So you want to do a postbac – a guide from a STEM perspective

Who am I, what is this, and why am I writing it?

Hi! My name is Elizabeth and I'm currently a graduate student at Emory University in the Population Biology, Ecology, and Evolution program. I graduated from UW-Madison with my BS, worked full-time for half a year, and then was a Fulbright student scholar at Boğaziçi University in Istanbul, Turkey. I think that everyone should consider taking some time "off" before graduate school, so I'm writing this guide. I'll cover what a postbac can look like, some different types of opportunities available to you, who can benefit from postbacs (everyone!) and how, and then offer my personal experience.

I am a biologist and a US citizen. Most of my own knowledge in this area tracks with my own interests and background. I expect that a lot of what I'm about to say will be transferrable to the STEM research fields broadly, but you might find that this isn't the case. If possible, always discuss your options with mentors in your desired field.

I really hope you find this guide helpful! If you have feedback, suggestions, or questions, feel free to reach out to me on twitter: @lizsomsen

What's a postbac?

In the sciences, a postbac tends to refer to the period of time between finishing your undergraduate degree and starting a doctoral program. For most people (but not all), this time is spent doing something somehow relevant to your future academic and professional ambitions. These also tend to be long-term (6+ month) experiences. That's a pretty broad definition! Tons of experiences can and do make excellent choices for postbacs. I've divided these experiences into those that are primarily research-focused and those that are primarily education-focused.

The most obvious and familiar choice for a postbac is doing some sort of research. Basically, things in this category boil down to working in a lab. Many people will have had lab experience as an undergrad. As a postbac, you usually have fewer menial chores and more time spent at the bench or computer, which translates into a richer research experience. Besides, you get paid a lot better than you do while in school, if you were lucky enough to get paid at all! Research roles aren't just limited to standard lab tech positions; there are a variety of programs sponsored by different institutions that are especially set up for and advertised for postbacs. Depending in your experience and who you're working for, the degree of control you have over your research project(s) can vary.

An education-focused postbac is usually something like a master's degree or equivalent. In the US, it is not necessary in the STEM fields for people to obtain a master's before getting a PhD. In fact, it's most common to go straight from your bachelor's degree to your doctoral degree. (There are a number of reasons for this, both good and bad.) I'm going to go into more detail below about master's programs and what the benefits can be, but you might be surprised to learn that they aren't just the "last resort" for people trying to get into PhD programs. There is one big note for master's programs, however. In the STEM fields, we're used to doctoral programs being fully funded. That means that you're not paying for your tuition and that you can expect to receive a modest stipend to support yourself (the specifics for this, including teaching requirements, vary significantly). In the US, it's extremely uncommon for master's programs to be funded in this way. You're probably going to have to pay for it, and it's not going

to be cheap. There are places where you can get TAships to recoup some of your losses, but they're few and far between. I wouldn't recommend paying for a master's unless it's absolutely necessary; student debt is already a very serious problem in the US, and it doesn't make sense to go into more debt unless you truly need to. You might also look into getting a master's abroad, which can be significantly cheaper. Stay tuned below to see some very prestigious scholarships for master's programs!

Research	Education
-Fulbright (research) -NIH IRTA -APHL-CDC -CDC ORISE -DOE Scholars -NIH NCI ICRC -WHO internship program (currently suspended) -some research-based master's programs -laboratory assistant/associate researcher positions	-Rhodes (masters and DPhil) -Gates Cambridge (masters and DPhil) -Churchill -Marshall -Mitchell -Fulbright (masters and PhD) note: international master's programs tend to be more research-heavy than US equivalents

All sorts of considerations might play into your decision to pursue these opportunities. What degree of autonomy would you like over your research? How much time are you willing to spend? Do you have the desire and ability to live abroad? Do you want formal coursework, or would you prefer exclusively research?

The application process also varies wildly among the above opportunities. Obtaining a job as a research tech at a university, state lab, or NGO might require a CV and an interview, whereas you should expect essays, multiple selection rounds, and interviews for some of the nationally competitive scholarships. The amount of preparation you can put into your postbac search matters a great deal in selecting what you want to apply to. The Fulbright might be a great fit for you, but if you find out about it a month before your school's application deadline, you're probably better off spending your time on other options. Cast as wide of a net as you can and believe in yourself!

