

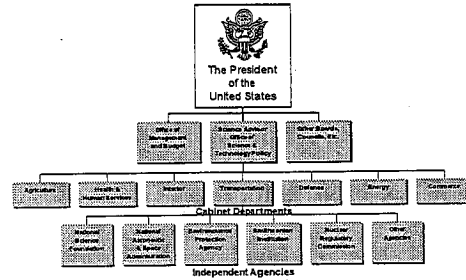
## National Science Foundation Funding Opportunities and Proposal-Writing Strategies



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## NSF Is an Independent Agency of the Executive Branch of the U.S. Government



## The NSF Mission

- To promote the progress of science
- To advance the national health, prosperity, and welfare
- To secure the national defense  
(from the NSF Act of 1950)

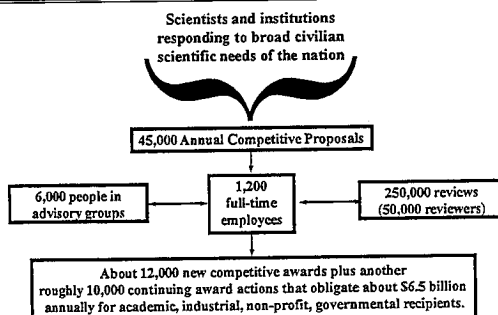
## The NSF Vision

Advancing discovery, innovation, and education beyond the frontiers of current knowledge, and empowering future generations in science and engineering

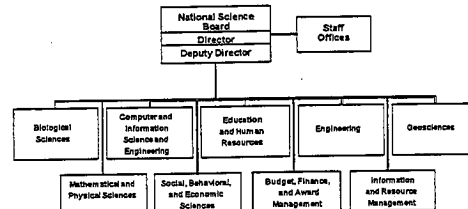
## NSF Strategic Outcome Goals

- **Discovery:** Foster research that will advance the frontiers of knowledge, emphasizing areas of greatest opportunity and potential benefit and establishing the nation as a global leader in fundamental and transformational science and engineering.
- **Learning:** Cultivate a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens.
- **Research Infrastructure:** Build the nation's research capability through critical investments in advanced instrumentation, facilities, cyberinfrastructure and experimental tools.
- **Stewardship:** Support excellence in science and engineering research and education through a capable and responsive organization.

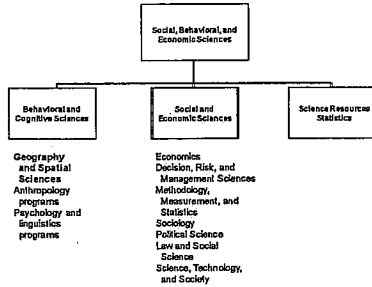
## NSF Is a Science Management Agency



## NSF Is Divided into Directorates



## Directorates Are Divided into Divisions, and Divisions Are Divided into Programs



## Much of NSF's Funding Goes to Support Basic Research

What is basic research?

"It's like true love!"



You can't really define it, but you know it when it's there.

## Let's Try to Describe Basic Research Anyway...

- Basic scientific research is grounded in a broader theoretical framework.
- It focuses on one or a few questions grounded in that broader framework.
- It uses scientifically sound approaches to assess the viability of answers to those questions.
- Its focused results also contribute to enhancement of broader theoretical knowledge.

## As a result...

- Basic scientific research contributes to general understanding.
- It's research that's well grounded in a general theoretical framework or that generates development of new frameworks.
- It's research that's valuable even if we don't care about its specific findings or applications.
- It's research that often increases our knowledge of how we expand our knowledge.

## Basic "vs." Applied Research

- It's not "either/or."
- Basic research results often have great direct and indirect utility and applicability.
- But at its core, basic research is first and foremost about broader theoretical development, not the focused application of specific research results.
- Analysis and synthesis are favored over prescription.
- Normative studies do not fare well at NSF.

