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"A strong application always demonstrates an appreciation of the background of the field, with appropriate references to the results of others."

### A Guide to NSF Success

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United States  
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This article provides suggestions and ideas about how to make your next National Science Foundation (NSF) proposal more competitive.

proposal more competitive.

NSF provides proposal information in a variety of ways: Dear Colleague Letters, Program Descriptions, Announcements, and Solicitations. The best way to keep in touch with grant opportunities is by subscribing to one or more of the available alert services, such as [NSF's notification service](#), the [IEEE newsletter](#), and [Grants.gov](#). NSF also provides a [guide for preparing proposals](#) that provides specific instructions for each stage of the application process.

### Planning research proposals

As you prepare to submit a research proposal to NSF, the first step is to search NSF's Web site broadly on each of your areas of interest to find competition solicitations and relevant NSF organizational areas. Then examine the [award abstracts database](#) to see what parts of NSF have funded similar work.

As you study each call for proposals, identify the overarching goal of the NSF program. Study the review criteria critically: What are the criteria? What will the reviewers look

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for? Direct your proposal to the program in which it fits best; there, it will get the most appropriate reviewers and have a high priority for funding. If you list multiple programs on the cover sheet, list first the program most central to your topic.

A critical point to consider is whether the idea you're proposing is easily differentiated from the work included in your existing grants. Your proposal should not look too similar to work that is already funded; even titles and summaries should be distinct. The new proposal should go beyond your already-funded work in terms of both intellectual merit and broader impacts. Discuss any overlap in your project description, specifying what is new.

If the problem you're addressing is complex, it may be imperative to assemble a multi- and interdisciplinary team. An added benefit to forming such a team is the opportunity to build relationships and capitalize on strengths.

Although some programs allow you to submit more than one proposal in response to a particular call, it may not be a good idea. The first thing to do is contact the program director. Consider whether the time spent preparing multiple proposals would be better spent preparing just one. Many programs suggest limiting the number of proposals to one. For example, the [Division of Materials Research](#) "discourages the submission of more than one proposal from the same Principal Investigator (PI) during the proposal-submission window." If you *do* make multiple submissions, consider what will happen if they all get funded—how will you show success in each area? This factor is critical for the success of renewals and future submissions.

Before resubmitting a proposal, consider each of the reviewers' concerns and, if you want, contact the program director to gather further insight into how the proposal might be improved. Resubmitted proposals involve significant effort—not just yours but also the community's, as resubmissions are often assigned to new reviewers.

**Intellectual merit**

Proposals focused on an area in which the PI has prior accomplishments tend to get the best reviews. If you do not have documented expertise in the area, consider adding a co-PI who has that expertise or waiting until you have some preliminary results.

A strong application always demonstrates an appreciation of the background of the field, with appropriate references to the results of others. Not all research is hypothesis-driven, but a hypothesis helps focus a proposal and avoids the appearance of a fishing expedition.

Provide enough detail for the reviewers to evaluate the quality and extent of the planned activities. Be very clear about what you expect to accomplish scientifically, why it matters, and how it's different from what others have done. Risk-taking can make your proposal more exciting. Finally, ask yourself: If the project is successful, will it make an important impact?

Explain in your proposal why you want to do the work—your motivation and the scientific rationale. Describe why it is important that *you* carry out the work, place the work in context, and explain its likely impact. Then write a clear research plan.

**Broader impacts**

A clear explanation of the broader impacts of the proposed work is an important aspect of an application and a key to its success. In a typical funded proposal, this section takes up one to two pages within the project description. In certain types of proposals, broader impacts tend to take up even more space. For example, a successful [CAREER](#) (Faculty Early Career Development) proposal typically will include three to five pages on broader impacts, focused specifically on the integration of research and education and its likely impact. The different types of broader impacts are elaborated at several NSF Web sites ([GPG Representative Activities](#), [General Information](#), [Division of Chemistry](#), [ACS Showcase](#), [Division of Materials Research \(DMR\)](#), and [DMR Highlight Request](#)).

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I suggest you go beyond explaining the broader impacts and applications in science/engineering, education of graduate students, publishing and presenting, and teaching. Although all of these items are important, they are all normal activities of a professor. Activities that have a good chance of [diversifying the science and engineering work force will be looked on favorably by NSF staff](#). Other possible broader impacts include partnerships, interactions with industry, dissemination beyond scientific publications (e.g., radio, TV, museums, and K-12 education/outreach), ethics, mentoring, undergraduates, research experiences for teachers, and course development for new audiences.

One or two notable efforts often come across stronger than myriad, small, unrelated, and unconnected activities. In broader impacts, as in the other aspects of your proposal, make clear what is new and how it can be distinguished from your existing efforts and those of others. Back up your ideas with, as appropriate, an outline of your track record, references to literature--there is significant literature in this area, and you should be aware of it just as you are for your research activities--letters of support, and so on. The key factor to keep in mind is what impact the intended activity or activities will have.

#### Common mistakes

- Failing to address the broader impacts
- Not integrating education with research
- Presenting too many ideas, with the result that the proposal lacks focus (common among young investigators)
- For renewals, failing to publish in quality journals or failing to establish oneself as a leader in the field
- Not describing ideas in sufficient detail
- Making mistakes in English/grammar, figure references, etc.
- Failing to appreciate the background of the field (i.e., lacking references and/or originality)
- Proposing research in an area in which you are already funded for similar activities
- Not applying to the most appropriate program
- Making an inappropriate budget request and/or forgetting underrepresented groups (particularly in large proposals)
- For instrumentation requests: not enough users planned, failing to make a case for the impact, not justifying a replacement, or failing to justify top-of-the-line equipment.

#### Dealing effectively with declinations

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Having a proposal "declined" can be disheartening or worse. Studies suggest that researchers might do better to wait until they are no longer angry to seek feedback on a declination because they will be able to think about the information they receive in a more integrative, flexible manner [see [B. L. Fredrickson, "The Role of Positive Emotions in Positive Psychology" Amer. Psych. 56\(3\), 218-226 \(2001\)](#)].

If you plan to discuss a recent declination with the program director, consider the feedback you have received from the reviewers first. Your first goal in this discussion is to get clarification regarding the reason(s) for the declination, putting aside any conclusions you may have reached earlier. Make sure you understand clearly what could be improved to make your proposal competitive. Questions you might want to ask: Is this the best program for a resubmission? Was my budget appropriate? Did my proposal fail on criterion I (intellectual merit), criterion II (broader impacts), or both?

#### Renewals and prior support

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When asking for a renewal of funding, ensure that the prior-support section includes

the award upon which the renewal is based. Also include other recent, relevant grants. Adhere to the NSF format described in the [Grant Proposal Guide](#) and, in doing so, either reference or list your own papers. If you are tight for space, the reference section is your best alternative. If you decide to put these references elsewhere (e.g., in your biographical sketch), make their location clear to your readers. Discuss achievements in terms of both intellectual merit and broader impacts.

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Lynnette Madsen is the director of the Ceramics Program within the Division of Materials Research (DMR) at the National Science Foundation. She has delivered numerous talks about NSF policies, practices, and opportunities.	Comments, suggestions? Please send your feedback <a href="#">to our editor</a> .
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