Research Development Quarterly Workshop Series

Fall 2012: Funding Success with the National Science Foundation (NSF)

General Overview – 3:30 – 4:00 pm
Panel Discussion – 4:00 – 5:00 pm

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General Overview presented by:

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Next Workshop - Winter 2013: Funding Success with NIH
Important Resources

- Empowering the Nation Through Discovery and Innovation: NSF Strategic Plan for Fiscal Years 2011-2016 – Advancement of Research and Education
- NSF Program Officer: use proper etiquette when contacting them
- Postdocs: Writing assistance at the UCI Graduate Resource Center - [http://www.grad.uci.edu/services/grc/index.html](http://www.grad.uci.edu/services/grc/index.html)
- Faculty: Research Development Professionals in your School - [http://www.research.uci.edu/rdobsps/contact.htm](http://www.research.uci.edu/rdobsps/contact.htm)

Past awardees in your School or Department
The National Science Foundation (NSF) is an independent federal agency created by Congress in 1950, and with an annual budget of about $6.9 billion (FY 2010), funds approximately 20 percent of all federally supported basic research conducted by America's colleges and universities.

NSF is the only federal agency whose mission includes support for all fields of fundamental science and engineering, except for medical sciences.

NSF has two review criteria: Intellectual Merit and Broader Impacts. Additional criteria may be listed in the solicitation/announcement of the opportunity.

- **Intellectual Merit**: The Intellectual Merit criterion encompasses the potential to advance knowledge

- **Broader Impacts**: The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.
NSF Organization

• Divided into directorates (7):
  – Biological Sciences (BIO)
  – Computer and Information Science and Eng (CISE)
  – Education and Human Resources (HER)
  – Engineering (ENG)
  – Geosciences (GEO)
  – Mathematical and Physical Sciences (MPS)
  – Social, Behavioral and Economic Sciences (SBE)

• Each directorate divided into divisions then programs
  – See http://www.nsf.gov/staff/orglist.jsp for description of programs
  – Program Directors are permanent or IPAs (rotator assignment)
### 2012 NSF Funding Rates by Directorate

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• Program Solicitations/Announcements
  – Materials Research Centers and Teams (MRCT)
  – Centers for Chemical Innovation

• Cross-Directorate Programs
  – CAREER proposals
  – Major Research Instrumentation

• Unsolicited proposals
  – Annual and biannual submission windows in each division (e.g. DMR: Sept. 1 - Oct. 31)

• SGERs (small Grants for Exploratory Research; < $200,000 for 2 yrs)

• Supplements (including REU, RET)
Proposal Elements

• Project Summary (1 page)
  – Must clearly address in heading both Intellectual Merit and Broader Impacts*

• Project Description (15 pages)

• References Cited
  – Follow NSF guidelines (e.g. all authors, no et al)

• Biographical Sketch (2 pages)
  – Follow NSF guidelines*

• Current & Pending Support Form
  – Usually upload as .docx or .pdf. Must include current proposal info

• Supplementary Documents
  – Letter(s) of Collaboration; Do not include letters of endorsement

• Budget (typed directly into fastlane; UCI requires internal excel budget)

• Budget Justification

• Facilities and Equipment

• Data Management Plan
  – DMP Tool: http://nsfdmp.lib.uci.edu/

• Postdoc Mentoring Plan (if applicable)

• Suggested Reviewers

* Guidelines to change in new GPG - Jan. 2013
Suggested Format and Organization

• Font: 11pt (up to 12pt) - Times New Roman
• 1” Margins all around
• Right justified margins
• Page #s on center bottom
• Bolded, numbered (e.g. 2, 2.1, 2.1.1) non-contrasting-font heading of varying sizes for varying levels
• Italicize key works within text for emphasis
• Grammar, spelling and punctuation correctness
• Effective use of graphics (referenced in text and captioned with figure/table numbers) and include some simple/non-complex graphics. If possible, not text wrapped

Exact guidelines can be found in GPG
• This may be the only thing the reviewer will read and the first thing the program officer reads

• State your goals/objectives/hypothesis in 1st or 2nd paragraph.

