Principal Investigators Association™

Executive Report:

Prepare a More Competitive MRI Grant Application

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A Note from the Publisher

Dear Professional:

Thank you for ordering "*Executive Report: Prepare a More Competitive MRI Grant Application*" from the Principal Investigators Association Library. This resource is designed to help you better understand — and make the most of — an NSF Major Research Instrumentation (MRI) grant application.

Karen Markin, PhD, served as co-author of this report. She is director of research development at the University of Rhode Island. Her office assists multidisciplinar y faculty to find sources of funding and prepare competitive proposal narratives. She has served as a proposal reviewer for several organizations, including NSF and the U.S. Department of Education. Dr. Markin also published a widely cited series of columns about grantsmanship in the Chronicle of Higher Education. She is a member of the International Communication Association and an adjunct professor of journalism at URI.

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Best Regards,

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Overview

Although writing a research grant is no easy task, applying for a National Science Foundation (NSF) Major Research Instrumentation (MRI) grant can be especially difficult. The complex proposal format is significantly different from the standard research grant application. And if you don't address those key differences in your MRI application, your funding request will be shot down.

The MRI program supports the acquisition and development of instruments that are too expensive or not appropriate for other NSF programs. It is intended to raise the overall quality of research and promote the integration of research and education. The program also values sharing expensive instrumentation, not just among multiple investigators, but among multiple institutions. The NSF allows and even encourages private sector collaborations, and there is a provision for working with commercial entities as sub-awardees.

MRI awards range from $100,000 to $4 million. For the past few years, the award rate has remained around 30 percent, excluding Recovery Act Awards. The NSF has budgeted $90 million for the MRI program and will make about 175 awards this funding period. The average award has been around $451,000, and the median is approximately $330,000.

If you're considering an MRI grant, start by looking at projects the NSF has already funded through the program. Even if you've read the call for proposals, there could be a slight difference between what you think the agency is looking for and how this is interpreted in practice.

For example, the NSF has funded:

- A single-crystal CCD divrechtometer
- A high-resolution microscope
- The development of a dynamic etonic probe
- Research instruments for sequencing DNA
- A 355-element real-time infrasound array and an acquisition of a terrestrial laser scanning instrument. ■

Chapter 1:
Know Your Eligibility Before You Start

Before you waste significant time crafting your MRI application, double-check the eligibility guidelines for this type of funding.

What is not eligible?

- Standard lab equipment. You might think the MRI program is a good avenue for nabbing those upgrades to standard lab equipment, but the agency won't pay for routine items.
- Equipment that's already accessible. The grant won't pay for infrastructure, routine computer maintenance, toxic waste removal systems or telecommunications equipment.
- Construction, renovation and instruments primarily used in standard science and engineering courses. The NSF stipulates that you can use the equipment for these purposes, but the equipment's "primary" use must be research. Also, there is a provision regarding assorted unrelated instruments.

The NSF offers special guidance on suites of instruments as well. In certain cases, you can purchase multiple instruments, but there are specific requirements. On the MRI homepage, the agency says, "The entirety of the integrated instrumentation should be focused on a specific research question or set of inseparable questions." You must convince the reviewers the instruments can be viewed as a single instrument to support independent research or training activities. Talk to a program officer before you assume your proposal meets that requirement.

Another key factor is the $100,000 to $4 million budget parameters. Don't fret if the amount of money you're asking for isn't even in this ballpark. There are exceptions. The NSF will take a request for less than $100,000 if it's for the mathematical sciences or the social, behavioral or economic sciences. In addition, non-PhD-granting institutions can submit requests for less-costly instrumentation.

Avoid Submission-Limit Blunders

One easy way to have the NSF reject your proposal is to ignore the submission limits. The NSF limits each university to three applications: two for acquisitions and one for development. Hopefully, your institution has a policy for this. To find out, check your Sponsored Project Office's website, where you should find information about the internal selection process. Alternatively, perform an Internet search for your university's name and "internal selection process" or "limited competition."

If your institution submits too many applications, the NSF may return all of them without review. You don't want to put in the work and get turned down because you didn't follow a simple application guideline.

Tip: Read the frequently asked questions (FAQs) on the MRI homepage: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5260. You'll find a wealth of information, as well as the answers to your specific questions on eligibility and many other topics. ■

Chapter 2:
Don't Leave Out These Key Elements

The NSF wants to see very specific items in your narrative. In particular, it should explain the equipment's shared use, impact on infrastructure and broader impacts.