The benefits of postbacs

It's no secret that it takes a long time to get a PhD – for some fields, it's normal to spend 6+ years in doctoral programs. This alone can make one question whether taking a 1-2 (or 3, or 4) year break is worthwhile. After all, many of us would like to graduate before 30! In this section, I'll detail what you can gain from a postbac experience and why it can be well worth your time. I've tried to frame these benefits two different ways. First, I'll use the research/education dichotomy I just made to detail the advantages to each option and those that are common to both options. Then, I've broken down options by three broad types of students I imagine might read this guide: those that want to improve their potential grad school applications, those that have solid applications, and those that already have stellar applications.

Benefits by research vs education

I'll begin by talking about master's programs. For your standard 1- or 2-year US-based master's program, you'll likely find that there is a mix of research and coursework. Some may have an emphasis in either way; for example, a non-thesis master's likely won't have much research at all, whereas a for a thesis program you'll have to write… a thesis. I think that non-thesis master's programs aren't the best choice for those interested in future research careers; graduate admissions panels care a great deal about your research skills, so you want your application to convey your ability as strongly as possible. Avoid non-thesis master's, if possible, unless there's another reason (see the by-application section below). That being said, a second degree can be a wonderful option to learn more things. It's possible to find very specific programs that can help you learn a lot about a given field. Your knowledge base will certainly broader and it's a good choice for people looking for more formal learning opportunities.

There are also several extremely prestigious scholarships that support students studying abroad, particularly at universities in England. The application process for these opportunities is quite lengthy and involved, and they are extremely difficult to get. However, the award is superb: the chance to study at top universities abroad with nearly all expenses covered. Many of these scholarships offer one or two years of support, perfect for those looking to pursue a master's degree before returning to the US for graduate school (or even for a few years of initial funding for people looking to do their PhD abroad). Additionally, many master's degrees outside the US are more research-focused than those in the States. So, these scholarships can be good options for those looking for research experiences as well. For people who would be competitive applicants, putting in the time and effort to apply could pay off in a big way. It's easy to fall into the numbers trap and conclude that it's not worth applying because of the sheer enormity of the competition. Nevertheless, every year, some of your peers do get these opportunities; I'm living proof of that. Believe in yourself!

Research postbacs are a wonderful way to acquire more and more varied research experiences. If you worked in a research lab during undergrad, you probably didn't work for more than two different PIs and the only opportunity for full-time work was during the summers. I started working in a research lab my freshman year and stayed there until I graduated. I then worked in the same lab full time for just shy of six months, and in my experience, even having worked there already for 3.5 years, I still became a lot more fluent and comfortable in the lab after working full-time. It can also increase your chances of being a publication co-author, a significant early-career achievement.

There are some benefits that are common to both options. Either one you choose, you will surely become a more confident and skilled scientist. It's almost impossible to get worse at science by doing more of it. And, regardless of your choice, the period of life in your early twenties is one of immense personal growth. You might find that your interests and ambitions are in flux and that being able to spend more time thinking about what you want before making a commitment to go to grad school is helpful. For anyone who still isn't sure that graduate school is right for them, I would especially recommend a postbac. A doctoral program is a huge commitment that will affect your nearly *every* aspect of your life. It is not easy. In my opinion, it's not something worth starting unless you're convinced it's the best option for you. It's not fun to talk about burnout, mental health challenges, or leaving without a degree; that's not the picturesque side of getting a PhD, but it is a very real one. All else considered, it seems better to me to delay grad school by a year or two, get some experience under your belt, and make the most informed decision rather than hastily making an important choice.

Strengthening your CV

It's an unfortunate reality that your talent and work ethic are not the sole determining factors of your success in graduate school and beyond. Who you know and where you've been can open doors that might have otherwise remained closed. For example, I suspect that if I were to reapply to graduate schools, I would get more interviews with a Fulbright Scholarship on my CV than I did without it. Even if you're not concerned about your chances of getting into your dream program, this is far from the last time you will apply to anything. I anticipate that my research experience as a Fulbrighter will be beneficial when I apply to grants and fellowships during graduate school. Having an impressive postbac experience can add to your application and give you an edge when applying for competitive programs and funding opportunities. Generally, having previous funding makes getting more funding easier. If you can demonstrate early on in your career that you can successfully apply for funded grants, it might make schools, PIs, and others more willing to work with and fund you.

This doesn't only apply to the more "prestigious" options on the list. Certainly, being a Rhodes scholar has never failed to impress. However, even laboratory assistant positions can also be of great help to one's application. For example, I seriously considered applying to a technician position with a PI that is very well-known in the field I'm interested in. Working with that person and gaining familiarity and fluency with their research might not stand out to everyone, but it would to people who are in my line of research. I'm sure that a letter of recommendation from that person (upon completion of a successful research stint) would have carried weight. In some cases, even the name of an institution alone is helpful. Maybe you end up working in a lab and discover that type of research isn't for you (which is still a great and helpful thing) – it still looks good to have MIT or Stanford on your CV.

