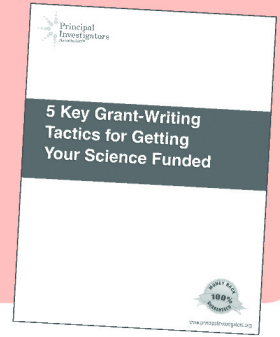


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The monthly guide to preparing and submitting optimal grant applications

Inside This Issue

Narrow the Focus of Your R21 Application..... 46

Create a Strong Biosketch for NIH or NSF..... 47

Need Help With Your NIH Grant Application? Create a Committee of Experts 49

Bonus: When a Disaster Affects Your Federal Funding..... 50

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Four Steps to Help You Justify Personnel to NIH

When submitting an NIH grant application with a non-modular budget, you must justify the personnel needed to conduct your research. Follow these four tactics to get through the application’s Research and Related (R&R) Budget component.

1. Include names

Although you don’t always know who will perform certain tasks, try to provide names of personnel whenever possible. Avoid entering “to be named” on the application because NIH guidelines allow reviewers to remove unnamed personnel from your budget.

“Having a name is better,” says **Dorothy Lewis, PhD**, Professor of Internal Medicine at the University of Texas Health Science Center. “Especially because you know what the person’s expertise is.”

That way, you can write, “Jacob Jones is a lab technician who will conduct experiments using the flow cytometer to track T-cell function.”

continued on page 44

Specific Aims:

The Logical Framework That Holds Your Grant Proposal Together

by **Christopher Francklyn, PhD**

If you think your abstract is the most-read part of your grant application, think again. Reviewers who don’t read your entire proposal will usually flip to your Specific Aims page to ascertain your project’s purpose.

That’s because panelists can quickly peruse it and grasp your research’s key features. A good reviewer should be able to read the page and decide whether your application is potentially fundable or contains a major flaw that undermines its overall merit.

What Specific Aims should do

Specific Aims describe the relationship of your work to current biomedical problems, outline critical areas where knowledge in your field is

continued on page 45

If you can't include a name, Lewis suggests you:

- Describe the percent of effort the job requires.
- Explain you will recruit a person for the position.
- Indicate that the new hire will possess the expertise needed.

2. List the percent of effort

"Do you want a full-time person, or do you want a half-time person?" Lewis asks. "You have to decide that based on the scope of work in the grant."

For example, say "Jacob Jones, at 50 percent, will be doing X, Y and Z assays."

Lewis cautions against overreaching with the amount of work you expect your personnel to perform. For example, if you propose to pay a post-doc 50 percent, but the proposal indicates the work is a two-person job, reviewers will flag it.

"They will say, 'There's no way you can do this amount of work with this much personnel,'" says Lewis. "The reviewers are experienced scientists, and they're going to know that what you are proposing is going to take more effort."

To avoid overreaching, she suggests asking the following questions:

- Is the amount of work too ambitious? For example, you shouldn't say you'll obtain 500 samples if you only have enough supplies and personnel time for 250.
- Are you being realistic about what the designated person can do? Say it takes one person four hours to process four specimens. If you claim that one worker will process 16 of them in an eight-hour day, reviewers will question that.

You can find more information on determining percent of effort at http://grants.nih.gov/grants/policy/person_months_faqs.htm. This NIH site lists answers to frequently asked questions and provides a conversion calculator.

3. Explain what personnel will do

"When you justify personnel, NIH requires you to list the individual and the percent of effort," Lewis says. "Then you describe what each person will do, what his role in the project is."

For example, say, "Co-investigator Mary Ames is going to review experiments performed by Jacob Jones."

Remember, the more you budget for positions, the more you have to consider how to explain your need for them. This is especially true if you have multiple people in the same category.

"If it looks like you've got a duplication of effort, then you've got to justify it," says **Wayne Barbee**, PhD, Assistant Director of Research at Virginia Commonwealth University.

When your personnel appear to overlap, Barbee suggests explaining:

- How the overlap is essential to planning
- Why it's necessary to carry out the experiments
- How it is key to making the objectives work.

If you need three technicians in your lab, Barbee advises against listing them as, "Tech 1," "Tech 2" and "Tech 3."

"It's best to define each tech," he says. "For instance, a culture technician, a hematology technician and an animal technician."

