

Applying to (STEM) PhD Programs from Undergrad

Eric Gagliano

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Introduction

What is this Document?

Congratulations on considering grad school! Applying for grad school is weird: the process isn't very transparent, and there seems to be a "secret code" that acts as a barrier to entry to most people unfamiliar with the process. **This guide is meant to document my experience in applying and pass down the insight I was lucky enough to be given.** This guide IS NOT representative of everyone's experience or every program out there, but hopefully this will equip you with some of the knowledge you need to become a successful applicant. There isn't a "right" way to do this--this was just how I did it. Don't only use this guide, there are plenty of other resources out there! This guide is a compilation of advice I've received, and is only meant to supplement other knowledge already out there. The only reason I've made it this far is because I've had wonderful mentors and supporters who have guided me along the way. In truth, I owe all my success to them.

How to Reach Me

Feel free to reach out whenever you need. If you don't already have my contact info...

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The Undergrad Disadvantage

From what I've seen so far, it looks like most applicants to PhD programs already have a masters in a related subject and/or have work experience in the field they are applying to. In a lot of ways, this might put you at a disadvantage compared to other applicants. A program or professor may be more inclined to select a student that has "proved" themselves capable in some way, whether that means having already written papers or perhaps already being familiar with the concepts and software used in their respective field. That's ok--it's still possible to succeed! Especially if you are preparing earlier in your undergrad career, you can focus on acquiring valuable and relevant experience and knowledge.

Preliminary FAQ

Is a PhD for me? / Just Because You Can Doesn't Mean You Should

I don't know! You're probably the person most well qualified to answer that question. From what I've been told, a PhD is for someone who:

- Very interested in/passionate about a narrow field of study
- Willing to work independently
- Ok living frugally for 5+ years
- Self-motivated

And is not for someone who:

- Wants to make more money
- Wants to be called "Dr."
- Expecting more of undergrad style education

Also, not to be discouraging in any way, but it may seem tempting to pursue graduate school as a back-up plan. Perhaps you can't find a job right out of college, or you want to do some more learning. That's ok! Explore your options, but remember that a PhD is a huge time commitment and the decision to pursue one shouldn't be taken lightly.

Do I Have to Pay for my PhD? / What is Funding?

Unlike most bachelors and masters programs where you have to pay your way through school, for STEM PhDs, you will just about always be funded. This means that you will not have to pay your own tuition and you will be given a stipend (don't expect a lot though).

Wait..... so you get paid to go to school???

It's a little more complicated than that. I would liken it almost to a job. You work as an RA (research assistant) and a TA (teaching assistant), and in exchange you get your tuition paid for and a stipend (check out some stipends here: <https://www.phdstipends.com/results>). Your research goes towards making progress on projects professors have funding for, and your teaching goes towards filling classes for the money farm that we call the "undergraduate degree". All of this is to say that you are earning your funding, one way or another!

How Long Will it Take?

It depends on your program and your progress. I've heard the average time to a STEM PhD is probably 5-7 years, but can still vary considerably.

Things to Know: Barriers to Entry

Unfortunately, this grad school application process is not very equitable. I wanted to put this at the front of the guide so you know what to expect.

Lack of Transparency

The grad school application process is notorious for not being transparent. If you simply followed the instructions on an average program's website, you'd miss out on some crucial info. Undergrads "in the know" would have a much better shot getting into PhD programs. **This is what this guide aims to help with.**

Money

The GRE, which is required by many (but not all, so check!) programs costs \$205 to take. This includes sending 4 score reports if you know the schools you will be applying to on test day, and \$27 per additional score report. This, along with the cost of the application fee for each application (around \$50-\$100 per application, some even more), AND ALSO transcript costs (for UT, \$20 per school) can all add up really fast.

Connections

You will likely need three letters of recommendation, and I was advised these should really be three professors. If you have networked at all with professors at the school you apply to, you might have a better shot at getting your application looked at.

Research

If you are applying for a PhD program straight from undergrad, professors and programs will want to see some experience in order to evaluate your potential for original and independent research.

Getting Started

Great! If you've made it this far, you're probably wondering how to get started. I've defined two starting spots: one for people in the early stages of undergrad, and one for those that will be applying soon. In truth, I didn't formally start thinking about applications until the end of my junior year. If you plan to apply for fall, the deadlines for applications will usually be in December and you should start in summer. Remember, this timetable is just a recommendation, and if you are more responsible than me, do some of these things earlier than required!

OPTIONAL: Preparing in the Early Stages of Undergrad

It's hard to know early on if a PhD is for you unless you've gotten a chance to do research and take graduate classes. This section will hopefully help you test the waters a bit. If you do decide to apply for a PhD, starting out this early will help you better position yourself to get more experience and better prepare yourself for the application process.

Undergraduate Research

Participating in undergraduate research is something you **really really** should do before applying to STEM PhD programs because research will be the majority of what you would do in a PhD. It's best to find out now if this is what you like. Plus, you need to start building your skillset and have a track record of decent research in order to prove to your program and faculty that you are capable of conducting independent, novel research. Whether it's paid or unpaid, undergrad RA or off campus lab, super relevant to the area you want to apply to or not, it's important to at least have some sort of research experience to point to. For clarification, I think it's also ok to use a more broad definition of undergraduate research--I think experience at a national lab, or an R&D style internship could also be attractive and relevant research experience.

Finding Undergraduate Research Opportunities

I usually give a presentation every year to my FIGlets on research and how to find opportunities. The gist basically is use your resources first--sometimes there are programs that are dedicated to matching undergrads with research. For example, UT has the GLUE program and the TREX program. Look for department wide emails that advertise research. The next step is basically cold calling professors. In a typical cold call email, I would do the following:

1. Introduce yourself (name, year, major)
2. Express interest in their current work
3. Briefly mention your previous experience
4. Thank them for their time and attach your CV (or resume)

Keep the email short, you don't want to overwhelm them! It's also likely that they won't respond, in which case after a couple of weeks you can try a follow-up email or approach them in their office hours if you are brave. If that still doesn't work, move on and message another professor. Here is a mock interest email:

Mock Interest Email

Subject: Potential Undergraduate Research Opportunity?

Hi Dr. Doofenshmirtz,

My name is Eric Gagliano and I am a second year Computational Engineering student here at UT. I've been interested in your research on how to take over the entire tri-state area, specifically on your use of the chicken soup-inator to destroy Tony's Deli. In fact, I am hoping to further explore the field of evil inventions in order to see if research in this domain is the right career path for me. I wanted to reach out to ask if you will have any undergraduate opportunities in the coming semester? Though I don't already have previous research experience, I'm proficient in MATLAB, I've taken Mechanics of Solids taught by Perry the Platypus, and I'm hard worker with a lot of free time this upcoming semester. I've attached my resume in case you or someone you know might be interested. Thank you for your time!

All the best,
Eric Gagliano
<resume.pdf>

Classes

Your choice of coursework is important because it will allow you to effectively explore your area of interest as well as further build your subject knowledge. Also, classes can be an important part of your application because it displays the training you've had up until this point. Not that anyone tries to get bad grades, but do try your best to do well in your classes, especially ones that are relevant to your area of interest. Programs will see your grades for each class you take, so WOW them if you can!

Make Use of Your Electives

Most undergrad STEM programs will allow you a certain amount of electives, or classes not necessarily on your degree plan that you get to choose. Consider this a blessing, because it will allow you to explore potential areas of study. Make use of these effectively--don't waste this opportunity by taking blow off classes! Especially with multiple electives, you can start to take classes broadly in order to narrow down your exact interest.

Take Graduate Classes

It's also a great idea to try to take some graduate classes if you have room in your schedule or they can count for electives. Graduate classes tend to be more narrow in focus which could really help you further refine your area of interest. This could also be really helpful because it shows your ability to undertake graduate level coursework. Graduate level coursework is usually more project-based than undergraduate coursework, so it's also a good opportunity to gain more hands-on and applied experience.

Connecting with Professors

Like other things in adult life (ooof), one of the currencies of academia is connections. Networking will likely be important in whatever future career you participate in, so it's best to get some experience now. Believe it or not, professors are people too! And professors are people who are really important to know. Besides being helpful later down the line with letters of recommendation, professors can be really helpful as mentors and friends. For instance, one of the professors I researched with became a mentor for me and gave me a large chunk of the advice that is in this document. Without her, I wouldn't be where I am. Besides just advice though, she also became a part of my support system through this process, and I am forever grateful for all she has done for me.

If you can, try to make at least three solid connections with professors in undergrad because you will need three letters of recommendation later down the line, and it would be helpful if you don't have to scramble towards the end to find randos to write your letters. This can be through researching with them, taking a project based class where you work closely with them, taking a graduate level class with them, having them become a mentor of sorts to you, TAing a class for them, etc.

Get Involved

Undergrad is a wonderful time to explore your interests, so make it a personal goal to try out as many (reasonably with regards to your health & bandwidth) different things as you can. Different types of research, community service, classes, internships, organizations, sports, social groups, etc. It's not worth it nor is it healthy to spend your entire undergrad career with a singular pursuit to get into grad school. Have some fun and enjoy yourself along the way. You also just might find a passion for a subject through unexpected means, so keep your eyes open and have an open mind!

May-June-July: Refining Your Area of Interest & Preliminary School / Prof Search, Investigating Program Requirements / Due Dates, The GRE, Building your CV

Refining Your Area of Interest & Preliminary School / Prof Search

If you've decided that grad school is for you, you likely have an area of interest and now is the time to start exploring what's out there. Start to narrow this idea down if you can. It might not be enough to tell a program or professor that you are interested in "controls". What about controls interests you? What methods and prior research in controls have you been exposed to? Which applications of controls excites you? Usually, the more specific, the better.

With this knowledge, start to look for what programs excel in this area. What programs advertise expertise and breakthroughs in this area? What programs feature this type of research on their website? And most importantly, start looking for professors that specialize in this area. If you want to be super productive, perhaps peek ahead to the "Searching for Professors" in the September-October section. A head start in this area now will alleviate some pressure in the future.

This section is less about tangible goals and more about getting your feet wet with what the academic landscape in your field looks like, and finding out who the "heavy-weights" in the field are. Don't stress too much if you haven't found the perfect professor to work with--we'll get to that eventually.

Looking at Program Requirements & Due Dates

Now that you've had the chance to look at the webpages of some of the programs you are interested in, find the PhD program requirements page. This will help you to make sure you meet minimum qualifications, such as GPA, previous degree requirements, citizenship, etc. I wouldn't immediately cross a school off your list at this point if you miss a requirement, as when you reach out to the professor you are interested in there you can be upfront about missing a requirement and see if they might make an exception. Looking at the requirements should help you better understand what type of person the program is searching for.

This is also a great opportunity to look at due dates for applications! This will let you start to plan ahead, bookmark some application pages for easy reference later, look at how application materials might be different for different schools, and get some due dates on the calendar so you can start creating a preliminary timeline for yourself.

Studying for and taking the GRE

Summer is here, and that means GRE season! The GRE is basically the SAT of grad school. Five out of the seven programs I applied to required the GRE. So, chances are you will be taking the GRE. Largely, admissions decisions aren't made on your GRE score. I've been told that as long as you are around the average range for the schools you apply to, it neither hurts nor helps your application significantly. However, it is required by many programs so it is best to take this test seriously.

A Note on Cost

This test is expensive! It costs \$205, and \$27 extra for every score report you want to send after your (4) freebies to schools that you HAVE to declare the day you take the test. As in, if you don't know any of the schools you'll be applying to on the day you take the GRE, you miss out on 4 "free" score reports. However, you can apply for a fee reduction here: (https://www.ets.org/gre/revised_general/about/fees/reductions).

A Note on Equity

Besides the GRE not being a good predictor of grad school success, the GRE has been shown to "...severely restrict the flow of women and minorities into the sciences". I totally agree and feel like the test should be removed entirely from admissions considerations. Fortunately, more programs have recently removed the GRE requirement and hopefully by the time you are applying it is gone from your programs requirements. Read more here: (<https://www.nature.com/articles/nj7504-303a>).

So, we've established that this test sucks. But if any of the programs you've looked into so far require it, you are probably going to take it. For me, I suck at these types of tests, so this was the scariest yet most inconsequential part of the application process.

Preparing

There are a ton of ways to prepare for the GRE. In order to assess how much time you need to prepare, I would take an initial practice test and take it seriously, timed, no distractions, no handheld calculator, etc. Compare the score you get with either the score you want, or the average GRE scores of the program you are applying to. Some help finding these average scores here: (<https://www.prepscholar.com/gre/blog/average-gre-scores-by-school/>). Based on the score difference between what you got and where you want to be, create a study timeline. For me, I started studying at the beginning of summer, and I took the test at the end of summer. That was supposed to be the plan, at least.

The advice I was given was that for STEM programs, the quantitative reasoning score is far more important than the verbal score. So to the extent that the GRE matters, it's probably worth your time to focus on the quant section. This section is also easiest to improve because there are a relatively small number of math concepts that are tested over, whereas the verbal section can pull obscure words from a bank as big as a dictionary.

All of the quantitative reasoning math concepts can be found here: (https://www.ets.org/s/gre/pdf/gre_math_review.pdf). While this is inclusive, it reads like a textbook and is kind of awful to go through. If that's your thing, more power to you. Some of these concepts are covered in Khan Academy videos which can also be helpful: (https://www.ets.org/gre/revised_general/prepare/khan_academy). If you are willing to shell out some cash though, the best way you can prepare for the GRE in a timely and structured way is using the Magoosh website: (<https://gre.magoosh.com/plans>). When I checked while making this guide, this service was \$149 for 1 month or \$179 more 6 months. This is a lot more than I paid, so I'm guessing they raised their prices. However, this way was best for me because it held my hand throughout explaining the test structure, giving good GRE specific test-taking tips, thoroughly teaching me all the math concepts, and walking through problems step by step. The practice questions all came with video explanations after the fact, which was also super helpful to me. So based on your first practice test, if you think you need a significant score boost and a structured program, this might be a good way to bump yourself up.