A note on research interests

Upon first consideration, it might make sense that those who are unsure about the research they want to pursue in graduate school would have the most to gain from a postbac. Undoubtedly, a postbac is an excellent time for those who are unsure about what field they're most interested in to explore their options. While some graduate programs at large universities offer first-year admissions to "umbrella programs" so that students are free to rotate through many different departments, such an option still entails one huge choice: the institution. You might find exactly what you want to do, only to realize that you don't mesh with the professors researching that topic, or that they're not taking students, or that you hate the location, or any number of things that matter far less if you've made a much shorter-term commitment like a postbac. Defining your research interests (even as modestly as eliminating one type of research from those you're considering) before applying to graduate school can help you make more informed choices on where to apply, saving you time and money. And, depending on where you do your postbac, you might still have access to a wide variety of departments and faculty members to learn about.

I would submit, however, that even people with very honed research interests stand to benefit from a postbac. You can tailor your postbac search for opportunities that allow you to develop skills you didn't acquire during undergrad that you anticipate will be useful for graduate school. Maybe you want to do structural biology work but didn't get to have a lot of hands-on

microscope time while you were just an undergrad lab assistant. You could apply for a job in a microscopy core or a structural biology lab and work on beefing up those abilities. Or, you could try and get a position with a potential grad school mentor or collaborator to get a head start on making connections. Conversely, you can always choose to do research unrelated to that you want to pursue in grad school. Maybe you have a clear idea of what you want to do but have always had a secondary interest in another topic. Maybe you just saw a cool job posting. There is still much to be gained from working in a different place, with different people on a different topic. There's a lot of pressure in grad school to succeed (read: publish). You might find that the idea of taking a year to just enjoy doing science without as much stress over the outcome is exactly what you need before buckling down again during your PhD.

Specific research interests	Both	General interests or unsure
-Fill gaps in your research or educational background you'll need for grad school -Meet potential collaborators -Explore secondary interests before committing to thesis work -Possibly: find a new research area or interest; change or integrate this into your original plan	-Experience new lab structures and mentorship styles -Diversify your skillset with new techniques -Meet new people and potential mentors -Strengthen your CV -Personal growth -Possibly: Experience living in a new place/culture -Possibly: Get a head start on integrating into your grad institution	-Get a better sense of if you're interested in a particular field -Explore more opportunities before committing to a school or program -Possibly: have access to a variety of people doing different work you can learn about

Benefit by application status

Now, I'll try and break things down by what your theoretical grad school application looks like. I believe every one of you reading this has the potential to succeed in graduate school. Still, I expect that different people are at different stages of *readiness* for graduate school. This section isn't meant to make you feel like you can't apply to grad school now if you want – I'm just trying to offer suggestions that you might find helpful!

For people who have areas of their application they'd like to improve, both research and educational experiences would be good options. A research postbac can help you gain valuable experience if you didn't work in a lab or have access to one at your undergraduate institution. This may be doubly helpful as it can help you decide if a research career really is right for you. An educational postbac can also be suitable. A master's program can give you a chance to boost a low undergrad GPA and provide evidence for academic success. If you decided later in your undergrad career to switch to a science path, but still graduated or plan to graduate on time, you could use a master's degree to supplement missing foundational coursework or take more specialized classes in your field of interest. As mentioned above, however, think carefully about whether the financial commitment of a master's program is the right decision for you.

For people with strong applications already, postbacs offer many different opportunities. A research postbac is a great choice – more experience is never a bad thing, and working in a new

lab can help you focus your interests or gain new skills you're interested in. You might even meet a future collaborator! It's also a chance to pursue "off-topic" interests before making a firm research commitment in graduate school. Most of us are interested in science, or STEM more broadly, because we enjoy puzzles and like learning. A postbac can be a chance to "play" and enjoy learning about new, interesting things without the pressure of academic success. Some educational postbacs can also be good choices. Consider applying to some of the notable scholarships; they really strengthen your grad school application and excellent learning experiences to boot. Someone must receive those awards – why not you? I wouldn't recommend an unfunded master's program unless you can do one that is research-focused; you likely don't need the extra coursework. Even then, it's hard to see how that would be a better option than a lab job. One possible exception is a master's in a related field that somehow synergizes with what you'd like to study in grad school. For example, I'm interested in combining public health and basic science research in my future career. Getting a master's degree in epidemiology would have been a very natural fit and would have added to my application. If this sounds like something you'd be interested in, take some time and search for dual degree programs, which allow you to combine your PhD with another degree. Often, these are PhD-JD or MD-PhD programs, but some PhD-MS (or equivalent) programs exist.

