

*Commentary***Eleven strategies for getting into graduate school in ecology & evolutionary biology****Eric L. Walters***Eric L. Walters* (ewalters@odu.edu), Department of Biological Sciences, Old Dominion University, Norfolk, VA 23529, USA**Abstract**

Getting into graduate school can be tough if you have not done your homework. I outline eleven strategies for increasing your chances of successfully being accepted into an ecology or evolutionary biology lab. Try to get good grades as an undergraduate, do well on the Graduate Record Exam (if applicable), join a lab reading group or undertake an undergraduate thesis, take time to forge relationships so you can have strong reference writers, obtain relevant work experience, author a publication, read peer-reviewed literature, attend national meetings, come up with some good research ideas, develop a relationship with a potential advisor, and apply to at least ten schools. If you follow these strategies, you have a high probability of getting into graduate school in ecology and evolutionary biology.

Keywords: graduate school; grades; GRE; reading groups; references; work experience; publishing; peer-reviewed literature; national meetings; graduate advisor; timing

The problem

Based on my twenty-five years of experience, I have found that most undergraduates are relatively clueless when it comes to applying to graduate schools. Many seem to think that the process to apply to graduate schools is similar to that used when applying to undergraduate schools. Prospective candidates often blindly apply to schools with “good names” without really thinking too much about with whom they will work or even the topic

of their proposed research. These naïve individuals seem more focused on the coursework offered than the track record of the proposed advisor or the overall quality of the graduate program. There is wide leeway in how graduate programs in ecology and evolution operate but most fit a common mold. Having been associated with the graduate programs of eight universities (two Canadian, six American), I can offer the following general advice when preparing for graduate school in ecology and evolutionary biology.

Eleven Strategies to Success**1. Good grades / marks**

Many of us enjoyed our undergraduate experience—some of us probably a little too much. If you are reading this as someone who is currently engaged in an undergraduate degree, work hard to get good grades / marks. It does have an effect on graduate entrance committees. If you've already graduated and are reading this, what's done is done. You have two options: (a) take some refresher classes to demonstrate that you can get good grades and / or (b) make up for the low GPA in other ways (see below). Many graduate programs have a minimum GPA so this bar may be such that you WILL have to improve your undergraduate grades to get through the admissions process.

2. The Graduate Record Exam (GRE)

If you apply to graduate school in the United States, most schools require the GRE. Most, if not all, schools in Canada do not require the GRE. Recently, several

schools in the U.S. have also removed the GRE requirements (Kuo 2017). The schools that do require the GRE as part of the entrance requirements are presumably interested in how you perform relative to your peers. I don't know how many times I've heard the excuse that "I don't do well on standardized tests." Get over it—none of us do. Work hard to get a good GRE score and you'll be well on your way to getting your foot in the door. Make sure you've mastered geometry so you can score well on the quantitative portion of the GRE. Some schools also require Subject GREs so you should check each school's requirements.

3. Participate in graduate classes and lab reading groups

It goes without saying that upper level undergraduate classes serve to provide at least some experience in a field of ecology or evolution. The classes are often more specialized and typically smaller in size, providing more one-on-one time with teaching faculty. Sitting in on or participating in graduate level courses, as an undergrad or recent graduate, is also an excellent way to get extra training in courses that are relevant to your future graduate career. Attending lab reading groups (often referred to as "journal clubs") is another way to familiarize yourself with recent research topics and an opportunity to meet graduate students and faculty members, many of whom could potentially write future letters of reference (see next strategy). As intimidating as it might sound, most faculty will welcome any undergraduates that wish to attend reading groups. This venue is an excellent way to immerse yourself in the academic culture, something rarely experienced by merely taking undergraduate classes.

4. Have good *and* relevant references

If you plan to apply to graduate school, you want to have references with clout writing the letters. While you may get a glowing recommendation from the restaurant manager where you worked during your summers, this is not going to mean anything to most potential advisors or graduate entrance committees. They want to see academic references—the better known the person writing the letter, the better its effect on the committee. Failing academic references (including either faculty or graduate students), having a non-biologist scientist write a letter is the next best thing. If you're really desperate, only then would I use non-academic, non-science references. With proper planning, you should be able to have three solid academic references. If you don't, then you haven't done your homework.

