1 Introduction

I wanted to write this guide because I read others’ thoughts when I was preparing my applications and I found many of them extremely helpful. I applied for the NSF Graduate Research Fellowship Program (GRFP) three years in a row. I received an Honorable Mention the first two years and I finally earned an award offer from my third attempt. Having said that, I have learned a lot. After all, most people are only eligible to apply twice, and many of those either don’t apply the second time or win the award on their second attempt. Through all this, I have learned how to write not-so-good essays that will get you some recognition (and no money), but more importantly, I have also learned how to write good essays that will put you in the best position to win the big prize.

This isn’t the only place you’ll find this kind of information, and if you have managed to find my ramblings, I certainly hope you will find the time to read what other people have to say as well. Perhaps the best advice I can give you is to read as much as you can and consider everyone’s input. The best thing you can do for yourself is take advice from current fellows, past fellows, and professors who have been review committee members in the past.

Basically, I have formulated these notes based on my own applications, reviewer rating sheets from my own applications, things I have read online from other fellows, NSF application seminars at Purdue University, and more. However, please don’t take anything that I say as “law.” These are just guidelines and I would strongly recommend that you formulate a style that accurately echoes what you want to portray in your application.

2 Why Apply?

Okay, so the primary perks are most likely the financial benefits. (a) The current value of the fellowship stipend is valued at $32,000 per year for three years (a number that is set to increase to $34,000 per year). If you have a graduate research assistantship (RA) or teaching assistantship (TA), I highly doubt you are making this much money. If you’re not on a RA or TA, then you might not be making any money. Well, this sounds good already. (b) NSF pays a financial stipend of $12,000 directly to your university (if your university tuition is higher than this, don’t worry...you won’t have to pay any differences out-of-pocket). If you have an RA or TA, this probably doesn’t mean much to you since your tuition is likely already paid for; if you’re paying for graduate school yourself, you just got an even bigger raise. (c) Furthermore, you are also exempt from paying any additional fees required by your
university. At Purdue University, this is on the order of $2,500 per calendar year which would normally have to be paid out of your (probably less than $32,000) graduate stipend. It just keeps getting better, right?

Aside from the financial benefits, you are extremely marketable in the eyes of an advisor (remember, they don’t have to pay you anything!) and you are not bound to a specifically-funded research project. This means you can work for the professor who has the well-known name but has no money to sponsor you. This also means you can do research that truly interests you, as opposed to the project that is funded by industry or government. You have just gained some serious flexibility and marketability as a graduate researcher. You also currently receive access privileges to the cyberinfrastructure XSEDE (formerly TeraGrid) supported by NSF. If your research involves computing, you probably already have access to computational resources, so I don’t see this as a particular perk, but it is available, nonetheless. Finally, you earn international renown as a National Science Foundation Fellow.

Further, NSF sets itself above other national fellowships as the best choice for applicants. Compared to other national fellowships (NDSEG, NASA ASP, NASA GSRP, Hertz, etc.), NSF confers many more fellowships (~2,000) each year. Granted, there are typically more applicants for NSF since it draws applicants from so many more disciplines. Despite this fact, the chances of receiving a NSF fellowship are typically quoted in the range of one in ten or better (since the number of awards has increased in recent years from ~1,000 to ~2,000). In addition, receiving an NSF fellowship provides flexibility which is typically not offered with other fellowships. Notably, NSF offers three years of funding which can be stretched over a five-year period. This allows the fellow two years of deferment options which can be used for accepting research assistantships, teaching assistantships, or other sources of funding which increase your research breadth during your graduate studies. I have also heard of people taking one or two years between MS and PhD programs to act in a ‘research scientist’ capacity for a university laboratory. However, these options are more difficult to approve and typically still require the fellow to be in an ‘academic research’ environment.

3 Preparation

3.1 Familiarizing Yourself with the Application Process

Before you start off writing your essays, I would recommend following these steps to make sure that you understand all of the rules and define your goals for your essays:

First: Read the program solicitation (the 2014-2015 version is available on my website). This has all the information about the fellowship including eligibility, rules, benefits, etc. Pay specific attention to the discussion of “intellectual merit” and “broader impacts” in the explanation of the Review Process. Also, if it’s written in boldface, it’s typically important, so read those parts carefully.