4. Explain why personnel are qualified

When justifying personnel, indicate their special skills and accomplishments.

For example, you might say, "Jacob Jones will be conducting experiments X and Z because of his 15 years of experience with X and Z."

When describing personnel experience, Lewis suggests you:

- Indicate his involvement in preliminary data development.
- List his years of experience.
- Note why the experience is relevant to your research.

You should also explain the skills a team member has that no one else can provide, Barbee says. ■

NIH & NSF Funding Advisor (ISSN-2155-3556) is published monthly in pdf format by Research Resources, 3606 Enterprise Avenue, Suite 160, Naples, FL 34104 USA
Telephone: (800) 303-0129 Fax: (239) 676-0146 Email: info@principalinvestigators.org Website: www.principalinvestigators.org

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Chairman and Publisher: **Leslie C. Norins, M.D., Ph.D.** Editorial Director: **Chris Owens** Editor: **Jennifer Smith**
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Subscription rates: USA, USA possessions and Canada, one year (12 issues): \$365. Other international subscriptions: \$395. Back issues: \$60 each.

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lacking, and establish your project's purpose. Include the basic questions and hypotheses driving your work, and state the project's goals and objectives. Also, outline the experiments you will perform.

Your aims should provide readers with a glimpse of the long-range goals that drive your research (your "10-year question"). And they should focus on the questions you can address during the grant period (roughly five years).

To design compelling aims, you must have your finger on the "pulse" of your field. This comes from attending scientific meetings, reading recently published papers and speaking with colleagues. Grasping what others in your field deem important is critical. Issues that only matter to you won't meet the reviewers' requirements for significance.

What you should include

You may want to consider using a standard format for your Specific Aims to ensure they all include the necessary information. Principal Investigator Association's manual, "NIH R01 Grant Application Mentor," recommends using the following subheadings to structure your aims:

- **Rationale** — In this section, describe what you are trying to show and why. This is also the place where you defend the specific approach you plan to use, consider alternatives and begin to describe your logic in designing your experiments.
- **Experimental Approach** — Here, detail how you will perform the experiments, and convince reviewers you can do them. An established investigator can highlight key papers in his bibliography that support his experience in the proposed techniques. A new investigator must either show preliminary data demonstrating such familiarity or recruit collaborators with widely acknowledged expertise in the method.
- **Outcomes and Alternatives** — Use this section to describe your experiments' potential results and their implications for your proposed model(s).



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Aims must be related but independent

Ensuring aims are connected creates logical structure for your project. If the connection is weak or defective, it doesn't matter how compelling your opening paragraphs are.

Aims should also be independent of one another. If experiment B depends upon experiment A's outcome, you're setting yourself up for failure. Instead, structure your aims so the results can provide a synergistic attack on the main problem.

Five mistakes to avoid

1. Writing more than one page. If you can't communicate your aims in a page or less, you are either providing too much detail or proposing too many aims.
2. Creating aims that are vague with respect to rationale, approach or significance
3. Failing to clearly explain the central question or how you intend to answer it
4. Using jargon and acronyms unknown to non-experts
5. Not including a general model or interpretative framework to understand the results. (Caveat: There are exceptions to this rule. For example, if the value of the data you plan to collect is so interesting and unique that people are willing to forgo a hypothesis.)

Discussing your aims with a program officer

Keep in mind there are two distinct sets of reviewers:

1. The study section, which will include your peers in the field
2. Institute program officers (POs), who will look at your work through the lens of "programmatic considerations."

POs respond to institute-specific strategic imperatives, many of which appear on their web pages in the guise of Requests for Applications or Program Announcements. These reviewers assess how your application fits with the institute's overall grant portfolio. And they pass this information on to the institute director, who makes the final funding decision.

That's why you should discuss your aims with POs before submitting your application, particularly if you don't have a funding history with that institute. This allows you to introduce yourself and your research, and you can ensure your application is in line with strategic program interests. ■

Narrow the Focus of Your R21 Application

Researchers often submit R21 grant proposals that are too broad or overly ambitious, according to NIH. But you can narrow the focus of your exploratory or developmental project if you consider this grant mechanism's limits.