## How Do You Gain Access to Some of NSF's Funds?



- Submit a proposal to compete in one of the standing program competitions for "unsolicited proposals"
- Submit a proposal for a special program competition like the Doctoral Dissertation Research Improvement (DDRI) Award competition

**In Addition to Its Standing Programs, NSF Has Many Special Funding Opportunities**

HSD  
 CAREER RAPID EAGER Minority  
 PECASE TCW RPGs/CAAs  
 CI-TEAM SBIR RUI/ROA ITR SCISIP  
 REU GK-12 GOAL NANO CDI CNH EPSCoR CCLI

Check the NSF Web site for more information or contact relevant program officers

**Be Aware of Special Funding Opportunities for Underrepresented Researchers**

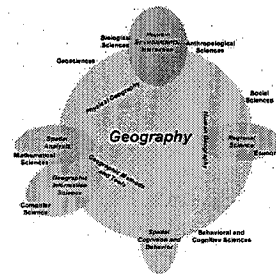
- Programs for researchers from underrepresented groups and minority institutions.
- Programs for researchers at predominantly undergraduate institutions.

**Identifying the Best Program(s) or Competitions(s) for Your Research**

- Focus on theory
  - In which communities is your theoretical framework drawn?
  - To which communities will it contribute?
- Consider where you will publish results
  - Which journals will disseminate your findings?
  - Who are the researchers who read those journals?
- "Map" communities and readers onto NSF programs/competitions to identify the best fit.
- NSF programs can jointly review proposals.

**The NSF Geography and Spatial Science (GSS) Program**

- Geography has been served by a standing program since the 1970s.
- Following strategic planning in 2008, the Geography and Regional Science Program was renamed as GSS in March 2009.



**GSS Vision and Mission**

**Vision:** ... to advance discovery, basic understanding, and education in geography and the spatial sciences.

**Mission of GSS is:**

- To stimulate and support basic research in geography and the spatial sciences;
- To foster the involvement of geographers and spatial scientists in interdisciplinary research;
- To advance the development and capabilities of geographers and spatial scientists.

**GSS Goals**

- To promote scientific research in geography and the spatial sciences that advances theory and basic understanding and that addresses the challenges facing society;
- To promote the integration of geographers and spatial scientists in interdisciplinary research;
- To promote education and training of geographers and spatial scientists in order to enhance the capabilities of current and future generations of researchers.
- To promote the development and use of scientific methods and tools for geographic and spatial scientific research.

## GSS Objectives and Strategies

- **Research competitions in GSS**
  - "Regular" research project awards
  - Doctoral Dissertation Research Improvement (DDRI) awards
  - CAREER awards
  - Awards for interdisciplinary teams that examine human system dynamics and contribute to the enhancement of geographic and spatial scientific theory
- **Interdisciplinary research competitions**
  - Targeted special competitions in areas of interest to GSS and one or more other programs
  - Participation in interdisciplinary competitions that span NSF divisions and directorates

- **Research community development**
  - Promote advanced research methods
  - Promote the sharing of perspectives, approaches, and/or methods between geographers/spatial scientists and researchers in other relevant fields
  - Support activities to diversify geographic and spatial scientific workforces
- **Engage in outreach and communications**
  - Disseminate information through professional society publications
  - Conduct workshops and make outreach presentations
  - Highlight the work of geographers and spatial scientists

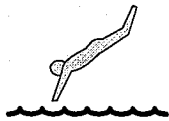
## What GSS Supports

GSS supports "research on the geographic distributions and interactions of human, physical, and biotic systems on the Earth's surface. Investigations are encouraged into the nature, causes, and consequences of human activity and natural environmental processes across a range of scales. Projects on a variety of topics (both domestic and international) qualify for support if they offer promise of contributing to scholarship by enhancing geographical knowledge, concepts, theories, methods, and their application to societal problems and concerns. GSS encourages projects that explicitly integrate undergraduate and graduate education into the overall research agenda."

## Critical Dates for Submitting Proposals to GSS

- **Regular proposal submission target dates:**  
**January 15 and August 15**  
*(Note a maximum of two weeks leeway past the target date.)*
- **Doctoral Dissertation Research Improvement (DDRI) proposal submission deadlines:**  
**February 15 and October 15**  
*(There is no leeway for a deadline.)*
- **CAREER proposal submission deadline:**  
**Late July** *(see CAREER solicitation)*

## How to Plunge Into the Research Funding Pool



Some Advice on Obtaining Funding from NSF (and Other Sources)

## Obtaining Funding Is Like Entering a Diving Competition



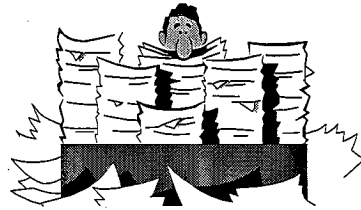
Your chances of success are best if you:

- Learn the rules of the competition.
- Learn which entries receive the highest marks.
- Learn how the competition is organized.
- Hone your skills and correct your defects.
- Take care to do your best.
- Realize that how you place will also depend on how well other competitors do.

