

NIH & NSF *Funding Advisor*

The monthly guide to preparing and submitting optimal grant applications

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How to Develop a Beneficial Dialogue With a Program Officer

PIs have to be more than just strong grant writers to get their research funded. They also should have certain relational skills that allow them to successfully establish an ongoing dialogue with NIH and NSF program officers (POs) to seek advice, find out about funding trends, and determine time and funding limits.

The main reason that you contact the program officer is to make sure your ideas are in tune with the agency's current funding trends, says **Dr. Charlie Senn**, director of proposal management, Office of Research at the University of Tennessee. "You are looking for signals that you might be heading down the wrong path. You don't want to put hours or weeks of effort into a proposal when a five-minute conversation would let you know you're barking up the wrong tree."

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How to Write a 'Broader Impacts' Statement Reviewers Will Like

by Thomas R. Blackburn, PhD

Time after time as a proposal writing coach, I encounter PIs who seem baffled by how to construct true broader impact statements for their NSF proposals.

Instead of addressing head-on what NSF is looking for under the "broader impacts" rubric, they substitute a broad, enthusiastic restatement of the "intellectual merit" argument (e.g., "The insights promised by this research will revolutionize our understanding of transgenic planetesimals ...").

Plan before writing narrative

To start, you cannot address the Broader Impacts criterion as an afterthought once you finish the scientific narrative. You have to carefully consider your points before you can incorporate them into your narrative. Begin with a list of possible broader-impact themes that you intend to make part of your project from the beginning.

Example: You are a field biologist who studies giraffe maternal behavior in the wild and in zoos. A sketchy list of broader-impact themes might look like this:

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Experienced PIs reach out more

Program officers couldn't agree more.

Most phone calls come from experienced PIs who need the least help, says **Dr. Harold Perl**, senior lead PO in behavioral research, dissemination and training, Clinical Trials Network at NIH's National Institute on Drug Abuse.

"They know how important it is to establish and maintain a relationship with a PO. So it's not only permissible to call us to ask basic questions, but encouraged."

How can you plan for and initiate that dialogue? Consider the following:

1. Reach out when you're just formulating the idea

"The best time to call a PO is when you're just thinking of an idea," says Perl. "That's when the most experienced ones call us. When the application deadline is two weeks away, it's usually too late for us to help."

Reasons: "We can give you direction, advice — even suggestions for potential collaborators," says Perl. "We may know someone nearby — sometimes at your own institution — who could be a viable collaborator."

2. Consider a "concept paper"

Although some PIs may call POs they know with the germ of an idea, both Perl and Senn say writing a concept paper is a good idea, too. Use it to structure and clarify your thinking on how your research will mesh with the agency's goals. The advantage is that it gives the PO

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something in writing, making it easier for them to follow your thinking, get all the details and suggest any revisions. Offer to send it to them after an initial e-mail contact.

In this simple paper, "state the problem," explains Perl. "Begin with a brief rationale, add a few sentences about your basic research question and how you plan to answer it. It's essentially the abstract of your NIH application — but with a little more detail on methodology."

This also assists the PO to stay abreast of the latest developments: "Even if I'm an expert in a particular area of science, I would presume the applicant has more knowledge about the specifics of his research, and I want to get up to speed on what his ideas are," says Perl.

3. Identify the right PO

"Sometimes, you don't know whom to contact," says Perl. "We are frequently asked for help in getting to the right person."

Two suggestions:

- Ask your colleagues doing similar work who their POs are or who at the agency they typically work with, says Perl. Even if that's not the right PO for your project, it's a starting point. "It might be the PO down the hall, but I can direct you," explains Perl.
- Look at the NIH (www.nih.gov) or NSF (www.nsf.gov) Web site to get within range of the right person. For example, each NIH institute or center has a list of contacts for researchers. On the National Cancer Institute (NCI) Web site, for instance, you can click on "NCI Contacts for Applicants," which takes you to a contact list broken down by area of research.

"Every NIH institute has a different mission," says Perl. "Look at the mission statements and organization charts to determine which institute addresses your area of science." Perl notes, however, that you still need to follow up with contact to make sure you have the right PO. "A lot of time, PIs are doing multidisciplinary work, and there may be

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some overlap among institutes or POs. Directly ask, “Are you the right person who manages this area of science?””

And once you find the right person, make the first contact. Both Perl and Senn recommend the same approach. “Write an e-mail and ask for a convenient time for a follow-up call,” says Senn. Offer to send the concept paper and set up an appointment.