Shared Use

The term "shared use" appears numerous times in the MRI program announcement for a reason. The agency wants to know that many people will use the equipment, including those outside your department and even your university. Therefore, you must show the NSF's funding will benefit not just you, but principal investigators (PIs) from different disciplines as well.

Contact PIs in different departments and institutions. Find out what they're working on and how the instrument might benefit them. Also, reach out to private non-profits like museums and science centers, as well as commercial entities that might become involved as sub-awardees in a consortium. You can also seek out students who might be interested in using the instrument, and this can double as an effective recruiting tool for your institution. If you're requesting a piece of equipment or instrument that's accessible through virtual means, that's even better.

Impact on Infrastructure

The second major item you must include in your narrative is the instrument's impact on infrastructure. This can be tough to define, but there are ways to think about it that can help. For example, the NSF wants to know how the instrument might affect the scientific infrastructure in terms of your discipline and the institution as a whole.

Think about how the instrument might benefit research training and education, as well as your university's research program. Could the equipment allow you to develop a new course or provide outreach to secondary schools and other institutions? Impact on infrastructure relates to the "shared use" item because the agency is looking for proof that the instrument will benefit a larger population.

Broader Impacts

In terms of broader impacts, the NSF wants you to show you'll promote the instrument's use to broaden the participation of underrepresented groups in science. How will you do that? Some examples of broader impacts include:

- Performing outreach with programs that already serve such groups at your institution
- Becoming involved with your institution's internship programs
- Looking for partnerships your institution might have with a university that serves mostly underrepresented students.

Another significant component to the broader impacts portion is explaining the benefits to society as a whole. For example, you might say: "The instrument would help us gauge the severity of hurricanes so disaster teams can prepare an informed response." This shows a clear societal benefit.

Broader impacts shouldn't appear only in your narrative. They should be included in your abstract as well. The NSF will look for broader impacts and intellectual merit in your abstract first. The proposal won't even make it to the reviewers if you don't include them there. Highlight broader impacts and intellectual merit using subheadings and bolded text to make them easier to find.

Vital Supplementary Documents

An MRI proposal requires more supplementary documents than other programs. And if you don't include all the required documents, the NSF will turn down your proposal. So don't overlook these attachments.

Management Plan: The agency asks for your management plan primarily to ensure the instrument won't sit in its box while you're trying to make space for it in your building. You must have a designated place for the equipment and be prepared to have the instrument up and running immediately. Describe where you'll house and operate the instrument, what a technician service will cost, how you will allocate instrument time, and how you'll attract new users.

Institutional Commitment: The NSF wants you to show your institution is committed to running and maintaining the instrument. Obtain a letter — two pages maximum — from your institution's higher-level administrators, stating that it will take responsibility for the equipment's operation and maintenance.

The letter should also include a description of the MRI awards your institution received during the past five years, along with each instrumentation award's status. The agency wants you to show your university's track record and demonstrate that it puts instruments to good use. You can find information on past awards from your Sponsored Program Office or from the NSF award database at http://www.nsf.gov/awardsearch/.

Cost Sharing: The agency requires exactly 30 percent cost sharing, and you must include a letter documenting this. Start with your Sponsored Program Office to find the right person to commit the funds. The only caveat here is for non-PhD-granting institutions, which are exempt from cost sharing.

Data Management Plan: This is different from the management plan, and it doesn't necessarily require a detailed explanation. But you should include this supplementary document, even if you're asserting that your project has no need for such a plan.

The data management plan should be no more than two pages. The document should describe how the proposal will conform to NSF policy on the dissemination and sharing of research results. The agency expects investigators to share with other researchers — at no more than incremental cost and within a reasonable amount of time — the primary data, samples, physical collections, software, curriculum materials and other supporting materials created or gathered in the course of work performed under its grants.

The NSF reviews the data management plan as an integral part of the proposal, and FastLane will not permit you to submit a proposal that is missing a data management plan.

Post-Doc Mentoring Plan: If you have post-docs involved in your project, you must include a supplementary document describing the details of your mentoring plan. Along with this, you must have a letter stating your institution's status as a PhD-granting institution. ■

Chapter 3:
Make Your Proposal Stand Out

Once you've made sure you have all the required components for your proposal, your next task is to make it stand out. The best thing you can do is share your enthusiasm about your research and make the reviewer excited about the transformative effects the instrument will have. Detail all the great things you'll do with the instrument:

- How will this instrument advance the various disciplines it's involved with?
- What substantive developments do you foresee?
- What transformative impact might it have?
- How does your project fit into a strategic plan for your institution, state or region?

