hearted. This is a real time sink. I love what I do, but it is easy to get a bit burned out. In order to succeed in research and get an academic job, you must be willing to expend a huge amount of human capital. It is a delicate balancing of personal life and research. On the other hand, it is incredibly rewarding. I am still striving for the perfect balance. For those with less enthusiasm for science, I think alternatives to the Ph.D. or at least alternatives to hard-core academic positions should be considered seriously. Perhaps more research based programs (less of the dual teaching/research demands) or more teaching based programs are a bit easier...or private sector or government work with more defined/restricted job responsibilities would be a bit saner! Still, it's great in many ways. I knew this was the right career path when I was an undergraduate and a bunch of people started talking about what they wanted to do if they won the lottery. It came around to me and I didn't want to leave the lab -- sure, maybe I would go to the Great Barrier Reef on vacation, but then I'd be back at the lake and in the lab. That's what my advisor said, too. At that point it really hit me that I loved aquatic science -- I was content with it. Without that feeling, I doubt I would have made it through the trials and tribulations of my grad program, the stresses of junior faculty life, and several illnesses.

Choose a dissertation topic that has a molecular and/or modelling component.

Develop collaborations early... work at the interface between disciplines and become communicative with other disciplines.

Marine science is all chemistry. Learn it. Every biological, physical, and geological question can lead back to chemistry.

More Math, statistics, programming background

Think outside the box, linkages between disciplines is a skill needed.

Forget it. Those already in power will stab you in the back to ensure that you don't supplant them. Only the sycophants succeed by taking minimal research risk.

Make sure that your supervisor has the student's interests as the highest priority, rather than completion of the supervisor's research agenda; i.e., ensure that the supervisor is not in a conflict of interest with regard to your career and educational planning.