### How Do You Learn the Rules of NSF Competitions?

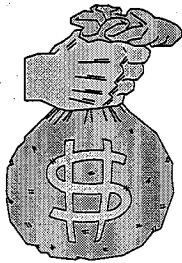
- Read and follow instructions in the NSF *Grant Proposal Guide*.
  - Publication is available online at <http://www.nsf.gov>
- Follow instructions in any special announcements or solicitations
- Contact the relevant program officer(s).
  - Phone numbers and e-mail addresses are available via <http://www.nsf.gov>.

### Learn Which Entries Receive the Highest Marks



Try to think like a program officer!

### NSF Programs Are Engaged in “Reverse Alchemy”



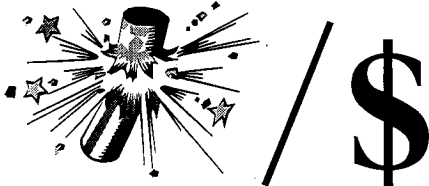
- We have “gold.”
- We want to invest it in “basic research.”
- We want to receive the best possible “return on investment.”

### The “Investment Broker” Analogy Is Even Better

- We have funds to invest.
- We’re selecting from a range of options.
- We’re looking to invest in a portfolio that will maximize returns.



### What Is the Crucial Ratio for a Program Officer?



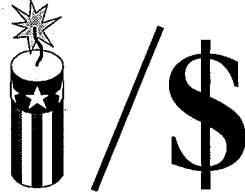
“Bang for the Buck!”

### What Kind of “Bang” Is a Program Officer Looking For?

- Significant contributions to general scientific understandings.
- Enhancements of theoretical understandings in addition to any expansion of specific knowledge, especially potentially transformative advances.
- Broader impacts, such as enhanced education, greater diversity, improved infrastructure or methods, and beneficial applications.
- Dissemination of results, especially in refereed, widely disseminated publications.

## So What Is the Crucial Ratio for a Program Officer?

Likelihood of Significant Contributions to General Scientific Understanding and Broader Impacts



“Potential Bang for the Buck!”

## Decisions Will Be Based on NSF Merit Review Criteria



NSF now asks reviewers to comment on two major criteria:

- Intellectual merit
- Broader impacts

### The First Criterion:

What is the intellectual merit of the proposed activity?

The following are suggested questions to consider in assessing how well the proposal meets the criterion:

- How important is the proposed activity to advancing knowledge and understanding within its own field and across different fields?
- How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, please 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?

### Potentially Transformative Research

- The addition of “potentially transformative” to the Intellectual Merit review criterion is the first change to the NSF merit review criteria in more than a decade.
- “Transformative research is defined as research driven by ideas that have the potential to radically change our understanding of an important existing scientific or engineering concept or leading to the creation of a new paradigm or field of science or engineering. Such research also is characterized by its challenge to current understanding or its pathway to new frontiers.” (National Science Board)

### The Second Criterion:

What are the broader impacts of the proposed activity?

The following are suggested questions to consider in assessing how well the proposal meets the criterion:

- 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, 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?

### When You Prepare a Proposal, Think Like Those Who Will Evaluate It

- External reviewers
  - They tend to be specialists; relevant theory and technical details matter.



- Advisory panel members
  - They largely consist of generalists; so broader significance matters.




- Program officers
  - We’re the investors, seeking “big bangs for our bucks.”



### What's Included in a Competitive Research Proposal?



- An explanation of the theoretical framework within which the research question is set.
- Specification of the methods to be used to answer the question.
- Elaboration of how expected results will enhance the broader theoretical framework and have positive broader impacts.
- Biographical information about investigator(s).
- A budget with justification of expenses.

### Some Tips on Writing a Competitive Research Proposal

- Try to answer any reasonable questions that reviewers might ask about your plans.  
 "Have an out-of-body experience" – Reread your drafts from a reviewer's perspective.
- Make sure your proposal is technically correct. Careless writing and math imply careless scholarship.
- Convey your enthusiasm in your writing.
- Comply completely with the guidelines.  
Use **FastLane** or **Grants.gov** as required for the specific competition. (Give yourself extra time if you must submit via Grants.gov.)

