



NSF Grant Opportunities Broader Impacts-A Primer

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National Science Foundation (NSF)

- Created in 1950 as an independent federal agency
- Budget (FY19) ~\$8 billion
- Supports ~25% of federally-funded basic research in U.S. colleges and universities
- >50,000 proposals; ~12,000 new awards per year supporting >350,000 scientists, educators and students



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NSF funds basic research and education in all scientific disciplines

Dr. France Córdova



Director and National Science Board

Biological Sciences

Computer & Information Science and Engineering

Education and Human Resources

Engineering

Geosciences

Mathematical and Physical Sciences

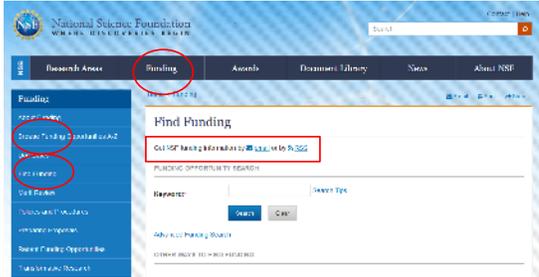
Social, Behavioral & Economic Sciences

*Have programs with interests in the Biological Sciences

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Can Search or Browse funding opportunities: www.nsf.gov



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What types of Proposals are considered?

- Response to General Solicitations
 - e.g., 18-585-MCB General
 - Has embedded sub-Programs
 - Contains information on required elements, due dates, etc
- CAREER Proposals
 - 17-537
 - Foundation wide
 - Asst. Profs, 5 yrs support
 - Due date-July 27, 2020

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RUI

- RUI-Research in Undergraduate Institutions
 - Supports research at Primarily Undergraduate Institutions (PUI). Includes 2-and 4-yr institutions
 - Foundation wide-see RUI page for requirements
 - Submitted to specific programs-contact cognizant Program Director(s) for more details
 - Supports Individual and Collaborative Proposals

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ROA

- Research Opportunity Awards
 - Supports PUI faculty to work on existing project funded by NSF.
 - Awards are made as Supplements to existing project
 - Typically provide Summer Salary + Materials and Supplies
 - Search NSF for existing awards, contact Principal Investigator (PI) to discuss project and how you might fit in. PI then submits Supplement request.

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Collaborative Proposals

- Projects that involve 2 or more institutions.
- May be submitted as single or multiple submissions that are linked
- A lead institutions is designated (who is in the driver's seat), other institution in non-lead
- A Proposal can be submitted as both a Collaborative and RUI

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Dear Colleague Letters (DCLs)

- Windows of opportunities for special programs/initiatives
- Typically short-term
 - **NSF 18-031** Dear Colleague Letter: Rules of Life (RoL): Forecasting and Emergence in Living Systems (FELS)
 - Funded 20 projects, Providing \$300K/2 yrs, to each
 - **NSF 19-058** Dear Colleague Letter: UKRI/BBSRC-NSF/BIO Lead Agency Opportunity in Bioinformatics, Microbiome, Quantum Biology and Synthetic Biology/Synthetic Cell

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How to get funded

- Identify programs that seem to fit your research
- Discuss your idea with a Program Director
- Understand the proposal and review process
- Cover all the bases in your proposal
 - **Intellectual Merit**
 - **Broader Impacts**

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Advice for Writing an Excellent Proposal

- | | |
|--|---|
| • Read the solicitation | • Emphasize creative or innovative aspects |
| • Identify your audience | • Provide proof-of-concept |
| • <u>Frame a big picture</u> | • Describe the expected outcomes |
| • <u>Identify significant needs, gaps, and hypotheses</u> | • Relate the outcomes to what you set out to do |
| • Describe the plan to address the needs, gaps, and hypotheses | • Read the solicitation |

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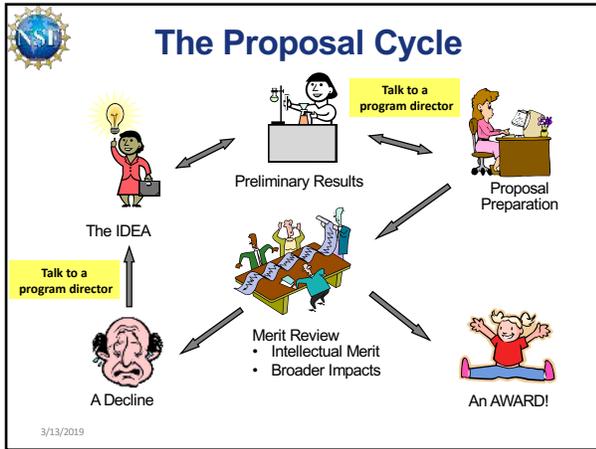