From Morgan Santoni-Colvin: For cheaper studying: I found the manhattan 5lb was very good for refining my quant strategies too, and it's only like \$20 which was really what made me use it over magoosh. Also definitely worth mentioning the ETS official guide and problem sets (like \$20 per book), and powerprep exams because those are 100% resemblant of the question style of the GRE. On that though, it may be worth noting that the free exams provided through the website are generally easier than the actual test and that the pay-to-play ones are more representative of the difficulty. I didn't do magoosh but my understanding is they are especially good for quant like you said, especially because they include high-difficulty problems.

Take the Test

Congrats on getting this far! From the ETS website, here are things to know for test day: (https://www.ets.org/gre/revised_general/test_day/). It would be helpful and reduce your overall expenditure if at this point you know 4 of the programs you are going to apply to so you can type them in on the score reporting page. You will be told your Verbal and Quantitative Reasoning score as soon as you've finished the test, but the official score report and writing section score won't be delivered to you until later. If you scored way below where you wanted to, evaluate whether it's worth it for you to retake the test. For me, I scored a little below what I wanted, but I was not in the position to pay more so I just stuck with my score even though it was on the lower end of average GRE scores of applicants who applied to my programs.

Build your CV

While not strictly needed right this moment, I found building and completing your CV at this point in the timeline was super useful for me. It will help you when you are reaching out to professors for recommendations, it is very important to have when reaching out to potential advisers, it is required by some applications, it helps build a narrative about your academic career so far, and will prove to be a useful tool when figuring out how to “sell” yourself. I spent a lot of time building my CV, and honestly I think it’s most of the reason my application was so strong. Ok but what the heck is a CV?

CVs and their Purpose

A CV is basically an extended resume--it is meant to be comprehensive. It will be likely more than one page. CV stands for “Curriculum Vitae” which is old people talk for “course of life”. CVs are usually used in place of a resume in academia and will very likely be used in your application. According to studential.com, a CV may include:

- **Personal Details and Contact Details** - This should include your name as the document title, with all other details beneath.
- **Education and Qualifications** - Make sure this is in reverse chronological order. Include any relevant qualifications and/or relevant awards and prizes.
- **Relevant Work/Research Experience** - This can include both full time and part time work, paid or voluntary. Remember to keep this relevant to your application.
- **Skills** - Include specialist and technical skills, along with IT skills, plus any skills that would be crucial for the PhD position.
- **Posts of responsibility** - Highlight any post of responsibility, such as course organisation.
- **Attendance at conferences and seminars** - List any conferences and/ or seminars you have attended or been invited to.
- **Interests/hobbies** - Include any journals, relevant to your application, you read to keep abreast of new developments. Other relevant hobbies and interests should also be included.
- **References** - Include at least two academic referees who have given you permission to be included in your CV.

Tailoring Your CV

Well damn that’s a lot of stuff. And you may not have everything on that list--I sure didn’t! I never went to a conference, never been invited to have a talk, never authored an academic publication, and I was too scared to ask anyone if I could put them as a reference on my CV. But, like most things in this process, you need to work with what you do have and sell it as best you can.

I'll talk about this later in the document, but you want to make sure that you are a good fit wherever you end up. You don't want to be hired somewhere for someone who you're not! Therefore, I would try to make your CV as representative of who you are as possible. Prop up the things that make you special! For me, while I didn't have any papers or conferences to speak of, I did have a ton of volunteering experience that I wanted to highlight. For me, it was important for a program to see that side of me, because I want to be somewhere that appreciates that type of work and hopefully participates similarly.

I would start by creating a master document of all the things you want to put. Just mass copy and paste from resumes or your linkedin descriptions so you have a pool of things to throw on the CV. You can always edit descriptions once they are on the CV, but I found that starting out was the hardest part, and copy and pasting things I already had saved time and gave me a bit of momentum.

Choose a Template

Once you have a master list of all the things you want on your CV, it's time to choose a template! This part really shouldn't be that important, but I spent a lot of time obsessing over a template because I wanted to choose one that best accentuates who I am. While there are a lot of good templates out there, the following website has two decent examples: (<https://www.prepscholar.com/gre/blog/graduate-school-resume-cv-template/>). But google docs, microsoft word, and others all have good templates. When I was looking for a template, I would get stressed because a lot of the sections like invited talks didn't apply to me. That's ok! Don't be afraid to modify the template and create and delete sections so you can best showcase your work. Personally, I searched Overleaf's CV templates, found one closest to what I wanted, and modified the heck out of it until it fit my needs.

My CV

Here is the CV I ended up using for my grad school applications. Some things to note: by a lot of people's standards, this has far too many words on a page, is too small font size, and has dumb things like my hobbies. A lot of people don't put their classes either, but I wanted to highlight the diversity of classes I took because I thought it was one of my strengths. There are a TON of very fair criticisms out there, but I ended up proud of it because I felt like if any of my friends read it, they would say "Yup, that's definitely Eric". You won't be able to please everyone, so I would definitely get some advice and critiques, but at the end of the day go with your gut. Make sure to save your CV as PDF. And for the love of god, don't be dumb like me: make sure someone proofreads it.

Eric Gagliano

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Education

The University of Texas at Austin

Bachelor of Science, Computational Engineering

- Certificate in Humanitarian Engineering
- Minor in Business Foundations
- GPA: 3.83/4.00

Austin, TX

08/2015 - 05/2020

Recent Coursework

Engineering

Computational Fluid Dynamics
Computational Structural Analysis
Electromechanical Systems
Linear System Analysis
Mechanics of Solids

Math

Partial Differential Equations & Applications
Applied Regression Analysis
Matrices and Matrix Calculations
Differential Equations & Linear Algebra
Probability I

Programming

Advanced Computational Engineering
Software Engineering & Design
Scientific Computing
Engineering Computation
Numerical Analysis

Interdisciplinary

Dynamics of Polar Systems
Computational Modeling in Bioengineering
Nuclear Environmental Protection
Humanitarian Product Design
Senior Design Project

Research Experience

Center for Space Research

Radar Interferometry Group, Research Assistant

Austin, TX

08/2018 - Present

- Researched under Dr. Ann Chen to model seasonal glacial flow in Western Greenland using Interferometry on Synthetic Aperture Radar (SAR) data from Sentinel-1.
- Built Digital Elevation Models (DEM) from ArcticDEM data and validated the advertised sensor resolutions using statistical methods.
- Constructed interferograms to measure glacier velocity and to conduct seasonal analysis to determine the spatial speedup during the warmer months.
- Gained familiarity with Computer Vision and Image Processing concepts by implementing cross-correlation, feature detection, texture analysis, and SIFT.

Sandia National Laboratories

Autonomy for Hypersonics Group, Year Round Intern

Albuquerque, NM

08/2018 - 08/2019

- Developed method for efficiently correlating SAR images to DEMs in real-time using Computer Vision techniques for use in navigation in GPS-Denied environments.
- Created a ridge detection algorithm in MATLAB for use on Digital Elevation Models to extract a peak and mountain range "skeleton".
- Improved cross correlation code run times from 3 hours to 12 seconds using a combination of FFTs, down-sampling, parallelization, and GPU based computations.
- Implemented SURF to perform rotation-invariant feature-based image registration between projections of radar images and gradients of elevation maps.

Center for Analysis Systems and Applications, R&D Intern

05/2018 - 08/2018

- Added complexity to a cloud generation and atmospheric MATLAB model, focusing on clustering algorithms and global temperature profiles.
- Updated a proprietary sensor and signal processing library from Python 2 to 3, debugged relevant errors, and improved code testing capabilities.
- Modernized a large satellite modeling and simulation codebase for better compatibility with current capabilities and input formats.

Center for Mechanics of Solids, Structures, and Materials

Austin, TX

Individual Project, Research Assistant

01/2018 - 05/2018

- Researched under Dr. Ravi-Chandar to investigate crack propagation and fracture patterns in specific alloys of aluminum.
- Used ABAQUS (Finite Element Analysis software) to model fracture of AL6061-O using the Johnson-Cook Damage Model.
- Validated computational model of fracture by fatiguing and testing aluminum specimens in a hydraulic material test station.
- Speckled test specimen and used Digital Image Correlation software as a secondary source for strain measurements and visualization.

Applied Research Laboratories

Austin, TX

Modeling and Simulation Group, Student Technician

06/2017 - 01/2018

- Developed a prototype active sonar ontology to represent target properties during signal processing using TopBraid Composer.
- Supported the architecture design for the Army's next iteration of the Games for Training (GFT) program by evaluating proposed requirements.
- Performed trade studies and analysis on scenario generation, model interchange formats, and vehicle dynamics systems for GFT.

Teaching Experience

COE 301: Introduction to Computer Programming

Undergraduate Teaching Assistant

08/2019 - Present

- Hosted weekly interactive office hours for a class of 80 students to help them debug their C++ and MATLAB code and better understand concepts.

Department of Aerospace Engineering & Mechanics

First Year Interest Group Mentor

08/2016 - Present

- Mentored 60 first year students (over the course of four years) in their academic and social careers.
- Organized speakers and events and lectured on student requested topics to teach students about their major, time management, UT traditions, campus resources, etc.

Leadership & Volunteering

Camp Kesem

Volunteer Historical Data Intern (for the national organization)

09/2018 - 12/2018

- Large-scale data collection and cleaning of alumni, volunteer, camper, and campsite contract information from various databases and imported them into Salesforce.
- Presented a gap analysis on vital campsite data, made data management recommendations, and suggested uses for newly acquired data to the CEO of Kesem.
- Recommendations to be implemented in the near future, such as regional contract data to be used to ensure fair campsite contract negotiations.

Unit Lead, Summer Counselor, & Active Member (for the UT chapter)

12/2017 - Present

- Ensured safety, managed schedule, and was responsible for 14 campers and 5 counselors as the unit leader of Yellow Unit 2019.
- Summer Counselor for the UT Austin Chapter of Camp Kesem, a week-long camp for children whose parent has or had previously been diagnosed with cancer.
- During school year supported donation drives, wrote letters to the kids, volunteered regularly to raise money to send kids to camp, and personally raised over \$2400.

Student Engineers Educating Kids (SEEK)

Vice President of Mentoring

05/2019 - Present

- Devised ten STEM-related projects and lesson plans and oversaw their weekly implementation across 15 Austin area schools serving over 160 children.

Program Officer

01/2019 - 05/2019

- Coordinated and managed a group of student mentors assigned to Barbara Jordan Elementary and facilitated the curriculum and faculty orientation.

Weekly Volunteer

08/2018 - Present

- Taught after-school STEM curriculum to elementary children through fun projects such as bottle rockets, marble roller coasters, and baking soda volcanoes.

Students Expanding Austin Literacy (SEAL)

Weekly Reading Buddy

08/2016 - Present

- Visited underprivileged elementary schools and community centers every week in East Austin to read with and mentor students who were identified as under-performing.

Theta Tau Professional Engineering Fraternity

Not On My Campus (NOMC) Peer Educator

08/2018 - Present

- Attended extensive NOMC trainings in sexual assault prevention, gave comprehensive presentations to Theta Tau, and acted as a resource to members in need.

Weekly Math Tutor

08/2015 - 12/2017

- Volunteered weekly for four semesters to tutor middle school students in math to prepare them for their STAAR exam.

Committee Positions

Department of Aerospace Engineering & Mechanics

Computational Engineering Curriculum Committee, Student Representative

1 semester

- Served as the student representative and gave advice based on student feedback for the COE curriculum committee comprised of department faculty.

Camp Kesem

Make the Magic Committee

1 semester

- Helped plan and organize a massive fundraising event for the UT Austin chapter of Camp Kesem, with an attendance count of over 200 donors, raising \$44,000.

Theta Tau Professional Engineering Fraternity

Pledge Committee

3 semesters

- Worked to promote an inclusive and respectful culture among new pledges and provided advice, encouragement, and introductions, especially for the shy pledges.

Rush Committee

6 semesters

- Assisted in recruitment of new members by helping set up events and fostering a safe and comfortable environment.

Student Engineering Council Representative

1 semester

- Represented Theta Tau in the Student Engineering Council and maintained communication between the two while providing feedback to the Cockrell School.

Other Memberships

UT Concert Chorale

4 semesters

- Performed a variety of high-level choral literature as a Tenor I/II in one of UT's official ensembles. (7hrs/week)

Collegium Musicum

4 semesters

- Practiced and performed in a student-run mixed ensemble focused on performing a cappella works. (4hrs/week)

The Leadershape Institute

1 semester

- Selected for and participated in a week long camp focused on leadership, ethical decision making, emotional intelligence, and self-discovery.

Tau Beta Pi Engineering Honor Society

2 semesters

- Worked fundraising shifts, attended professor chats, and volunteered at food banks and other Austin area opportunities with other members.

Projects

Improving Access to Feminine Hygiene Products in Syrian Refugee Camps

08/2019 - Present

- Collaborated with the Lebanese Red Cross on low-cost fabrication of menstrual pads by improving on a prototype and field study of a previous team.
- Raised \$8000, purchased supplies, and built multiple prototypes of a device that would seal a super-absorbent polymer between a mesh and an impermeable layer.
- Navigated both a hygiene protocol and local social customs surrounding menstruation and hygiene to deliver both an effective and culturally sensitive solution.

Understanding Ice Melange in Greenland through Image Processing and Remote Sensing Methods

10/2019 - Present

- Created a novel method using image processing techniques and Landsat data to determine the spatial pattern of ice melange in the fjord of Risk Isbrae in West Greenland.
- Converted Landsat data to a Normalized Difference Snow Index and performed k-means clustering using Gabor filter bank responses to classify types of ice melange.

Designing a Low-Cost Ultrasonic Anemometer (Senior Design Project)

01/2019 - 05/2019

- Tasked with designing a compact, drone mounted, two component anemometer by SeekOps, a methane detection company for the oil and gas industry.
- Iterated on all aspects of the design, from CAD and CFD models in SOLIDWORKS, to MATLAB models of the waveforms, to LTSpice models of the electronics.
- Design envelope delivered to SeekOps with technical recommendations and detailed instructions on how to build our modeled prototype.

