

TIPS FOR PROPOSAL WRITING

SOME PRACTICAL GUIDELINES

1. Start early. (But, don't assume that if you will not be able to meet a submission deadline or target date that you must miss a review cycle. Call the agency before the due date, explain your problem, and ask if there is a procedure for submitting late.)
2. Read the instructions carefully (before you write, while you are writing, and when you have finished writing). Not including all required information or not following the designated format will be noted by reviewers and program officers.

Use the agency's maximum page limits as an indication of the detail expected in a proposal. Don't exceed it or try to fit the limit by squeezing too many words onto a page or eliminating spacing. At the other extreme, a proposal that is substantially shorter than the limit is probably lacking in necessary details. Keep within stated guidelines. Avoid jargon and unnecessary abbreviations. Be liberal with headings to break up the text. (If you use number or letter designations be sure that they match in each section.)

3. Use the same care in preparing your proposal as you would for a manuscript being submitted to a journal. (Reviewers will comment on typos, not using standard formats, missing references, etc.) Send glossy photos of illustrations if critical detail is lost in printing copies of the proposal (ask how many are needed). FastLane currently does not print reviewer copies in color.
4. Make your goals specific and clear: What questions are you asking? Constantly keep these goals in focus. Devote at least a paragraph to putting your proposed experiments in a long-term context. Distinguish between your overall interests and objectives and those you wish to achieve during the tenure of the proposed grant. **Proposing much more work than can possibly be achieved during the requested grant period is one of the most common mistakes made by first-time applicants.**
5. Ensure that you have an appropriate rationale for each study: Why is your work important?
6. Describe previous experiments carefully and clearly: Are you a careful and critical scientist? Have you included appropriate controls for every experiment?
7. Design your experiments with exquisite care. Discuss pitfalls, interpretations and strategies. How are you going to do the work? Do you have enough experience with the techniques proposed? Have you suggested appropriate methods, not ones that you think are in fashion? Make very clear which experiments you consider to be the most important and which you will drop if they appear unproductive.
8. Get as much help as possible from colleagues, peers and mentors from your laboratory or campus, NSF publications (Program Announcements, Grant Proposal Guide, Web Pages, Funded Project Abstracts, Reports, Special Publications), program officers (incumbent and former "rotators"), previous panelists, serve as a reviewer, etc.
9. If you are continuing work initiated as a graduate student or postdoctoral fellow, make it clear that your work will not be competing with that laboratory. If possible, include a letter from your mentor stating that the project is now yours to pursue or that you will work in cooperation, not in competition. (Collaborators from other departments, industry cooperation, letters of support and matching funds are not requirements; however, they can help you make your case.)

10. Revise relentlessly, remove verbiage and unnecessary detail - be simple and concise. At the same time give enough information in each section to ensure that your reader does not have to refer constantly to other sections.
11. Remember that "The ill and unfit choice of words wonderfully obstructs the understanding" (Francis Bacon) and "The more words there are, the more words there are about which doubts may be entertained" (Jeremy Bentham).
12. Be sure to give credit to all your sources. For example, if you use several paragraphs taken directly from a review article in your introduction, put it in quotes and cite the source (a reviewer of your proposal may have written the article!).
13. If you have papers submitted for publication, ask if you can attach them as appendices. NSF does not currently allow appendices for regular research proposals. Some agencies require that manuscripts be accepted in order to be included. Avoid listing many papers as "in preparation" as it will appear that you have a problem getting your results down on paper (and the term is virtually meaningless).
14. If you are applying to several granting agencies, avoid partially overlapping proposals. Funding of one would probably prevent the funding of the second, even though the second may contain portions that are unique to that proposal.
15. Track your proposal through the NSF FastLane system (electronic submission of proposals is required by NSF). If it is mis-assigned to a program or review section, try to get it changed as soon as possible. If you have a substantial breakthrough in your research between the time of submission and review, submit a brief update to your proposal (call the agency first to determine the necessary format and deadline).

REQUIRED SECTIONS OF AN NSF RESEARCH PROPOSAL

See the NSF Grant Proposal Guide for details (available at the NSF website <http://www.nsf.gov>)

Single Copy Documents:

- Information About Principal Investigators/Project Directors and co-Principal Investigators/co-Project Directors
- Deviation Authorization (if applicable)
- List of Suggested Reviewers or Reviewers Not to Include (optional, but very helpful in the review process)
- Proprietary or Privileged Information
- Proposal Certifications

Proposal Sections

- a. Cover Sheet for Proposal to the National Science Foundation
- b. Project Summary
- c. Table of Contents
- d. Project Description (including Results from Prior NSF Support)
- e. References Cited
- f. Biographical Sketches
- g. Proposal Budget (cumulative and annual budgets, including subaward budget(s), if any, and up to three pages of Budget Justification)
- h. Current and Pending Support
- i. Facilities, Equipment and Other Resources
- j. Special Information and Supplementary Documentation
- k. Appendices (Include only if approved in advance of proposal submission by NSF Assistant Director/Office Head, or designee, or by program solicitation)

You are allowed 15 pages to justify and describe the proposed work. You may structure this section any way you wish, but it usually includes information on the following:

Results from Prior NSF Support

If you have never had an NSF grant, this section will not be applicable. However, if you do have preliminary data that have not been published and they relate to the proposed work, be sure to include these in the Project Description.

