Proposal Writing

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Adapted from slides from
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http://www.cmd-it.org

Types of Proposals

- Research
  - Single-investigator
  - Multi-investigator
- Research Infrastructure
- Education
  - Curriculum Development
  - Educational Innovation
- White Paper, Special Projects, RAPID, EAGER, Travel, Workshops, Postdoctoral Fellowships, Faculty Fellowships (industry or foundations), etc.
- Supplements – standard, REU, RET, ROA
- SBIR, STTR

Meta-Tips

- Know the agency's organizational structure
- Know your agency's programs
  - Solicited vs. unsolicited proposals
- Review the Summary of Awards
  - Past trajectory
- Know your program officer and division director
  - Current trajectory
- Participate in agency-sponsored workshops
  - Help set future trajectories
- Serve on review panels and as an ad hoc reviewer
  - Read lots of proposals
  - Practice good citizenship
- Develop good proposal-writing habits

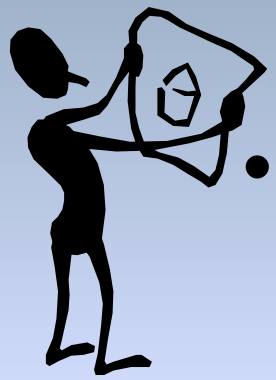
Outline

- Research Proposal Preparation
- Tips for Writing Successful Proposals
- Some Fatal Flaws in Proposal Writing

Research Proposals

A *fundable proposal* describes a good idea and attainable goal, well expressed and motivated, with a clear indication of methods for pursuing the idea, evaluating the findings, making them known and having broad impact. *NSF now requires a data management plan.*

Step 1: Carefully Read the Program Announcements and Solicitations



- Find the right program early!
  - It's better to do this well before you write
- Talk with your Program Officer to make sure that your ideas fit in the program
  - If the Program Officer tells you that your ideas are too narrow or don't fit the program, look for other sources
- Make sure that your project is worthwhile, realistic, well-planned, and innovative
- *Start this process many months before the deadline*

Step 2: Develop Your Good Idea

- Key Questions
  - **What do you intend to do and how will you do it?**
  - **Why is it important?**
  - **What does the literature provide?**
- Make sure the idea is innovative and exciting
  - Survey the literature
  - Talk with others in the field
- Convince people that you can do it
  - Obtain preliminary data to support feasibility
  - Determine available facilities and resources
    - What infrastructure do you have to work with?
    - With whom will you work (students, collaborators, industry partners)?

Step 3: Prepare the Proposal

- Obtain the agency's Grant Proposal Guide (GPG)
- Get it - Read it - Follow it
  - Proposal preparation and submission
  - Submission of collaborative proposals via
    - Subaward
    - Separate, yet linked, proposals
  - Review criteria and review process
  - Return without review criteria
  - Withdrawal, declination, and award processes

Parts of a Proposal (NSF)

- Cover Sheet and Certifications
- Project Summary
  - Both intellectual merit and broader impacts described
- Project Description
- References cited
- Biographical Sketches
- Budget and Budget Justification
- Current and Pending Support
- Facilities, Equipment and Other Resources
- Supplemental Documentation
  - What is allowed may vary by programs and directorates
- Single Copy Documents
  - Reviewer suggestions, confidential information, letters of support, etc.
- Data management document (2-pages)

Project Summary

- This one page is critical because it:
  - It may affect which program or panel will review your proposal
  - It must include a statement addressing both merit review criteria: *Intellectual Merit* and *Broader Impacts*
    - Proposals that do not separately address both criteria within the one-page Project Summary will be returned without review
- Intellectual Merit
  - Describe the scientific/engineering problem and its importance
  - State the overall objective of the project
  - State the specific aims
  - Describe how the aims will be achieved
- Broader Impacts
  - Educational & outreach activities; infrastructure; dissemination of results; underrepresented groups; benefits to society
  - See http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf

Project Description

- This is the key to a strong proposal
- Overall concept and rationale
- Hypothesis-driven or data-driven or innovation-driven
- Execution
  - Careful
  - Thorough
  - Appropriate
- *Warning:* Most NSF formal proposals are limited to 15 pages. Some preliminary proposals and other special cases may be limited to fewer pages. Check the program solicitation!