Specific Aims are restricted

"I like to see two Specific Aims for an R21," says **John Ivy**, PhD, a senior research development officer at Texas A&M University.

If you have more than two, you may need to re-evaluate them. "Figure out what your Specific Aims actually say," says **Kenzie Cameron**, PhD, an assistant professor at Northwestern University. "If your aim is presenting a hypothesis, then maybe it's not an aim."

Also consider whether the multiple aims you're proposing are actually tasks for accomplishing a single goal. For example, say your aims include:

1. Identify and isolate mutant variants in which protein X fails to bind to the signaling compound.
2. Clone the variant genes.
3. Sequence the genes.

"Those aims are individual tasks necessary to achieve your objective, which is to identify protein X residues necessary for binding signaling compound Y," Ivy says.

In such a case, he recommends combining the aims into one and describing the originals in the Approach section of your application.

Here's an example of two brief but comprehensive Specific Aims taken from a funded R21 application:

Aim 1 is to test whether plasma microparticles detected in pregnant women will reveal physiologic events during gestation and pre-eclampsia. We will measure the microparticles using standardized polychromatic flow cytometry to examine remodeling and/or reduced angiogenesis or the induction of autoantibodies.

We will examine microparticles coming from platelets, white blood cells, endothelial cells, epithelial cells, muscle cells and placental cells. We will examine integrins, adhesion molecules, and AT-1R associated with different cellular events occurring in the developing placenta, as well as levels of cell death and types of dying cells.

Our expectation is that this cross-sectional analysis will reveal the physiology of normal pregnancies and distinguish them from early or late pre-eclamptic pregnancies.

Aim 2 is to determine whether proteomics performed on microparticles over gestation and on subsets of microparticles from normal and pre-eclamptic women will reveal key differences in protein expression patterns associated with pre-eclampsia.

This will be done using trypsin digestion of subsets of the microparticles, followed by labeling with iTRAQ reagents, 2D separation, and MALDI tandem mass spectrometry.

We expect there will be large protein expression differences, such as increased inflammatory proteins and expression of antibodies in microparticles from pre-eclamptic women, and these differences will be reflective of the pathogenesis of pre-eclampsia. We hope to discover new types of pre-eclamptic markers with this proteomics approach.

Time is short

An R21 grant has a maximum project period of two years. "So reviewers are going to be asking if you can do the work you propose within the two-year period," Cameron says.

They will reject an overly ambitious project on the grounds that you can't complete it in the time allotted. For example, proposing to test a hypothesis in three different species and develop a protocol to test in humans would be overly ambitious for a two-year grant.

If you can't accomplish your project in two years, you may need to break it down. Start by:

- Identifying the aspects you must accomplish, and think about doing only these parts.
- Considering whether you can reposition your project's endpoint. For instance, in the example above, you would forgo the project's human element and test your hypothesis only in three species.

Funding is limited

The R21 provides \$275,000 in direct costs. Developing your budget early in the grant writing process will help you determine if your project is appropriate for the grant. If you exceed the \$275,000 cap, your scope is too broad.

To reduce costs, Cameron recommends focusing on personnel. Compare team member responsibilities. If you notice an overlap in duties, you can afford to cut employees. "But you don't want to cut your personnel to the point where you're unable to do what you propose," Cameron says.

continued on page 47

R21 Application continued from p. 46

The following is an excerpt from a personnel justification for the project outlined in the example Specific Aims above:

Dr. A (10 percent effort, 1.2 calendar months per year) will serve as Principal Investigator of the proposal and will oversee all the flow cytometry experiments, as well as coordinate the efforts of others. She will analyze data and write papers to report the work. She will oversee the work of the research associate (Dr. B, 50 percent effort, 6.0 calendar months per year) to examine microparticles in the plasma in pregnant women. Dr. B will develop panels of antibodies to examine both maternally derived and fetal microparticles during gestation in normal pregnant women and in those diagnosed with pre-eclampsia.

Dr. C (5 percent effort, 0.6 calendar months per year) will obtain the specimens from pregnant women after informed consent and will direct the research nurse (Ms. D, 25 percent effort, 3.0 calendar months in year 1; 12.5 percent effort, 1.5 calendar months in year 2) in obtaining the

samples. It is anticipated that all the specimens will be collected by 18 months, so only that amount is budgeted for Ms. D. Dr. C will assist with analysis of the data, so 2 years are requested for him.