What do you intend to do?

You should start with a brief introduction that states the overall objectives of the proposed research to put your reviewers into the picture at once. Make your aims as succinct and as clear as possible, they should be well thought out and feasible. Do not make your reviewers struggle through complex questions or tortuous prose.

Why is the work important?

Contrary to popular belief and practice, this is not merely a literature survey of the background of the field. To answer the question why the work is important requires the following:

- A description of the research activities that led you to the work you are proposing, such as an extension of work already in progress or exploration of a new trend.
- A means of showing that you are thoroughly familiar with the field and have a balanced knowledge of it. Be selective and discriminating in your choice of references rather than being all-inclusive.
- A good background and literature survey will permit you to emphasize the areas where there are gaps in knowledge that you intend to fill and hence will lead you to.
- How your proposal will verify (or refute) your hypothesis and or yield new conclusions of a general biological or practical significance.
- What are the broader impacts? (see below)

What has already been done?

This section permits you to show (1) the feasibility of your proposed studies; and (2) your qualifications as an investigator. Indeed, in times of fiscal constraint (that is, almost always), your reviewers will feel much more confident about your capabilities if you can show them some pertinent preliminary experiments. **But**, particularly for a new investigator, they must be meticulously carried out and presented. Do not ruin good work by a poor description of it.

How are you going to do the work?

Again, contrary to popular belief and common practice, this section is not like the "Materials and Methods" portion of a paper, but rather is concerned with demonstrating that the applicant can design an appropriate research protocol, show the strategy planned and the procedures to be used (and their advantages and limitations), is familiar with potential difficulties, has considered alternative approaches and included pertinent statistical analytical methods, and has discussed interpretation of the results. Can the proposed experiments answer the study questions?

NSF Review Criteria

Criterion 1: What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior

work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

Criterion 2: What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

PIs should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to the above-described NSF merit review criteria. NSF staff will give these elements careful consideration in making funding decisions.

For specific examples of activities that address criterion 2 see http://www.nsf.gov/od/opp/opp_advisory/oaccrit2.jsp.

WHY PROPOSALS FAIL

1. Absence of innovative ideas and/or hypotheses. Surveys, preparation of standards, screening of cDNA libraries, isolation and maintenance of cell lines do not in themselves constitute novel ideas, even if the work has not been done before. Money may be requested for these studies, but usually only as part of an overall scheme.
2. Errors in logic and experimental design. The experiments will not provide the results that they are purported to do. The methods are not described properly. Adequate controls are not included. The methods may be "fashionable" but are inappropriate for the proposed studies - simpler "old-fashioned" methods will give better results more quickly and cheaply. Too few samples for statistical analysis.
3. Errors in presentation and expression. So poorly written that the reviewers miss the point, or cannot tell what questions are being addressed, or find statements ambiguous. Overcrowded writing that obscures your message. Insufficient background to support studies. Sloppily written with errors in experimental detail so that reviewers have little faith in the author's abilities.
4. Not exciting.
5. The author has attempted to enter a new area without the background and/or expertise to make the project feasible.
6. Unrealistically ambitious (even after taking into account the inexperience of a new investigator).
7. Wholly unjustified budget.
8. Proposal incomplete or incorrect (e.g., lack of information on current and pending support, no letters of support from named collaborators, etc.).
9. In the wrong program or not directed toward the mission of the granting agency.

REVISING A PROPOSAL

1. Keep calm!
2. Read the reviews very carefully. If your project was described poorly, your reviewers may have misunderstood your intent.

3. Answer all pertinent questions or criticisms and correct errors and omissions.
4. Add any new preliminary studies.
5. Based on the reviews, consider adding new experiments, but do not write a new proposal. If it goes to the same reviewers, as it probably will, they will find it more difficult to review a proposal that is rewritten entirely, than one that is revised appropriately.
6. If one component of your proposal is clearly undesirable, remove it and improve on other aspects or add a new one (but only if it is excellent).
7. If reviewers have mistaken your intent (see 2), revise the writing.
8. If reviewers question your expertise, emphasize where you can obtain training and/or help and collaboration from your colleagues.
9. If reviewers criticize your budget, your resources, your commitment, change them (but only if the criticisms make sense).
10. **For all of the above**, get advice from colleagues and mentors in your own field, in related and unrelated fields, and from administrators at your own institution and the granting agency (the NSF Program Director has a lot of experience in the field and is a great source of construction advice).

Hopefully you won't need the advice in this section. I wish you success in your proposal writing and career!

This handout was revised by Deneb Karentz (University of San Francisco) with information from:

- Dr. Philip D. Harriman, Former Program Director for Microbial Genetics and Microbial Observatories, Division of Molecular & Cellular Biosciences, NSF
- Dr. Pamela Talalay, Johns Hopkins University
- Dr. Dennis Peacock, Former Head of Antarctic Sciences Section, Office of Polar Programs, NSF
- National Science Foundation website (<http://www.nsf.gov>)