Modeling Cardiopulmonary Resuscitation with Different External Pumping Techniques

02/2019 - 05/2019

- Investigated the American Red Cross CPR 2018 Guidelines by computationally modeling the left ventricle's response to various CPR frequencies and pressures.
- Extended on work from a previous research team's attempt to abstract the left ventricle as a non-linear electrical circuit.
- Combined our adaptation of the circuit abstraction with input data from a SIMULINK model, and built an interactive Python model with variable CPR parameters.
- Confirmed best CPR practices by studying responses to changes in our model parameters and realized flaws in the previous team's circuit abstraction approach.

Web-Accessible Time Series Analysis of Prices from a Redis Database

01/2019 - 05/2019

- Deployed a distributed, web-accessible cloud system using a Flask app and created an accompanying REST API to analyze time series price data of various goods.

Finite Element Code Creation and Validation

03/2019 - 05/2019

- Created a 2D Finite Element Modeling code in MATLAB using triangular elements to analyze stresses and strains of plates with various meshes to test accuracy.

Study on Austin Animal Center (AAC) Adoption Rates

10/2018 - 12/2018

- Investigated the effect of age on AAC adoption rates with R and multivariate logistic regression using data from the AAC's database of 93,000 animals since 2013.

Computational Study on the Effectiveness of Flettner Rotors

03/2018 - 05/2018

- Evaluated the potential use of Flettner Rotors in modern day avionics using OpenFOAM CFD software and MATLAB to generate meshes.
- Simulated a Flettner Rotor in turbulent atmospheric conditions and visualized the velocity profiles and pressure fields using ParaView.
- Implemented a momentum analysis method to produce accurate estimations for real world specifications of required rotor dimensions and RPM.

Infectious Disease Model

11/2017 - 12/2017

- Implemented the SIR variant of a Compartmental Disease Model in C++ and FORTRAN to simulate an outbreak of measles using human geographic data of the US.
- Ran large scale simulations and created accompanying visualizations using Texas Advanced Computing Center's STAMPEDE 2 supercomputer.

Brain Tumor Modeling and Prediction in Rats

03/2017 - 05/2017

- Created and analyzed visual representations of tumor growth in rats using 768,000 experimental data points from brain slices in Python.
- Combined a Gompertz function and probability density functions to optimize a model for predicting future tumor growth with tolerable accuracy.

Reverse Engineering a Mechanical Timer

08/2016 - 12/2016

- Deconstructed mechanical timer and modeled 27 individual parts in SOLIDWORKS.
- Improved timer by redesigning bell mechanism, fabricating rapid prototype using campus 3D printers, reconstructing timer, and testing performance.

Trajectory Simulator

11/2015 - 12/2015

- Created a physics sandbox using MATLAB to simulate and visualize combined orbits of the sun, earth, moon, and potential satellites with an interactive GUI.

Skills

Programming: MATLAB, Python, R, C++, Julia, FORTRAN, Java.

Software: FEniCS, ABAQUS, OpenFOAM, ParaView, SOLIDWORKS, AGI's STK, Protégé, Excel, PowerPoint, DIC Software, EIG.

Clearances/Other: Department of Defense Secret Clearance, Department of Energy L Clearance, Arduinos, Comfortable in Linux, CPR Certified.

Additional Info

Achievements: Honors R&D Program at ARL, National Speech & Debate Association Degree of Outstanding Distinction.

Interests: Cryosphere, Geophysics, Atmosphere & Climate, Humanitarian Applications of Engineering, Space, Modeling & Simulation.

Hobbies: Volunteering, Choir, Hiking, Curling, Board Games, Dodgeball (Fall 2019 UT Intermural Champion), Gaga Ball, Super Smash Bros.

August-September-October: Asking for Letters of Recommendation, Searching & Reaching Out to Potential Advisers, Starting Applications, and The NSF GRFP Application

Asking for Letters of Recommendation

Letters of recommendation are one of the most important parts of your application. Most programs as well as the NSF GRFP application (which we will get to soon) require 3 letters.

Who to Ask

As mentioned earlier in the document, I've been told that it's preferable that your letters be from professors. These letters are supposed to evaluate your potential to succeed in research and graduate school, so it's important to find people who can speak to your previous work positively. This is another reason why it is so important to start to cultivate good relationships early in your undergraduate career.

To be more specific, here are some things you may want to look for in a letter writer. Look for someone who:

- Knows you well, hopefully a little more than just name basis
- Is a professor
- Has seen your research ability first hand
- You've worked closely with on a class project (think senior design prof)
- Knows your goals
- Likes you

Your letter writer doesn't have to have all of these things! Though you usually need three letters, check your program requirements to make sure you don't need more. I would recommend choosing four people just in case a letter writer gets flakey on you.

When and How to Ask

Depending on who you ask, different people will give you different answers on when to initially request a letter of recommendation. I would say two months is a good middle ground. If you know your letter writer is particularly busy, perhaps consider giving them more notice. It's likely that the first deadline will be November 1st if you are going to do the NSF GRFP (we'll talk about this in the next section), which you definitely should do. So I would recommend asking at the beginning of September.

I would recommend asking in person, that way you can get a sense of if they're reluctant to write you a letter. You probably don't want a letter from someone who is pretty hesitant about it. For me, I sent a quick email to my letter writers asking if I could set up a quick meeting with them to get their advice on some grad school stuff and possibly ask for a letter from them. Here is one of my emails:



Eric Gagliano <ericgagliano@utexas.edu>
to clint@ices.utexas.edu ▾

Mon, Sep 30, 2019, 2:51 PM



Hey Dr. Dawson!

I'm applying to PhD programs this semester and I was wondering if I could talk to you about advice for marketing myself as a COE major, additional schools to consider, and possibly a request for a recommendation? If you're free sometime this week or next I would love the chance to meet with you in person!

All the best,
Eric Gagliano

When you talk to them in person, tell them about your goals, interests, and with who or what schools you're thinking of applying to. Hopefully they can provide some good advice, especially if they work in that field! This is a great opportunity to get some powerful insight, so don't squander it! At the end of the meeting, you can ask them if they would be willing to write you a letter of recommendation. If they say yes, ask what they need from you. Some will request your CV, your application materials, a rough draft of your statement of purpose, your transcript, etc. Some may even ask that you help write the letter. Once they say yes, I would send a follow up email thanking them for writing you a letter and also attach your CV and other relevant info (I worked on this project with you and accomplished this etc). Let them know when to expect the deadlines. Once you begin the application process on each programs website, you will be sending each letter writer a link via email to upload their letter.

Searching for Potential Advisers

Your adviser will probably be the most important person in your graduate career. Your advisor is a faculty member whose role is to guide you through graduate school in both classwork and research. Different advisors will have different areas of expertise and mentoring styles, so it's important to choose the advisor who will be best for you.

Where to Start

Here is some advice I recently gave a friend: Since choosing your advisor is one of the biggest decisions you'll make in this, it's important to do your research. I would start by finding a professor that most aligns with what interests you—don't search a program first and then find a

professor in that department. I mean, you can do that, but you might end up compromising on your research subject.

In terms of searching tips, here are a couple of approaches: First, search for research papers in your domain that excite you. Use google scholar and find papers that feel most closely aligned with what you would want to do in the future. Look for the authors of those papers and google them. Look at their personal research or group page to better understand their area of interest.

Second, (these aren't mutually exclusive, i think it's beneficial to do both) is to find a professor at UT that does similar work (doesn't have to be super close) and ask to meet / zoom with them. Talk about your interests and what you eventually want to do in the future and ask them for advice: who should you talk to at what schools? The truth is academia is kinda closed off, and an insider in your domain is super valuable because they know the nuances of the different areas of research of other professors and the differences between them. Academic papers are super hard to read at first so it's hard to figure out for yourself what professor most aligns with your interest. This is a good way to find your initial leads and both of these pathways together should land you with a list of professors to pursue as potential advisers.

Reaching out to Potential Advisers

The Inquiry Email

This is probably the most important part of the process both because this will likely be your advisor throughout your PhD and also because they largely make the decision to accept you to the program. We really want to knock it out of the park with our first email then and make a good first impression. This is in part why spending time building the CV earlier is super important, now we can show off all our hard work!

First, do your research and check out their group and/or personal webpage. A lot of professors seem to have a section about how to join their lab or research group. If they do discuss how to express interest in working with them, follow those instructions! If not, or if their page instructs you to email them, let's start working on crafting an inquiry email.

Now is a great time to whip out the CV we made earlier. Make sure it's in PDF format and attach it to the email. Don't be dumb like me and forget to attach it because you will look stupid when you say "attatched is my CV" and they reply:



Helen Amanda Fricker <hafricker@ucsd.... Tue, Nov 12, 2019, 12:51 PM



to Gp-admission, me ▾

Dear Eric,

There was no CV attached.

Email time! I've been told it's best to keep these no more than medium length, whatever that means. The goal here is to make your introduction, grab their attention, and hopefully interest them enough to want to continue a conversation. A good strategy is to focus the first

paragraph on who you are and your academic background and the second on expressing interest in their work (and also include some detail about their website or a publication of theirs to prove that you did your homework and are interested enough) and then also ask if they will have any openings for the term you are applying for. Here is a template I made and then edited for each professor:

Dear Professor -----,

My name is Eric Gagliano and I am in my final year as a Computational Engineering undergraduate at the University of Texas at Austin, where I work with Dr. Ann Chen on using remote sensing techniques to measure seasonal glacial flow in Western Greenland. Besides this current work, I have a lot of varied research experience, including working at Sandia National Laboratories studying computer vision applications to SAR images for autonomous navigation of hypersonic vehicles in GPS-denied environments, working with a materials professor to computationally model fracture in specific alloys of aluminum, and working at Applied Research Laboratories on sonar data processing for the Navy.

I'm planning on applying to PhD programs soon, and I was very interested in the work you do with -----.

I was wondering if you were planning on taking on any students or had any opportunities in your lab for Fall 2020? I would also be interested in any advice or other information you may have. I have attached a copy of my in-progress CV in case you or someone you know may be interested. Thank you so much for your time, I really appreciate it!

All the best,
Eric Gagliano

Unfortunately, not everyone will respond. I got lucky because eight out of the thirteen emails I sent out were responded to. I hear it can usually be a lot worse, some friends have told me only a third of their inquiry emails were responded to. It's also a good idea to keep a spreadsheet of who all you've sent an email to and associated information, which you can later turn into an application checklist for each school:

	A	B	C	D	E	F	G	H	I	J	K
1	School	Professor	Response to Inquiry	Application Due	Application Materials	Link	Applied?	all letters submitted?	"I applied" email	STATUS?	FINAL STATUS
2			no reply, but multiple people have said hard to get along with / our personalities may clash		application, GRE, 3 letters of rec, unofficial transcript upload, supplemental materials		will not apply				
3	Stanford		enthusiastic, talk went well lookin good, i should probably email him when i apply	12/10/2019	letter of intent, resume, writing sample, official transcript, 3 letters of rec, GRE	https://earth.stanford.edu/ge	YES	DONE	SENT	interview	rejected
4	Boise State		excited "really great fit", listed ways i can be funded, skype sounded promising	12/15/2019	letter of intent, resume, writing sample, official transcript, 3 letters of rec, course summary	https://www.boisestate.edu/	YES	DONE	SENT	accepted	accepted
5	UM		responded, not sure about funding, encourages to apply, wants skype call	12/15/2019	Application, 3 letters of rec, transcript, statement of purpose, personal statement, CV	https://clasp.engin.umich.edu	YES	DONE	SENT	deciding on funding	no response
6	UW		skyped, says CV impressive, would be good fit. Stay in contact, maybe reach out after the new year	12/15/2019	500 word SOP, 3 letters, transcript, GRE, resume	https://www.ce.washington.edu	YES	DONE	SENT	interview	accepted
7	UCSD		generic info about Scripps	12/16/2019	statement of purpose, official transcript uploaded, 3 letters of rec, checklist of courses, application, 3 letters of rec, 2 transcripts,	https://scripps.ucsd.edu/doc	YES	DONE	SENT	accepted/ visit day	accepted
8	UBC		no reply	1/1/2020	optional GRE	https://www.eoas.ubc.ca/aca	will not apply				
9	MIT		responded, skype went very well, planned to not take students but he may change mind if his funding and time work out	1/5/2020	bio, 3 letters of rec, GRE, subjects taken form, statement of objectives	https://eapsweb.mit.edu/gra	YES	DONE	SENT	accepted/ visit day	accepted
10	UW		no reply	1/5/2020	online app, GRE	https://www.ess.washington.edu	will not apply				
11	UW		no reply	1/5/2020	online app, GRE	https://www.ess.washington.edu	will not apply				
12	Columbia		not taking students, but other professors in polar science will be and he encourages to apply. Mention use of big data in SOP, mention perhaps	1/5/2020	GRE, transcript, statement of purpose, CV, 3 letters of rec, sample of scholarly writing	https://eesc.columbia.edu/pr	YES	DONE	SENT	no response	no response
13	UW		not taking students, he recommended 2 others though- or	1/5/2020	online app, GRE	https://www.ess.washington.edu	not taking students				
14	CalTech		no reply	1/1/2020			started, decided not to submit				
15	Key										
16				Looks really good, discussed funding							
17				Great talk, will apply / looking into funding							
18				Encourages to apply / recommended other people							
19				No response							
20				Wouldn't want to work with them							

The Skype/Zoom Call

If you've received an email back with interest from the potential adviser, they will likely set up a call to chat. This is a great opportunity for them to learn about you, your background and your interests, and a great opportunity to learn about them, their ongoing projects, and their mentorship style / lab expectations. You should go into this call already having a good idea of what they do, but it's ok to ask about specifics or about details of ongoing projects. I would treat it almost like an interview: you don't want to not have done your research, because it will look bad when you ask them "so what do you guys do here?". Additionally, I would have written down some questions that you prepared beforehand to ask them. **Ask genuine questions which you think will help you make your decision. Ask yourself "What is important to me in a program or advisor?", and form your questions around those. For example, are you very independent and like a more hands-off mentorship style? Ask them what their mentorship style is like!** Some questions that I asked:

What do you think the most exciting research your group is currently working on?

