Funding from the National Science Foundation
Outline

• Organization of National Science Foundation (NSF)
• Directorates, divisions, and programs (applying for funding)
• How funding works at NSF – basics of NSF grants
• Budget details
• Tips and advice
NSF in a nutshell

• Independent agency
• Supports basic research
• Uses grant mechanism
• Low overhead; highly automated

• Discipline-based structure
• Cross-disciplinary mechanisms
• Use of Rotators and permanent PMs
• National Science Board
FY2014 NSF Research Grant Dollars per Capita

2014 Research Dollars per Capita

- ≤ $5.00
- $5.01 - $10.00
- $10.01 - $15.00
- $15.01 - $20.00
- $20.01 - $25.00
- $25.01 - $30.00
- > $30.00

State population estimates for July 1, 2014 from U.S. Census Bureau
NSF 2014 funding data from NSF Budget Internet Information System
Example: ENG Directorate

**NSF ENG**

Investing in engineering research and education and fostering innovations to benefit society
Divisions under ENG

Assistant Director
Pramod Khargonekar
Deputy Assistant Director
Grace Wang

Emerging Frontiers and Multidisciplinary Activities (EFMA)
Sohi Rastegar

Directorate Operations Officer
Judy Hayden

Senior Advisor
Mihail Roco

Program Director for Evaluation and Assessment
Alexandra Medina-Borja

Engineering Education and Centers (EEC)
Don Millard (acting DD)

Chemical, Bioengineering, Environmental, and Transport Systems (CBET)
JoAnn Lighty (DD)

Civil, Mechanical, and Manufacturing Innovation (CMMI)
Deborah Goodings (DD)

Electrical, Communications, and Cyber Systems (ECCS)
Samir El-Ghazaly (DD)

Industrial Innovation and Partnerships (IIP)
Barry Johnson (DD)

Programs:
- Manufacturing Machines and Equipment (MME)
- Dynamics, Control and Systems Diagnostics (DCSD)
Programs that span multiple directorates and agencies

Example:
National Robotics Initiative (NRI)

- National Science Foundation
  - Directorate for Computer & Information Science & Engineering
    - Division of Information & Intelligent Systems
  - Directorate for Engineering
  - Directorate for Education & Human Resources
  - Directorate for Social, Behavioral & Economic Sciences

- National Aeronautics and Space Administration
  - Space Technology Mission Directorate, Game Changing Technology Program

- National Institutes of Health
  - National Institute of Biomedical Imaging and Bioengineering
  - Eunice Kennedy Shriver National Institute of Child Health and Human Development
  - National Eye Institute
  - National Institute on Aging
  - National Institute on Deafness and Other Communication Disorders
  - National Institute of Neurological Disorders and Stroke
  - National Institute of Nursing Research

- U.S. Dept. of Agriculture
  - National Institute of Food and Agriculture
National Science Foundation Budget

Budget Authority in billions of constant FY 2012 dollars

Source: National Science Foundation budget requests. FY 2012 figures are latest AAAS estimates and FY 2013 figures are President's request.

© 2012 AAAS
Sample budget for difference programs in ENG Directorate*

**ENG R&RA Budget ($M)**

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<td>248.11</td>
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<td><strong>ENG TOTAL</strong></td>
<td>$833.12</td>
<td>$892.31</td>
<td>$949.22</td>
<td>$56.91</td>
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*P. P. Khargonekar, Presentation at USNC/TAM 2015 Annual Meeting May 1, 2015*
So, you want money to support work...

