Writing a Good NSF Proposal

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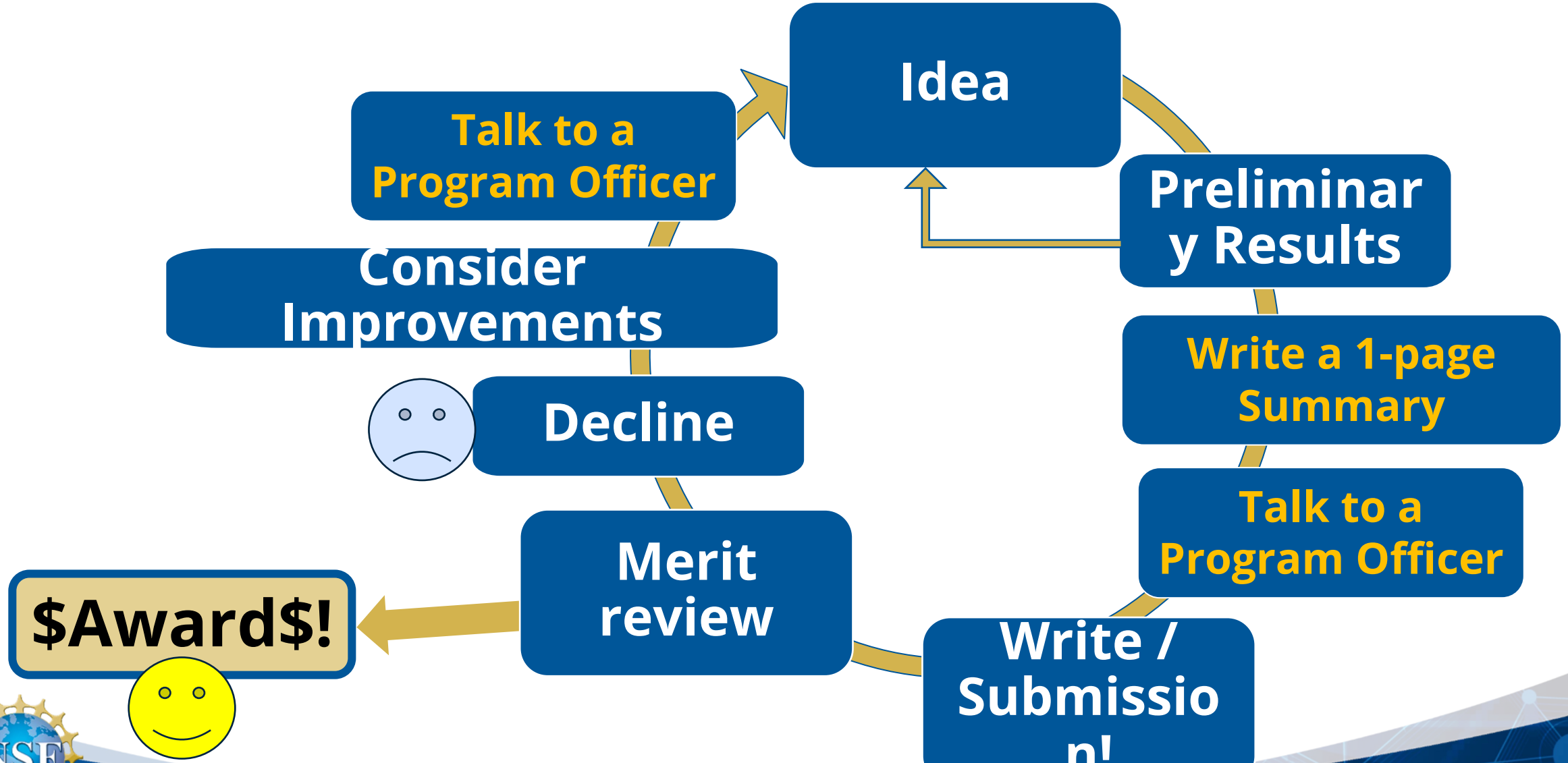
Proposal Submission Process: PI's View



NSF Merit Review Criteria

Intellectual Merit

- Potential to advance knowledge within/across fields
- Creative, original, potentially transformative
- Well reasoned and organized ideas and experiments
- Qualified investigators
- Adequate resources