Project Description

In 15 pages, you need to cover

- Objectives and expected significance
- Relation to present state of knowledge
- Experimental methods and procedures
- Results from prior agency-sponsored support (required if applicable)
- Relation to your (the PI's) longer term goals
- Broader impact
- Optional sections:
  - preface, background, preliminary studies, specific objectives, significance, experimental plan

Project Description

- Know your audience – the reviewers, PO!
  - Write accurately, concisely, and clearly
  - Make it easy for reviewers to like your proposal
  - You never get a second chance to make a first impression
  - First page tells it all
  - Figures and tables get your points across clearly
  - Some reviewers (particularly on interdisciplinary proposals) may not be experts in your specific field

Biographical Sketch

- Usually limited to only two pages
- Professional preparation
- Appointments
- Publications
  - 5 closely related
  - 5 other significant publications
- Synergistic activities
- Collaborators & other affiliations
  - Collaborators (last 4 yrs) & co-editors (last 2yrs)
  - Graduate and Postdoctoral Advisors
  - Thesis Advisor and Postgraduate-Scholar Sponsor

Budget

- Budget should be
  - reasonable, but request what you need
  - for personnel, equipment, travel, participant support and other direct costs (subaward, consultant, computer services, publication costs)
  - for cost of educational activities associated with research, where appropriate
- Must be accompanied by “Budget Justification” for direct cost line items

Current and Pending Support

- List everything, including the proposal being submitted
  - current, pending and anticipated
- Be careful of overlap
  - Perception of overlap could be detrimental in the review
- Multiple submissions
  - when they are allowed to same program

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Get Help

- Read:
  - Sponsoring agency publications
  - Successful proposals
- Look before you leap:
  - Serve as a reviewer and panelist
- Talk with people in-the-know:
  - Current Program Officers
  - Former POs (rotators or IPAs)
  - Successful colleagues
  - Sponsored projects office at your institution

Start Early and Get Feedback

- Write:
  - Rewrite and rewrite again…
- Get critiques from:
  - Mentors and colleagues
  - Previous members of review panels

Be Reasonable

- Be aware of the scope:
  - "Too ambitious" vs. "Too narrow"
- Be honest and up-front:
  - Address issues instead of trying to hide them
  - Acknowledge possible experimental problems and have alternatives

Make It Easy for Reviewers

- Know your audience:
  - All reviewers may not be experts in your specific field
- Simplify and streamline:
  - Make sure you get your overall idea across
- Pay attention to details:
  - Run the spell checker and proof-read
  - Prepare clear photos, graphs, etc.
  - Make the font size as big as you can

Seven Deadly Sins of Proposal Writing

1. Failure to focus on the key problems and payoffs
2. No persuasive structure: *poorly organized*
3. No clear differentiation: *competitive analysis*
4. Failure to offer a compelling value proposition: *potential impact*
5. Key points are buried: *no highlights, impact is lost*
6. Difficult to read or appreciate: *full of jargon, too many low-level technical details or not enough details*
7. Credibility killers: *misspellings, grammatical errors, wrong technical terms, inconsistent format, …*

Funding Criteria: Intellectual Merit

- How *important* is the activity to *advancing knowledge and understanding* within the field or across different fields?
  - *Significance of expected results*: incremental? high impact? high-risk but high-gain?
- How well *qualified* are you to conduct the research?
  - Not necessary to have track record on specific topic, but *quality of prior work* usually a consideration, as are *preliminary results*
- How creative, *original* are the concepts and ideas?
  - Should be *ground-breaking* in some aspect
- How well conceived, *organized* is the proposed activity?
  - *Well-articulated problem* and *well-structured research plan*
- Is there sufficient *access to resources*?
  - Ownership is not necessary, only *access* to equipment, facilities, human capital, …

Funding Criteria: Broader Impacts

- Does the activity advance discovery and understanding while *promoting teaching, training and learning*?
- Does the activity *broaden the participation* of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?
- 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 other disciplines and society* as a whole?

(See *www.nsf.gov/pubs/gpg/broaderimpacts.pdf*)

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Fatal Flaws

- Inflate the budget
- Use a template for letters of support
- Assume your past accomplishments are well known
- Assume a website is sufficient for research dissemination
- Provide a vague statement about assessment
- Assume program guidelines have not changed from previous year
- Assume your spelling and grammar are perfect
- Substitute vague comments for good examples
- Assume page limits and font size restrictions are not enforced
- Disregard deadlines

Closing Remarks

- *Many successful* proposals share similar characteristics
  - *clearly written, well motivated, organized, original, targeted, important, accomplishable, impactful, significant*
- *Funding depends* on many things, some of which are beyond your control
  - availability of funds, portfolio of existing funded research projects, set of reviewers, timing, …
- Be persistent and give your *best effort; success will come!*

Agency	Link
National Science Foundation	www.nsf.gov
NSF: CISE Directorate	www.nsf.gov/cise (also on twitter)
NSF: OCI Directorate	www.nsf.gov/oci
Office of Naval Research	www.onr.gov (also on twitter)
Army Research Office	www.aro.army.mil
Air Force Office of Scientific Research	www.afosr.af.mil
Defense Advanced Research Projects Agency	www.darpa.mil
DARPA: Defense Science Office	www.darpa.mil/dso/
DAPRA: Microsystems Technology Office	www.darpa.mil/mto/
DARPA: Information Processing Techniques Office	www.darpa.mil/ipto/
Defense Threat Reduction Agency	www.dtra.mil
Department of Energy	www.energy.gov
DOE: Science and Technology	www.energy.gov/sciencetech/
Department of Education	www.ed.gov