Why You Want NSF Funding

- Funds curiosity-driven research
- Pays full overhead (no match)
- Provides summer salary support
- Uses the grant mechanism
Start here ->

nsf.org

Then look at NSF’s NSF Grant Proposal Guide!!! Follow the rules or rejection is guaranteed!!!
Preparing the Proposal:

• Start Early (3-6 months before deadline)!
• Review NSF Award Abstracts (Fastlane.org)
• Talk to your NSF Program Director
• Talk to your colleagues; have experienced colleagues review a draft and comment
• Recruit and describe university infrastructure support for your proposed project
• Address the merit review criteria
• Compliance checks (see GPG*)

Program directors

• Program directors are your contacts for becoming a reviewer and panelist

• Available to you for advice and appointments (conference booths, visits to NSF)

• Do your homework before you meet with or call program officers, prepare specific questions
  • They can’t provide much insight about specifics of the program, but they can determine whether your ideas are appropriate for the program

• Program directors can help you find out about other programs and make contacts across the Foundation
Working with your Program Director

• Funding decisions are based on many factors, but not on personal relationships with program directors (merit review process)

• Program Officers should be treated as you would a respected colleague

• They are busy: contact them only when necessary (check the agency web site first) and in a way that allows for an efficient reply (email is preferred)

• Do not contact them when you are upset (following a declination)
Different types of funding

- Doctoral Dissertation Research Improvement Grants
- Post-doctoral Fellowships
- Professional Development Fellowships
- Scholars Awards
- Standard Research Grants (Collaborative)
- Small Grants for Training and Research
- Conference and Workshop Awards
- Other Grant Opportunities
  - CAREER
  - EARly-concept Grants for Exploratory Research (EAGER)
  - RAPID response research (RAPID)
  - Dear Colleague Letters (DCL) – special calls
The proposal process through NSF
Flow of money: types of grants and how money flows

**Standard**

- NSF/Company
  - Total
  - Total - Overhead
  - UU
  - PI/Lab

**Collaborative**

- NSF/Company
  - Total
  - Total - Overhead
  - UU
  - PI/Lab
  - Total1
  - Total1 - Overhead1
  - PI/Lab

**Collaborative as subaward**

- NSF/Company
  - Total
  - Total - Overhead
  - UU
  - PI/Lab
  - Total
  - Total2
  - Total2 - Overhead2
  - PI/Lab
  - Total1
  - Total1 - Overhead1
  - PI/Lab
  - Overhead on subaward
  - Total2
  - Total2 - Overhead2
  - PI/Lab
Flow of money (STTR and SBIR grants)

Money goes to company, then university bills company

*Company applies for the grant and university becomes the partner
CAREER: Faculty Early Career Development Program

• Recognizes and supports the early career-development activities of those educator-scholars who are most likely to become the academic leaders of the 21st century.

• Awardees are selected on the basis of creative career-development plans that effectively integrate research and education in the context of the mission of their institution.

• Untenured faculty (or comparable)

• Single scholar award

• ~$400,000 minimum award, 5-year duration

• Three proposals lifetime limit

• Deadline: usually in July

• “Walk on Water” expectation
EArly-concept Grants for Exploratory Research (EAGER)

• Exploratory work on untested, potentially transformative ideas
• High-risk, high-potential payoff
• $300,000 maximum; 2 years
• Eight page descriptive
• Internal review only
• Contact program officer first
Rapid Response Research (RAPID)

- Research when data are ephemeral (perishable)
- $200,000 maximum; 1 year
- 5 page project description
- Internal review only
- Contact program officer first
Review Process Overview

Two distinct audiences – technical and general

You

Program Director

reviewer

reviewer

reviewer

reviewer

reviewer

reviewer

Panel

Program Director

$ or $
NSF Sources of Reviewers

- Program Officer’s knowledge
- References listed in the proposal
- Google
- Community of Science and other databases
- Reviewer’s recommendations
- Investigator’s suggestions

If you are starting out as faculty member, contact PM to serve on review panel!
Give careful consideration

• Two NSF Merit Review Criteria
• Integration of Research and Education
• Integration of Diversity into projects and activities
• Additional program-specific Review Criteria (listed in the program announcement)
• Institutional data—know thyself and tell the reader.
Two Funding Criteria