For example, do you have a new president who is interested in promoting the life sciences as an area of strength at your college? If so, tie your narrative into that. Show how you're carrying out an institutional goal and how the project is supported on your campus.

Perhaps your state has an economic development plan. How does your project tie in? Discuss how your work will advance the goals set by those around you. Demonstrate how those people will support you in your work.

Is your region trying to develop life science industries or something similar to replace a defunct industry? Talk about how the instrument will advance that overall goal. Detail in your proposal how you'll be an effective leader and carry out the proposed activities. The NSF reviewers want to know someone's going to stay in charge of monitoring this equipment, not just doing the scientific applications.

Present a Realistic Budget

Another important component of your proposal is crafting a budget that's realistic and reflects the real costs involved. Reviewers want to see a budget that's honest, not padded or too frugal.

If you pad your budget, the reviewers will see right through it. But if you're too modest with your budget, reviewers will think you don't know what you're getting into. And they'll be reluctant to fund your project.

Key Resources: The MRI program announcement has a checklist of all the documents you need to include, accessible online at http://www.nsf.gov/pubs/2011/nsf11503/nsf11503.htm. A brief version of the checklist is in Appendix B of this report.

The MRI homepage (http://www.nsf.gov/od/oia/programs/mri/) also has a lot of useful information, including FAQs, lists of projects the NSF has funded and slide presentations. ■

Appendix A:
FAQs on MRI Program Proposals

The program solicitation says the "existence and availability of comparable instrumentation (at organizations in close geographical proximity or otherwise accessible through collaborations or other cyber-infrastructure) should be outlined in the facility's equipment and other resources." How do I prove this? Are there any documentation or geographic proximity guidelines I need to follow?

This is a tricky element of your proposal because accessibility of a comparable instrument could depend on several different factors. Geographic proximity in terms of miles is one element, but you might also have accessibility barriers if the instrument is difficult to get to. Perhaps your researchers can't use the instrument because the other university's researchers have preference, and the only available time slot is 2 a.m. Because the distance in miles element is rather relative, you should provide a sensible argument of why the instrument isn't easily accessible for your PIs. You want the reviewer to see that you can't use the comparable instrument, and you need your own equipment.

A neighboring organization has a similar instrument to the one we're applying for, but the current instrument is not as state-of-the-art as the one we need. The current instrument is also for one dedicated project and not accessible to us. What, if any, information should we provide in our proposal?

The NSF says you can request an upgrade to an existing instrument. But maybe you're not looking to upgrade that particular instrument.

If the newer instrument does things the old one can't, you have a good argument for purchasing a new one. Also, if this existing instrument is dedicated to another project, and no one else could ever use it, you don't really have it. That would be a very good argument for why you need the newer instrument of your own. Just clearly state in the proposal why you can't use the equipment.

How comprehensive should we make the data management plan for an MRI? Should it address the potential data generated, or should we stick to the research activities cited in the proposal?

You'll want to discuss this question with your program officer. You could say you don't need a data management plan. If you're going to have a lot of different users for a piece of equipment, you can't possibly be in charge of making all that data available.

Perhaps if you're the PI and you're requesting the instrument, you could talk about how you're going to make the data for more particular studies available. The NSF doesn't necessarily want your data management plan to be exceedingly elaborate because the crux of the program isn't about collection or interpretation of data; it's about the instrument.

Do I need to include previous NSF awards other than MRIs?

The agency's guidelines specifically state that you should include just MRIs. If you have a question about receiving another very similar equipment grant from NSF in the past — such as one of the course curriculum and laboratory improvement grants — you could talk to a program officer and find out if you should include those awards. But still, MRI means MRI. The NSF wants to see that the instrument you've received has been put to good use and your institution knows how to manage finding space and portioning out the instrument's use.

I know where to see abstracts of successful grants, but where can I find complete grants? Are they freely available to the public?

Under the Freedom of Information Act (FOIA), all funded proposals are public documents, and you can request those from the NSF. Go to the FOIA office or homepage to view a straightforward procedure for requesting full proposals the NSF has funded. Look at some of the abstracts, pick something that seems closely related or substantially similar to what you want to do, and request that.

