FACSS XXI

How to Fund a Research Program Part II

Proposal Writing

Learning from Reviewers' Comments

(Some hints from Cynthia J. Jameson)

Part II of How to Fund a Research Program, a proposal writing Workshop given at 21st FACSS (Federation of Analytical Chemistry and Spectroscopy Societies) Conference in St. Louis by 4 former NSF Program Officers.

DISCLAIMER: What follows are strictly from my own point of view based on my experience as an NSF Program Officer, and in no way should be taken as official NSF pronouncement of any type.

A. Who are the reviewers?
B. Is the reviewer addressing the Program Officer of the agency or the PI?
C. How should the PI view the reviewers' comments?
D. Interpreting reviewers' specific and general comments and acting upon them

A. Who are the reviewers?

The program officer will generally have picked a diverse group of reviewers.

- Experts in the very specific sub-fields involved in the proposal.
- Experts in related fields which have some overlap with some aspect of the proposal.
- Experts in a competing sub-field, i.e., other methods of getting the same kinds of information than the method proposed here.
- A theoretician may be picked to get some comments on whether these experiments, if successful, would yield information which will advance the fundamental thinking in the field.
- A mix of older established researchers and younger recently funded PIs.
- A yet unfunded PI- after all, reviewing proposals is a good learning experience for writing your own.

- If the PI is from a small department or a primarily undergraduate institution, there will usually be at least one reviewer from a similar institution.
- Some reviewers are chosen for their general knowledge of the broader field of science, to put this proposal in its proper context.

B. Is the reviewer addressing the Program Officer of the agency or the PI?

In writing a review, the reviewer addresses BOTH the PI and the Program Officer of the agency.

The review of a SUCCESSFUL proposal will generally be addressing the Program Officer, detailing what is outstanding about the proposed experiments, the relevance of the proposed work to the rest of science, the excellent qualities of the PI, in other words giving the Program Officer the reasons for funding the proposal. There is usually NO useful information for the PI in such a review.

The review of a FAILED proposal is generally addressing both the PI and the Program Officer. It tells the latter why this proposal should not be funded. At the same time it speaks directly to the PI as to what is wrong with the proposal. There is usually MUCH useful information for the PI in such a review.

C. How should the PI view the reviewers' comments?

- Reviewing new PI proposals is a form of anonymous mentoring.
- Many reviewers (see examples in this collection) provide useful direction: Consult the work of these authors; this detector or this chemical system is unsuitable; the results of this experiment will have impact on such and such unrelated areas; etc... As a researcher, you will probably only get this opportunity during your first 2 or 3 unsuccessful proposals. After you get your first major grant, you are on your own. You will likely get no more helpful hints.
- The reviews of a failed proposal are generally much more informative than a successful one.
- Usually the most critical hard-hitting reviews are the most useful to the PI because they point out the weaknesses of this proposal and provide hints on how to write a more competitive proposal or even change the whole design or the project.

D. Interpreting reviewers' specific and general comments and acting upon them

- The comments viewed collectively and the tone itself provides useful information.
- Sometimes more than one reviewer catches the same weakness, in which case one should take it more seriously.
- Not every single comment should be acted upon, but should be viewed in the context of all the others from the same reviewer and all reviewers collectively.

Examples of comments and action:

comment: ”... is probably not a good enough justification for initiating a new research program at this time. However, these experiments may have much broader implications to questions about surface modification, etching, energy transfer and charge exchange.”

interpretation: In your introduction, you have failed to provide compelling reasons why this project should be done at all. You must consider a bigger picture than that which you have written in your proposal. The reviewer gives the hints at what they might be.

action: You should do some reading and find out in what way your experiments can shed some light on questions about surface modification, etching, energy transfer and charge exchange, and when you rewrite your proposal you should make these an important part of your justification for doing the project.

comment: ”There is virtually no attempt to link his experimental results with existing theoretical techniques. There have been major advances in this arena in the last 10 years.”