Second: Read the document explaining and exemplifying the “broader impacts” referred to in the program solicitation. These are extremely important!
Third: Read the “broader impacts” document again, and again, and again. Seriously. In the program solicitation, there are only two criteria by which your application will be judged – intellectual merit and broader impacts. The intellectual merit is probably fairly self-explanatory...you have accomplished a lot academically and you are highly-qualified to apply for this fellowship. The broader impacts criterion can be more difficult, though, and it is important that you wrap your head around what it means.

Another good way to prepare is to attend seminars and presentations designed to help you apply for NSF and other national fellowships. Many universities offer these programs which may be organized by the Graduate School, individual colleges and departments, or student organizations. Keep your eyes and ears open for information about these programs.

3.2 Preparing to Write

When it comes to your essays, one of them will be writing about yourself, so that probably won’t require any extensive research (hopefully). The second, the proposed research essay, will require some more thought. It is important to know, though, that you are not in any way bound to do the research that you propose! That’s right, NSF just wants to know that you are capable of formulating a well-thought-out research proposal in your field of study. So, this means you should write about what you are familiar with. Don’t bother researching something you know nothing about if you just conducted a literature review on something else two months prior. Now, having said that, you need to make sure that your proposed research topic still fits within your field of study and ties together well with your other essays. This is one of the most important things – tying everything together. We’ll touch on that again in the next section, though.

When I was preparing to apply for NSF GRFP the first time, my brother told me about a talk he heard by Stuart Pimm at Duke University. He said there are two good approaches to getting published: (a) find a controversial topic in your field and find a potential way to solve it or (b) find a foundational or widely-accepted view in your field and prove it wrong...like really wrong. This certainly doesn’t apply in all fields, but it’s something to consider, at least...

The best way to begin formulating your research proposal is to start a dialogue with your advisor. Tell them you are applying for a NSF fellowship and I will be shocked if they do not offer to help you (remember, as a fellow, you will potentially save them a lot of money that they no longer need to use to pay you). This is probably a good jumping-off point. If you don’t have an advisor yet, choose someone you might like to bounce ideas off of, or choose a professor from your undergraduate years to give you some help. If you are an undergraduate student applying for your first year of graduate school, choose your favorite professor and ask them for some help.

All the while, remember: You do not have to actually do the research you’re proposing.
4 Essays

Now, if you didn’t read the program solicitation yet, you should go back and do it now. At this point, it’s important to note the guidelines for writing your essays (they’re clearly defined in the program solicitation) which describe the font size requirements, margin requirements, etc. Don’t make the line spacing less than normal to fit more words on your pages. The page limit might seem like a curse, but it’s important that you avoid trying to pack as many words as possible into the essays (if you read my essays from 2010, you’ll see this problem).

Here are a few key points to consider:

**Key #1: White space is paramount when writing your essays.** Typically, the reviewers will have about ten minutes or less to read your essays, your letters of recommendation, and your application. Because of this, your essays need to be well-organized and look inviting to the reader. If you submit an essay that is packed margin-to-margin with text, it will be extremely overwhelming and your application will already have a bad start in the eyes of the reviewer. One of the easiest ways to achieve white space is to leave at least one blank space between paragraph.

**Key #2: Your essays (and your letters of recommendation) must tell one story.** You want the individual parts of your application package to work together to tell the story of you. You shouldn’t bring up some research project that you worked on if you can’t write about something that you learned from it. If you had an internship with an industry leader, you can (and should) write about the project in your combined personal statement, but it would be really helpful if (for example) you could also write about some community enrichment project that you also took part in as a result of that internship. Your research proposal essay should be well-grounded in your combined personal statement. Also, if you worked on a research project with a professor, they should be probably be one of your reference writers.

