NSF Proposal Preparation: The View of an Ex-Program Officer

Joseph Brennan

The task of obtaining external funding to support research has become a critical point in the career of the young mathematician. Obtaining funding can have a profound effect on the recipient's career as the imprimatur of external funding provides in the eyes of many a confirmation of the importance of the recipient's research activity. While the reality is that the research proposals that are funded tend to be the ones that are excellent, there are very many excellent research proposals that are not funded. This note is intended to provide some insight into the process of funding at the National Science Foundation (NSF) based on my two years' experience as a program officer in the Division of Mathematical Sciences. While the advice I give is directed to the applicant for NSF funding, the basic principles are applicable to funding proposals to any external funding source.

It is important to recognize that the agenda for the process is established by the National Science Foundation. This agenda is not ordinarily established by mathematicians but is instead the consequence of intellectual, political, and cultural concerns of the government. The immediate consequence of this is that the direction and employment of funds as well as the criteria for awarding them is established in order to satisfy the NSF's own purposes rather than an agenda established by the mathematical community. It is important to be alert to the agenda of the NSF and to understand its needs in the process of supporting mathematics. The mission statement of the NSF calls for it "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense…". Although the objectives of the mission statement are not usually explicitly addressed in the proposal submission, it may be useful to contemplate how the proposal addresses these issues—most particularly for mathematics—in promoting the progress of science.

Applications to the NSF for funding are made in response to a Program Solicitation. That solicitation might be the program's description of the area program; it might be an explicit solicitation for proposals for the particular program; it might take the form of a "Dear Colleague letter". A prospective applicant should examine the range of solicitations to find the solicitation that best fits the proposed work. A typical solicitation contains a detailed description of the program, the method by which the proposals are to be evaluated, criteria by which proposals are to be evaluated, budgetary guidelines, and contact information for program officials. **Proposals sent in response to a solicitation need to be responsive to the solicitation**. In particular the solicitation should be carefully and fully read and the issues that are raised by the solicitation need to be fully addressed in explicit detail by the proposal.

The statement in bold of the previous paragraph may

One also needs to establish why the proposer has the abilitposer

NSF explicitly address two criteria for funding decisions. The second criterion examines the broader impact of the proposal. Simply put this asks for the consequences that funding the proposal will have on the broader community of science. These will vary from proposal to proposal but might include training of students in the techniques of the area or applications of the work to questions in another area of science. Mission oriented agencies such as the Office of Naval Research express this in a more direct manner: asking that proposals explain "Potential contributions of the effort to the agency's specific mission." The requirement is the same, however, across all funding agencies: Explain why giving the money to this project furthers the aims of the funding entity.

It is very important to remember one of the first statements of this article: that it is important to recognize that the agenda for the funding process is established by the entity that is doing the funding. The agenda of the entity will be reflected in the funding criteria; proposals need to address the issues raised by the criteria.

The budget is simultaneously the simplest and the most complex part of any proposal. The simple solution to the question of budgeting is: **The budget should be sufficient to attain all of the objectives of the proposal**. There is an additional caveat.

Total Direct Costs. Proposers should also be alert that some proposals specifically exclude certain participant support costs from the total direct costs or provide for an alternative computation of the F&A.

At some point in the award process, proposers might be asked to reduce the requested budget. A significant reduction of a budget submitted to a federal agency will trigger a requirement to reduce the scope of the project. This means that the agency acknowledges that the funds will not be sufficient to obtain all the objectives that were established in the proposal and calls upon the investigators to reduce the level of activity of the project and the corresponding objectives to be obtained. The reduction in scope of the project should be correlated with the change in the budget.

Receipt of an award does not end the responsibility of the investigator. There is an obligation to spend the funds in accord with the objectives of the project. One might review the semiannual reports to Congress of the Inspector General of NSF (`http://www.nsf.gov/oig/pubs.jsp`) to provide an indication of the degree of seriousness the federal government takes in auditing its expenditures. There is also an obligation to fulfill the conditions upon which the award has been made, from promoting seat belt use to periodic reporting on the accomplishments of the project. One should remember that the obligation remains upon the funding entity, the program, and the program's employees to justify the expenditure. In particular, programs need success stories. These provide programs with the opportunity to increase base funding levels while programs unable to document successful accomplishment of their goals may face below-average increases or even decrease of base funding levels.

Having funding from a program or funding entity does not preclude seeking additional funding from the same or different programs or entities to support other projects. (Note that seeking funding for the same project would be unethical and potentially criminal.) One should not become dependent on a single funding source to support our students or our objectives.

A wise man said to me: "Don't ask me how to obtain funding; rather present to me a good idea and a source will be found to fund it." Ultimately the test of whether a proposal will be funded is if the idea presented in the proposal is found meritorious in the marketplace of ideas. It is incumbent upon us as mathematicians to provide evidence that support of our discipline is essential to the development of science. Exploring and finding vehicles for support of mathematics and mathematics students is essential in that quest.