Broader Impacts

- Potential to benefit society
- Promote training and education
- Enhance infrastructure, resources
- Engage in outreach to community
- The Missing Millions – broadening opportunity

What Makes a Proposal Competitive? Intellectual Merit - *The Good*

- Potential for **high impact; Important**, not just Interesting.
- New, **original** ideas
- Focused, feasible project plan
- Articulated knowledge of subject area and published relevant work
- Experience in essential methods/approaches, and/or collaborator expertise
- Sound, clear, succinct, scientific rationale
- **Realistic** amount of work; sufficient detail; critical approach (pitfalls and alternative hypotheses considered)
- **Well written** and understandable to someone not working directly in the field

Writing a Competitive NSF Proposal

Try to think like a reviewer – often someone not familiar with *your* work in detail.

Are you covering key information on **Intellectual Merit**?

What **Applicants** want to convey

- Present a *new* idea
- Detail the research rationale and approaches
- Explain the expected outcomes and alternative plans
- Demonstrate qualifications
  - Preliminary data
  - Publications

What **Reviewers** look for

- *Impact*: is your project a significant stride or an incremental step in the field?
- *Foundation*: is it based on a sound rationale and data?
- *Feasibility*: can your stated goals be accomplished?

Broader Impacts – Benefiting Society

Teaching, training, and learning (undergrads + grad students)

Broaden participation of underrepresented groups

Build or enhance partnerships (with other organizations, including international)

Broad dissemination to enhance scientific + technological understanding

Enhance infrastructure (labs, equipment, + work in developing countries)

Local impacts (policies @ state + local level)

https://www.researchinsociety.org/

ARIS
Advancing Research Impact in Society

Some Notes on Broader Impacts

- It's not a formula, so it should not be a paragraph at the very end
  - Do something that **interests you**, has measurable outcomes, matches the time you are willing to devote
  - Go above and beyond what you are already paid to do
- Resource your Broader Impacts activities
- 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
- **Assess** whether the activities have the intended outcome
  - Ask for help with this, it's OK!
- See resources at Center for Advancing Research Impact in Society (ARIS); researchinsociety.org

Additional Excellent Features

- **Expected outcomes** are described
  - UNexpected outcomes are considered
- Outcomes explicitly related to original Goal(s)
- Ideally, negative results should be interpretable and meaningful

- Recognition of Reviewers
  - **Easy to read**
  - Neat and tidy
  - Budget is reasonable
  - All relevant and current literature is cited
  - You can (and should) suggest reviewers

How to Get Started…

- Think **broadly** about what basic scientific questions your research might address
- Consider what Broader Impact activities you **want** to propose
- Peruse the NSF website (www.nsf.gov) to identify likely programs
- Contact a Program Director **before** you submit a proposal
  - Email a one-page synopsis of your research idea (tips for synopsis)
  - Ask for feedback; **we are here to help!**

Advice for Writing an Excellent Proposal
More Good!

- Start early!
- Read the solicitation!
- Identify your **audience**
  - Balance between general and specific subject area knowledge
- Frame a **big picture**
- Identify significant needs, gaps, and **hypotheses**
- Describe the plan to address the needs, gaps, and hypotheses
- Emphasize **creative** or innovative aspects
- Provide **proof-of-concept**
  - Preliminary data- especially if approach is new to you, or the field
- Speak with a Program Director
- Reread the solicitation

Common Mistakes: Scientific
The Bad

- Work is too close to what has been done before - **incremental advance** or limited impact
- Project scope is too large or is too narrowly focused to be exciting
- Proposed methods / research plan will not yield results that address the stated goals of the project
- Experimental / theoretical / analytical design is **flawed**
- Aims are **interdependent**
- Failure to be **transparent** in writing
    - Disconnect between what you are Thinking and what the Reviewer Reads *(a copy of you does not come with every copy of the proposal…)*

What You Don't Want to See in Your Reviews

The Ugly

- The PI has not been very productive either during or since the Ph.D.
- The proposal is naïve / overly ambitious
- Potential pitfalls and alternate strategies are not described
- Alternate interpretation of data is ignored
- PI has failed to cite essential literature
- Necessary resources are not available, or the PI does not have demonstrated expertise (collaborators)
- Strong Intellectual Merit, but Broader Impacts are weak