**Key #3: Use boldface text in your essays to lead the reader to your most important points.** Primarily for your combined personal statement, I would recommend emphasizing one point in each paragraph (again, within reason). This point should be an example of ‘intellectual merit’ or ‘broader impacts.’ After all, those are the only ways that the reviewer will be judging you, right? This point can come at the beginning, middle, or end of the paragraph, but emphasize what you want to reader to know in bold, and then use the rest of the paragraph to exemplify the point you are trying to emphasize. This way, if the reviewer is short on time and only reads one line from each paragraph, you can be sure that they will be reading the most important lines.

**Key #4: Ask everyone to read your essays.** Receiving feedback is important to writing good essays. Your professors may be good candidates for this. If you are already a graduate student, your labmates would be great candidates for this. Your classmates or parents might be good candidates for this. Your university might have a writing help center.

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1When I applied, the previous research and personal statement were two separate essays – now they have been combined into what I am calling the ‘combined personal statement.’ This actually makes it easier to tell one coherent story about your background as an individual and a researcher.
Your university might have a staff member who helps students write proposals (check the Honors program if there is one). No matter who reads your essays, make sure someone is reading them and, if possible, ask those people (yes, several are better) to read them more than once.

**Key #5 (optional): Summarize your Intellectual Merit and Broader Impacts at the end of each essay.** Again, these are the only two official metrics for judging your application, so it is vital that you address them appropriately and directly. Don’t assume that you are getting your points across. Instead, spoon-feed the information to your readers. If you summarize your intellectual merit and broader impacts at the end of your essays, then the reader will be able to specifically read your contributions to intellectual merit and broader impacts in five or six simple lines.

**IMPORTANT!** The following sections were written to support the three-essay application format (prior to 2013). New applicants should combine the suggestions for the Personal Statement and the Previous Research into your one ‘Combined Personal Statement.’

### 4.1 Personal Statement

You can read guidelines for writing a personal statement just about anywhere. The primary goal here is to lead the reader through your life and address several points: (a) How you arrived at where you are now, (b) Why you want to do what you’re doing (or proposing to do), (c) How you have made contributions to the academic community in the past, and (d) How these past contributions show your ability to continue to contribute to the academic community in the future. Remember, this is your best opportunity to sell yourself to the reader.

A few questions to get your brain thinking when writing your personal statement essay:

- Have you been a tutor?
- Do you volunteer at your church?
- Did you build houses with Habitat for Humanity for Spring Break?
- Do you want to be a teacher/professor? If so, why?
- Did you create a new product or website that helps students learn a certain subject?

### 4.2 Previous Research

As with the personal statement, your previous research essay is just an explanation of what you have done in the past. The easiest way to write this is to make it blatantly apparent for the reader. Write where you worked, explain what you did, and then describe the intellectual merit and broader impacts of that research experience separately. Move on to the next research experience and repeat: where, what, intellectual merit, broader impacts. That’s it. Easy, right?

If you have performed research under a specific professor or advisor and that person is also one of your reference writers, I may be valuable to name them explicitly in your previous
research essay. This way, when the reviewer reads the letter from that person, they can refer to the work you did in the previous research essay and remember how the story ties together. Yes, you’re still trying to tell a story...

Important things to remember when writing your previous research essay:

• Separate your Undergraduate and Graduate research experiences into two distinct sections.
• Have you conducted research or a literature review for your proposed research topic, maybe in a class? If so, then you probably know what you’re talking about.
• Are you describing something in your research proposal that will call upon certain skills that you learned in a previous research experience? If so, make sure to emphasize them in this essay so it will be apparent later that you know what you’re talking about and you understand specifically what is required! Experience is valuable.
• List your publications at the end of the essay (if any).

4.3 Proposed Research

Now, the research proposal is the black sheep of your essays. You’re not writing just about what you’ve done in the past anymore. Once you choose your topic, it is important (as with everything else in this application) to make sure your research proposal is understandable and straight-forward for the reader. One way to do this is to loosely follow the scientific method and modify it as you see fit. For example:

1. Summarize your research.
2. Hypothesize the results and/or their benefit.
3. Describe the research plan (will you have human subjects, do you require specific facilities or instrumentation, etc.).
4. What are your anticipated results?
5. What is the intellectual merit of your study (why are you qualified to perform this research, why is your university the best place to do it, etc.)?
6. What are the broader impacts of this research (how will the rest of the scientific community benefit from your study, etc.)?
7. List your references.

