# Writing an NSF Proposal; a PI's and a panelist's perspective

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# The main NSF website

http://www.nsf.gov

1. Find funding opportunities and solicitations.

2. List of upcoming due dates.

3. Search existing awards (learn about your department and institution. What types of grants have people at your institution been successful at obtaining? RUI, REU etc).

4. How to prepare your proposal.

5. Learn about funding trends.

6. Search the site (eg. "merit review" or "grant proposal guide" etc).

# Fastlane

https://www.fastlane.nsf.gov/index.jsp

FastLane is an interactive real-time system used to conduct NSF business over the Internet.

1. Submission of grant proposals.
2. Award management and reporting functions.
3. Applications for postdoctoral and graduate fellowships.
4. Uploading letters of recommendation.
5. Reviewer and panelist functions.

# Merit Review Process

The following website covers the Merit Review process in great detail, including timelines for proposal preparation and for the review process.

http://www.nsf.gov/bfa/dias/policy/meritreview/index.jsp

There is also a handout outlining the NSF timelines for proposal submission, review and award processes.

# Merit Review Facts

1. All proposals submitted to NSF are reviewed according to the two merit review criteria: Intellectual Merit (IM) and Broader Impacts (BI).

2. Most proposals that are awarded do not receive all "Excellents".

3. Principal Investigators submit on average about 2.1 proposals for every award they receive.

4. NSF promotes broadening participation in science and engineering. (see handout)

5. NSF annually has active awards at over 2000 awardee organizations.

# Merit Review Criteria

1. Intellectual Merit (IM)
2. Broader Impacts (BI)

# Intellectual Merit

NSF description.

*How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?*

# Broader Impacts

NSF description.

*How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?*

*Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.*

# Broader Impacts contd...

*NSF staff will give careful consideration to the following in making funding decisions:*

*Integration of Research and Education*

*One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students, and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.*

# Broader Impacts contd...

*Integrating Diversity into NSF Programs, Projects, and Activities*

*Broadening opportunities and enabling the participation of all citizens, women and men, underrepresented minorities, and persons with disabilities, are essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.*

# Broader Impacts – Examples

In DMS broader impacts are generally taken to be impacts on *people*.

1. General public (giving or organizing public lectures).
2. High school (giving talks, math circles, MathDay).
3. Undergrads (REU, UROP, with publications).
4. Grads (URM, special training/mentorship activities).
5. Post doctoral associates or other junior faculty (mentorship activities, efforts at placement).
6. Collaborations with or other support for URM mathematicians.
7. Editorship, conference organizing.
8. Blogging, significant web pages.
9. Software, textbooks, some monographs, expository articles.

# Major Components of a Proposal

Read the Grant Proposal Guide (or online instructions) if you are in doubt about a particular item. Remember that there are many types of grant proposals (RTGs, FRGs, RUIs, REUs, etc). The following are the main components for a standard grant proposal.

1. Summary (one page, third person, highlight IM and BI).
2. References (separate from proposal narrative, remember how to split PDF files into two pieces!).
3. Bio sketch (at most 2 pages, read the directions carefully, pay attention to synergistic activities (broader impacts)).
4. Budget (contact your institution's grant office for a template).
5. Budget justification (this is mainly for the program directors).
6. Narrative (at most 15 pages). Keep an eye on font size, ease of reading, margin size etc Keep it well organized and easy to scan quickly for key information/ideas.

# Major Components — Bio Sketch

A lot of the bio-sketch material will help the program directors with conflict of interest (CoI) determinations. Other portions will be of use to the panelists/reviewers. Follow the directions carefully, have clear headings and items neatly bulleted. Generate a TEX template and never lose it!

1. Professional preparation: u-grad, grad, p-doc experience.

2. Appointments: (potential CoI).

3. Publications: 5 closest to project, and 5 others.

4. Synergistic activities: think of your BI statement!.

5. Collaborators/coeditors: (potential CoI).

6. Your grad advisor(s)/post-doc sponsor(s): (potential CoI).

7. Your grad students and post-docs: (potential CoI, also panelists look at this).

# Major Components — Pointers

1. Summary. Highlight the proposal's key Intellectual Merit and Broader Impacts activities. Give at least one paragraph to each. Use these titles/headings explicitly in boldface or italics.

2. Budget. Start with a template spreadsheet from your institution's grant office. They will often have overhead etc percentages filled in as macros.