How much collaboration does your group do with other groups/departments?

typical day in your lab look like?

on the outreach tab? what type of stuff could I get involved with?

types of courses to take next semester that would better prepare me?

Don't be too worried about keeping the conversation going, from my experience they seem to take over and steer the conversation. Stay in contact with them if you can! Hopefully they can give you some insight into the program application.

Starting Applications

Now that you have a good idea of some of the schools you will probably be applying to, look further into the application process. Back in the May-June-July section we looked at program requirements and due dates. Let's take it a step further and start signing up for application accounts and filling out preliminary info. There will probably be a lot of copy and pasting from your CV, as a lot of times they have different fields to fill in for each category of info they want. You can now work on application materials as best fits your timeline, so peak ahead a bit for tips on personal statements and such.

The National Science Foundation Graduate Research Fellowship Program Application (NSF GRFP)

Though this step is technically optional, I highly highly highly recommend it. Even if you think you have a 0% chance of winning the fellowship, you're probably underestimating yourself AND even if you don't win, this is great practice and can even serve as a template for your statement of purpose you'll need to write anyway for your applications. **ALSO, if you end up getting turned down from a program or professor because they don't have funding for you and then you end up winning this award, email them and there will be a chance that they will take you on because you come with your own funding!** This is a good way to stay on track with the other deadlines. Seriously, you have nothing to lose. Do it!

What is the NSF GRFP and Why You Should Apply?

If you are a U.S. citizen, national, or permanent resident, you can apply for the NSF GRFP. Check out this link for great program information:

<https://www.nsf.gov/ehrpubs/grfpoutreach2020.pdf> (updated 2020) The TLDR is that this is a competitive fellowship program that will fund 3 years of your PhD if you win (they will pay your tuition and pay you 34,000 a year for 3 years). They usually receive between 12,000-17,000 applications and fund 2,000 of them. So the odds aren't too bad! Here are the eligible fields of study:

- Chemistry
- Computer & Information Science/Engineering
- Engineering
- Geosciences
- Life Sciences
- Materials Research
- Mathematical Sciences
- Physics and Astronomy
- Psychology
- Social Sciences
- STEM Education

The entire application consists of 5 things:

1. Personal Info (includes Education, Work/Research Experience, Field of Study, Honors, Awards, Publications)
2. Personal, Relevant Background and Future Goals Statement (3 pages)
3. Graduate Research Statement (2 pages)
4. Transcript
5. 3 Letters of Reference (minimum is 2, but it is highly recommended to have 3)

All things considered..... That's not a lot. All of the application materials are due the third week of October (the field you apply to will determine which exact day yours is due), and all reference letters are due November 1st. With this application, it is VERY VERY important to follow all instructions exactly, especially formatting. If you do not comply with their format, they will not even look at your application. Watch the GRFP Tutorial here: https://www.nsfgrfp.org/applicants/grfp_application_tutorial

NSF Merit Review Criteria

In all of your application materials you will be judged on the two NSF Merit Review Criteria: Intellectual Merit and Broader Impacts.

Briefly, Intellectual Merit refers to "How important is the proposed activity to advancing knowledge within its own field or across different fields?". This includes "Demonstrated intellectual ability (grades, curricula, awards, etc.), Other evidence of your potential, such as ability to: Plan and conduct research, Work as a member of a team as well as independently, Interpret and communicate research, Take initiative, solve problems, persist. The potential of your approach to your field of study and your Research Plan to advance knowledge."



Intellectual Merit

Your potential to advance knowledge

- Demonstrated intellectual ability (grades, curricula, awards, etc.)
- Other evidence of your potential, such as ability to:
 - Plan and conduct research
 - Work as a member of a team as well as independently
 - Interpret and communicate research
 - Take initiative, solve problems, persist.

The potential of your approach to your field of study and your Research Plan to advance knowledge.

Evidence of Intellectual Merit can be found in all parts of the application -
Personal Statement, Research Plan, letters, experiences, awards,
achievements, and transcripts.

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Broader Impacts refers to: "How well does the proposed activity benefit society or advance desired societal outcomes?" More specifically, "Potential impact of the individual (you!) on society, Potential impact of your research on society; why it's important Societal benefits may include, but are not limited to: Increasing participation of underrepresented groups, women, students with disabilities, veterans, Outreach: Mentoring; improving STEM education in schools, Increasing public scientific literacy; increased public engagement with STEM, Community outreach: science clubs, radio, TV, newspapers, blogs, Potential to impact a diverse, globally competitive workforce, Increasing collaboration between academia, industry, others".



Broader Impacts

- Potential impact of the individual (you!) on society
- Potential impact of your research on society; why it's important

Societal benefits may include, but are not limited to:

- Increasing participation of underrepresented groups, women, students with disabilities, veterans
- Outreach: Mentoring; improving STEM education in schools
- Increasing public scientific literacy; increased public engagement with STEM
- Community outreach: science clubs, radio, TV, newspapers, blogs
- Potential to impact a diverse, globally competitive workforce
- Increasing collaboration between academia, industry, others

Evidence of Broader Impacts can be in all parts of the application - Personal Statement, Research Plan, letters, experiences, awards, achievements.

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It may be good to look back at your CV and start figuring out which activities fall under what categories. Remember, you will need to address the two criteria everywhere in your application! In fact, it's recommended to address both criteria in both the Personal Statement and Research Statement into two separate sections.

Personal, Relevant Background and Future Goals Statement

This statement is the bread and butter of your application. This is where you get to tell them your story, background, goals and make the case that you have great potential for STEM research. Here is a summary of what you should talk about:



Preparing a Competitive GRFP Application

Personal Statement

Tell your story; demonstrate your potential for STEM research:

- Experiences (professional and personal) that contributed to your motivation and preparation for pursuing a STEM career
- Previous research/industrial/professional experiences
 - What was the project?
 - How did you become involved? Where was it done?
 - Why was this project worth doing?
 - What was your contribution to the project?
 - How did your part of the project fit into the whole?
 - What have you learned?
 - Any advanced course work?
- Career aspirations and future goals
 - How have your experiences shaped your goals?

Clearly address NSF's Merit Review Criteria – Intellectual Merit and Broader Impacts – in separate sections.

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Remember, this slide is just a summary. Look at the actual solicitation for finer details. I was advised to have headings for each portion of the statement which definitely helped me organize my thoughts and also allowed me to better address the Merit Criteria separately. The great part of this statement is it can act as a solid foundation for the personal statements you will write for each school's application. In fact, my personal statements are largely (>50%) borrowed from this document. Since these statements are similar, if you need some help on this statement, skip ahead to the Personal Statement subsection for more resources.

Here is my own Statement that I used in my NSF GRFP application:

Eric Gagliano: Personal, Background, and Future Goals Statement

Personal Statement

My fascination with geosciences began when I watched *Planet Earth* for the first time at nine years old. Living in the small farming town of Magnolia, Texas, the “worldliest” thing I had been exposed to was Panda Express. The earth seemed so vast and mysterious, and I wanted to be able to help make sense of it all.

Nine years later, I entered the University of Texas at Austin to study Aerospace Engineering, hoping to use remote sensing to better understand the earth. I was quickly advised though that if I wanted to seriously pursue geosciences in graduate school, I needed to diversify and change degree programs. After my first semester, I applied to the inaugural class of Computational Engineering in the Cockrell School of Engineering, the first and only institution at the time to offer an undergraduate degree in this subject. Through a competitive application process, I secured one of only twenty seats in the major.

My time at UT has been very fruitful: I’ve learned a great deal and have found many passions. That’s not to say though that things have been easy for me. I’m all too familiar with rejection from professors, unpublishable results, tedious data cleaning, and codes breaking for seemingly no reason. But this has helped develop the quality I have come to most appreciate about myself—my perseverance. I may not be the most naturally smart or have the most eloquent essays, but I am determined and hard-working enough to compensate. My goal is to improve lives and empower people through my research and volunteering. I hope to convince you to take a chance on me by showing you that I am capable of producing meaningful research and positive change.

Intellectual Merit

I started my first research experience as a Student Technician in the Modeling and Simulation Group of Applied Research Laboratories, a Department of Defense University-Affiliated Research Center. It was here that I fell in love with research: the collaboration, the freedom to try new ideas, and the excitement of working on something that few people had touched before. I had to maintain a DoD Secret clearance which was scary at the time, but I got to do interesting work for the Navy. I made important contributions to the team, such as developing a prototype active sonar ontology using TopBraid Composer to represent potential target properties during signal processing.

Realizing that research was the most interesting academic activity I had done at college, I decided to work on campus with Dr. Ravi-Chandar, an esteemed materials professor, to investigate crack propagation and fracture patterns in specific alloys of aluminum. I gained lots of experience in computational modeling, material damage models, finite element analysis using Python and ABAQUS, and I learned how to independently proceed with research given very little guidance. Because my professor was extremely hands off (intentionally so), I spent many nights banging my head against the wall struggling to figure out my next move. Though frustrating at times, I became a better and more independent researcher because I learned how to work through failure and set my own goals. After finishing my independent project, I realized that while materials research is interesting, I was not passionate about it the way I was passionate about geosciences.

These two previous research experiences were finally enough to “get my foot in the door” with programs and research which really interested me. Thus, I worked as an R&D intern in the Center for Analysis Systems and Applications at Sandia National Laboratories. I worked on adding complexity to a cloud generation and atmospheric MATLAB model which would help predict cloud cover to test remote sensing capabilities. Additionally, I modernized a large Python satellite

and remote sensing codebase for better compatibility with new data from more recent remote sensing missions. I loved my work at Sandia because I was able to combine my knowledge of computational engineering with my passion for geoscience. At the end of my internship, I was invited to stay as a year-round intern in their recently launched Autonomy for Hypersonics division. I was given a DoE L clearance and tasked with working with both Sandia and Dr. Ann Chen from UT's Aerospace department on a collaboration project.

When I returned to UT, I quickly became integrated in Dr. Chen's Radar Interferometry Group in the Center for Space Research, where I've been working ever since. In the beginning, I learned how to read previous scientific papers from the glaciology and remote sensing domain, and I was mentored by a grad student in glacial dynamics, remote sensing techniques, interferometry, image processing, and computer vision. Then began the real work with Dr. Chen, where I built Digital Elevation Models (DEMs) from ArcticDEM data and I modeled glacial flow and seasonal speedup using Interferometric Synthetic Aperture Radar (InSAR) derived from the European Space Agency's Sentinel-1 satellites. I first focused on recreating results of previous important InSAR papers to validate my approach before applying my methods to the specific area Dr. Chen was interested in (a medium sized ocean-terminating glacier in Western Greenland).

Returning to Sandia for the next summer, I continued my work with SAR, but this time with a different application. The Autonomy for Hypersonics group wanted me to apply my knowledge of Computer Vision and Image Processing to create an algorithm to efficiently correlate singular SAR images to a large DEM for use in autonomous navigation in GPS-denied environments. I not only created the requested algorithm, but I exceeded expectations by creating a custom ridge detection algorithm, creating a cross correlation code, and implementing SURF (a computer vision feature detector and descriptor), all which worked in tandem to geolocate the position of a hypersonic vehicle using only SAR returns and a coarse DEM. Using my knowledge of computational science, I did what my team thought was almost impossible with current hardware: it was projected that my method would take 3 hours per run, but my specific implementation ran in 8 seconds. This breakthrough will potentially allow the group in the future to provide navigation to hypersonic vehicles in real-time.

Coming back to UT for my final year, I've brought my insights back to the Radar Interferometry Group. While my work in Hypersonics was interesting, I am far more intrigued by the insights remote sensing can bring in the cryosphere. I've been continuing my work with glaciers, and I am taking a Dynamics of Polar Systems graduate class to better understand the fundamental physical phenomena occurring in the polar regions. In addition, my strong background in engineering and mathematics (such as my Computational Fluid Dynamics and Partial Differential Equations classes) will enable my success in glaciology.

Broader Impacts

Because 40% of the US population lives in high-density coastal areas, quantifying sea level rise is important to keeping people and important infrastructure safe from flooding, shoreline erosion, and storm surges. Sea level rise is hard to predict, but better modeling of Greenland and Antarctica's glacial flows will help reduce the uncertainty in our estimates. My current and future work hopes to support this goal. Besides the broader impacts of my research, I am personally passionate about making the world a better place for underrepresented and neglected groups.

In the US, we are far from any semblance of education equity. In Austin, I've observed the difference in opportunity for kids based solely on which side of I-35 they live on. That is why I am committed to improving educational opportunities for minority and underserved kids through

my involvement with Student Engineers Educating Kids (SEEK) and Students Expanding Austin Literacy (SEAL). I am currently the Vice-President of Mentoring for SEEK, an organization that visits underprivileged elementary and middle schools weekly to teach STEM curriculum through fun projects such as bottle rockets, marble roller coasters, and baking soda volcanos. Though previously I have fulfilled other roles in the organization, as VP Mentoring I currently create the STEM related projects and lesson plans, order the required materials, and oversee the weekly implementation of the projects across 15 Austin area schools serving over 160 children. On the other hand, SEAL focuses on literacy. I have been a weekly reading buddy for 8 semesters now, where I go into schools and community centers and read with and support the buddy I've been assigned for that semester.

Outside the realm of STEM, for the past two years I've been very involved with Camp Kesem, a non-profit with over 100 chapters across US college campuses, focusing on supporting children whose parent currently has or had previously been diagnosed with cancer. Each chapter hosts a week-long sleep away summer camp to provide a safe space for the kids to have fun and talk about their experiences with cancer. Besides being a Unit Leader and Summer Counselor, I've personally helped raise over \$1500 for my campers. I was also the Volunteer Historical Data intern for the national branch of the organization where I collected and cleaned records of all camp personnel and campsites, made data management recommendations, and suggested analysis techniques for newly acquired data. After presenting to the CEO of Kesem, some of my recommendations will be implemented to improve and ensure fair campsite contract negotiation which will eventually help the entire organization serve more kids!