4. Look for any signals that you’re not quite on track

Listen to questions the PO may ask. They won’t give you a definitive answer, Senn says, but they will offer suggestions, advice and ask questions to see if what you’re doing meets the agency’s approval criteria. These questions will also give you a sense of where you might tweak your idea.

Example: “Say there’s an NSF solicitation out there, and the agency is looking for transformative ways to teach stem cell education in high school,” says Senn. “You may have done previous research in that area and would like to expand on it. The PO might ask you: Does the expansion of your research qualify as *transformative*?”

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- Exhibit at zoo?
- Recruit high-school kids as assistants for zoo observations? (behind-the-scenes)
- Talk to local university psychology/anthropology classes?
- Partner with Dr. Smith at Historically Black State?
- Post-doc for field work in Botswana?
- Internships for non-major undergraduates?

As you develop your Project Description, you will be able to include these — and other, better ideas — as you write, and you should find some of them leading you to new ideas about shaping your study that you might have missed without this aid.

Keep in mind that your broader impacts credentials appear in two places:

- The Project Summary must present — within a single page — separate statements explaining the

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“You may get signals that the PO is concerned that your idea might be more *incremental* than *transformative*,” Senn says.

One such signal might be in the form of a question like this: “How would this transform the field — as opposed to adding to what’s already being done?”

5. Remember that the official documents and Web material aren’t always the final say

Although you certainly do want to review an agency’s published material as a starting point, be aware that some things may have changed since it was written.

“There are always micro-adjustments, such as what funds are available, the current state of the agency’s portfolio,” explains Perl. “For example, say an institute is already funding 20 projects in one slice of science. They are unlikely to fund another. They would rather look at something that is complementary to balance out the portfolio.”

Perl suggests you directly ask the PO a question like: “Are there any new considerations? What area of science is your branch really focusing on right now, or the next fiscal year, or the next two years?” ■

Intellectual Merit of your research idea and the Broader Impacts of NSF support.

- Details about the broader impacts must be woven in as an integral part of the 15-page Project Description (the Narrative).

Consider NSF’s core values

Also when constructing your broader impact language, pay attention to NSF’s values because these are the driving forces that guide the agency in making funding decisions. Review the *Mission and Core Values* and the *Vision and Goals* (www.nsf.gov/pubs/2006/nsf0648/nsf0648.jsp) that flow from them.

Goal 1: “Discovery” is what you promise to create with your scientific work. It is most of what your proposal narrative is about. But the goals don’t stop there.

NSF wants your work to “cultivate a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens” (**Goal 2**). It wants to “build the nation’s research capability through critical investments” in a list of tangible scientific assets: instrumentation and tools (**Goal 3**).

In addition, NSF provides lists of sample activities that meet each of the Broader Impact goals in *Merit Review Broader Impacts Criterion: Representative*

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Activities (www.nsf.gov/pubs/gpg/broaderimpacts.pdf).

But you cannot treat the list of activities you find there as a cafeteria menu to choose from for two reasons:

- The activities listed are very generally stated: “Encourage student participation at meetings and activities of professional societies;” “Participate in conferences, workshops and field activities where diversity is a priority.” Your proposal will have to be specific about *which* “conferences, workshops and field activities” and *how they relate* to the project you seek to fund.
- Simply parroting ideas provided by NSF will never convince a reviewer that you embrace the strategic goals that lie behind them. Your broader impacts must flow naturally from your project, your local situation and your partnering with NSF in “cultivating a ... broadly inclusive science and engineering workforce.”

When you do, you may find that none of NSF’s pre-tailored language exactly fits what you propose to do, but reviewers will recognize that you understand and wish to advance the core values that drive them.

Keep terminology consistent

Finally, allow reviewers to easily find and appreciate your Broader Impacts. Reviewers will use your Project Summary as a map of the Project Description. That means there must be an exact match between what you claim in the Summary, and what you describe in detail in the Description.

Reviewers will more easily recognize broader impacts if you use the same terms to describe ideas in the Summary and in the Project Description. Here are some examples:

- If you intend to address NSF’s goal of increasing representation of women in science and engineering, and the Summary promises active recruitment of women students through “role models” in your seminar series, call them that in the narrative — not just “collaborators.”
- “Accessibility” should appear as such in both places — not as “wheelchair ramps” in the narrative when “inclusiveness” was promised in the Summary.
- Does your newly developed software improve signal-to-noise in counting duck eggs, as well as, potentially, in all research in animal husbandry? Label it as an improvement to “Research Infrastructure” in both the Summary and the Narrative.

A well-thought-out Broader Impacts statement cannot save a mediocre scientific idea. But a weak dimension can knock even an excellent scientific idea out of contention for funding.