3. Budget justification. Your institution's grant office may recommend standard language about overhead, projected salary increases etc. This is very useful!

4. Budget justification. If you request student/post-doc support then your narrative should also address specific projects.

5. Narrative. See "Tips/Pointers" at end of presentation.

# Typical Panel

1. Lasts about 2-3 days.

2. Composed of 12 panelists and several program directors.

3. Panel demographics; senior and junior, women and other URM.

4. Panelists discuss 48-50 proposals, and make recommendations to the program directors.

5. 12 proposals per panelist, 3 panelists per proposal.

6. Panelists get proposals about one month in advance of panel discussion.

7. 5 names in the "highly recommended for funding" category.

8. 15 names in the "recommended for funding" category.

9. 30 names in the "not recommended for funding" category.

# Typical Panel contd...

10. Assumption: all the "highly recommended" and approximately half of the "recommended" proposals may get funded.

11. Each proposal gets about 10 minutes discussion before being initially placed in one of three categories.

12. At least one (perhaps 2) of a proposal's reviewers may not be experts in that specific area.

13. 10 minute discussion consists of comments by the 3 reviewers and then general discussion. A panelist who likes your research but who was not assigned to review it may have 3-4 minutes to quickly scan your proposal for any significant aspects that he/she can bring up in the discussion.

14. After initial placement, the discussion will tend to focus on relative ranking of the 15 names in the middle category.

# Typical Panel contd...

15. "Highly recommended" proposals tend to be from true leaders in the field; have outstanding IM and BI components.

16. Highlighting unique features of your proposed activity helps your case in the 10 minute discussion, and for "equalization" process that program directors conduct after the panels have finished.

17. Layout/organization of your proposal can be critical. Keep in mind the 3-4 minute window in which an advocate of your research has to make a case during the 10 minute discussion.

18. Changing culture: Eight years ago versus today. Providing rationale for including BI activities.

19. Changing culture: Junior panelists often have been part of intensive mentoring and outreach activities at sites with VIGRE awards. They expect significant BI.

# Tips and Pointers

1. Ask someone who has received support recently for some advise, or if you can look at their proposal.

2. Take time to prepare components carefully (ask for time instead of rushing — "soft deadlines").

3. Get to know your institution's grant office, and your grant preparation liaison. Find out about their schedule, expected rush times, internal routing times.

4. Think about the "synergistic activities" section of your bio sketch.

5. Write summary in third person which highlights IM and BI. Include IM and BI as titles/headings in your summary.

6. IM: Why is "X" important to your field? What are potential implications of solving "X"? Do the methods of attack have independent interest or applications?

# Tips and Pointers contd...

7. IM: What special tool/idea/skill are you providing, how are you going about solving "X"? (past progress, new ideas,...).

8. IM: Stretch it a little, but keep it believable!

9. IM: Not too much detail! A reviewer once remarked, *This is not a proposal, but a sketch of a proof.*

10. IM: Never include a proof of a lemma/theorem!

11. IM: Not too little detail. A 5-6 page proposal will not receive serious attention.

12. If you get funded, volunteer to serve on a panel.

13. BI comparisons (weighted by seniority of PI) and narrative style (clarity, organization, momentum etc) have been used as tie-breakers in panel discussions.

# Summary

1. IM will be the major factor in the initial decision to place a proposal in one of the three funding categories. Think about how your research sits in the broad field, and how it impacts the field as a whole. Are you bringing new techniques which may have applications elsewhere? Are you developing a set of techniques that are modeled on an existing set which have already had major applications in a parallel area? What are the broader implications of solving a particular problem in your proposal?

2. You need to convey the answers to these questions to the reader in a clear and convincing way. Remember that a panelist who is a strong advocate of your research program may not have been a reviewer of your proposal, and may have limited time to quickly scan your narrative in order to point out the highlights during the panel discussion.

# Summary

3. BI are an extremely important aspect of your proposal. Panels will use BI considerations to rank proposals of comparable IM.

   Remember that the DMS interprets broader impacts to mean *broader impacts on people.* Look along the academic pipeline: junior faculty; post-doctoral associates; graduate students; undergraduate students; high school and elementary school students. Are there ways that you can influence these groups today, that will increase the awareness and appreciation of mathematical research in the future? What about traditionally underrepresented groups?

4. Do not forget to address both BI and IM in the one page summary. Use "Broader Impacts" and "Intellectual Merit" as (highlighted) headings in the summary.