Declination is a Part of the Process

- Stay **Calm** and Do NOT Get Discouraged!
  - Read the reviews and Panel Summary **more than once**
  - Ask others to interpret the reviews for you; gain perspective
  - Reflect on your next moves after you have had time to digest the feedback (Reviews, Panel Summary, PD Comments, Context Statement)
  - **Contact your Program Director**

- **Resubmit** after addressing significant weaknesses
  - Send a Revision, not a Rebuttal
  - Do you need more preliminary data?
  - What were the common themes in the reviews?
  - Is one component better than another?
    - Where are significant strengths that you can build upon for resubmission?

Common Mistakes: Failure to Follow Guidelines

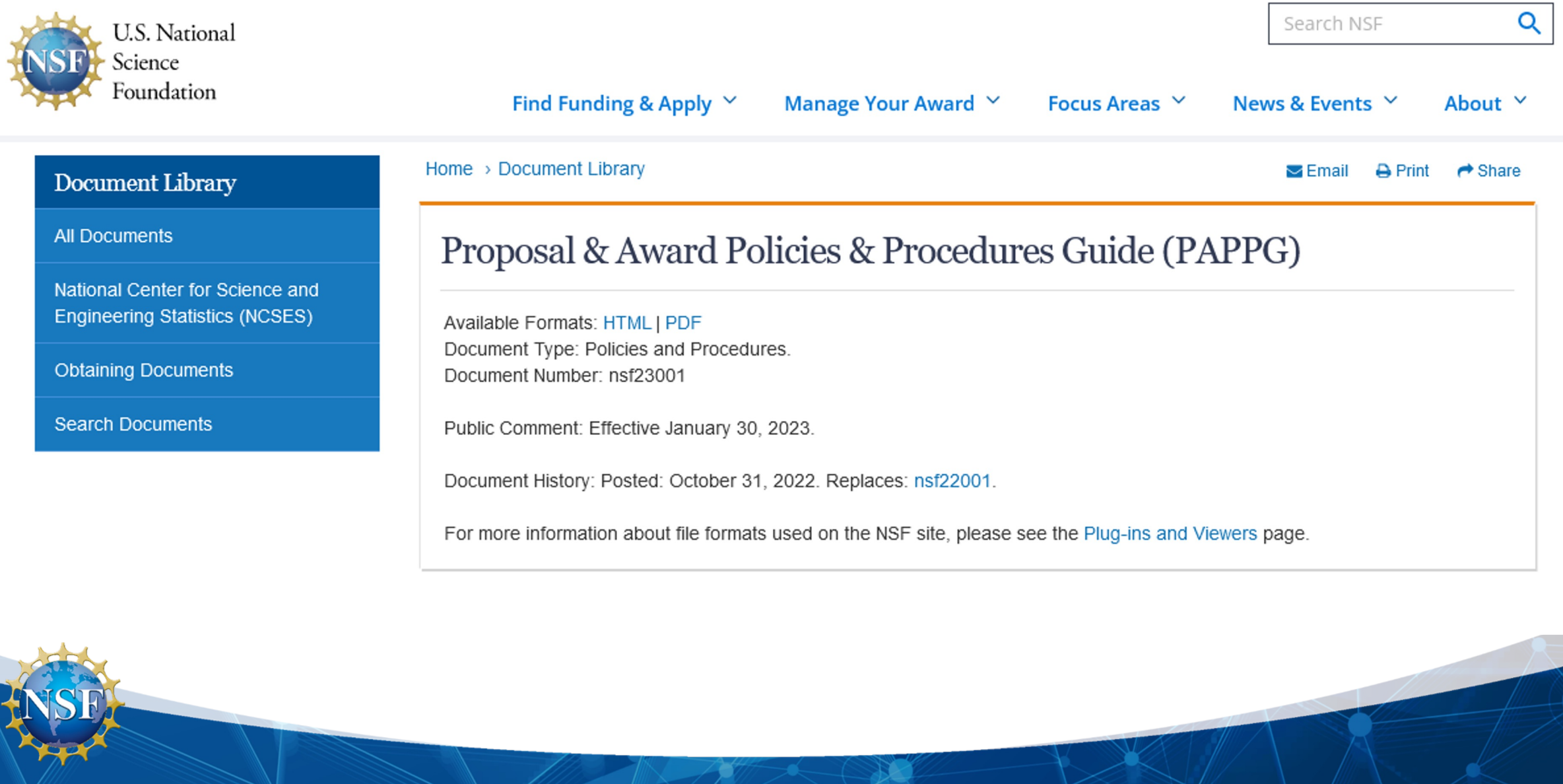
More Ugly!