Dr. Blackburn holds undergraduate and doctoral degrees from Carleton College and Harvard University, respectively. He is an author and principal of Thomas R. Blackburn Grants Consultancy, a Washington-based consulting service that offers proposal-writing workshops and individual counseling on proposals. He previously taught college science courses for 30 years and later managed more than 3,000 grant proposals as Senior Program Officer of the American Chemical Society Petroleum Research Fund. ■

6 Simple Mistakes That Can Derail Your Grant Application

Often, the simplest, most basic errors can hurt grant applicants the most, causing reviewers to shun what could otherwise be excellent research proposals.

Three experts — **Dr. Neena Abraham**, gastroenterologist and Associate Professor of Medicine at Baylor College of Medicine; **Dr. Daniel Vaszgird**, Director, Office of Research Integrity and Compliance at West Virginia University; and **Dr. David Rubin**, gastroenterologist and Associate Professor of Medicine at the University of Chicago Medical Center — review six of the most common traps, along with what to do — and not to do — to avoid them:

1. Failing to allocate enough time to write

Typically, you can assume that you will need 120 hours to write, review and revise an NIH application for a three- to five-year grant. A smaller, non-governmental grant can take three or four months to complete, including time for senior colleagues on campus to offer a critical review and for you to incorporate any changes they suggest.

Bottom line: Overestimate the time you think you’ll need, and plan all your timelines accordingly.

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2. Skipping the instructions

Be sure to follow the instructions regarding font, font size, margins and word count. Pay attention to details regarding allowable budget expenses. Do not bend, modify or get creative with the instructions. When in doubt, contact the program officer. Here are examples of the kind of mistakes that are still seen because some applicants get too “creative”:

- If the instructions specifically say no appendices, don't include them.
- If the funder asks for five pages, don't shrink your seven-page report to five by reducing the type to 8-point to make it fit.
- Don't try to include something you know is likely to be rejected, like hiring graduate assistants at \$100 per hour.
- Travel costs seem to be a problem for many. If travel is in your budget, discuss it in your project description. If you learn that international travel for staff members isn't allowed, don't try to slip it in.

3. Poor writing

Don't assume that the reader understands your jargon and can follow the compelling rationale or breach the gaps in your logic. Lead the reviewer to logical and natural conclusions regarding your project's compelling rationale, innovation of your science and clarity of your methods. Highlight the importance of your proposal, but keep the abbreviations, strange acronyms and jargon to a minimum.

Example from NIH:

Poor writing with unusual or unexplained terms: Public Health Relevance: We propose to conduct a collaborative, mixed-methods study on alcohol, tobacco and heroin abuse and addiction in Nigeria. This is a country where substance abuse has been increasing recently, and where limited resources and treatment programs exist for substance abuse and addiction. Both qualitative and quantitative survey methods (truck drivers) will be administered to gain insights on the prevalence and the risk and protective factors of alcohol, tobacco and heroin use. Such information is needed for future prevention and intervention efforts, and may be applicable to wider medical settings such as primary healthcare in other resource-poor communities throughout the world.

Clear, without jargon: Public Health Relevance: Substance abuse and addiction places a significant burden on individuals, families and society in the United States. The healthcare costs for treating substance addiction can be staggering. This research will contribute to the development of clinically-effective methods for reducing substance use that are provided at low or minimal cost, which will be of medical and economic benefit to all.

4. Failing to edit and revise

Take a break from writing, then return to revise your proposal based on reviews from senior colleagues. Ask an educated layman to review your application to ensure that he can understand your rationale, your science's importance and clarity of your methods. Another possibility is to have a medical writer assist you with copy editing. Be sure to use correct grammar, spelling and syntax to avoid run-on sentences, and always use active verbs. For example:

Don't say: *A number of issues of importance to the success of all viruses that infect humans will be addressed by this project.*

Instead say: *This project addresses a number of issues that are important to the success of all viruses that infect humans.*

5. Avoid plagiarism

The NIH, NSF and other organizations run all grant proposals through plagiarism programs. Before submitting yours, do the same. You can even Google sections of it to be sure you haven't inadvertently copied from someone else's research. Programs include iThenticate, Plagiarism Detector and Copyscape.