I also hope to make a broader impact with my focus on Humanitarian Engineering. In addition to my degree, I am pursuing the Humanitarian Engineering certificate because I hope to use science to uplift people in humanitarian crisis and in the developing world. For example, my current capstone project is a collaboration with the Lebanese Red Cross to create a device for low-cost fabrication of menstrual pads for women in Syrian Refugee Camps. Once I become a professor, I hope to encourage and implement this type of service-based learning at my institution.

Finally, I hope to make a broader impact with my mentorship. In my time as a First Year Interest Group Mentor, I've had the opportunity to collectively mentor sixty freshman over the course of four years in their academic and social careers. I host weekly hangouts and meetings to help my students bond and teach them about important topics, such as time management, UT traditions, and campus resources. Also, as a volunteer TA for an introductory programming class, I go above and beyond for my students, regularly meeting them outside of my regular office hours to ensure they succeed. Through my focus on educational equity, kids in need, humanitarian engineering, and mentorship, I strive to improve the lives of others in everything I do.

Future Goals

Ultimately, studying glaciology will allow me to combine my unique skillset in computational engineering with my passion for geoscience. My past and current experiences in research have trained me to produce high quality work and I hope to continue this trend throughout my PhD. I hope to continue my focus in the cryosphere and work with experts to improve our understanding of polar ice. Long-term, after I obtain my PhD, I hope to do some post-doctoral work, eventually become a professor, lead my own research group, and teach. In this position I can contribute meaningful science and help inspire and mentor the next generation of scientists. As an educator, I will continue to champion educational equity in STEM, and promote initiatives such as interdisciplinary programs to tackle humanitarian issues through service-based learning.

Graduate Research Statement

The Research Statement is a chance for you to propose your own research plan. Basically, choose a research topic and describe how you will tackle it. I was told that this doesn't necessarily have to be either what you are currently working on or what you want to work on. It does have to align with the area of interest you check on your application though. My FIG mentor and friend Joey Williams gave me the following advice, "The intent behind writing the research plan is to demonstrate that you are able to do a basic literature review, understand the current state of the field, and propose a direction to go in the future. My research plan was written about a project I was working on in undergrad, but I had zero intention of working on it or anything like it in my graduate degree.". Make sure to include figures using the correct formatting, as it will help fill space if you are intentionally trying to be vague (oops) and it will help you better describe your research plan. Plus I personally think figures add a bit of "wow" factor. Here is the summary slide on the Research Statement:



Preparing a Competitive GRFP Application

Research Statement

Describe your proposed research plan:

- Communicate your research idea and approach
- Explain your research plan and methods
- What do you expect to learn? How will you know if the project is successful?
- What would you do next?

Keep in mind:

- Avoid jargon
- Communicate clearly for non-specialists
- Make your contributions clear

Clearly address NSF's Merit Review Criteria – Intellectual Merit and Broader Impacts – in separate sections.

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This is arguably the hardest part of the application, especially if you are new to the domain in which you are applying. You really need to know about a field before you start randomly proposing a new direction. If you are currently doing undergraduate research (or did some recently), talk to the professor you work(ed) with and see if you can enlist their help for

some guidance on this. I foolishly didn't, so my Research Statement included some guesswork on my part. I would later find out that some of the research problem I layed out had already in part been tackled... 20ish years ago. Whoops. Had I asked my undergraduate research professor at the time to look over it, she would have surely pointed this out to me.

Even though in some respects I'm a little ashamed of my Research Statement, I will show it here so you can get a better idea of what to shoot for:

Eric Gagliano: Graduate Research Plan Statement

Motivation

Sea level rise is becoming a major threat to coastal populations. Globally, there are 600 million people that live within 10 meters of sea level.¹ In the United States, 40% of the population live in high-density coastal areas. If our climate continues to warm, we will see accelerated sea level rise due to thermal expansion of the ocean and land-based ice loss. In particular, Greenland and Antarctica contain enough ice to raise global sea levels by 65 meters.² Greenland specifically is the largest singular contributor to sea level rise, as its melt grew over 650% from 1992 to 2011.³ It follows that it is important to quantify the rate of ice loss because it has a significant impact on the rate of sea level rise.

Background

Interferometric Synthetic Aperture Radar (InSAR) has proven to be a reliable method for high precision measurements of glacial flow velocities.⁴ Using current techniques, InSAR can reliably measure millimeter level deformations regardless of cloud cover and illumination. However, significant issues arise when glacial displacements exceed a certain spatial threshold in a given temporal window which can cause interferogram decorrelation. In my previous research, I've studied an area in Western Greenland which experiences a 200-300% seasonal speedup during the summer months. Areas close to meltwater streams move fast and decorrelate rapidly in all seasons (Fig 1 left, notice blue horizontal streaks indicating decorrelation). However, during the summer months, decorrelation is much more widespread due to the faster glacial movements (Fig 1 right). Currently, many scientists use extrapolation or speckling techniques to recover velocities from this low confidence data which is often unreliable.

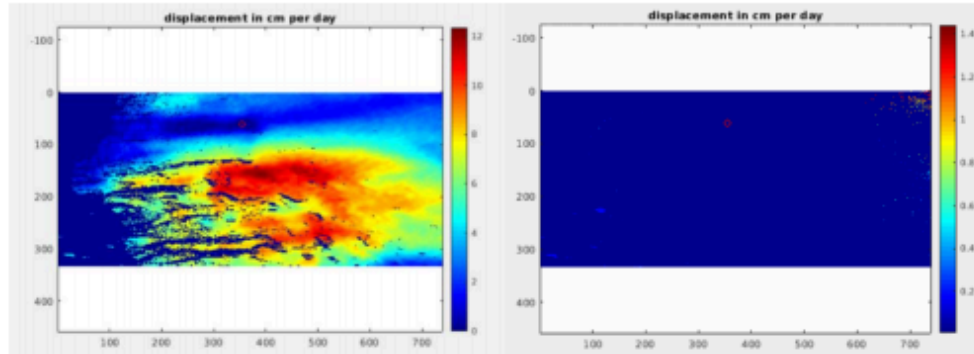


Fig. 1 Winter Interferogram (left) with decorrelated meltwater streams and Summer Interferogram (right) with more widespread decorrelation due to summer speedup

¹ Neumann B, Vafeidis AT, Zimmermann J, Nicholls RJ (2015) Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding - A Global Assessment. PLoS ONE 10(3): e0118571. <https://doi.org/10.1371/journal.pone.0118571>

² Van den Broeke, M.R., Bamber, J., Lenaerts, J. et al. Surv Geophys (2011) 32: 495. <https://doi.org/10.1007/s10712-011-9137-z>

³ Velicogna, I., T. C. Sutterley, and M. R. van den Broeke (2014), Regional acceleration in ice mass loss from Greenland and Antarctica using GRACE time-variable gravity data, Geophysical Research Letters, 41(22), 8130-8137, doi: <http://dx.doi.org/10.1002/2014gl061052>.

⁴ Gabriel, A., Goldstein, R. M., & Zebker, H. A. (1989). Mapping small elevation changes over large areas: Differential radar interferometry. Journal of Geophysical Research, 94(B7), 9183. <http://doi.org/10.1029/JB094iB07p09183>

Experimental Plans/Intellectual Merit

In order to more precisely determine glacial velocities in areas of interferogram decorrelation, a model combining the usual InSAR method with Digital Image Correlation (DIC) and Speeded Up Robust Features (SURF) is proposed.

DIC is a common process that uses image registration techniques to fully define a displacement map (See Fig. 2). DIC is used in current attempts to track “speckle” patterns in SAR data. SURF is a computer vision image registration algorithm designed to detect scale invariant and rotation invariant features (See Fig. 3).

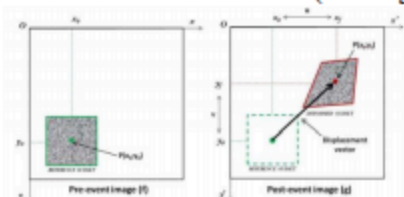


Fig. 2 Digital Image Correlation Process⁵

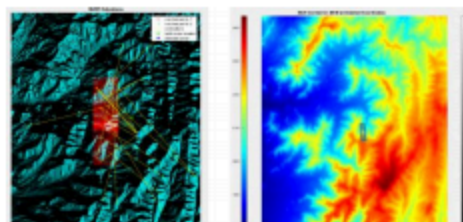


Fig. 3 SURF I wrote for SAR/DEM correlation⁶

This plan can be broken down into the following 3 efforts:

1. **Data collection.** I plan to use Digital Elevation Model (DEM) data for use in Interferogram production from ArcticDEM. SAR data will be acquired from Sentinel-1A and Sentinel-1B through the search.asf.alaska.edu data portal website, and we will use the 6-day interferometric pairs.
2. **Algorithm development.** DIC and SURF will supplement the regular InSAR model. I plan to run into many hurdles here with optimizing weightings of each model based on conditions dictated by the data. I will prototype the algorithm in MATLAB before moving to more efficient options for final implementation.
3. **Results verification.** To assess the accuracy of the new algorithm, it would be helpful to choose an initial test area with fast summer velocities and ongoing fieldwork to compare velocity outputs of the algorithm with the measured velocities in the field. If no suitable data is found, fieldwork may have to be requested.

Broader Impacts

This new method of glacial velocity measurement will improve accuracy and reduce uncertainty in current models, thus we will more accurately know contributions of specific glaciers to sea level rise. We can then better assess the risk sea level rise will play in the future, and we can identify vulnerable populations that may become displaced. I hope to also involve undergraduates and possibly high school students in this research, because the glacial velocities of ocean terminating glaciers contributing to sea level rise is something easily understood and is relevant in popular science. By involving younger people in the interpretation of the data we give them partial ownership of the results, increasing the awareness of our changing world for the younger generations and hopefully inspiring some of them to pursue careers in earth science.

⁵ Schwalbe, E. and Maas, H.-G.: The determination of high-resolution spatio-temporal glacier motion fields from time-lapse sequences, *Earth Surf. Dynam.*, 5, 861–879, <https://doi.org/10.5194/esurf-5-861-2017>, 2017.

⁶ Gagliano, E. Authorized for Unlimited Unclassified Release. SAND#:SAND2019-9073PE Research presented in this document was performed on behalf of Sandia National Laboratories funded by internal Laboratory Directed Research and Development (LDRD).

Reference Letters

Not a lot is different here, we already went over letters of recommendation a bit. Though I didn't know this at the time, for this particular application it is recommended (hah!) to have your recommender address the Merit Criteria. Oopsies. But if you give your recommenders enough notice, I feel like this shouldn't be too hard to do. Remember, these are due November 1st. Here are the summary slides for Reference Letters:



Reference Letters

GRFP letters differ from regular grad school letters.

- Make sure your reference writers know about GRFP and NSF's **Intellectual Merit** and **Broader Impacts** criteria.
- Ask if they think they know you well enough to write a strong letter.
- Discuss with them why you think you're a good candidate for GRFP (show them your statements before you apply).
- **For reference letter writers:**
 - GREs are not part of the application.
 - A strong letter can say things that students wouldn't say about themselves.
 - Do not overshadow the student if you describe their research.



Reference Letters

Reference Letter Deadline:
Friday, November 1, 2019 5PM ET

- **THREE (3) reference letters are STRONGLY RECOMMENDED**
- Two (2) reference letters are **MANDATORY**
- List and rank up to 5 reference letter writers
 - Top 3 will be used
- Select your reference letter writers carefully
 - Familiarity with you as a person is important
 - Share personal and research statements with them
- **View Your Application Package Status** in the GRFP site to monitor letter submission

No exceptions or extensions for Reference Letter deadline.

Feedback

It turns out that whether you are awarded the fellowship or not, the reviewers will give you feedback on your application. I ended up getting the fellowship, but honestly my feedback felt like my success wasn't super warranted. In particular, it seems the reviewers main concerns with me were no publications/presentations (fair point), a lack of focus (because of the wide variety of past experiences), not having the skills needed for my research plan, overconfidence in my proposed research's broader impacts, and various other little things. Honestly, I felt throughout my application materials I addressed most of these concerns, but at the end of the day they are the experts and they have the final say. I've heard that academia can be pretty harsh with criticism, so perhaps I just need to get used to that (honestly, I'm pretty sensitive).

I've attached my feedback here for you to compare with my actual application materials so you can improve your application and anticipate concerns:

Intellectual Merit Criterion

Overall Assessment of Intellectual Merit

Very Good

Explanation to Applicant

This applicant enjoys very good academic background and training. The applicant showed that he is one step ahead of his colleagues and has a guaranteed future success in this field. However, the science realm of the suggested plan requires a broader set of skills besides the skills that the applicant currently possesses.

Broader Impacts Criterion

Overall Assessment of Broader Impacts

Very Good

Explanation to Applicant

This is a sensitive area of study. While the suggested work will certainly benefit the state of the art and the state of technology in this area, it also comes with a lot of uncertainty. The level of impact of the different factors involved in this matter are still under investigation. Therefore, many of the expected impacts of this study are dependent on the other factors and are not clear as it stated.

Summary Comments

The applicant possesses a strong academic background and skills that are significantly important and helpful for the suggested plan.

Intellectual Merit Criterion

Overall Assessment of Intellectual Merit

Excellent

Explanation to Applicant

The applicant's strong academic record in engineering supports an assessment of strong quantitative skills. It is obvious that the applicant is now expanding his areas of expertise into Geoscience. The wide variety of past research experiences can be interpreted as a lack of focus - the application could be strengthened by explaining what you learned from each of those experiences and why you chose to engage in the next project so that a clearer vision of where you are trying to go would become more apparent.

Broader Impacts Criterion

Overall Assessment of Broader Impacts

Excellent

Explanation to Applicant

The applicant's past outreach to under-served populations in Austin is great and his volunteer efforts with Camp Kesem are notable. He has also served as a mentor in the past. This part of the application could be a bit stronger if you described how you will continue those efforts in the future by spelling out specific, concrete future plans.