Another option is to ask people who have submitted funded proposals if you can have a copy of theirs. As a courtesy, your institution's Sponsored Programs Office likes to have the grantee's permission before sharing a proposal. The NSF is required to share these proposals because they're public documents, but they can leave out certain salary information. It's quicker and simpler to get a proposal from somebody you know, whether that person is on your own campus or a colleague from another institution.

How can I make our education and outreach plans stronger?

The best way to show you're serious is to put it in the budget. You can say you have outreach and education plans. But if you have zero allocated in the budget — for supplies, transportation or someone to work on it — the reviewer won't take your plans seriously.

Also, include as many plan specifics as possible. You don't necessarily need letters from others, but be sure to say you spoke to the school's principal and agreed to a program or activity. Don't say, "If I get this grant, I'll see if I can find some local high schools that would like to send people over in the summer to use the equipment." You don't want to create a "what if" scenario.

How many goals or projects should I mention in the grant proposal so it doesn't appear over-ambitious?

You could mention as many as a dozen goals or projects. The "over-ambitious" part is not as much of a concern as you might think because these are all going to be parallel projects. Typically, you're going to have a lot of people with something in common that causes them to all use this equipment, but they're all going to be working on their own projects. That's their time, which you don't have to manage.

The only issue is the instrument allocation time, which would vary by the nature of the instrument. Just make sure your list of goals and projects doesn't look like you've got far more requests for time on that machine than you could possibly accommodate. That would be a problem. ■

Appendix B: Checklist Tool

One sure way to have your grant proposal returned without review is to omit any of the required elements. The MRI website offers a detailed checklist for putting together your proposal, but the following is a shorter version you can use.

_____ **1. Cover Sheet** (1 page)

- Make the project title concise and accurate, such as "MRI: Acquisition of _____" or "MRI Consortium: Development of ____"

_____ **2. Project Summary** (1 page maximum)

- Include intellectual merit and broader impacts in two separate parts or paragraphs

_____ **3. Project Description** (15 pages maximum, including all figures and charts)

- Address the intellectual merits and broader impacts
- Include subsections (a) through (e):

(a) Instrument location and type: Describe the physical location, and use the NSF's codes for the instrument category

(b) Research activities to be enabled: Include either instrument acquisition or instrument development, as well as who will use the instrument and how they will support and disseminate their research

(c) Description of the research instrumentation and needs

(d) Impact on research and training infrastructure; note that proposals requesting more than $2 million must address the instrument's potential impact on the national level and in the research community

(e) Management plan

_____ **4. References Cited** (formatted to comply with grant proposal guidelines or NSF grants.gov application guide)

_____ **5. Biographical Sketches** (2 pages each)

- Must include biographical sketches of the PI and co-PIs listed on the cover sheet
- Include any designated senior personnel who would use or help develop the instrumentation
- Provide a separate biographical sketch of the person responsible for the instrument's management, if applicable

_____ **6. Budget and Budget Justification** (Justification part is 3 pages maximum)

- Yearly and cumulative budget pages
- Total project cost
- Cost sharing (from non-federal sources during award period)

_____ **7. Current and Pending Support**

- For only the PI and co-PIs listed on the cover sheet, as well as designated senior personnel

_____ **8. Facilities, Equipment and Other Resources**

- List similar or related instrumentation at or near the organization

_____ **9. Supplementary Documents**

- Required:
  - Statement for each sponsored research office of either non-PhD-granting, PhD-granting or non-degree-granting
  - A letter of commitment for the instrument's operation and maintenance, as well as the MRI awards made to the organization during the past five years and the status of the awarded instrumentation (2 pages maximum)
  - Data management plan (2 pages maximum)
- When applicable:
  - Statements from sub-awardees' sponsored research offices that acknowledge the proposal is part of their submission limit
  - Post-doc mentoring plan (1 page maximum)
  - A letter documenting the organization's commitment for required cost sharing (1 page maximum)
  - A letter confirming any private-sector partner or collaborator (1 page maximum)
  - The host organization's commitment to housing the instrument, if it's not housed at the submitting organization (1 page maximum)
- Encouraged:
  - Itemized vendor quotes
  - Statements confirming individuals' substantive collaboration efforts

_____ **10. Single-Copy Documents**

- Encouraged:
  - List of suggested reviewers ■