Division of Molecular and Cellular Biosciences (MCB)

Virtual Office Hours

Welcome!

We will begin at 2pm ET

Questions and Answers

Submit your questions via the Q&A box on your screen

- You may elect to submit your question anonymously.
- For specific questions about your project, please contact a Program Director.

Next MCB Virtual Office Hour

May 8, 2024: Faculty Early Career Development Program (CAREER)

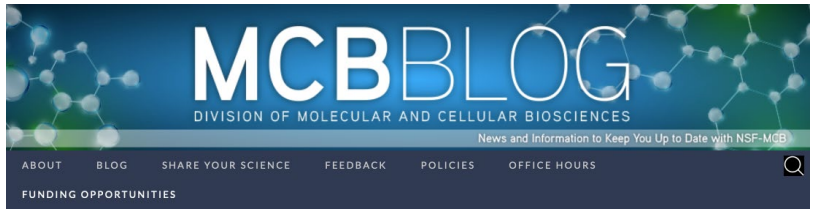
MCB Virtual Office Hour

Today's Topic:

How to Write a Great NSF Proposal

Richard Cyr-rcyr@nsf.gov

Slides and recordings of past presentations at
https://mcbblog.nsfbio.com/office-hours/2/

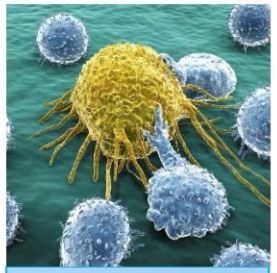


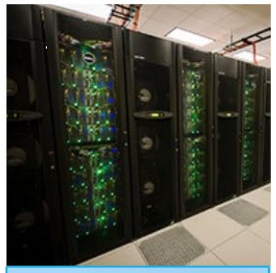
Note: underlined text = hyperlinks

National Science Foundation

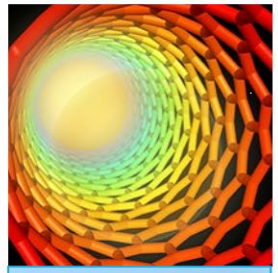
- **Funding for basic research and education across all STEM disciplines since 1950.**
- **Supports 24% of all federally-funded basic scientific research.**
- **FY23 at a glance:**
  - Budget: $10.9 billion
  - ~39,000 proposals
  - ~11,000 competitive awards to ~352,000 scientists, educators and students
  - Overall funding rate of 28%

NSF Organization – 8 Directorates and 2 Offices

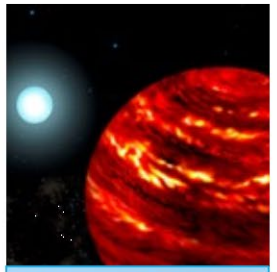

Biological Sciences *


Computer & Information Science & Engineering *


STEM Education *

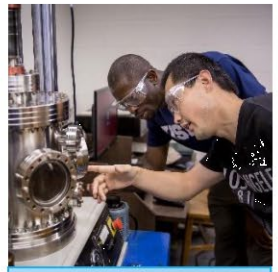

Engineering *


Geosciences *


Mathematical & Physical Sciences *


Social, Behavioral & Economic Sciences


Technology Innovation & Partnerships * Newest!


Integrative Activities *


International Science & Engineering *

* Fund biological research projects

Funding Opportunities for International Collaboration

Partnerships with International Agencies for Collaborative Proposals:

- French Agence Nationale de la Recherche (ANR); NSF 24-015
- German Deutsche Forschungsgemeinschaft (DFG); NSF 22-015
- Indian Department of Biotechnology (DBT); NSF 24-054
- US-Israel Binational Science Foundation (BSF); NSF 20-094
- Swiss National Science Foundation (SNSF); NSF 23-049
- UK Research and Innovation (BBSRC); NSF 23-143

Supplemental Funding for Collaborations between NSF and European Research Council Awardees

Supports NSF awardees for research visits to appropriate ERC-funded European research group; NSF 24-053