Summary Comments

This applicant possesses strong quantitative skills that will serve him well within the Geoscience community. He also has a good

record of engagement with the community, though a clearer statement of how he anticipates continuing that sort of work in the future would enhance the application.

Intellectual Merit Criterion

Overall Assessment of Intellectual Merit

Excellent

Explanation to Applicant

Evaluating the applicant's potential to advance knowledge in glaciology first considers the personal statement and background information provided. The applicant has had a distinguished experience as an undergraduate. The first measure of this was the applicant's excellent performance (GPA 3.83) in a degree plan with many rigorous analytical and quantitative courses. The applicant's classwork has been paralleled by an impressive series of research experiences, including acting as a research assistant in two labs, and a long internship at the Sandia National Laboratories. Both the applicant's description of activities and products from those internships as well as very positive comments in support letters reveal an energetic and highly capable student. Although the applicant does not indicate any publications or presentations at professional meetings, praise and success as an undergraduate teaching assistant and a mentor indicate good communicative efforts. Especially notable in these regards are the applicant's skills at computer programming and integrating different analytical approaches to the study of glaciology. All of these activities are in concert with the applicant's stated goal of pursuing a PhD and becoming a professor with a research focus on glaciology. In this regard the support letters indicate that the applicant has already made original contributions to the analysis of data on glacial flow velocities, a critical component of predicting contributions of glacial melt water to sea levels. Overall this is a very strong application with respect to intellectual merit. The applicant's plans are clear and other than the lack of mention of presentations or publications there are no real weaknesses in the application.

Broader Impacts Criterion

Overall Assessment of Broader Impacts

Excellent

Explanation to Applicant

Both the stated goals as well as the record of helping and outreach activities are evidence that this applicant has excellent potential to achieve broader impacts during and after graduate school. As an undergraduate, the candidate has already given considerable time to organizations such as Student Engineers Educating Kids and the Kesem program. Notably, the candidate is pursuing a certificate in humanitarian engineering with a focus on helping people in the developing world. Those efforts have already started by the candidate's participation in a project with the Lebanese Red Cross to help women in Syrian refugee camps. Furthermore the applicant has mentored over 60 freshmen in the past four years. These accomplishments bode well for the future goal of the applicant who, as an educator, plans to continue to champion educational equity in STEM. Overall this is a very strong statement concerning the potential impacts that may be expected from this applicant.

Summary Comments

Overall this is a very strong application from a student that has pursued an undergraduate experience with a clear focus on the future role as an educator and researcher. Both the intellectual merit potential for making broader impacts are very strong parts of this application.

Resources

Very thorough review of the entire process, as well as example essays and feedback:
<http://www.malloryladd.com/nsf-grfp-advice.html>

More GRFP overview, but also large collection of previous winner essays and ratings across various fields:

<https://www.alexhunterlang.com/nsf-fellowship>

Fellowship opportunities for minorities and women:
<https://www.profellow.com/fellowships/26-stem-graduate-fellowships-for-minorities-and-women/>

November-December: Complete the Applications, Let Potential Advisers Know, Make Sure Letter Writers Submit

Complete the Applications

It's crunch time now! Let's finish up these applications.

Statement of Purpose / Personal Statement / Statement of Objectives

I won't have much to say here that hasn't already been said by everyone else out there, so I will summarize what other people have said and link to additional resources. Check these resources out below!! Just some important things to note: there are **differences** between Statements of Purpose, Personal Statements, Statement of Objectives, and whatever other combination of words they can throw together. This is why it is important to read deeper into the application requirements for each school, as they will usually explain further what needs to be in each statement. Sometimes these phrases will be used interchangeably, and sometimes one school's SOP could be completely different than another school's SOP. So just make sure to fully comply with formatting and length requirements as well as address what each school and program ask you to.

Here we will talk about what is generally in these statements. Again, each program will have different requirements so personally I created a master statement and then modified it for each separate program. In general, things that may be worth addressing:

- Who are you?
- Any unique background / barriers to academics?
- What are you interested in?

- What is your motivation/why this degree?
- What is your relevant experience (research, classes, jobs, internships, projects)?
- What did you learn via those experiences / any challenges?
- Any scholarly publications?
- How does that experience relate to the program you are applying to?
- Specific examples that helped you decide your area of study?
- Specific examples of problems you might want to address?
- Who would you want to work with and why?
- Why are you a good fit for this program?
- Short and long term career goals?

Here is an example of a SOP prompt for a school I applied to (Scripps Institute of Oceanography @ UCSD):

Content

Focus your Statement of Purpose on the reasons you are interested in attending a specific graduate program at UCSD. Check the department requirements for the Statement of Purpose. The statement should be well organized, concise, and completely free of grammar, punctuation, and spelling errors. Before submitting the statement, seek constructive comments and criticism from friends and advisors.

Five primary topics to cover in your statement of purpose:

1. *How did you become interested in this field? Establish that you have had a long-term interest in the field and that you have taken positive steps in pursuing your interest. Give the committee members a sense of your particular talents and abilities and their relevance to your academic interests.*
2. What experiences have contributed toward your preparation for further study in this field? Demonstrate your interest by providing examples of research experiences, internships, work experience, community service, publications, or life experiences. Briefly describe what you did in each experience. Also, make sure to articulate what you have learned about the field and how those lessons stimulated you to pursue an advanced degree.
3. What are your future goals? Specifically state your degree objective (Master's or Ph.D.) and specify what subdisciplines you are interested in pursuing. For example, if you are applying in political science, the committee needs to know whether you are pursuing American Politics, Comparative Politics, International Relations, or Political Theory. Let the reader know that you are planning a future career as a university professor, researcher, or consultant, or in public service or private practice (or whatever your goal happens to be).
4. What are your research interests? Within your subdiscipline, you should be able to identify one or two topics that are of interest to you. When possible, be specific about your research agenda. Remember that you will be working with professors in research; therefore, your research interests should parallel those of the faculty. (You will usually not be expected to know exactly what you want to research; faculty know that initial interests often change.)
5. How are you a "match" for the program to which you are applying? Explain what attracts you most to the institution/program to which you are applying. Align your research interests with those of one or more of the affiliated professors. The better the "match" with the program/professors, the better the chance that you will be admitted.

Other factors to weave in (remember these are secondary factors):

- Give examples of personal attributes or qualities that would help you complete graduate study successfully.
- Describe your determination to achieve your goals, your initiative and ability to develop ideas, and your ability to work independently.
- Describe background characteristics that may have placed you at an educational disadvantage (English language learner, family economic history, lack of educational opportunity, disability, etc.).
- Leave the reader believing that you are prepared for advanced academic work and will be successful in graduate school.

This prompt in particular is super helpful in building a general "master statement" from which you can tailor to each school.

To beat a dead horse: each program will have different requirements for a SOP so follow the instructions exactly for each program. These questions, however, are a great starting point. For the programs I applied to, 4 or so of the statements were 90% the same, but a couple of others were different because of different page requirements / essay prompts.

Lastly, some important reminders. Remember to mention your potential advisor in this statement and why you would like to work with them. Remember to tailor each statement to the specific program you are applying to. Remember to proofread your statement repeatedly. Remember to share your statement with friends and professors and ask them to review and proofread it.

My Statements

Here are a couple different statements I used in my application process. Note the variation in page length and content. The first example is a one page SOP for UW, the second example is a two page statement of objectives for MIT, and the third example is a Personal Statement for UM with no mention of academics. This is because they make you submit both a Statement of Purpose and Personal Statement. The latter only speaks to “How have your background and life experiences, including cultural, geographical, financial, educational, or other opportunities or challenges, motivated your decision to pursue a graduate degree at the University of Michigan?”. This separate statement without academics isn’t too uncommon!

Eric Gagliano's Statement of Purpose for University of Washington CEE PhD

I chose to apply to UW's Civil & Environmental Engineering PhD program because my work and fascination with remote sensing and the cryosphere closely aligns with the research interests of Professor David Shean. Additionally, there would be great opportunities to collaborate because of the proximity of UW's eScience Institute, Applied Physics Lab, and Department of Earth and Space Sciences.

My goal is to improve lives and empower people through my research and other work (though I won't have enough space in this short statement to back-up my non-research interests, I hope the attached CV will demonstrate my dedication to volunteering, teaching, and mentorship). I hope to convince you to take a chance on me by showing you that I am capable of producing meaningful research and positive change.

My research training is quite broad, and I will be skipping over a large chunk of it to meet the 1 page SOP requirement. If you are interested, it is detailed in my accompanying CV. The short of it is sonar modeling work for the Navy in the Modeling & Simulation Group at Applied Research Laboratories, crack propagation modeling in materials research with Dr. Ravi Chandar, and my first summer at Sandia National Laboratories studying cloud generation and atmospheric modeling for use in testing remote sensing capabilities. After my first summer at Sandia, I began a collaboration project between Sandia and Dr. Ann Chen from UT's Aerospace Department.

When I returned to UT, I quickly became integrated in Dr. Chen's Radar Interferometry Group in the Center for Space Research, where I've been working ever since. In the beginning, I learned how to read previous scientific papers from the glaciology and remote sensing domain, and I was mentored by a grad student in glacial dynamics, remote sensing techniques, interferometry, image processing, and computer vision. Then began the real work with Dr. Chen, where I built Digital Elevation Models (DEMs) from ArcticDEM data and I modeled glacial flow and seasonal speedup using Interferometric Synthetic Aperture Radar (InSAR) derived from the European Space Agency's Sentinel-1 satellites. I first focused on recreating results of previous important InSAR papers to validate my approach before applying my methods to the specific area Dr. Chen was interested in (a medium sized ocean-terminating glacier in Western Greenland).

During my second summer at Sandia National Labs, I continued my work with SAR, but this time with a different application. The Autonomy for Hypersonics group wanted me to apply my knowledge of computer vision and image processing to create an algorithm to efficiently correlate singular SAR images to a large DEM for use in autonomous navigation in GPS-denied environments. I not only created the requested algorithm, but I exceeded expectations by creating a custom ridge detection algorithm, creating a cross correlation code, and implementing SURF (a computer vision feature detector and descriptor), all which worked in tandem to geolocate the position of a hypersonic vehicle using only SAR returns and a coarse DEM. Using my knowledge of computational science, I did what my team thought was almost impossible with current hardware: it was projected that my method would take 3 hours per run, but my specific implementation ran in 8 seconds. This breakthrough will potentially allow the group in the future to provide navigation to hypersonic vehicles in real-time.

Coming back to UT for my final year, I've brought what I've learned back to the Radar Interferometry Group. While my work in Hypersonics was interesting, I am far more intrigued by the insights remote sensing can bring in the cryosphere. I've been continuing my work with glaciers, and I am taking a Dynamics of Polar Systems graduate class with Dr. Ginny Catania and Dr. Patrick Heimbach to better understand the fundamental physical phenomena occurring in the polar regions. In addition, my strong background in engineering, coding, and mathematics (such as my Computational Fluid Dynamics, Advanced Computational Engineering, and Partial Differential Equations classes) will enable my success in CEE.

Studying CEE with a focus on remote sensing and glaciology will allow me to combine my unique skillset in computational engineering with my passion for geoscience. My perseverance in past and current research has trained me to produce high quality work despite obstacles and I will continue this trend throughout my PhD and beyond. I hope to continue my focus on the cryosphere and work with experts to improve our understanding of polar ice. Long-term, after I obtain my PhD, I hope to do some post-doctoral work, eventually become a professor, lead my own research group, and teach. In this position I can contribute meaningful science and help inspire and mentor the next generation of scientists.

Eric Gagliano's Statement of Objectives

My fascination with geosciences and the cryosphere began when I watched *Planet Earth* for the first time at nine years old. Living in the small farming town of Magnolia, Texas, the “worldliest” thing I had been exposed to was Panda Express. My corner of the earth was small, but outside of my bubble, Earth seemed so vast and mysterious, and I wanted to be able to help make sense of it all. Ever since then, I have positioned myself through my classwork and research to be able to make meaningful contributions to the field.

Nine years later, I entered the University of Texas at Austin to study Aerospace Engineering, hoping to use remote sensing to better understand the earth. I was quickly advised though that if I wanted to seriously pursue geosciences in graduate school, I needed to diversify and change degree programs. After my first semester, I applied to the inaugural class of Computational Engineering in the Cockrell School of Engineering, the first and only institution at the time to offer an undergraduate degree in this subject. Through a competitive application process, I secured one of only twenty seats in the major.

My time at UT has been very fruitful; I've learned a great deal and have found many passions. That's not to say though that things have been easy for me. I'm all too familiar with rejection from professors, unpublishable results, tedious data cleaning, and codes breaking for seemingly no reason. But this has helped develop the quality I have come to most appreciate about myself—my perseverance. I may not be the most naturally smart or have the most eloquent essays, but I am determined and hard-working enough to compensate. My goal is to improve lives and empower people through my research and other work (though I won't have enough space in this statement to back-up my non-research interests, I hope the attached CV will demonstrate my dedication to volunteering and mentorship). I hope to convince you to take a chance on me by showing you that I am capable of producing meaningful research and positive change.

I started my first research experience as a Student Technician in the Modeling and Simulation Group of Applied Research Laboratories, a Department of Defense University-Affiliated Research Center. It was here that I fell in love with research: the collaboration, the freedom to try new ideas, and the excitement of working on something that few people had touched before. I maintained a DoD Secret clearance and made important contributions to the team, such as developing a prototype active sonar ontology using TopBraid Composer to represent properties of potential targets during signal processing.

Realizing that research was the most interesting academic activity I had done at college, I decided to work on campus with Dr. Ravi-Chandar, an esteemed materials professor, to investigate crack propagation and fracture patterns in specific alloys of aluminum. I gained lots of experience in computational modeling, material damage models, finite element analysis using Python and ABAQUS, and I learned how to independently proceed with research given very little guidance. Because my professor was extremely hands off (intentionally so), I spent many nights banging my head against the wall struggling to figure out my next move. Though frustrating at times, I became a better and more independent researcher because I learned how to work through failure and set my own goals. After finishing my independent project, I realized that while materials research is interesting, I was not passionate about it the way I was passionate about geosciences.