- Essential documents are missing
  - Departmental letter (if required)
  - Letters of collaboration
- Letters of collaboration are non-compliant
- Extraneous documents are included
- Document is (physically) not easy to read
  - Margins too narrow
  - Font size too small
  - Figures too small or low res. / legends lack detail
  - Excessive use of acronyms

- Sloppy
  - Typos, misspellings, incorrect figure placement
  - Conversion from Word to PDF is inaccurate

DON'T wait until the last minute

General Guidelines for NSF Grants



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PAPPG (NSF 23-1) dated January 30, 2023 (PDF, 3.53 MB)

Summary of Changes to the PAPPG

Table of Contents

Introduction

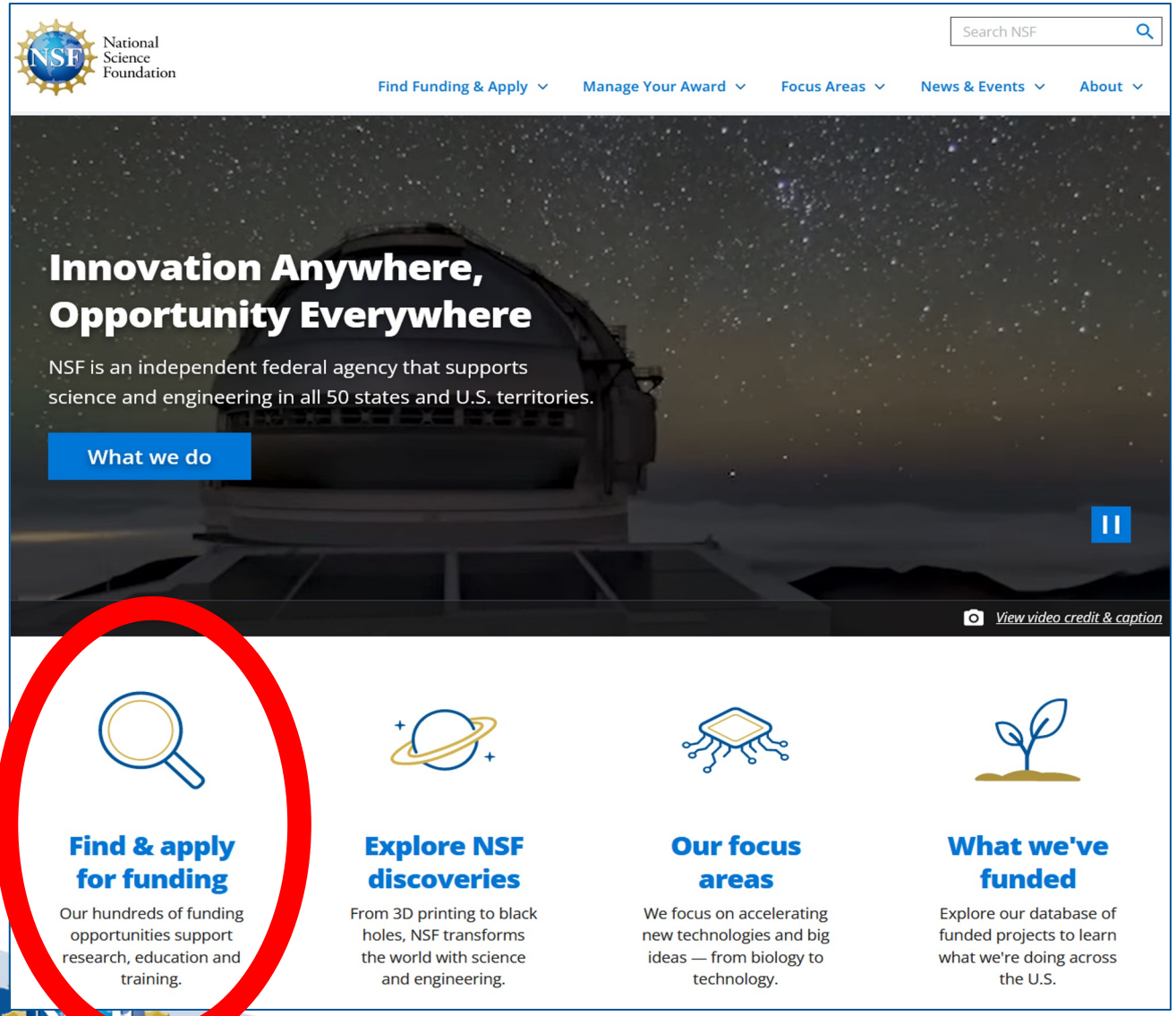
A. About the National Science Foundation