### What Expenses Should Be Listed in a Budget?

All expenses necessary to complete the project.

- For every possible expenditure, ask yourself:
    - Is this expenditure necessary at this level to complete the project? – or –
    - Would the research be diminished substantially if this expenditure is not made or is significantly reduced?
-  If you answer "Yes" to these questions, include the expenditure in the budget.
- If you answer "No," leave the item out or reduce it to reasonable levels. 
- Be cognizant of overall funding limits for awards and for a program or competition as a whole.



### What If Your Proposal Is Funded?

- Work with the program officer(s) to ensure that the "Bang for the Buck" is maintained during pre-award negotiations.
- Check with NSF regarding any significant changes during conduct of the project.
- Conduct the research properly and disseminate the results promptly.
- Regularly report findings, products, and contributions (even after the funding has ended).

### What If Your Proposal Is Declined?



- Pause a while to let the pain subside somewhat.
- Evaluate the reviews.
  - If criticisms focus on correctable points, revise and resubmit the proposal.
  - If criticisms are more general, consider other funding sources or other lines of inquiry.
- If you have questions or want additional information, contact the program officer.

### Some Related Advice from Some Colleagues

#### A Good Proposal

- A good proposal is a good idea, well expressed, with a clear indication of methods for pursuing the idea, evaluating the findings, and making them known to all who need to know.

## The Ten (or so) Commandments for Proposal Writing

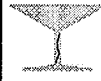


- Thou shalt have a brilliant idea.
- Thou shalt read the *Grant Proposal Guide* and the relevant program announcement or solicitation.
- Thou shalt explicitly address **Intellectual Merit** and **Broader Impacts** in the Project Summary.
- Thou shalt get help with proposal writing.
- Thou shalt write for the right audience.
- Thou shalt not irritate the reviewers with small fonts, dense type, and excessive jargon.

## A Division Director's View of the Major Reasons Proposals Are Declined



- Proposals fail to establish a sound theoretical framework and/or are poorly related to relevant literature.



- Proposals fail to specify research methods in sufficient detail or have flawed research plans.



- Theoretical frameworks are sound and research plans are solid, but they don't match up with each other.

## How to Develop a Proposal

- Determine the best possible funding sources.
- Give yourself plenty of **TIME**.
- Understand the ground rules.
  - Read announcements and instructions carefully.
  - Read the *NSF Grant Proposal Guide*.
  - Make sure your project really fits the program scope.
  - Look over prior award abstracts.
  - Ascertain evaluation procedures and criteria (see the solicitation).
  - Talk with NSF program officer about specific questions.
- Coordinate with your chair and research office.
- Ask successful PIs for copies of their winning proposals.
 

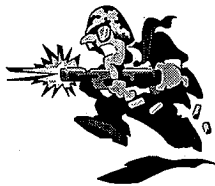
*"Few things are harder to put up with than the annoyance of a good example." Mark Twain*

## Speaking of Time... A Suggested Timeline for Developing Proposals

3 months before the deadline	Develop prospectus for proposal and share it with colleagues as well as relevant agency program officers.
1 month before the deadline	Complete what you think is a very solid first draft of the entire proposal. Share it with colleagues and ask for honest, constructive advice.
2 weeks before the deadline	Use comments from colleagues to revise the proposal one or two more times.
1 week before the deadline	Forward the proposal to your sponsored projects office so that they can complete their work and submit the proposal a day or two before the deadline.
5 months after the deadline	Politely ask the managing program officer when a decision might be made about your proposal (if you haven't heard about its status already).

## Above All Else, Be Persistent!

Remember the words of Christopher Morley:



*"Big shots are just little shots  
who keep shooting!"*

## A Final Reminder...

- If you have questions, contact:  
Your sponsored research office  
Your NSF program officer
- If you need additional information:  
Surf into the NSF Website  
at <http://www.nsf.gov>



## The NSF Staff Is at Your Service



Well, it's not quite that easy, but we will do whatever we can to help you make the strongest possible case for your projects.

Call or write!

## Contact Information

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**703-292-7301**

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- Consult the NSF web site to identify program officers for other programs or competitions.

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