For people with impressive applications, it can be easy to think that applying to go straight to grad school is the best choice. Of course, it's not a bad one, but neither is taking a post bac. As stated in the previous paragraph, more research experience never hurt anyone and adding a publication or two to your CV is always a good thing. The discussion in the above paragraph about "off-topic" research applies to you, too. Furthermore, if you're highly qualified, you would likely be a competitive applicant for some of the prestigious awards mentioned earlier. Having these experiences makes you an even more attractive candidate to graduate schools and even more likely to receive funded awards while in grad school. Both options can also be a way to find future research collaborators and further your research interests.

Future importance

To summarize this section, a postbac can be an excellent way to prepare you for graduate school and an excellent experience even if you're already well-prepared. It's a natural time in your personal and academic life to take a walk through the metaphorical park before setting off on the through-hike that is getting a PhD. You might find that, at the end of your postbac experience, the trajectory of your life has shifted slightly – or massively! That's a good thing, not a bad thing, even though it can be scary to think about. Lastly, and more practically, a postbac can be an excellent way to save some money before starting grad school. I can guarantee that regardless of where you go to grad school, you won't be living large as a student. Working as a technician, or carefully managing any scholarship stipend you receive, can help you create an emergency fund to help cover moving costs and unexpected expenses.

What to do next? A few practical tips

It's tough to make generalizations about what to do if you're considering a postbac because people and programs are so different. I've tried to list a few general tips:

1. Start thinking as early as you can, especially if you'd be competitive for national and international awards. The timeline and process for each type of postbac varies widely, but I'm firmly in the "start early, finish early" camp. You'll want to give yourself plenty of

time to write, revise, and secure recommendation letters as necessary. Don't forget to double check any school-specific deadlines.

2. Seek advice from mentors. If you're currently in a research group, talk with your PI or other supervising scientists about your interests and ambitions. Talk with graduate students you know, particularly those in the same field you're interested in. They might have done a postbac themselves or know other students who have and can be a valuable source of advice.
3. Take full advantage of institutional resources that are available to you. If you're interested in applying to the more prestigious scholarships, reach out to your school's scholarship coordinator (they might be housed in the international studies office). Many of these scholarships require your school to endorse you. To facilitate that process, there is often a school deadline that is earlier than the one listed on the official website and a dedicated staff member whose job is to help students apply to these scholarships. More broadly speaking, many universities have writing centers, offer scholarship workshops, and conduct mock interviews. Why not make the most of them? Fortune favors the prepared!
4. Use twitter! I didn't have a personal twitter account before I created one with the primary purpose of keeping up with rapidly evolving SARS-CoV-2 research while I was working in the field. Since then, I've been amazed at how many adverts for graduate students, research assistants, conferences, and scholarships I've seen. Regardless of whether you currently use twitter, you might consider making a dedicated "professional" account to compartmentalize your public and private lives. Follow interesting researchers in your field, popular field-specific and high-impact journals, and any relevant national and international groups or agencies.
5. If you don't know where to start, I think the NIH IRTA postbac is an excellent option for those interested in any kind of research funded by the NIH. I haven't applied, but I understand that the application is straightforward and that you're encouraged to reach out to PIs individually to ask about the availability of a postbac and direct them to your application.
6. I think everyone should apply to the NSF GRFP before graduate school as many times as you can. If you don't know about the GRFP, it's one of the most prestigious graduate fellowships in the US and offers great support. Once you've started a doctoral program, you can only apply once, but you can apply as many times as you want before starting grad school. If I had thought things through better, I would have applied again during my Fulbright year. If you take a postbac and know three people that could write you letters of support, there is nothing to lose and so much to gain by applying. It's incredibly competitive, but it's great practice at grant writing and you'll probably be able to repurpose any postbac or grad school application materials for your GRFP app, or vice-versa! Of course, if you apply for a GRFP and are awarded one, you should know that they are not deferrable – you'll need to start graduate school the next academic year or deny the award.