Salary support requested for all personnel is equal to the level of effort contributed to the project. Base salaries for all personnel are prorated based on an institutional start date of September 1. All salaries include an annual 3.0 percent cost-of-living increase, except those capped by NIH.

Consider future plans

“Realize this is one of many grant proposals you will likely write,” Cameron says. “You don’t have to answer every single question in one grant.”

But the R21 should be the keystone of your future research. So you may want to consider which project components you can include in a future proposal. To do this:

- Identify secondary outcomes that a larger study could better address.
- Tie your proposed research to your long-term plans.
- Let reviewers know what the next step in your research will be. ■

Create a Strong Biosketch for NIH or NSF

The biographical sketch (biosketch) portion of your grant application highlights your education and accomplishments as a scientist. But this section shouldn’t just list accolades; it should communicate your ability to perform the proposed project.

Keep in mind that your biosketch will differ depending on which agency you are asking for funding. NIH and NSF have different requirements and expectations for this section.

Guidelines and suggestions for NIH

1. Be brief. The biosketch can be no more than four pages.

2. Craft a strong personal statement. This is where you explain how and why you are capable of carrying out the proposed project.

To do this, describe studies you’ve done in the past that led to conclusions relevant to the current project, suggests **Karin Rodland**, PhD, of Pacific Northwest National Laboratory. That way, it won’t be a stretch for reviewers to imagine you can succeed.

Consider this excerpt from an NIH application:

The goal of this application is to develop an engineering methodology for optimizing the supply of nutrients to large tissue-engineered cartilage

constructs, using a combination of theoretical and experimental techniques.

My background provides the necessary expertise for a wide range of the technologies proposed in this application. My doctoral research focused on the 3D reconstruction of the native articular geometry of diarthrodial joints, including thickness of articular layers and articular contact, using stereophotogrammetry ...

3. Focus on health. NIH’s goal is to advance human health — through disease prevention, successful treatment and improving quality of life — so you must address this in your biosketch, says **Geoff White**, President of Discovery Consulting LLC.

To get an idea of how to do this, review the following excerpt from the aforementioned application:

This background has allowed me to develop anatomically accurate engineered cartilage constructs that *reproduce the anatomy of human joints*. My extensive research on cartilage mechanics and lubrication has focused on experimental measurements and theoretical modeling that *advance our state of knowledge* of the functional properties of cartilage in relation to its structure ...

continued on page 48

4. Demonstrate prestige. NIH is looking for “gold stars” next to your name, and you can provide them by listing your professional memberships and honors.

“NIH wants to know how important you are,” White says. “It wants to know all the societies you’re a member of, what roles you played in those societies and what committees you were on.”

Take this excerpt from an NIH application as an example:

Professional Membership

- | | |
|--------------|--|
| 2006-2008 | Associate Editor, Journal of Osteoarthritis and Cartilage |
| 2006-2008 | Chair, American Society of Mechanical Engineers |
| 2008-present | Executive Committee Member, Biomedical Engineering Society |

Honors

- | | |
|------|--|
| 2003 | Fellow, American Institute of Medical and Biological Engineers |
| 2003 | Best Paper Award, Stapp Car Crash Journal, 47:1-13 |
| 2007 | Fellow of the American Society of Mechanical Engineers |

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5. Be selective with publications. NIH recommends listing only 15 publications. The agency suggests using your five most recent, the five most important to your field and the five most relevant to your proposed research.

And there are three things these publications should demonstrate, according to Rodland. They should show you’ve worked in the field before, have a track record of success, and have made an impact in your area of research.

6. List other financial support. Include federal and non-federal funding, current grants and those completed in the last three years. Provide the dates of each grant, the funder, the project title, your role and the budget.

Strategies and requirements for NSF

1. Keep it short. NSF expects you to limit biosketch information to two pages.

2. Focus on education and advancement. “NSF is interested in training scientists, as well as learning about all aspects of science, engineering and math,” White says.

3. Detail your contributions. Under the heading “Synergistic Activities,” list a maximum of five examples that demonstrate how you transfer science knowledge. For instance, creating curricular materials, refining research tools or developing databases to support research and education.