How your proposal will be judged

- Two merit review criteria
 - **Intellectual merit**
 - Potential to advance knowledge and understanding within and across scientific fields
 - **Broader impacts**
 - Potential to benefit society or advance desired societal outcomes
- Highly rated and fundable proposals will be strong in both criteria

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Panel Ranking Rubric

Panel Rating Categories

- High Priority**
 - Strongest in both intellectual merit and broader impacts and/or
 - Most likely to contain transformative ideas
- Medium Priority (3 bins)**
 - High
 - Medium
 - Low
 - Strong in both intellectual merit and broader impacts
- Low Priority**
 - Weaknesses in intellectual merit or broader impacts or both and/or
 - Likely to have incremental impact
- Non Competitive**
 - Seriously flawed in some fundamental way and/or
 - Missing some crucial element or idea
 - Lack of Broader Impacts

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Sample Panel Ranking Board

High Priority	Medium Priority	Low Priority	Non Competitive
Lincoln	Roosevelt (T)	Harding	Buchanan
Washington	Jefferson	Pierce	Johnson (A)
	Truman	Fillmore	
	Roosevelt (FD)	Harrison	
		Tyler	
		Grant	
	Wilson	Taylor	
	Eisenhower	Adams(J)	
		Monroe	
	Jackson		
	Kennedy		

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Common Grant-Writing Mistakes

- Proposal fails to:
 - Follow the guidelines (both PAPPG and Solicitation)
 - Seriously address both merit review criteria
 - Frame a compelling Big Picture-Who Cares?
 - Connect the experimental plan to the Big Picture
 - Lay out an appropriate plan
 - Too ambitious or too narrow
 - Interdependence of aims

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Additional Suggestions

- Don't be afraid to "Think Big". Few proposals push the envelope.
 - But, panels are conservative.
 - Contact a Program Director (or two) in advance if you have a particularly provocative idea.
 - Suggest reviewers
- Read the solicitation(s) carefully. Funding decision are driven, in part, on Cluster/Division priorities.

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Why Broader Impacts?

- NSF supported by taxpayer money-Congress votes on budget
 - Need to stay relevant
- "We need to reach out to Congress and other stakeholders and be proactive in explaining what NSF is about and why we are vital to the nation's future..." France Cordova, 2014
- Such activities were considered as early as the 1960's, but became codified in 1997 with the reduction of review criteria from 7, to 2

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What counts as a Broader Impact Activity?

- **Intrinsic merit of research**
 - Nice to state, but insufficient on its own for many programs.
- **Activities directly related to specific research projects**
 - Involvement of students/K12 teachers in research is common in MCB proposals
 - K12
 - Undergraduates
 - Graduates
 - Post-docs
 - K12 Teachers
- **Activities directly supported by, but are complementary to, the project.**
 - Public outreach (science museums, public talks, public demonstrations, etc)

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Some Examples of Broader Impact Activities

- Some of the following are atypical, but they do represent the breadth of things people are doing.
- More information on all can be found on the MCB Blog site (mcbblog.nsfbio.com)

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Science and Baking



Cell Division Cake

Ahna Skop-Award 1716298.

For every paper she publishes, she bakes a thematic cake, then explains the science behind the design.

Used as hook to explain cell biology to public PI has baking site on Pinterest

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Near-Peer Mentoring



Allyson O'Donnell pairs High School students with trained undergraduates to engage students in her own research-NSF CAREER Award 1902859

Uses Grinnell College developed SURE survey as one assessment tool

She piloted the program and now 6 other labs are doing this at Duquesne. Note integration with CAREER research and teaching along with taking a leadership role at her institution.

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Yeast Art



"Palette" of yeast strains expressing various pigments

Started with Award 0718846 to Jeff Boeke



Acoustic-based nanorobot used to inoculate agar "canvas", yeast grown, then incubated in cold for colors to mature

Used to teach public about pigments and genetic engineering. Also used as clickbait to scientific reports/summaries

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Teaching CRSPR in the Classroom-A new tool for teachers

BioBits Kit-Started with Award to Michael Jewett (1716766)

Used to teach kids about modern genetics and to provide springboard for discussion on Bioethics



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What We Hear from the Community About Broader Impacts

- **The concept is confusing**
 - What's the formula?
 - Pick two from a smorgasbord?
 - How much time should I devote?
 - Can I use existing programs at my institution?
 - How do I pay for this?
 - What if my institution won't support this concept?
 - How do I assess broader impacts?

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More Advice to PIs

- **It's not a formula**
 - Do something that interests you, has measurable outcomes, and matches the time you are willing to devote
 - Go above and beyond what you are already paid to do
- **Ask for money if you need it**
- **Use existing infrastructure, as appropriate-Don't need to reinvent.**
 - But... Give, as well as take-build on something that works at your institution
 - Realize that institutions certify to support your efforts
- **Ask for help with assessment**
- **See National Association for Broader Impacts brochure for more ideas-broaderimpacts.net**

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