The National Science Foundation (NSF) is an independent Federal agency created by Congress in 1950 to "promote the progress of science; [and] to advance the national health, prosperity, and welfare" by supporting research and education in all fields of science and engineering.

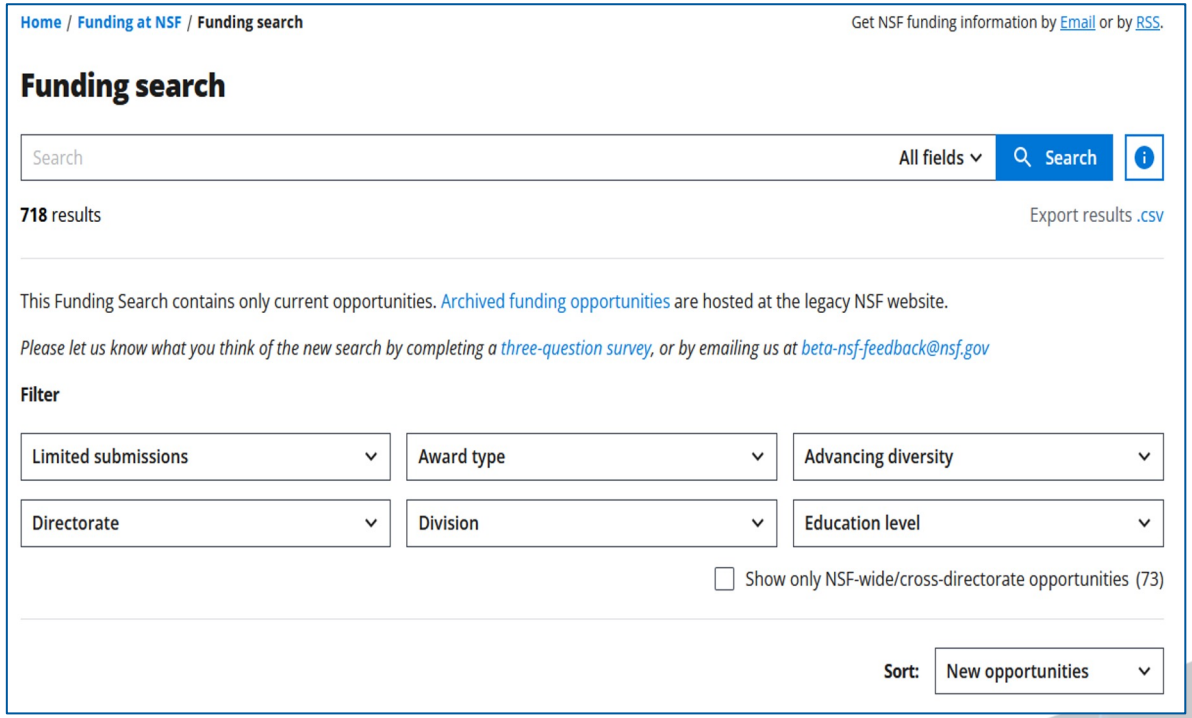
From those first days, NSF has had a unique place in the Federal Government: it is responsible for the overall health of science and engineering across all disciplines. In contrast, other Federal agencies support research focused on specific missions such as health or defense. The Foundation also is committed to ensuring the nation's supply of scientists, engineers, and science and engineering educators.