Be sure to include activities that show how involved you are in the scientific community, White says. And communicate your interest in helping people learn the discipline.

The following example is taken from an NSF application:

Synergistic Activities

- Winner of the prestigious Chang Jiang Scholar Award from the Ministry of Education (Beijing, China) and Li Ka Shing Foundation (Hong Kong, China), and Guest Chair Professor endowed by the Chang Jiang Scholar Awards Program, Wuhan University, China
- Articles cited by researchers in more than 35 countries
- Editorial Boards: *Journal of the Urban and Regional Information Systems Association* (2002-present); *Journal of Transport Geography* (2005-present); *Environmental Health Insights* (2008-present)
- Chair, Transportation Geography Specialty Group, *Association of American Geographers* (2002-04)
- Review panelist for different programs of NSF and the National Cancer Institute (NIH-NCI); Manuscript reviewer for over 40 journals, conferences, and publishers.

4. Include all of your recent collaborators. Name individuals who have advised you and those you have mentored.

continued on page 49

5. Limit your publications. You may include only 10 published papers, and five of them must be closely related to your proposed project. The other five may not be relevant to the project, but they must be significant in your field.

6. List other financial support. Include federal and non-federal funding, current grants and those completed in the last three years. Provide the dates of each grant, the funder, the project title, your role and the budget.

Consider this example from an NSF application:

Current and Pending Support

9/15/09 to 8/14/13 Mentoring, Educating, Training, Research and Outreach (METRO): A Coordinated Approach to Increase Diversity in the Geosciences

Funded by: NSF
Role: PI
Budget: \$1,400,000
1.3 summer months

9/01/07 to 8/31/11 Developing Biomedical Research Infrastructure for California's Central Valley

Funded by: NIH
Role: Co-PI with Dr. X
Budget: \$315,000
0.9 academic months

For more information on crafting an NIH biosketch, see Principal Investigators Association's report "Successfully Use Your Biosketch and Abstract to Define Your Project and Your Qualifications," available here: www.principalinvestigators.org/r01biosketch/. ■

Need Help With Your NIH Grant Application? Create a Committee of Experts

Gather a few people with the relevant experience — mentors, seasoned colleagues or researchers at the top of your field — to help you develop a fundable grant application.

"PIs need all the help they can get," says **Gary Nieman**, PhD, Senior Research Scientist at SUNY Upstate Medical University. "If there are people willing to assess and analyze your project before you get going, that is worth its weight in gold."

Selecting committee members

If you need advice regarding whom to approach, ask around your institution, suggests **Imeh Ebong**, PhD, Assistant Vice President for Research at the University of North Florida. Your colleagues, post-docs and graduate students might know which senior scientists will be receptive to an invitation.

Consider asking the leaders in your field. For example, when Nieman began working on his latest project, the first thing he did was consult the people whose literature he respected the most.

Of course, less experienced investigators may be at a disadvantage. "I have 35 years of experience reading papers, whereas junior faculty may see the first paper and say, 'They all look good to me. Who should I pick?'" Nieman says.

To identify the leaders in your field, he suggests you:

- Search for relevant papers in PubMed (www.ncbi.nlm.nih.gov/pubmed), and look for those researchers who consistently appear as senior authors.

- When reading the papers you've found, take note of the authors whose research is cited the most.
- Look for scientists who frequently receive federal funding by searching NIH's RePORTER website (<http://projectreporter.nih.gov/reporter.cfm>).

Nieman also suggests inviting investigators who have served on study groups to be part of your committee. You can find them by searching the Center for Scientific Review study section roster index (www.csr.nih.gov/committees/rosterindex.asp).

"These individuals will instantly know if your well-designed idea has a chance at getting funding, or if the idea — no matter how well-designed — has no prayer whatsoever," Nieman says.

Contacting potential committee members

The key is to find committee members who are willing to lend you their time and talents. To make the initial contact with a potential member, Nieman recommends sending a letter that:

- Conveys your enthusiasm for your project
- Asks for assistance and describes how the person's expertise can help you
- Requests to speak with him via phone or in person.

Moving beyond written contact will help you develop solid relationships with your committee members. And you'll need that if you want to return to these scientists with questions after your proposal is funded.

continued on page 50

Committee continued from p. 49

“For instance, if you’re thinking about a certain protocol, you want to be able to go back and ask for their suggestions,” Nieman says. “With their experience, they can probably give you the answer in 10 seconds, but they have to take the call first.”