1. Intellectual Merit
2. Potential Broader Impacts
Intellectual Merit

• How important is the proposed activity to advancing knowledge and understanding in its own field or across different fields?
• How well qualified is the proposer (individual or team) to conduct the project?
• 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?
Potential Broader Impacts

• Promotes teaching, training and learning

• Broadens the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)

• Enhances the infrastructure for research and education, such as facilities, instrumentation, networks, partnerships

• Disseminates results broadly to enhance scientific and technological understanding

• Benefits society, by enhancing public understanding of science, for example
Data Management Plans

• All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans
• DMPs must be placed in the Special Information and Supplementary Documentation section
• FastLane prevents submission of proposals that are missing DMPs
• The DMP will be reviewed as part of the intellectual merit or broader impacts of the proposal or both.
Budget tips

• Amounts
  • Reasonable, Realistic for work
  • Well-justified, Need-established
  • In-line with Program Guidelines

• Eligible costs
  • Personnel
  • Equipment
  • Travel
  • Other Direct Costs, Subawards
  • Facilities & Administrative Costs (UU 49% overhead)
Major components of a budget

1. Salaries: PI summer salary, grad students, ugrads, classified staff, admins, etc.

2. Equipment: Items > $5000 (No overhead charged)

3. Participant support: Fellowship $$, cost to pay participants for studies (No overhead)

4. In-kind Contributions/cost share

Operating: Supplies, publication costs

Travel: Domestic/Int.

Subaward: (Usually taxes $25K of what goes out)

Tuition

Fringe rate: Percentage of salary

Overhead (49%)

Overhead (49%)

Total
## Budget Example

<table>
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<tr>
<th>YEAR (F&amp;A)</th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>FINAL</th>
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Funding Decisions

• Panel ranks proposal, but program officer make recommendation to fund

• Feedback to PI

• Informal and formal notification

• Scope of work and budget discussions
Who Gets Funded (Ideal World)

- "Typically funded"
- "Almost Always Funded"
- "Gray" Zone
- Almost Never funded

Number of proposals:

Excellent > Very Good > Good > Fair > Poor
How good does your proposal have to be?

Mean Reviewer Ratings, by Method of Review - FY 2014

*Source: NSF Enterprise Information System, 10/10/14.
FY 2010 and FY 2014 Research Proposal Submission Rates, by Division

FY 2010 and FY 2014 Research Proposal Success Rates, by Division

*Source: NSF Enterprise Information System, 10/10/14.*
Number of proposals submitted and success rate

*Source: NSF Enterprise Information System, 10/01/14.*
Reasons for Declinations

- “Trust-me” proposal
- Not feasible
  - Expertise gaps
  - Insufficient funding
  - Too ambitious
- Incremental contribution
- Bad luck
Myths about NSF

• Only funds scholars at elite graduate institutions
• Only funds “famous” academics
• Once declined, you are likely always to be declined
• Only funds “normal science”
• Advisory committees make funding decisions
NSF vs. NIH

- NSF tends to be smaller
- NSF is more open to risky, exploratory, paradigm-challenging work
- NSF stresses basic research
- NSF has no scoring system, percentile system
- NSF program officers make funding decisions
- NSF uses “revision encouragement” loosely
It is useful to submit, even if declined...

- Revise and resubmit
- Discover other funding sources
- Forces thinking
- Builds relationships
- Receive reviews from experts
Commandments for Writing Competitive NSF Proposals

“Thou shalt propose a brilliant idea.”
“Thou shalt read the PAPP, or at least the good parts.”
“Thou shalt get help with proposal writing.”

“Thou shalt spell chek.”
“Thou shalt write for the right audience.”
“Thou shalt not irritate the reviewers.”

“Thou shalt not kill (with some exceptions) too many trees.”

"Thou shalt not steal the work of others."
Final Advice

• Learn to love rejection
• Team up
• E-mail, call, or visit Program Officer with specific questions
• Encourage dissertation improvement grant proposals
• Keep an eye out for new programs