If you follow some structured form (it doesn’t have to be exactly this), you will have a nice research proposal that looks presentable and is easy to follow (and hopefully has plenty of white space).

Here are some helpful things to consider when writing your proposed research essay:

• What is the significance of this research?
• Only include figures if they are beneficial to the reader – they take up space!
• Bulleted lists may be useful.
• It may be beneficial to provide a timeline somewhere in your proposal explaining how you plan to spend your three years on tenure as an NSF fellow.
• What potential problems do you foresee with your research and how will you address them if they arise?
• If you are building a new facility or product, what are the potential contributions of the new facility or product?
• Don’t forget the intellectual merit and broader impacts, and please address them explicitly!
• Are you going to present the results at a conference, or maybe in a journal?
• Will you give presentations to school-age children or disseminate knowledge to the community in a non-technical setting?
• You do not need to cite every single reference you read, but four to six might be good. Choosing references which are newer over those that are older may signify that the topic is still significant in the field (I was dinged once for choosing ‘old’ references).
• Choose a reference style that doesn’t require much space (e.g., Science Magazine) or maybe omit the article title from the citation to save space.

5 Transcripts

Nothing much to say here, except that you should wager plenty of time for your transcript(s) to be mailed to NSF. To my knowledge, you can upload an electronic version of your transcripts, but you still have to mail hard copies. The last thing you want is for your application to be deemed incomplete due to a transcript malfunction.

6 Letters of Recommendation

Finally, this is the last piece of the puzzle for your application. Your reference writers have the opportunity to corroborate the statements that you have claimed up to this point in your essays. With this, it is important to choose your reference writers carefully so that they can help wrap up your application – you’re trying to tell a story after all, right?

As I discussed earlier, your reference writers should be people with whom you have first-hand experience working. Whether you are a graduate student or undergraduate student, your advisor should absolutely be one of your reference writers. This person likely will have the most to say about you. If you have performed research with someone, they would also be a good candidate for a reference writer. I think it is important to have as many PhDs as possible writing references. Nonetheless, if you have someone from industry who can speak volumes about your work but doesn’t have a PhD, I would not hesitate to ask them to write you a letter.

Also, it is important to give your reference writers sufficient time to formulate their thoughts. I would recommend notifying your reference writers at least one month before the reference is due (especially since the deadline typically falls at a point in the semester when they will be very busy).
Most professors will be at least familiar with the NSF fellowship, but there are a few things they could touch on in their references letters:

- If you introduced your reference writer in your combined personal statement essay as someone with whom you conducted research, tell them so they are aware.
- If you took a heat transfer class with one of your reference writers, and your proposed research calls upon heat transfer, you might ask the writer to speak of your heat transfer expertise.
- If the reference writer was an NSF fellow him/herself, or has previously advised NSF fellows, they may want to ‘compare’ you to other NSF applicants or fellows (I do not find this to be particularly useful, and I only note this because it was a specific point from one reviewer’s rating sheet for one of my application years).

As soon as you have a good working copy of your three essays, it would be a good idea to send a packet of files to your reference writer. Here are some ideas of things to include in your packet:

- A short letter thanking them for their contribution and suggesting to them what you would like them to discuss.
- Copies of your three essays.
- A copy of your CV or resume (although they should get most of the information they would need from your essays).

The best advice I can give you here is not to be surprised when your reference writers wait until the last minute to submit their letters.

7 Conclusion

As I said before, this document should not be your Bible for the NSF GRFP application, but rather a list of suggestions. Read, listen, and gather as much information as you can and you’ll come up with the best application package that you can. If you think it will help, read my example documents (remember the application process has changed from a three-essay to a two-essay format), but also read other peoples’ documents since you will see there is no perfect recipe for winning an NSF award offer.

If you have any questions, feel free to email me at rberdanier@psu.edu. I probably won’t read your essays and I certainly won’t write your essays, but I would be more than happy to answer any other questions you might have.

Good luck!

P.S. If you feel like any of my resources helped to improve your NSF application, send me an email to let me know! :-)

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