Selling to Skeptics: a Guide to the PUI Researcher for Submitting Successful MRI Proposals

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Do you realize that the majority of reviewers of your next MRI grant proposal are likely to be full-time researchers at research universities? Unfortunately, many university research panelists are not that familiar with the situation for faculty at primarily undergraduate institutions, and may not appreciate the PUI scholar's level of research expertise. This lack of understanding can be a handicap to PUI researchers submitting proposals for major research instrumentation, especially if the PI loses sight of the fact that it is a proposal for research equipment and must be justified on the grounds of the quality of the research that will be facilitated by having the equipment. I recently served on an MRI panel, during which I took note of PUI grant assessment by my colleagues sitting around the table. In this article, I will define some of the hurdles and provide insights to help you write better, more convincing MRI proposals.

PUI Faculty Members Must Conform to the University Model of Productivity Assessment

A typical MRI panel consists of approximately 12 members. In our session, seven were from Ph.D.-granting institutions, one from a comprehensive (M.S. degree) university, one from a government laboratory, and three from four-year colleges. The small percentage of peer investigators from PUIs is typical for MRI panels. University researchers (understandably) predominate and can often dominate discussion. The result is that research productivity is assessed through publications and funding success. I draw your attention to a recent PowerPoint presentation, "Strengths and Weaknesses of Typical NSF Proposals", by NSF Program Director, Dr. Joan Frye (**www.nsf.gov/od/oia/programs/mri/presentations/jfrye.ppt**) who quotes a successful PUI proposal panel review summary statement:

> This is an excellent proposal from a high-quality liberal arts college. They have a healthy and vigorous incorporation of collaborative student-faculty research, both externally funded and leading to publication in peer-reviewed research journals. There is no doubt that the requested NMR spectrometer will be well cared for and put to good use for research and research training.

Dr. Frye's presentation goes on to emphasize that "research records and history of undergraduate research... (as well as) aggressive search for external funding," should also be used to assess an active undergraduate research program. While university panelists do make an effort to be sensitive to these other criteria, they remain secondary in the assessment process. The panel majority, then, may not be convinced of your expertise if research productivity is not clearly documented in a PUI proposal.

Biographical Sketches Highlight the University Assessment Model

The Biographical Sketch section of an MRI proposal highlights an individual's publications and grant money so that these are the major assessment tools of research outcomes. The PI and co-PIs are asked to list as many as ten publications, five specifically related to the project and five representative of other recent work. For university researchers, the PI and contributor biographies contain ten publications and active and pending grants, demonstrating that they are established scholars in their fields. Unfortunately, biographies from investigators at PUIs often pale in comparison. One PI had an impressive grant-writing record, but panelists complained that none were pending, which then brought into question with them the need for improved equipment. Further, some investigators from PUIs were penalized by reviewer-perceived lack of research by their department members who were listed as contributors on the proposal. If your biographical sketches do not measure up to the standards of your university peers with respect to numbers of

publications and grants, it will be important to address this in other sections of the proposal such as the Impact Statement.

You must work hard to show the panelists that you and your department deserve a new instrument; that you are capable of maintaining the instrument, and that once in place, the new instrument will facilitate your contributions to the frontiers of science.

Convince Panelists of your Command over the Research Areas, Methods, and Instrumentation Described in Your Narrative

Request the proper Instrumentation. It is imperative that you make a strong case that the instrument you are requesting is needed to do the research described in your proposal. With an instrument such as a FT-NMR spectrometer, for example, the consensus of my MRI panel was that for routine use, Ph.D. and M.S. granting institutions mostly need a 500 MHz instrument, whereas non-Ph.D. granting institutions benefit from a 300 MHz instrument. Ph.D.-granting institutions need excellent justification for a 600 MHz (e.g. a high demand for biomolecular work) instrument. Likewise, PUIs need excellent justification for a 400 or 500 MHz instrument. Asking for a 400 MHz instrument without convincing justification might result in a rejection, whereas a request for a 300 MHz spectrometer might have been funded (recognizing, of course, that any successful proposal must have a high-quality research plan as its core). One proposal that was praised by the university panelists came from a school that had no NMR spectrometer and asked for an Anasazi-upgraded 60 MHz FT NMR spectrometer. This was ideal because no expertise in maintaining a superconducting magnet was needed. The panel realized that a higher field instrument might be necessary for publication, but the PI showed initiative by using a spectrometer at a nearby university when necessary. Although the institution will eventually want to invest in a higher field instrument, the request was an excellent first step. Checking out recently funded proposals on the NSF website is an excellent way to gauge what you might reasonably request.