As previously mentioned, one way to meet professors is during lab groups. In fact, any professor that teaches you during your undergrad, serves as your undergraduate

thesis advisor, or who supervises a directed study course is a potential letter writer. Unfortunately, professors who only have had limited contact with you can typically only comment on your performance in class. The best, and easiest, way to get a good reference from an academician is to work in their lab (either paid or volunteer) or have them serve as your undergraduate thesis advisor.

After getting a reference to agree to writing you a letter, it is your job to make sure the reference has all of the information they need. At the very least, provide the referee with your resume / curriculum vitae, make sure they know where and with whom you are applying to work as well as an overall game plan on what you plan to study. You should also highlight any experiences, motivation, or skills that make you particularly qualified for graduate school. And, of course, give your references plenty of notice before any letters are due. Send them a reminder as the date nears.

5. Have relevant work experience

The advisor and the admissions committee will be looking for relevant work experience. Having worked as a painter, sales clerk, or lifeguard is not going to have any effect on an entrance committee. They are not going to care that you are fastidious about balancing your till at the end of the night or that you are the best-selling floor person at a shoe store. Find work experiences (paid or voluntary) that relate to your overall career interests. Any experience in an ecology or evolutionary biology lab will suffice, regardless of the specific research being conducted. In fact, the more varied your work experiences, the better appreciation you will have for the types of research questions that can be asked. So, even if you are not able to find (or perhaps unable to afford) a summer job related to ecology or evolutionary biology, at the very least try and volunteer in a research lab at your university.

6. Get published

A sure-fire way to get a potential advisor's or entrance committee's attention is to show that you have a publication or two. The advisor or committee is trying to assess your ability to be a successful graduate student. Having a publication implies that you can come up with original ideas, know how to write, are experienced with data manipulation / analysis, and have the motivation to be productive and follow through. A publication will almost always trump a poor GPA or GRE score. The clearest route to a publication is to conduct an undergraduate thesis or volunteer in a lab. Find a research topic that interests you and discuss your ideas with the faculty member who will serve as your undergraduate thesis advisor or in whose lab you are working. Tell him/her that you are interested in working towards a publication. They will most likely help you achieve this goal if you

show determination and motivation. Publications are the currency of academia and the ultimate achievement that most academics strive for.

7. Reading peer-reviewed publications

There are two important reasons a prospective graduate student should read peer-reviewed publications. The first is that it allows you to determine what research topics interest you. The second is that it allows you to find a potential advisor. Peruse the latest issues or do searches on topics that you are interested in. Almost all peer-reviewed publications can be viewed online through your school library's website. Unfortunately, local public libraries will usually not provide access to peer-reviewed journals so you will have to have access to a college or university library unless the publication is open access or available on the web. If you are unable to garner access to a university library then I would recommend Googling research topics and going from there.

8. Attend national meetings

Almost all of the major journals (e.g. Ecology, Evolution, Conservation Biology, Journal of Wildlife Management) are run by societies that have annual meetings. There is no better way than attending a meeting to find out what research is current and to meet major players in your field of interest. Google a society's web page and they will have information about their next annual meeting. These meetings will usually feature hundreds of oral and poster sessions. Showing your motivation for graduate school by attending a national meeting is a great way to impress a potential advisor about how serious you are. Often, you can pre-arrange to meet up with faculty members if you contact them before the meeting to see if they are attending. You can also approach speakers after their talk to find out more about them. Meeting programs are available well before the meeting takes place. You can look at the various themes that are being discussed and look up individual presenters to find out more about their background and interests. If you've done your homework, you could meet up with 10 or more potential advisors at one meeting.

9. Where to apply?

In my opinion, there are two main factors (and one optional one) that should help you determine where to apply.

(1) *Advisor*: You are going to spend the next 2–7 years working with your advisor. You want someone that you can get along with, who is going to help you realize your goals, is conducting research that fits with your interests,

and has a personality that meshes with the kind of person you are. Also realize that the more famous a person is, the more unlikely it is that you will have quality one-on-one time with them. Junior faculty members tend to have fewer students and more time to nurture graduate students. Faculty with large labs will often have less time to devote to you. They will sometimes rely on senior graduate students or postdocs to help you out. Some faculty members will be very good at hand-holding and others will be very hands-off. It depends on the type of person you wish to work with. Some will give constant positive feedback and others will only share feedback when it is negative. But, of all the factors, the advisor you will work with should be your number one determinant of where you apply. In fact, for most programs, if you have not identified a potential advisor, your application will be dismissed. You need to plan early and develop a relationship with the potential advisor.