These two previous research experiences were finally enough to “get my foot in the door” with programs and research which really interested me. Thus, I worked as an R&D intern in the Center for Analysis Systems and Applications at Sandia National Laboratories. I worked on adding complexity to a cloud generation and atmospheric MATLAB model which would help predict cloud cover to test remote sensing capabilities. Additionally, I modernized a large Python satellite and remote sensing codebase for better compatibility with new data from more recent remote sensing missions. I loved my

work at Sandia because I was able to combine my knowledge of computational engineering with my passion for geoscience. At the end of my internship, I was invited to stay as a year-round intern in their new Autonomy for Hypersonics division. I was given a DoE L clearance and tasked with working with both Sandia and Dr. Ann Chen from UT's Aerospace department on a collaboration project.

When I returned to UT, I quickly became integrated in Dr. Chen's Radar Interferometry Group in the Center for Space Research, where I've been working ever since. In the beginning, I learned how to read previous scientific papers from the glaciology and remote sensing domain, and I was mentored by a grad student in glacial dynamics, remote sensing techniques, interferometry, image processing, and computer vision. Then began the real work with Dr. Chen, where I built Digital Elevation Models (DEMs) from ArcticDEM data and I modeled glacial flow and seasonal speedup using Interferometric Synthetic Aperture Radar (InSAR) derived from the European Space Agency's Sentinel-1 satellites. I first focused on recreating results of previous important InSAR papers to validate my approach before applying my methods to the specific area Dr. Chen was interested in (a medium sized ocean-terminating glacier in Western Greenland).

Returning to Sandia for the next summer, I continued my work with SAR, but this time with a different application. The Autonomy for Hypersonics group wanted me to apply my knowledge of computer vision and image processing to create an algorithm to efficiently correlate singular SAR images to a large DEM for use in autonomous navigation in GPS-denied environments. I not only created the requested algorithm, but I exceeded expectations by creating a custom ridge detection algorithm, creating a cross correlation code, and implementing SURF (a computer vision feature detector and descriptor), all which worked in tandem to geolocate the position of a hypersonic vehicle using only SAR returns and a coarse DEM. Using my knowledge of computational science, I did what my team thought was almost impossible with current hardware: it was projected that my method would take 3 hours per run, but my specific implementation ran in 8 seconds. This breakthrough will potentially allow the group in the future to provide navigation to hypersonic vehicles in real-time.

Coming back to UT for my final year, I've brought what I've learned back to the Radar Interferometry Group. While my work in Hypersonics was interesting, I am far more intrigued by the insights remote sensing can bring in the cryosphere. I've been continuing my work with glaciers, and I am taking a Dynamics of Polar Systems graduate class to better understand the fundamental physical phenomena occurring in the polar regions. In addition, my strong background in engineering, coding, and mathematics (such as my Computational Fluid Dynamics, Advanced Computational Engineering, and Partial Differential Equations classes) will enable my success in geophysics.

I hope to work with Professor Minchew's Glacier Dynamics and Remote Sensing Group because my strong interest and previous background in both remote sensing and the cryosphere will allow me to help advance the fascinating research they are conducting, as well as my belief in the broader impact of this work. Globally, 600 million people live within 10 meters of sea level and 40% of the US population live in high-density coastal areas. Quantifying sea level rise is important to keeping people and important infrastructure safe. Sea level rise is hard to predict, but better remote sensing and modeling of Greenland and Antarctica's glacial flows will help reduce the uncertainty in our estimates. Working with Professor Minchew will help me support this goal. Besides the similarity in our academic interests, after skyping with him I am convinced he would be an exceptional mentor for me.

Studying geophysics will allow me to combine my unique skillset in computational engineering with my passion for geoscience. My perseverance in past and current research has trained me to produce high quality work despite obstacles and I will continue this trend throughout my PhD and beyond. I hope to continue my focus on the cryosphere and work with experts to improve our understanding of polar ice. Long-term, after I obtain my PhD, I hope to do some post-doctoral work, eventually become a professor, lead my own research group, and teach. In this position I can contribute meaningful science and help inspire and mentor the next generation of scientists.

Eric Gagliano Personal Statement

I grew up in the small farming town of Magnolia, Texas. Education there isn't good—in fact, the town is anti-intellectual and suspicious of people pursuing higher education. They have their reasons, as besides thinking they are pretentious, the residents believe that part of their struggles (lack of jobs, poverty) are the elites of the world, politicians and academics alike. However, I learned that the best way we can uplift these people is, ironically, through education. This experience in Magnolia helped me realize that besides my research, the way I can be most effective in making the world a better place would be improving educational equity through teaching and mentorship.

In the US, we are far from any semblance of education equity. In Austin, I've observed the difference in opportunity for kids based solely on which side of I-35 they live on. That is why I am committed to improving educational opportunities for minority and underserved kids through my involvement with Student Engineers Educating Kids (SEEK) and Students Expanding Austin Literacy (SEAL). I am currently the Vice-President of Mentoring for SEEK, an organization that visits underprivileged elementary and middle schools weekly to teach STEM curriculum through fun projects such as bottle rockets, marble roller coasters, and baking soda volcanos. Though previously I have fulfilled other roles in the organization, as VP Mentoring I currently create the STEM related projects and lesson plans, order the required materials, and oversee the weekly implementation of the projects across 15 Austin area schools serving over 160 children. On the other hand, SEAL focuses on literacy. I have been a weekly reading buddy for 8 semesters now, where I go into schools and community centers and read with and support the buddy I've been assigned for that semester.

I hope to also make an impact with my mentorship. In my time as a First Year Interest Group Mentor, I've had the opportunity to collectively mentor sixty freshman over the course of four years in their academic and social careers. I host weekly hangouts and meetings to help my students bond and teach them about important topics, such as time management, UT traditions, and campus resources. Also, as a volunteer TA for an introductory programming class, I go above and beyond for my students, regularly meeting them outside of my regular office hours to ensure they succeed. Through my focus on educational equity and mentorship, I strive to improve the lives of others.

Throughout and after my PhD, I hope to pursue opportunities to teach and mentor in my community. As an educator, I will continue to champion educational equity in STEM. I sincerely hope the University of Michigan can be a part of my journey.

Resources

Super helpful SOP Guide Section:

<https://owlcation.com/academia/How-to-Applying-to-STEM-PhD-Programs-US>

General difference between a SOP and Personal Statement as well as assorted tips.

<https://www.prepscholar.com/gre/blog/statement-of-purpose-vs-personal-statement/>

Great page that shows a possible set of stages for writing the SOP:

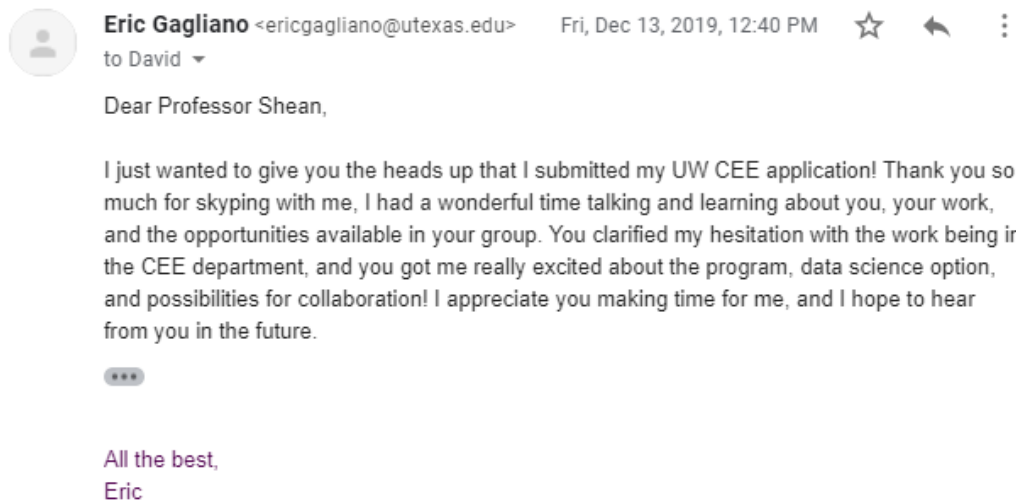
<https://web.mit.edu/msrp/myMSRP/docs/Statement%20of%20purpose%20guidelines.pdf>

Nice collection of STEM SOPs

<http://statementofpurposeexamples.com/stem/>

Let Potential Advisers Know When You Submit

Staying in contact with your potential advisers is one of the best tips you can get. They, almost single handedly, will eventually decide your fate. When you submit your application, it is important to let them know so they can pull it out of the stack when the time comes to look at applications. A quick email showing your enthusiasm works well, here is an example:



Make Sure Letter Writers Submit

Make sure to keep track of which letter writers have and haven't submitted their letters! A spreadsheet is super useful for this, as sometimes you'll have a writer miss a link in their email. Use your best judgment when reminding your writers--sending an email everyday may not be appropriate, but maybe a 2 week and 1 week reminder might be useful. Sometimes your letter writer may forget or have other things come up.

Unfortunately, one of my letter writers did not submit before the deadline and was not responsive to my emails. I'll show my emails below so you can get an idea of how to gently nudge a letter writer. For this particular person, I ended up having to drop in on their office hours in order to get things moving. By the time they eventually submitted, I had already heard back from most programs.

Rest of the Recommendations



Eric Gagliano <ericgagliano@utexas.edu> Wed, Dec 11, 2019, 10:07 PM



to [redacted]

Hey Dr. [redacted]!

I just wanted to send you a list of the schools that still need the letter of recommendation uploaded. Most of them are due by the 15th. If you need me to resend any of the requests, please let me know. Thank you so much again for everything!

Boise State

UCSD

University of Washington

MIT

Columbia

Caltech

All the best,

Eric

Recommendation Deadline Tomorrow Night



Eric Gagliano <ericgagliano@utexas.edu> Sat, Dec 14, 2019, 4:27 PM



to [redacted]

Hey Dr. [redacted],

Sorry to bother you again, just wanted to remind you that some of the submissions are due by midnight tomorrow (12/15 11:59pm). Let me know if I should resend any of the requests. Thank you so much!

All the best,

Eric

Letters Due!



Eric Gagliano <ericgagliano@utexas.edu>

Thu, Jan 2, 8:26 PM



to [redacted]

Hi Dr. [redacted]

I hope you had a great holiday! I just wanted to send a reminder email that some of the letters of recommendation are past due and a couple are due by the 5th! I just resent the requests in case they got lost at the bottom of the inbox. For reference, here are the 6 schools that still need the letter:

Boise State

University of Washington

Caltech

UCSD

MIT

Columbia

Thank you so much again for your help in all of this!

All the best,

Eric

Letters of Recommendation overdue



Eric Gagliano <ericgagliano@utexas.edu>

Tue, Jan 21, 2:04 PM



to [redacted]

Hi Dr. [redacted]

Hope you had a great break! Just a reminder that the remaining letters of recommendation are overdue. The following 5 schools still need them:

1. University of Washington
2. MIT
3. Boise State
4. UCSD
5. Columbia

I just resent the links in case they are at the bottom of your inbox! Thanks again for helping me with this.

All the best,
Eric

January-February-March: Application Decisions, Interviews/Visit Days

If you've reached this far, congratulations on submitting your applications! The hard part is over. Try to relax and forget about the applications for now.

Application Decisions

In general, I found out most of my decisions in January and one in March. Sometimes you will be directly "accepted" and then have a visit day, and sometimes you will be extended an "interview". Either way, the program will pay for you to visit in person (actually, who knows with COVID). Each program might do things a little differently. If you are extended an interview, you technically haven't been accepted! Once your interview is over, you will be contacted afterwards with their decision. I found that out of the seven applications I submitted, for the five that I was most in contact with my potential advisor, I ended up hearing back from, whereas with the two applications I didn't talk to the potential advisors much I did not receive a decision back. So again, make sure to stay in contact with your potential advisor!

Interviews/Visit Days

If you got an interview or got invited to a visit day, congratulations! Since programs vary widely on this topic, I'll stick to some broad advice.

Interview/Visit Day FAQ

But first, let's briefly get some FAQs out of the way.

Will my travel be paid for?

Your travel will be paid for. Sometimes you have to organize the flight yourself, but you will be reimbursed.

Will I have a schedule?

You will be given an itinerary and fully planned out schedule that will have tons of mini interviews with various professors and students (even if it's a visit day, you'll still have a bunch of "mini-interviews").

UW DEPT OF CIVIL & ENVIRONMENTAL ENGINEERING
Graduate Student Visitation, Hydrology & Hydrodynamics Group

Thursday, 13 Feb 2020
Arrive, informal happy hour at the College Inn Pub (6:30 pm). Organized by current students, Amanda Manaster, Shelby Ahrendt, Christine Baker

Friday, 14 Feb 2020

Morning Session (9:00 AM - 12:00 PM, Husky Union Building, 337, 4001 E Stevens Way NE, Seattle, WA 98195)

9:00 AM - 9:30 AM	Program Overview (Information Session on Faculty Members, Course Content/Credits, Programs)
9:30 AM - 12:00 PM	Research/teaching presentations by faculty (3 slides each) and student volunteers (1-2 slide each)
12:00 PM - 1:30 PM	Lunch w/ current students

Afternoon Session (1:30 PM - 5:00 PM, Husky Union Building, Wilcox and Ben Hall Building)

PhD Applicants: One-on-One interaction with faculty (30 minute blocks)

Applicant/Faculty	Derakhti	Horner-Devine	Hossain	Istanbulluoglu	Kumar	Lundquist	Moulton	Nijssen	Shean	Thomson
Location	BHB 216	Wilcox 163	Wilcox 167	Wilcox 160	Wilcox 161	Wilcox 165	BHB 211	Wilson 202	Wilcox 265	BHB 221
[Redacted]			3:00 PM	4:00 PM		2:00 PM		2:30 PM		
[Redacted]					2:00 PM	2:30 PM			1:30 PM	4:30 PM
[Redacted]	4:30 PM	2:00 PM			2:30 PM		4:00 PM			3:30 PM
Gagliano, Eric			2:30 PM			3:00 PM		1:30 PM	2:00 PM	
[Redacted]		2:30 PM		3:00 PM	1:30 PM		4:30 PM			4:00 PM
[Redacted]	2:30 PM				4:00 PM		1:30 PM			2:00 PM
[Redacted]		3:30 PM		1:30 PM	3:00 PM	4:00 PM		2:00 PM		
[Redacted]			3:30 PM	2:00 PM		1:30 PM		3:00 PM		
[Redacted]	1:30 PM	4:00 PM			4:30 PM		2:00 PM			3:00 PM
[Redacted]	2:00 PM	3:00 PM			3:30 PM		2:30 PM			1:30 PM

5:30 PM - 8:00 PM	Dinner @ Ivar's, 401 NE Northlake Way, Seattle, WA 98105
8:00 PM - -----	Return to hotel OR out for drinks with current students at Outlander Brewing (optional)

CAMPUS MAP: <http://www.washington.edu/maps/>

H & H Point of Contact: Prof. Nirni Kumar, 803-629-6723

Will I have meetings with people?