Preliminary data. The best way to show need is by providing solid preliminary evidence of work you have carried out in-house or elsewhere. If you are requesting an instrument that your school does not own but your research warrants, it is especially worthwhile to show data obtained from a similar instrument at another institution. Emphasize how these data improve your project, but how the current arrangement is impractical. If you have a 60 MHz NMR spectrometer, and are requesting a 300 MHz instrument, compare data side-by-side showing the need for the latter. If you have an epi-fluorescence microscope and need confocal capabilities, show just why this is so. In making such comparisons, data must be consistent with each other. There will always be at least one expert panelist who will pick out inconsistencies if they are present.

The PI must take responsibility for other contributors' requests. Proposals for instruments that primarily benefit one faculty member will have a more difficult time getting funded. Usually, PIs have colleagues who may use the proposed instrument, however simply gathering paragraphs written by colleagues is not enough. The PI should thoroughly read through these contributions, critiquing them and making corrections if necessary. In one proposal, a contributor wrote of an instrument that was not being requested by the PI! Further, the expert in the field (usually the PI) should make sure that the proposed work is feasible and that the instrument actually enhances the contributor's program beyond techniques already available in the department. The PI should note that he/she will collaborate with others to help in their endeavors.

Highlight expertise in instrument maintenance. Instrument maintenance is an important review criterion for MRI proposals. Expertise in instrument maintenance is often a "given" for a university setting but not necessarily so for a PUI. Some PUI departments may have a dedicated, trained technician overseeing instrumentation, but in many cases, it is a faculty member (most often the PI) who assumes responsibility for a new instrument. Provide detailed time allocation and instrument maintenance schedules in the proposal. Some PIs obtained reduced teaching loads, for example. Make clear how you or someone else has maintained other or similar instruments for research and teaching purposes. Having a service contract in hand is a plus. Make sure the infrastructure for taking care of the instrument will be thoroughly in place, and effectively convey this to your readers.

PUI grant-writers must be careful about divulging too much information on just how and why an instrument needs to be replaced, if the cause can be perceived as instrument neglect. This influenced the decision on a few proposals in my panel. If this is a relevant issue, show how a new arrangement or commitment is in place to properly maintain the new equipment.

Convince Panelists of the High Impact Your Own Research Expertise has on Others — Especially the Undergraduates that will soon be Applying to Graduate Institutions

Impact on undergraduate research training. This is clearly the area in which PUI investigators excel. Proposals containing an Impact Statement and evidence of excellence in research education are well received by RU and PUI panelists alike. Focus on student publications, off-campus student presentations, theses that are defended in front of outside evaluators, student recognition for outstanding research, student research fellowships, and any other peer-reviewed recognition you or your students have received. Highlight important research records that document your department's history of undergraduate research. You can address issues that may be of concern in the Biography here. Reference information in the Impact Statement in your narrative so panelists do not skim over it. Through your own assessment methods, highlight the impact research has made on students' learning (e.g. critical thinking, data interpretation, oral presentation and defense of an argument). Provide examples of complimentary remarks that pertain to instrument mastery that you may have written in reference letters for your students. A statement or two from students who have become expert in technically advanced instrumentation in your research environment would convey to the panelists the type of training your undergraduates receive and your own ability as an instructor.

You should be reaching out to under-represented groups for your research team. Document your success in this area in the Impact Statement.

Impact on lecture and non-research laboratory courses. Keep in mind that this is a Major Research Instrumentation Grant, and while training through general coursework is extremely valuable and must be included, it cannot supercede the research aspects of the grant. Panelists judge dedication to and expertise in research.

Outreach. Outreach to people outside your department and college will strengthen an MRI proposal. Unique state-of-the-art equipment should be made available to others (colleges, industries, or other community programs) in your surrounding area who could benefit from its use. One proposal from a PUI noted how it would share the equipment with a nearby university. Showing the value of ongoing and new sharing of instrumentation is a plus in an MRI proposal.

Departmental website. Make sure that your departmental website highlights the research activity of your department and that it is up to date. Reference your website in the proposal. Panelists now have immediate, individual access to the Internet during the review process. It is easy to connect to a PI's website and panelists sometimes do this whether you tell them to or not! For example, I was trying to make the case for research activity (and productivity) for a particular school and suggested going to the PI's department website for verification. We did, and unfortunately, the site contained little about the department's research activity. The proposal was not funded.

How do I fit all this into the Proposal?

Organized and concise writing is a must. Have peers proofread your document. Do not decrease your font size to the minimum allowed to fit everything in. Panelists read a dozen or more applications and you do not want to risk irritating the reviewers!

In summary, an MRI proposal is a request for instrumentation to facilitate research. The quality of the research you propose is the most important criteria used when assessing MRI proposals. You and your department's track record of publications and funding and of involving undergraduates in research, and the way you present this information in the proposal, will impact the reviewer's evaluation of your work.

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