

NSF Graduate Research Fellowship Program

(insights)

James Faghmous (U Minnesota)
Douglas Causey (U Alaska Anchorage)

IV- Previous Research Experience

Target criteria: communicate (scientifically and informally); to work independently or as a team; enhance scientific understanding; plan and conduct research; benefit society; broaden the participation of underrepresented groups; disseminated research findings broadly

(Note: NSF no longer has this as a separate essay, it is now combined with the personal statement essay. Because these two essays address different topics and demand different styles, it is still useful to consider these separately.)

In this essay, you want to show the reviewers that you can clearly, accurately, and concisely communicate previous research, your contributions, and the outcomes of your research. Research experiences come in all forms: Research Experience for Undergraduates (REU), internship in a lab, or working on a course project. Obviously, the more successful you were in the past the better, but it is really about communication. If you can't get people excited about your research, you won't be able to capitalize on your success.

Quality over quantity. Even if you have a lot of research experience focus on the one or two experiences that address *all* the criteria listed above. Dig deep into what made the project challenging and fun for you. What *exactly* did you do? Showcase instances when you worked alone and as part of a team. How did the two experiences differ?

Problem solving. Research is about solving a previously unsolved problem. So if you have no formal research experience, talk about a challenging problem you had and how you went about solving it. For instance, James once wanted to measure the actual velocity at which a cell moved across a computer screen. To compute the velocity, he needed to know the distance traveled and the time it took to cover that distance. To compute the distance, he had to figure out what was the (real-world) size of an actual pixel on the scene and count the number of pixels across the screen. To do so, he got a really tiny (micrometer) ruler and took a picture of it using the same camera at the same angle and deduced the distance traveled and subsequently, the cell's velocity. Now, this is a simple problem, but the fact that he went to great lengths to solve it shows the reviewer that he had basic problem solving skills necessary for research.

Resilience. Research isn't like anything you are taught in the classroom. The majority of research efforts are unsuccessful, otherwise everybody would have a Ph. D. As stated in a previous section, there is nothing wrong with failing. You should show to the reviewer that you have failed in the past but that didn't stop you from learning from the

experience and built upon it to achieve your objectives. Personally, if you submitted an essay where you were smooth sailing all along, the reader would think you are unprepared for graduate research.

Initiative. In graduate school, your advisor generally doesn't have the answers to your questions any more than you do. Therefore, it is imperative that you showcase discipline and initiative. Not only you need to be smart, but you must make things happen and not wait around until someone guides you by the hand. How did you secure your research experience? How did you take initiative and leadership in your project? Did you research various methods and chose the best one after a thorough examination or did you just select the method that "just worked"?

Team work. The majority of undergraduates go about describing their team work experience as if it was an individual effort only there were more people hanging around. That is not teamwork. Teamwork is about doing whatever is needed for the team to succeed. This means getting out of your comfort zone for the team's sake. What exactly was your role in the team project? What if you didn't do your work what would have happened? How did you demonstrate leadership (hint: not by giving orders)? How did you demonstrate initiative? Did you gain new skills the team needed even if you didn't want to?

How did you leverage your research experience beyond the lab. Once again, the NSF is investing in you, the person. So how did you use the experience outside research? Did you meet people from different backgrounds? Did you share your expertise with others in the lab? Did you meet other researchers for future collaborations? Did you organize social activities for your lab?

How did you share your findings. This point is extremely crucial! If you were published make sure you mention that and list the full citation at the end. If you were selected to present your research, mention if it was competitive or have one of your reference writers mention it (i. e. 2 out of 20 selected). But more importantly, how did you share your research experience and results with non-experts and the general public? Did you blog about your experience? Did you write about your research in the student paper? Did you present your research at a university wide event? Did you use the skills your acquired to serve your community?

What would Yoda do? While you are researching this application, you'll see many "advice" pieces telling you that if you don't have *any* research experience talk about what would you have done. This is terrible advice. We are sorry, but if you've never had a formal research experience, *and* never worked on a problem that, at first, you thought you could never solve and ended up solving, then you shouldn't apply for an NSFGRF. Would you hire someone to play quarterback on your team if they never ran in their life? Neither will the NSF.