• Value of your project (research and education) must be clear and compelling! Include educational integration plan and goals!

• Written in 3rd person

• Clearly address intellectual merit and broader impacts separately (and label them)

• Might consider adding a graphic
• Proposing research that moves in **creative, innovative** directions [repetitive use of similar phrases for novel]
• Emphasizing a **sufficiently detailed** education and overall project plan
• Including **meaningful engagement with underrepresented groups**
• Developing **integrated education activities that go beyond the conventional, the expected, and the pedestrian**
• Aligning one’s research with **collaborators** as appropriate
• Formatting **document design** deliberately with rhetorical intent to help navigate, emphasize, highlight, etc.
• Using **graphics judiciously** and with attention to good design (i.e., anticipating and accommodating readers’ needs)
• Avoiding leaving assumptions about the project plan up to reviewers conclusions
• Have a **realistic amount of proposed work** (for time period and being cost effective) with sufficient detail
PROJECT DESCRIPTION

1. INTRODUCTION OR PROJECT OVERVIEW
   1.1. Background of the field and motivation for the project
   1.2. Problem statement
   1.3. Forecast intellectual merit and broader impact

2. PRELIMINARY RESULTS
   (This is not just a pie in the sky idea, but a sound foundation for future results.)
   2.1. Past and current research in the field (the literature)
   2.2. Past and current research by the PI

3. RESEARCH PLAN
   (Intellectual merit is “shown” or proven throughout the document but emphasized in this
   section.)
   3.1. Introduction
   3.2. Goals (vision) and objectives (steps to attain goals)
   3.3. Challenges/Limitations
   3.4. Detailed plan (with detailed methods and procedures)
   3.5. Timeline (year by year outline of activities)

4. BROADER IMPACTS AND/OR EDUCATION INTEGRATION
   (As previously noted, these sections are often equated; however, as broader impacts may
   be generally outlined, educational activities are more explicitly outlined and tied into the
   research plan.)
   4.1. Industry (impact on or collaboration with)
   4.2. Academia and/or research field generally
   4.3. Education
      4.3.1. Graduate, undergraduate, secondary
      4.3.2. Outreach
      4.3.3. Women/minorities/underrepresented groups
      4.3.4. Collaborations
      4.3.5. Interdisciplinarity
      4.3.6. Education assessment/evaluation plan
      4.3.7. Year by year outline of activities
      4.3.8. Dissemination (e.g., papers, conferences, websites)

5. RESULTS FROM ONGOING NSF SUPPORT (if applicable)

Structure Example

- A description of the proposed research project, including preliminary supporting data where
  appropriate, specific objectives, methods and procedures to be used, and expected significance
  of the results. Have a succinct and focused project plan

- A description of the proposed educational activities, including plans to evaluate their impact

- A description of how the research and educational activities are integrated with one another

- Results from prior NSF support, if applicable
Intellectual Merit

NSF Definition:

1. How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields?

2. How well qualified is the proposer to conduct the project?

3. To what extent does the proposed activity explore creative and original concepts?

4. How well conceived and organized is the proposed activity?

5. Is there sufficient access to necessary resources?
Suggestions for Intellectual Merit

- Know the expectations of your scientific community
- Discuss size and scope of intellectual payoff
- Use plain, simple English
- Be sufficiently “risky” (transformative, high potential for payoff) or at least adequately creative
- Have preliminary data (less risky)
- Put specifics in the Methods section
- Have outlined goals and objectives
- Have a problem statement in the Introduction
- Have sufficient detail and a work plan
- Use tables, figures, and flow charts to save words
- Make it visually appealing (i.e. do not make reviewers curse you for making their job harder)
- Have a timeline
- Have evaluation or assessment of methods
- Give sufficient background of the field (don’t overly cite yourself)
- Include sufficient budget justification
Broader Impacts

NSF Definition:

1. How well does the activity advance discovery and understanding while promoting teaching, training, and learning?

2. How well does the proposed activity broaden the participation of underrepresented groups?

3. To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks and partnerships?

4. Will the results be disseminated broadly to enhance scientific and technological understanding?

5. What may be the benefits of the proposed activity to society?

Not even the best laid plan for broader impacts will outweigh lack of intellectual merit
Suggestions for Broader Impacts

1. Broader impacts to the scientific field and society as a whole:
   • How did/does your research advance the field?
   • How did/does your research impact society or industry?
   • How did/does your research promote international or interdisciplinary collaborations?
   • Will the results be disseminated broadly to enhance scientific and technological understanding?

2. Integration of Education and Research & Integration of Diversity (e.g. outreach, mentoring):
   • How well does the proposed outreach activity broaden the participation of underrepresented groups (e.g. ethnicity, gender, disability)?
   • How well does the activity advance discovery and understanding while promoting teaching, training and learning?
   • To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks and partnerships?

Have multiple detailed integration strategies
Examples of Activities that Advance Discovery While Promoting Teaching, Training and Learning:

• Integrate research activities into the teaching of science, math and engineering at all educational levels (e.g., K-12, undergraduate, graduate).

• Participate in the recruitment, training, and/or professional development of K-12 science and math teachers.

• Develop research-based educational materials or contribute to databases useful in teaching (e.g., K-16 digital library).

Material for slides 16-20 from Leyla Riley, Director of Academic Innovation, Partnerships, Henry Samueli School of Engineering
Examples of Activities that Broaden Participation of Underrepresented Groups:

• Establish research and education collaborations with students and/or faculty who are members of underrepresented groups.

• Include students from underrepresented groups as participants in the proposed research and education activities.

• Make campus visits and presentations at institutions that serve underrepresented groups.

• Peer mentor students from underrepresented groups who are considering or pursuing STEM majors.
Examples of Activities that Enhance Infrastructure for Research and Education:

• Stimulate and support the development and dissemination of next-generation instrumentation, multi-user facilities, and other shared research and education materials through the integration of open-source platforms and social media.

• Develop activities that ensure that multi-user facilities are sites of research and mentoring for large numbers of science and engineering students.
Examples of Activities with Broad Dissemination to Enhance Scientific and Technological Understanding:

• Partner with museums, nature centers, science centers, and similar institutions to develop exhibits in science, math, and engineering.

• Involve the public or industry, where possible, in research and education activities (volunteer work, service learning, internships).

• Give science and engineering presentations to the broader community (e.g., at museums and libraries, on radio shows, and in other such venues.).

• Participate in multi- and interdisciplinary conferences, workshops, and research activities.
Examples of Activities that Benefit Society:

- Analyze, interpret, and synthesize research and education results in formats understandable and useful for non-scientists.
- Provide information for policy formulation by Federal, State or local agencies.
- Increase science literacy for the general public through “awareness campaigns” that promote behavioral changes (i.e. recycling, water and energy conservation, prevention of sexually transmitted diseases, health screenings, etc…)
Review Process Overview

Four possible layers of review

Two distinct audiences – technical and general

You

Program Director

reviewer
reviewer
reviewer
reviewer
reviewer
reviewer
reviewer

Panel

Program Director

$ or $
Who Gets Funded

Number of proposals

Typically funded

Almost Always funded

“Gray” Zone

Almost Never funded

Outstanding
Excellent
Very Good
Good
Fair
Poor
Action Items for Proposal Preparation

• Talk to NSF Program Officers
  – Best to contact by email to set up a phone call
  – Ask the PO if your project fits within their program (and funding direction). Maybe even suggest to send him/her to review a white paper/short paragraph over email
  – Discuss your readiness to submit
  – Find out if your review will be ad hoc or panel. A panel is likely to have non-experts in specific research areas.

• Volunteer to serve on an NSF review panel
• Review funded proposals
• Seek mentors on campus
• Talk to departmental administrators and the Sponsored Research Office
• Start a “Broader Impacts” Activity