First order of business

Once your committee members are in place, you’ll want to discuss your research ideas with them and compose a list of three to five Specific Aims for their review and critique.

“The Specific Aims page is 90 percent of the grant,” Nieman says. “You have to hit that perfectly. It’s one page, so it’s not too burdensome for the members. And they’ll be able to tell instantly what changes you need to make, especially if they review grants.”

To ensure your Specific Aims page is ready for your committee’s review, ask the following questions:

- Is your hypothesis correct?
- Are each of your aims independent of one another?
- How will your project impact your area of study?
- How will it change the practices in your field?

“If you’ve answered all of these questions,” Nieman says, “your committee will have a great starting point to help you write a fundable grant.” ■

Bonus Article:

When a Disaster Affects Your Federal Funding

Note: Due to the recent natural disasters, you are receiving an additional article in the June issue.

A natural disaster can be devastating to your research, damaging lab equipment and destroying data. Such setbacks can drain your funds and disrupt your grant’s timeline.

Fortunately, NIH and NSF make allowances for such disasters.

If an event delays your NIH application

NIH will accept late submissions due to a natural disaster or other emergency situation. But the agency will consider your application only if the event affected your entire institution.

And the deadline will only be extended for the period of time your institution is closed, according to **Mary Karla**, an analyst in NIH’s Division of Receipt and Referral.

When submitting a late application due to an unforeseen event, you must include a cover letter detailing the reasons for the delay. It should contain:

- Your name and institution
- The application title
- A description of the event
- An explanation of the event’s timing and why it caused a delay.

If disaster disrupts your NIH grant

“Immediately let the government officials know any time something goes wrong with a federal grant,” says **Joseph Ferretti**, PhD, Senior Vice President and Provost at University of Oklahoma Health Sciences Center. “You will save yourself a lot of pain in the long run.”

When notifying NIH that a disaster has affected your grant, you must include specifics. To ensure you have the

necessary information at your fingertips, take the following steps:

- Document exactly what happened.
- Take inventory.
- Specify where damage occurred.
- Determine exactly what was affected.

If your equipment or supplies were damaged, NIH may award an administrative supplement to help you replace them. The supplement is an addition to your original grant, and there is no limit to the amount of money you can request.

Take the following steps to obtain an administrative supplement:

- Compose an email to your program officer (PO) to request the funds.
- Describe the situation in detail, explaining what type of disaster occurred, the damage sustained, the amount of time lost, etc.
- Have an institutional official send the email.

The PO will review your request and give you advice regarding the criteria for administrative supplements.

Large-scale disasters

If a disaster affects a large area, NIH may:

- Provide time extensions for financial and other reporting
- Publish opportunities for funded extensions for institutions in the devastated area.

“It’s difficult to put a notice out each time a natural disaster occurs,” Karla says. “We know these events can be devastating. But unless it affects a larger amount of people, we have the standing notices that PIs can refer to.”

continued on page 51

Disaster continued from p. 50

To access NIH notices regarding natural disasters, visit http://grants.nih.gov/grants/natural_disasters.htm.

If an event delays your NSF application

For many of its programs, NSF accepts proposals at any time. But if a grant application does have a deadline, the agency may waive it in the event of a natural disaster.

If you miss a deadline, the NSF Grant Proposal Guide recommends contacting the appropriate PO. Ask for authorization to submit a late proposal, and follow the PO's guidance. She will usually grant you five additional days.

"But it depends on what the issue is," says **Samantha Hunter**, a policy officer at NSF. "For example, five days wouldn't have been enough for Hurricane Katrina."

For additional information on exceptions to NSF's deadline date policy, visit www.nsf.gov/pubs/policydocs/pappguide/nsf11001/gpgprint.pdf.


If disaster affects your NSF grant

If you've already received NSF funding and an incident causes damage or delays, contact your PO for assistance. Call her as soon as possible after the incident occurs, and be prepared to provide the following information:

- The nature and time of the event
- How it affected your research
- An inventory of what was damaged or lost.

"The PO will need as much information as you can provide at that time," Hunter says. ■

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