You will meet with tons of people, both current and prospective students and faculty.

Is there a dress code?

You will be given a dress code. Usually business casual.

Will the food be paid for?

Your food is usually paid for.

If it's an interview, when will I find out the final decision?

In the case of interviews, they will probably tell you while you are there when you can expect a decision to be made.

If it's an interview, should I come prepared?

Yes, see the next section for preparation advice.

Should I try to impress them?

They will surely try to impress you and get you to come to their school! Try to be yourself if you can, that's already impressive enough :)

***IMPORTANT* What questions should I ask current grad students?**

Revised May 17th, 2022: Two years into my PhD, I've learned a whole lot more about the application process and grad school in general. **My biggest piece of advice is to make sure your future relationship with your advisor will be solid. This is essential, and will largely shape your graduate experience.** Therefore, you should try and ask graduate students (ones currently working with your potential advisor) some of these questions:

1. What has been your biggest conflict with your advisor so far, and how did it get resolved?
2. Are you aware of any of your advisor's former advisees that have left early or switched advisors? If so, why did they leave? See if they would be willing to speak with you.
3. Do you think your advisor makes decisions and suggestions that are in your best interest? Even if it doesn't directly/indirectly benefit your advisor? Do you feel you can pursue your own ideas and collaborate with who you want?
4. How comfortable are you and other students with freely expressing your views/ideas and/or disagreeing with your advisor? Do you feel like you have to walk on eggshells / manage your advisor's emotions?
5. What is your overall satisfaction with your advisor?
6. What stage of career is your advisor in / are they tenured? Do you think this affects how they operate / treat you?
7. What's the nature of your relationship with your advisor? Do you consider them a supervisor, advisor, or mentor? Do you feel they are too controlling? Do you feel you can

share difficult news with them? Do you think you would be comfortable calling them for advice in the future?

8. How does your advisor provide feedback?
9. Do you ever feel disrespected by your advisor?
10. Is your advisor receptive to feedback, especially on management / mentorship style? Or is it their way or the highway?
11. Has anyone ever had their funding threatened (implicitly or explicitly) if they did not do X, Y, Z?
12. What's one thing you would change about your relationship with your advisor?
13. How often do you work late? Do you feel like you always need to be on call?
14. What does the lab atmosphere feel like in general? Do things ever feel too hierarchical, competitive, or stressful?
15. How do students in the lab feel about their physical and mental health? Do they feel they can take care of themselves while trying to meet the lab's work expectations?

Ideally, you should try to figure out most, if not all of these things. At the very least, please, please, please, try and ask the first question. **Even if you get ~good vibes~ from one/most grad students, you owe it to yourself to be thorough.** You should also ask grad students about other things that are important to you, such as classes, city, friends, culture, health insurance, etc!

I still have questions about logistics.

Reach out to the interview or visit day coordinator if you have any questions!

Preparation & General Advice

First, know that this is just as much an interview for you as it is for them. You are deciding on where you will spend the next 5+ years, so you should be evaluating for yourself the program, the people, the academics, the culture, the community, etc. You don't want to end up somewhere that you won't be happy. To that end, have some goals in mind for your visit. What do you want to learn and what questions do you want answered? What do you think will be important for your success in grad school? What kind of environment do you want to be in?

This leads me to my second piece of advice. Using those criteria for what is important to you, create a list of things you care about so you can compare the different programs across different dimensions. I would keep details of all your visit days in some sort of spreadsheet. For instance, some of my columns were: professor, research group members, grad students in the department, research projects, department culture, classes, STEM outreach, stipend, location, cost of living, proximity to friends, etc. It just depends on what is important to you, but in this format it should be easier to compare programs.

Third, come prepared. Know your own research and experience and be able to talk about the details AND the big picture fluently! Know why you are interested in your potential advisor. What kind of work you want to do with them. It doesn't have to be super specific, but be able to have a conversation about their research with them. So make sure to read through their website and their recent papers and research! Make sure to stay engaged and ask them

questions to better understand how the lab operates and how you would fit in. By the time you leave, try to have an understanding of what a project with them would look like for you. Also, try and talk to them about non-academics. Tell them what is important for you, and what you are looking for in a program and in an advisor-advisee relationship.

Fourth, talk to the current students! Usually your schedule will already contain tons of opportunities to talk with them. They are an awesome resource because they will talk candidly about the program and their advisor. That's why it's great to talk to your potential advisor's current students. Find out their mentorship style, their expectations, their helpfulness, etc. Keep note of these things so you can figure out if you and your potential advisor are compatible.

Afterwords

After the visit is over, I would email your potential advisor, visit day coordinator, and your student guide (if you were assigned one) and thank them for their hospitality. These visit days and interviews take a lot of planning, and it would be nice to let them know you appreciate them taking time to have you! Also, follow up with your advisor with any out-standing questions you may have, and if you haven't been accepted, I think it would be pretty classy to mention whatever the outcome, you had a good time and you're glad you got to know them.



April: NSF GRFP Results, Making Your Grad School Decision

NSF GRFP Results

The date you will find out the results of the NSF GRFP tends to vary a bit from year to year. I found out March 30th, but I hear it's typical for them to announce the first week of April. If you were awarded the GRFP but were rejected from the school you wanted, reach out to them and tell them the news! If the issue was a lack of funding, there is a chance that they will change their minds now that you would be coming in with 3 years of funding. If you weren't awarded the GRFP, no worries! It's super competitive anyways. Plus, you can apply again in your first or second year of your PhD. Whether you are awarded the fellowship or not, your feedback sheet should be made available via the online portal a couple of weeks after the announcement. I've provided my feedback sheet above in the GRFP section.

Making Your Grad School Decision

All that hard work is about to pay off, time to make your decision! The universal deadline for decisions is April 15th. Whether you got into one school or fifty, it's time to evaluate offers and weigh your options. For this, you have to go with what feels right for you. I can't help much here, but recall your visits and think about where you would feel most comfortable, academically and culturally. You might want to reach out to your potential advisors if you still need clarification about anything. When I narrowed down my search to two schools, I created a huge pro / con spreadsheet which was helpful for me. For privacy's sake I covered up my thoughts, but it looked something that looks like this:

	A	B	C	D	E
1		University of Washington		MIT	
2		https://dshean.github.io/		https://glaciers.mit.edu/	
3		Pro	Con	Pro	Con
4					
5	Advisor				
6	Research				
7	Program				
8	Group				
9	Collaboration				
10	Friends				
11	Location				
12	Grad Students				
13	Classes				
14	Outreach				
15	Stipend				

(if you can't read the criteria on the left they say: Advisor, Research, Program, Group, Collaboration, Friends, Location, Grad Students, Classes, Outreach, Stipend)

Weighing your decision is hard, and there is not much I can help you with at this point, as this choice and the things you value will be different person to person. Like I did above, note the things that are important to you in a choice, and then compare and contrast programs along those categories. It may be helpful to talk your thoughts out loud with a trusted friend or advisor. Feel free to contact me if you want to talk it through!

Also, if you had any mentors or faculty along the way, especially if they are in a similar field to your potential programs, reach out to them and get their advice! In the end though, it's all you. Personally, I had to wait until the very last couple of days to decide because I was going back and forth between my two options for weeks. I was really lucky because I found those two amazing programs and two amazing potential advisors and two amazing lab groups. I wish I could have gone to both schools!

Once you've made your decision, make sure to officially accept / decline all your offers, then reach out to your new advisor and tell them the good news! I also think it's great to reach out to the potential advisors that you declined to thank them for their time, hospitality, and the opportunity to work with them. I also reached out to a couple of the grad students at one of the schools I declined because they were so friendly and helpful and I wanted to thank them!

Epilogue: Congrats, Thank You Notes, A Personal Note

Congratulations!

You did it!! I'm so proud of you. If you made it to the end, even if you didn't get any acceptances, you've really accomplished something big just by putting in so much effort to a crazy process.

Thank You Notes

Once everything is over, I would recommend sending out an email to your recommenders/mentors/etc announcing your decision and thanking them, **as well as physical thank you cards** (I know, a little more time consuming but I promise this is a nice touch that will really be appreciated) to all the people who have helped you along the way to thank them and tell them the good news! Here is an example email:



Eric Gagliano <elgagliano@gmail.com>

Tue, Apr 14, 2020, 1:35 PM



to clint ▾

Hey Dr. Dawson!

I hope you and your loved ones are healthy and safe. I just wanted to let you know that I've accepted an offer to do my PhD at the University of Washington to study the cryosphere using remote sensing techniques in their Civil and Environmental Engineering department! Also, I found out that I was awarded the NSF fellowship!

Both of these would not have been possible without your recommendation, advice, and support. Having you as a teacher and supporter has helped me start my scientific career, and I could not be more grateful. I want to thank you from the bottom of my heart for all your help.

I was hoping to tell you all this in person, although since UW doesn't start until late, if UT's Fall semester returns to on-campus learning I'll come stop by your office at the start of the semester and say hi! If there is ever anything I can do for you, or if you find yourself in Seattle with some free time and want to grab lunch or coffee, please feel free to reach me anytime at (281)-914-7744. Hope to see you soon!!

All my best,
Eric

A Personal Note

As you've seen, this process sucks. If you ever end up in a position of power where you can effect change in the process, strive to make it more transparent and equitable.

Appendix A: Professor/Program Sheet

	A	B	C	D	E	F	G	H	I	J	K
1	School	Professor	Response to Inquiry	Application Due	Application Materials	Link	Applied?	all letters submitted?	"I applied" email	STATUS?	FINAL STATUS
2			no reply, but multiple people have said hard to get along with / our personalities may clash		application, GRE, 3 letters of rec, unofficial transcript upload, supplemental materials		will not apply				
3	Stanford		enthusiastic, talk went well lookin good, i should probably email him when i apply	12/10/2019	online app, statement of purpose, 2 transcripts, 3 letters of rec, GRE	https://earth.stanford.edu/g	YES	DONE	SENT	interview	rejected
4	Boise State		excited "really great fit", listed ways i can be funded, skype sounded promising	12/15/2019	letter of intent, resume, writing sample, official transcript, 3 letters of rec, course summary	https://www.boisestate.edu/	YES	DONE	SENT	accepted	accepted
5	UM		responded, not sure about funding, encourages to apply, wants skype call	12/15/2019	Application, 3 letters of rec, transcript, statement of purpose, personal statement, CV	https://clasp.engin.umich.edu	YES	DONE	SENT	deciding on funding	no response
6	UW		skyped, says CV impressive, would be good fit. Stay in contact, maybe reach out after the new year	12/15/2019	500 word SOP, 3 letters, transcript, GRE, resume statement of purpose, official transcript	https://www.ce.washington.edu	YES	DONE	SENT	interview	accepted
7	UCSD		generic info about Scripps	12/16/2019	uploaded, 3 letters of rec, checklist of courses, application, 3 letters of rec, 2 transcripts, optional GRE	https://scripps.ucsd.edu/doc	YES	DONE	SENT	accepted/ visit day	accepted
8	UBC		no reply	1/1/2020	bio, 3 letters of rec, GRE, subjects taken form, statement of objectives	https://www.eoas.ubc.ca/aca	will not apply				
9	MIT		responded, skype went very well, planned to not take students but he may change mind if his funding and time work out	1/5/2020	online app, GRE	https://eapsweb.mit.edu/gra	YES	DONE	SENT	accepted/ visit day	accepted
10	UW		no reply	1/5/2020	online app, GRE	https://www.ess.washington.edu	will not apply				
11	UW		no reply	1/5/2020	online app, GRE	https://www.ess.washington.edu	will not apply				
12	Columbia		not taking students, but other professors in polar science will be and he encourages to apply. Mention use of big data in SOP, mention perhaps	1/5/2020	GRE, transcript, statement of purpose, CV, 3 letters of rec, sample of scholarly writing	https://eesc.columbia.edu/pr	YES	DONE	SENT	no response	no response
13	UW		not taking students, he recommended 2 others though-i or	1/5/2020	online app, GRE	https://www.ess.washington.edu	not taking students				
14	CalTech		no reply	1/1/2020			decided not to submit				
15	Key										
16	Looks really good, discussed funding										
17	Great talk, will apply / looking into funding										
18	Encourages to apply / recommended other people										
19	No response										
20	Wouldn't want to work with them										

My friend Suhas Raja has made a better template version of this that can be found here:

[Graduate Application Dashboard Template](#)

Appendix B: Checklist

Click here for a handy checklist I made:

[Applying to \(STEM\) PhD Programs from Undergrad Checklist](#)

Appendix C: Other Resources

Great site that walks you through an entire timeline of a school:

<https://grad.berkeley.edu/admissions/apply/>

TODO:

More resources?

Make more profesh