My own experience

I was split on whether to apply for postbac opportunities or graduate school. I had originally applied to several summer research opportunities for 2020, as I knew I wanted to get some experience outside the research lab I was working in. Because of the COVID-19 pandemic, a lot of these opportunities were cancelled. This was one factor that made me more interested in

taking a postbac. Ultimately, I decided to apply for the Fulbright, though I had my eye on several job openings and considered a Marshall scholarship as well. For the Fulbright research award, I had to write a one-page personal statement and a two-page research proposal, as well as find a sponsoring institution/lab within the country I was applying to. I would say that tracking down a mentor is the most difficult part of this process; I was lucky to find mine through a previous Fulbrighter that I was initially hoping would hire me for a year, but I had also found several leads through university connections. Ask PIs at your university if they have any international collaborators. Search for papers within your field of interest from international institutions and send cold emails. I'd expect this to take a while. You'll also need three letters of recommendation; remember to give your letter-writers as much of a notice as possible, as it's likely they're quite busy. If you are considering applying for a Fulbright advice, feel free to shoot me an email. However, every Fulbright office does things a little differently, so I can't guarantee that what I say would be transferrable past the finalist level.

Of course, the Fulbright application process is quite lengthy, so I had no clue whether I would get it before I needed to make the decision to apply for graduate school. I also wasn't sure how COVID would disrupt international study and travel. I was reasonably prepared to go straight to grad school; I felt like I had a strong application and knew what I wanted to do. For these reasons, I decided to apply for grad school in the same cycle. If you have the time and financial ability (grad school applications are quite expensive), it might not be a bad idea to apply concurrently. It was certainly more work overall, but since I did almost everything Fulbright-related during the mid-summer, I was still able to spend a lot of time on my grad school applications. I also applied to the NSF GRFP that fall, so it was quite busy application-wise, but I found that many of the statements were closely related enough that I could reuse parts of statements on other applications. If you decide to do this, just be up front with your LOR writers that you're going to ask them to write slightly different versions of letters and that there will probably be lots of applicant portals to keep straight. Maybe make them a spreadsheet or something.

I actually applied for graduate schools, interviewed, and even accepted an offer all before hearing back about my acceptance from Fulbright. I was lucky to get into one of my top choices for grad school and had basically forgotten about my Fulbright until I got the acceptance email. I initially wasn't sure I wanted to go – I had a lot of self-doubt and had honestly gotten excited to start graduate school in the fall. But, I eventually came around to the idea, and Emory was willing to defer my admissions offer by a year so I could come. (I would anticipate this would be true for most schools.) I'm so glad I did – I've learned a lot and had a ton of fun. If you choose to apply concurrently, you're of course not obligated to accept an offer at any graduate school and can reapply with your new and improved application the next cycle. I was pretty sure that Emory was the right home for me, though, so it was an easy choice!

I chose to write a project application that was only distantly related to the research I intend on pursuing in graduate school. There are a variety of reasons for this, both practical and personal. Of course, it makes just as much sense to find something that is aligned with your interests (if that's possible and if you know what they are). But, in my own experience, a lot of my learning during this year has been about lab structure, mentorship styles, and independence in research. Because I only worked in one lab throughout undergrad, just existing in a new lab has been helpful in contextualizing my previous experiences and helping inform what sort of lab I'd like to join in grad school. I've benefitted enormously from that alone, and I also have learned lab skills that I might use in grad school. I've had a lot of time to dedicate towards other learning

opportunities and, of course, exploring Istanbul and Turkey. So, don't be afraid to consider different options and research experiences.

Conclusions and helpful links

When I was deciding whether to accept my Fulbright grant, a professor who had written me a letter of recommendation told me this: "[A]s someone who pushed straight through from undergrad to PI, I wish I had taken more time to explore "off topic" opportunities. It is not a race, and grad school will always be an option, but the Fulbright won't." From where I stand now, that professor was absolutely right. I am glad that I decided to take this time to do something different, live in a new place, experience a new culture, work in a different lab environment, and just grow before settling into a PhD program.

Thus concludes my ode to postbacs! I hope that it's been helpful and maybe even opened your eyes to the possibilities that await you before graduate school. Please feel free to reach out to me if you have any questions. And, if you happen to be interested in infectious diseases or public health, I'd be happy to recommend some specific opportunities I know of within those fields.

Helpful links

https://bridgetophd.facultydiversity.columbia.edu/content/other-post-baccalaureate-opportunities (an excellent list of post-bac options from Columbia's bridge program)

https://awards.advising.wisc.edu/wordpress/wp-content/uploads/2016/06/Caroline-Levine-Advice-for-writing-a-Marshall-Personal-Statement.pdf (great general advice for writing personal statements)

https://github.com/gwisk/gradguide (the inspiration for this post; an excellent overview of all things grad school, including fellowships)