

Anatomy of an NSF proposal

- 1-2 pages placing your work in a broader context - what sort of problems do you expect to be solving 10-30 years from now? Why is the problem you're addressing relevant? This section should also have 1-2 paragraphs summarizing the proposed research contributions (what will you have done after 3-5 years?) Don't make this too broad or make it sound like you're doing something you're not - you want to convince them that the direction is worthwhile and will lead to bigger and better things, but you don't want to claim to cure cancer when all you've done is create a better pipette...
- You may also want to include 1-2 paragraphs discussing outreach and education, especially if this is a Career award or you have something particularly compelling to say in this area.
- 2-3 pages for previous work/work you've already completed/existing research. Be very explicit about work that is yours.
- 5-7 pages for the proposed work. This will probably include background on the problems. Stay away from comments like "we plan to investigate..." without any specifics. For every problem you should have your specific approach to it. And, ideally, this shouldn't be the approach that someone in your field would come up with after they sat down and thought about it for 10 minutes. Also stay away from the thesis-as-hammer grant proposal - I've seen a lot of proposals that take the basic idea from their thesis and just list a set of problems to try it on. Or list a set of directions straight from their future work section. You really want something a bit more visionary.
- In this section, the breakdown should be:
 - 2-3 pages of problems where you have already done some work and have preliminary results. The listed problems are extensions of existing work/address known flaws/application of current techniques to a new, but similar, problem. You should be 90% confident of succeeding in solving these problems. The solutions should be very detailed/explicit. I.e., this is where you demonstrate that you know the problem area well, you know how to solve the problems, and at the very least, you will definitely accomplish these goals.
 - 2-4 pages on longer-range problems, ones where the solutions are not as obvious. These problems might have one or more proposed solutions, and will, of necessity, be a bit vaguer. This is where you convince the reviewer to fund your proposal.
 - 1-2 pages of long-term, we'll get to them if we can, type problems. This is, in some sense, a peek at what your follow-up proposal will have in it...
- 2 pages on education/broader impact. It's rare to have anything unique here - it's usually "I'll run this course which will attract these minority students for some reason, and will integrate my research with the curriculum". If you can link into programs on your campus that do education for kids/high school/diversity, that's a good thing. If you have any industry contacts who are interested in your work, this is the place to mention them (include a letter of support in this case).
- (No longer optional) Results from prior funding (if any) or anything unique you want to say about yourself that makes you particularly suited to this research/outreach. Use this as a good place to show that you made good use of the last pot of money you got.

From Cindy Grimm, Oregon State University

- 1 page summarizing the proposed research and who's going to do it (e.g., graduate students) and how. Make this easy to find so the reviewers can quickly flip to it and not dig this information out of the body of the proposal. Include your integrated education plan.
- A conclusion summarizing why this research needs to be done, how it will help the community, why you're excited to do this... i.e., end on a high note. This is your chance to remind the reviewer about why they should be so keen on your proposal...

Broader impact/diversity/education

This is probably the area that has changed the most in the last 10 years, and requires a lot more thought/effort than it use to. Be as concrete as you can (list organizations, specific actions, outreach opportunities, preferably ones you already have a relationship with) and be realistic! Better to do one or two things well then try to do outreach to every community out there. The most important thing is to start these collaborations NOW, so that you can say "I am doing..." instead of "I will do".

Linking education and diversity with your research can be challenging, but try.

The biggest way to sell your broader impact is to have a collaborator outside of your field and a very concrete list of goals/problems from that collaborator. Again, start this early, because it can take 6-12 months to really start to see how your work can fit in with the goals of someone in an outside field. But it's well worth it, because these are the problems that will drive your next proposal...

Data management plan

This is relatively new, and basically arose because congress got tired of paid-for research/data disappearing as soon as the grant ended. These haven't really stabilized in content (unlike the facilities statement) but so far they seem to be a specific listing of the mechanisms by which your data/source code/papers will be archived. Also not a bad place to reiterate your commitment to, say, open source software - i.e., we will release this as part of Sourceforge/Git hub/Bit Bucket, etc. Usually also includes some sort of statement about how the data (usually on a web-page) will be archived for the long term. Your university may have established a data archive (sometimes through the library) that you can use.

Budget

I don't think I've seen a proposal killed because of an excessive budget (or a too small one), but it will result in reviewers making nasty comments about you to each other. Just remember that anyone who has a substantial role in the project should have commensurate funding (especially outreach activities). If you lay out a time-line with research problems and people assigned to them, then that should serve as a check on whether or not you have too many/too few people/the correct resources.

NSF may cut your budget anyhow. If they decide to, make sure you're clear about what you're going to cut out of the proposal in response.

Other forms

The other forms you'll have to fill out are the facilities and budget justification, and possibly a mentoring plan (post-doc) or a collaboration plan (multiple institutions). Your grant office should be able to help with these, but if not, find someone who's had a grant funded and borrow mercilessly. Your grant office may have very specific ideas of the format of the budget justification. Listen to them.

From Cindy Grimm, Oregon State University

Collaboration letters: Include only if someone will be actively contributing time/resources to your project. Some program managers are really picky about this - they don't want to see letters of the form "I think this person will do an excellent job, and I can't wait to see their research".

Career: Your department chair must write a letter for you. Be kind, and give them plenty of warning. This letter should demonstrate the support of the department for your research.