Almost all faculty members have web pages in this day and age. Most will list their publications and information about their current research. Try and read their most recent work. Reading a paper that someone wrote in 1974, for example, is not going to help you understand what their current research interests are. Make sure the person you have identified as a possible advisor has an academic position somewhere. Many authors will be graduate students or government scientists. You need to tease apart those who are in a position to accept graduate students from those who are not. Look at the author's affiliation and then go to their web site to confirm that they are a faculty member associated with a university (and that they are not retired—or worse, deceased!). Faculty members move around quite a bit as well. So, if you are reading a publication that is over a decade old, the affiliation may not be current. Again, Google the person and find out their current location and status. You should be able to find most of their publications on their web page in conjunction with Google Scholar or ResearchGate.

Once you have narrowed down a potential advisor, you should have some ideas about what you want to work on in their lab. Do not attempt to contact them with an email that simply asks if they are taking students. Draft a well-prepared and professional email that outlines your research interests and why you want to work with them. The email should also include an attached curriculum vitae so the potential advisor can read about your academic background.

If the potential advisor shows some interest, make sure to do your homework and find out more about what it's like to work in their lab by contacting current or former graduate students. You might also try contacting graduate students in other labs in the same department to get their take on what the reputation of a particular faculty member is in the department. Some great scientists make terrible supervisors / advisors so do your homework!

(2) *School*: The quality of the department to which you wish to apply needs to be assessed. Don't go by a school's overall reputation. Some schools may be held in very high regard by the public because they have an excellent Law or Medical school. These very same schools might have a very poor department with respect to your field of interest. Just because a campus may have some old buildings adorned with ivy doesn't necessarily mean it should be your number one choice. Speaking with faculty members at your undergraduate institution may help you separate out the better schools. There are also ranking systems (e.g. <https://www.usnews.com/best-graduate-schools/top-science-schools/ecology-rankings>) that you can look up.

(3) *Geographic Location*: Many students that I have spoken to want to go to school in a particular state / province or region of North America. I've heard students say they won't go to school in Canada because it's too cold or they don't want to go to the Midwestern U.S. because it's too flat or they want to avoid the Deep South because it's too hot. Get over it. You should not determine your entire future based on a few years in a location that is less than ideal. You most likely will not end up where you go to graduate school anyway, so why worry too much about the location? If the faculty member you have identified to work with happens to be at a great school in a great location then you are set. But, the reality is that the geographic location is simply not as important as the advisor and school.

10. Play the Odds

To successfully get into a graduate program means that all of the stars have aligned. You found an advisor with your particular research interests—who happens to be interested in you, who happens to have room in his/her lab, and who happens to be at a school that you want to attend. There are many reasons you may be turned down for graduate school. The department may be more equitable and give first priority to faculty members who do not currently have graduate students. The potential advisor you have identified may be going on sabbatical for a year or just accepted two students the previous year and does not have room in the lab. You cannot bank on just one person when applying to graduate school. My advice is that you apply to ten schools. Yes, it might be a bit pricey in terms of application fees, transcripts, GRE scores, and other associated expenses, but it's well worth the investment. Play the odds and realize that you have a slim chance of getting in at any one school. By spreading your risk, you increase the probability of at least one of the schools coming through for you.

11. Timing

Do not leave applying to graduate school until the last moment. Most schools will have application deadlines some time between December and February. You should be planning out your application process at least a year from the application deadline, if possible. The year will give you a chance to get your GREs out of the way (if applicable) and give you time to properly prepare and interact with a potential advisor. You want to plant the seed early and begin to develop relationships so that potential advisors have lots of lead time as they consider you as a future graduate student. Some potential advisors might even try to write you into a grant if they know you are interested and you fit into the research theme of the grant. And, if you apply early enough, you might even suggest working for or volunteering with a potential advisor. It is a great way to get a head start on your research, a way to impress the potential advisor, and an opportunity to assess whether you like working with the faculty member and their lab. Whatever you do, do not contact a potential advisor on short notice. The last thing you want to demonstrate is that you are not well prepared, that you cannot manage your time, and that you are not respectful of the potential advisor's time.

Conclusion

The process of applying to graduate school in ecology or evolutionary biology should not be taken lightly. You need to do your homework for the dividends to pay off. With proper preparation and thought, you can increase your probability of success. What's needed is dedication to your future career aspirations and to achieving your goals. With this in mind, the eleven strategies should be relatively easy to implement to ensure your success.