6. Forgetting the RCR

You are required to have a responsible conduct of research (RCR) plan in place for all students (graduate or undergraduate) or postdoctoral researchers who receive a salary from your grant. This ensures appropriate training and oversight. Discuss your plan with your compliance office to be sure you have the right measures in place. Example:

Sample RCR training plans for fellows, students and trainees from the University of Louisville: All faculty, fellows, students and trainees who need to complete training due to program or funding agency requirements will complete the online modules appropriate to their research in one of the following areas: Biomedical Sciences, Social, Behavioral and Educational Sciences, Physical Sciences, Arts and Humanities, or Engineering Sciences. In addition, they will participate in quarterly seminars offered in RCR topics areas and provide opportunities for interaction and discussion of issues among members of the target audience (e.g. undergraduate, graduate, post doctoral, junior faculty, tenured faculty, unit/department administration, etc.). Attendance requirements for the quarterly sessions will be established based on the individual's role in the project. ■

How to Respond to Agencies' Solicitations for Targeted Research

Before you send in an unsolicited grant proposal, check the NIH and NSF Web sites for targeted research efforts. It could change how you describe your contemplated work and potentially boost your funding chances.

Every year, NIH and NSF set aside funds for specialized area research, often seeking to encourage innovation, capitalize on new research methods and technologies, or explore new scientific terrain. In fact, NIH-solicited research funding could account for 20 percent to 25 percent of an institute's research portfolio in any given year, according to **Marvin Kalt**, Director of the Division of Extramural Activities for the National Institute for Allergy and Infectious Diseases (NIAID).

Bruce M. Kramer, Director of NSF's Division of Engineering Education and Centers, ballparked NSF-solicited research at 15 percent of the overall portfolio.

For these areas of specialized research, NIH issues requests for applications (RFAs). These begin as a "concept," which is a formal proposal presented at an advisory council public meeting where they are debated and voted upon. These meetings tend to occur one to two years before the actual RFA hits the street, says Kalt.

Kalt's advice: Look at concept summaries to gain a sense of forthcoming RFAs because every institute posts its concepts online. For example, NIAID posts them on a dedicated "Requests for Applications (RFA) — Initiative Development" page (<http://funding.niaid.nih.gov/researchfunding/sop/pages/rfa.aspx>).

Solicited proposals are different

For solicited projects, NSF and NIH depart from their regular processes. So if you fail to distinguish a solicited proposal from the usual investigator-initiated ones, you risk offering an inappropriate, non-competitive proposal.

NIH's RFAs and NSF's corresponding Program Solicitations use special review criteria relevant to the research and may include additional application requirements or limitations. Closely read these opportunities to assess the match between the agency's goal and your research interests.

"The thing to focus on is the language in the RFA itself," says Kalt, such as:

- An NIH RFA will list examples of research *not* supported by the RFA.
- NSF Program Solicitations specify review criteria in addition to the standard Merit Review measures.

Pay attention to details

Closely consider all details, no matter how small. "You would be amazed at the things that fall through the screen," says Kramer. It could be as simple as starting your project's title with a three-letter code so that reviewers can easily identify it. "Five to 10 percent of the submitters won't do it," he notes.

Before responding to a solicitation, consider basic elements like these:

- award mechanism (e.g., R01, cooperative agreement, program grant);
- earliest start date;
- maximum award period;
- maximum award amount;
- eligibility limitations (e.g., one proposal per institution, PI may not be named as Key Personnel in another proposal for the same competition); and
- eligibility requirements (e.g., institutional type or partnership with industry).

Don't try to force it

Kramer and Kalt stress that you should respond only if your research interests and expertise align well with solicitation goals. "People try to force-fit themselves, and that's very easily picked up by the reviewers. It's not likely to create an application that scores well," Kalt says.

Kramer observes that some PIs adopt an "I've got to find some way to get in there" attitude and stretch to justify or rationalize how their project fits. "Resist the urge to adapt what you really want to do to what you think the solicitation wants," he says. "If you bend it to what you think the solicitation is after, the whole piece doesn't look consistent any more. You end up with weird pieces that don't fit or make sense.

"Remember that these are going before peer reviewers. If there are 80 requirements in the solicitation, they are not going to be familiar with all of them and are not going to be enumerating every one as they read the proposal. Keep them interested. That is more important than hitting every detail, which you can't do in 15 pages anyway."

The difference between proposals recommended for funding and those that aren't, Kramer says, lies in convincing the reviewers you've mastered the subject matter well enough that the things you don't cover will be handled equally well. Then reviewers likely will give you the benefit of the doubt. But if you leave questions on their minds or they can't follow the argument, they may wonder if there is *anything* you will do right, he adds. ■

Select Agents: Show Reviewers Your Concern for Safety, Security

If your proposed research involves using select agents, your grant application has to detail how you'll use these materials. But how can you best convey to reviewers that you've thoroughly considered safely handling these dangerous substances even beyond what's in standard regulations?