interpretation: You have failed to make a connection between the experiments you propose and the theoretical models of the fundamental events and the mechanisms that are involved in the complex processes.

action: You should do some reading of the literature in the past 10 years and find out what the theoretical models are, in what ways they are successful, and specially in what ways they are deficient. When you rewrite your proposal you should say something about the theoretical models and what role your experimental results can have in providing critical tests for these models or in what way you can interpret your results with the help of the fundamental ideas in these models.

comment: “The authors should demonstrate that they will have enough ion intensity in the 1-5 eV range to make meaningful measurements especially since infrared measurements usually require a relatively large surface area.”

interpretation: Comments like this one are very helpful in that they are specific and easily addressed. This means that you have not sufficiently worried about sensitivity and the reviewer is doubting that your experiment can be successful.

action: Either do a calculation using the parameters in your setup or do actual measurements to see whether or not you will indeed have sufficient intensity. If the answer is yes, make sure you make this point in your revised proposal. If the answer is no, then back to the drawing board for a better design.

comment: “The choice of iron pentacarbonyl as a probe molecule seems to be not ideal since that molecule displays a complex chemistry of its own and is quite reactive after either photolytical or pyrolytical activation. Separating the different $Fe(CO)_x$ fragments is almost impossible given the gas phase transformations occurring in the different fragments. Also the mass spectrometric detection of $Fe(CO)_x$ moieties using... is hopeless because...even if...”

comment: “It is frequently very difficult to clean metals such as iron off of other materials such as silver without extensive ion bombardment and annealing. Frequently the impurity metal stays beneath the surface and is therefore not efficiently sputtered. Extensive sputtering may change the surface morphology which would make the data difficult to interpret. Before this proposal is funded the author should demonstrate that iron can be removed from single crystal silver without degrading the data obtained from subsequent experiments.”

comment: “The 10^4 energy resolution claimed (for the $Fe(CO)_5^+$ ions) is surely an order of magnitude too high because of their initial internal energy distribution. The latter could compromise the page 27 experiment concerning the fragmentation extent....”

interpretation: $Fe(CO)_5^+$ will pose possibly insurmountable problems.

action: Forget about using $Fe(CO)_5^+$, try another system. Very wisely our example PI switched to benzene ions for his preliminary experiment and rewrote the proposal around pyridine molecular ion.

comment: “There are no preliminary results to show the performance of any part of the set-up to be used for the experiments.”

comment: “No evidence (data) is given that the laboratory infrastructure is put together yet.”

comment: “I have incomplete information to evaluate the capability of the PI to accomplish the goals set in the proposal.”

interpretation: You have not included any preliminary measurements to indicate that individual pieces of the complex set-up can provide the intensity, sensitivity, resolution, discrimination, etc. that are required for the described experiment and you have not convinced the reviewers that your experiment can work.

action: You need to actually do some measurements, not necessarily with the chemical system proposed, but to conduct tests of the individual parts of your apparatus to see if they can perform to the specifications required for your overall experiment.

comment: “The PI proposes to use several spectroscopic tools ... It is not clear to me that the PI has thought out the types of information that she/he can obtain from these spectroscopies. Beyond the synthesis of ..., there is no research plan indicated here: What will I look for with this technique? What do I expect to find? What will that finding tell me towards the larger questions that I have posed about the mechanism for ...?”

interpretation: You have not written a research plan that goes beyond the first step of the project.

action: Assuming that reviewers’ comments gave you some indication that the goals you have set out are worthwhile pursuing, think about the whole plan to achieve that goal. Think about what information is required in order to find the answers to the questions that are targeted by the proposal. Consider spectroscopic techniques that are available to you. The reviewer has provided the basic questions you should answer for yourself in choosing various tools. Based on these, figure out which combination of tools will be most suitable. In this process, you will discover what needs to be in your research plan.