NSF highly encourages the leadership, partnership, and contributions of individuals who are members of groups underrepresented and/or underserved in STEM education programs and careers in all NSF opportunities. This includes leading and designing STEM research and education proposals for funding; serving as peer reviewers, advisory committee members, and/or committee of visitor members; and serving as NSF leadership, program, and/or administrative staff. NSF strongly promotes and expects that all individuals, including those from groups that are underrepresented and/or underserved in STEM are treated equitably and inclusively in the Foundation's proposal

How to Find Funding Opportunities



https://new.nsf.gov/funding



Solicitation Specific Information

U.S. National Science Foundation

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Document Library

- All Documents
- National Center for Science and Engineering Statistics (NCSES)
- Obtaining Documents
- Search Documents

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Facilitating Research at Primarily Undergraduate Institutions: Research in Undergraduate Institutions (RUI) and Research Opportunity Awards (ROA)

Available Formats: HTML | PDF
Document Type: Program Announcements & Information. View Program Page
Document Number: nsf14579

Document History: Posted: July 1, 2014. Replaces: nsf00144.

For more information about file formats used on the NSF site, please see the Plug-ins and Viewers page.

Facilitating Research at Primarily Undergraduate Institutions:

Research in Undergraduate Institutions (RUI) and Research Opportunity Awards (ROA)

PROGRAM SOLICITATION

NSF 14-579

REPLACES DOCUMENT(S):

NSF 00-144

National Science Foundation
Office of International Science and Engineering
Directorate for Biological Sciences
Directorate for Computer and Information Science and Engineering
Directorate for STEM Education
Directorate for Engineering
Directorate for Geosciences
Directorate for Mathematical and Physical Sciences
Directorate for Social, Behavioral and Economic Sciences
Directorate for Technology, Innovation and Partnerships

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

Proposals Accepted Anytime

Submission deadlines vary by program and proposals must meet program-specific requirements to be considered for review. PIs should contact cognizant program officers for guidance.

IMPORTANT INFORMATION AND REVISION NOTES

Prospective principal investigators (PIs) should contact disciplinary program officers to identify specific NSF programs and determine the feasibility and timing of a Research in Undergraduate Institutions (RUI) or Research Opportunity Awards (ROA) request. For general questions see: https://www.nsf.gov/crssprgm/rui_roa/contacts.jsp.

B. Eligible principal investigators for RUI/ROA proposals must be employed by or have a commitment to be employed by an eligible home institution (i.e., a predominantly undergraduate institution) at the time the proposal is submitted. Co-principal investigators may be from other institutions or from doctoral departments.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Research.gov or Grants.gov.

- Full Proposals submitted via Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov*. The complete text of the *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via Research.gov. PAPPG Chapter II.E.3 provides additional information on collaborative proposals.

See PAPPG Chapter II.D.2 for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the PAPPG instructions.

In general, preliminary proposals or letters of intent are not required for RUI proposals or proposals with an ROA component. If

Solicitation Specific Information

intent if instructed to do so by the cognizant program officer.

i. RESEARCH IN UNDERGRADUATE INSTITUTIONS (RUI) PROPOSALS

Unlike standard NSF proposals, RUI proposals must contain the following as supplemental documents:

1. a Certification of RUI/ROA Eligibility (see below); and
2. a separate RUI Impact Statement (see below).

The format of a RUI proposal must otherwise follow the guidelines in relevant program solicitations and the PAPPG (or the NSF Grants.gov Application Guide). ***Note: when in conflict, solicitation guidance takes precedence.*** The following additional guidance for certain sections is provided to facilitate the preparation of an RUI proposal.

Solicitation Specific Information

- Lack of information or non-conformity can result in a proposal deemed non-compliant
- Omission of specific information
  - In the solicitation has no deadline, an updated file may be made to become compliant
  - For solicitations with deadlines, proposals are RWR – Returned without Review

NSF Needs You!