Select agents are hazardous biological agents and toxins that the U.S. Department of Health and Human Services (HHS) and Department of Agriculture (USDA) identify as having the potential to pose a severe threat to public health and safety, to animal and plant health, or to animal and plant products. You can find a list of these agents, which the Centers for Disease Control and Prevention (CDC) maintains, at <http://www.cdc.gov/od/sap/docs/salist.pdf>.

To prove you're prepared, show them you care about safety and security, and explain your backup plans, say two NIH grant-writing experts.

1. Resist the temptation to merely “touch up” the boilerplate. True, customary information from your own institution gets you started. Tulane University in New Orleans supplies its PIs with the standard answers, including the university's CDC registration numbers, federally compliant containment and research facilities, policies on shipping and receiving, and bio-safety policy. You will need all of that.

“What readers (reviewers) are looking for is to have all their questions answered,” says **Chuck Putney**, a trainer/consultant based in Bennington, VT, who represents the Grantsmanship Center in Los Angeles. “Grant readers are people who worked at institutions, universities and hospitals, and they know how and where things went wrong at their own institutions. They know the boilerplate answers. They're looking for more.”

Provide details of your plan

Example: The standard language might be, “All researchers who will handle select agents will be trained according to the institution's biosafety policy and federal regulations.” But grant reviewers want to know *exactly* who will handle dangerous materials and how you will determine that they are prepared to do so.

Action step: **Dr. Charles Howard**, grant-writing consultant for GrantsCrafter Consultancy in Salem, OR, suggests some language like this:

“At this time, I (the PI) handle the procedures for (name the select agent or agents). I will train (name the lab tech) in the same fashion. Within one month, after being adequately trained, the person will begin handling the materials under my direct supervision. This person

will work with me for two months, and I will train and supervise until it is clear they can perform the work safely.”

Bottom line: “While the institution might have boilerplate language that states the institution's overall policy, addressing the specific circumstances — even if just a sentence or two — always strengthens your case,” says Putney.

2. Double-check information security. Regulators want to know you'll protect against accidental release of agents that can harm people, animals and plants. They also recognize that some of the biohazards have the potential for bio-terrorism.

In fact, in a recent workshop on guarding against bio-terrorism, USDA administrators argued for tougher regulations, including enhanced IT security.

Outline your IT security measures

If you're working with bio-materials that could become weapons in the wrong hands, you'll have an advantage if you add some verbiage about how you secure information in your lab.

Action step: Check with your IT department to ensure that your IT security is at the highest levels. And remember — this is crucial — that firewalls don't protect against end users' behavior. Even an air-gapped network (such as the one at the Dimona nuclear facility in Iran) can be penetrated if users carry flash drives in and out of a facility. If necessary, discuss the need for tougher information-handling procedures.

3. Explain your backup plans. As Putney says, grant reviewers know what can go wrong and want to know that you've considered it. A short description addressing common problems goes a long way toward establishing your credibility.

“When it comes to grant writing, the best offense is a good defense,” says Howard. “Take care of questions they might raise — whatever is necessary to make them feel secure that you can do it.”

Who tracks your shipments?

Example: In a pair of recent cases cited by the CDC, labs didn't receive shipments they had ordered. One was

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from overseas and was delayed by a strike. The other shipment didn't get to the lab because the institution's receiving department rejected it because the volume of dry ice in the package didn't match that on the label. In both cases, the institution and common carrier had procedures in place to notify parties when there was a problem.

Action step: Identify who in your organization will track the packages internally, without relying on the common carrier to do the job correctly or notify you of any mix-ups or delays.

4. Focus on already-existing facilities, equipment and experience.

Howard says that a lack of any of these will hurt you. The NIH doesn't want to pay for your learning curve, or expensive facilities, in handling select agents.

Example: Tulane tells its PIs to refer to the university's registered select agent laboratory in the primate research laboratory and notes that it has an aerobiology facility with a Class III BSC rating.

"It's better to say we've done this before, that we have all the facilities and containment procedures," says Howard. "And offer documentation."

Action step: Howard suggests you focus on what facilities, containment, equipment, training programs, security and safety measures, PPE and previous history of handling similar agents exist at your institution.

"You want to be able to say that we have the air-handling system, the positive air flow, traps and whatever's necessary to kill a pathogen in case it gets loose," explains Howard.

Note: The USDA is looking at risk tiers for CDC's select-agent list. This could mean in the future there will be different levels of management, safety and security, depending on an agent's risk level. The USDA proposed changes but has yet to issue a final rule. ■

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