Acknowledgements

I thank Catherine Dale and John Smol for insightful feedback that helped improve a previous version of this manuscript. Many people helped launch my academic career. Ted Miller, my Master's supervisor, took a chance on me as a naïve graduate school applicant with crappy undergraduate marks and trained me how to be a scientist. Tom Martin provided me with valuable field experience and taught me to be a critical thinker. Most importantly, he altered my career trajectory by introducing me to Fran James, my eventual PhD advisor. Fran served as a role model and showed me how to conduct rigorous science while consuming southern cuisine. Tom Miller taught me about academic politics and how important social interactions are to being a

successful scholar. Walt Koenig helped me learn to be productive and to “not sweat the small stuff”. I am grateful to you all.

Referees

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Response to referee

Dale (2018) has provided an important supplement to my original article. Her commentary provides a refreshing perspective from a newly minted graduate. She is right—the very first step should be to assess why one wants to pursue graduate study in the first place. I think many students think of graduate school as a natural next step in their pursuit of knowledge. Others, like me, may have worked in the “real world” for several years and felt limited and non-competitive with simply an undergraduate degree. I am sure there are others that are applying to graduate school to please parents, or perhaps as a consolation prize for not getting into medical or law school.

I found Dale’s commentary about whether a graduate degree increases job prospects or salary rather interesting. I think that a graduate degree, without a doubt, increases job prospects. She indicates that a PhD is needed for tenure-track faculty positions. Of course, many research scientists working for government or industry also need PhDs. Those interested in teaching, whether as a tenure track professor or not, at the college or university level will certainly need a PhD for many of the positions advertised. Dale is definitely on point when she states that most graduates with a PhD will not be getting jobs as tenure-track faculty members. In fact, according to Weissman (2013), most graduates with a PhD in biology are going to end up in industry.

Poor prospects for jobs notwithstanding, many students attend college or university simply to challenge themselves intellectually. Some students crave knowledge and the opportunity to earn an advanced degree. So, while it might be pragmatic to view places of higher learning as job training centers, others will argue that the pursuit of a graduate degree is ultimately about “the journey itself”, as Dale alludes to in her comments about how graduate school provided her with an opportunity to engage in research.

Arguably, the most important message to take away from Dale’s commentary is her missive on mental health. In my experience, finding graduate students who have not experienced mental health issues is the rare exception. It is indeed a very challenging time with high expectations and soft deadlines and is unlike undergraduate where one follows a cookie cutter schedule, typically taking five classes per semester over the span of four years, with predetermined midterm exams and finals. Undergraduate students have all deadlines spelled out and know that all that they need to do is attend classes, study, write term papers, go to labs, and take exams within the four-month semester.

In graduate school, however, the length of time that it will take to earn the degree is often open-ended (particularly in North America). Some graduate programs have little, if any, coursework while others may pile it on. The biggest differences from undergraduate, however, are the soft deadlines that pervade graduate student life. One is expected to publish one’s graduate research but there is typically no hard deadline. One needs to submit a thesis or dissertation—again, there often is no hard deadline for when it should be submitted. As a result of the lack of structure, many graduate students flit about from task to task and have difficulty seeing anything to completion. Without these firm deadlines, students often wallow in despair and think that they will never finish. As time goes on, their graduate committee will begin to put pressure on them to publish or finish. It can be a very lonely time and ripe for mental health issues to manifest themselves.

The good news is that graduate school, unlike an undergraduate program, inherently comes with a built-in support network. Most students will be in a lab where fellow graduate students can commiserate, the department will often have a graduate student organization where students can talk about challenges they are facing, the university usually offers counselling services and support groups, and each student will have a graduate committee with 3–5 faculty that will advise them as they progress. Most importantly, the graduate supervisor / advisor is there to offer guidance and support when the going gets tough. I view it as my job to provide my students with the opportunities, support (financial, logistical, and moral), and mentoring that they need to be successful. In my own life, the time I spent in graduate school is remembered quite fondly. I loved the camaraderie, the challenge, and being surrounded by like-minded people pursuing basic and applied questions in science. Like Dale mentions, I too remember the painful struggles but, ultimately, I remember graduate school as being one of the best times of my life. I highly recommend it!

Dale, C.A. 2018. Why are you strategizing? Response to “Eleven strategies for getting into graduate school in

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