NSF Merit Review Criteria

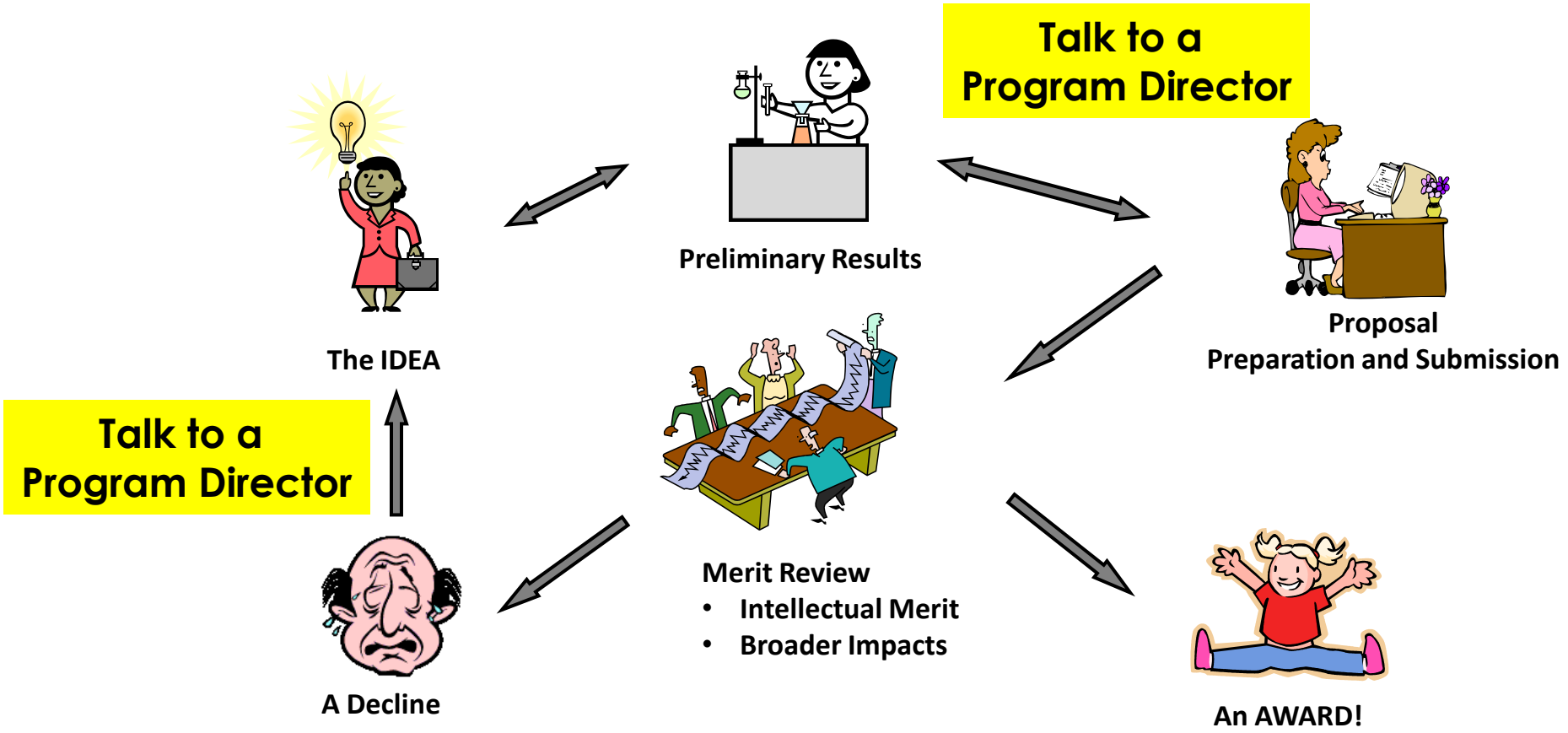
Intellectual Merit:

- Potential to advance knowledge
- Qualifications of the investigators
- Creativity and originality
- Organization of the ideas/experiments
- Access to resources
- Potentially transformative research?

Broader Impact:

- Promoting teaching, training, and education
- Enhancement of infrastructure for research and education
- Community resources and outreach
- Participation of underrepresented groups
- Benefits to society

Proposal Cycle from PI's Perspective



Panel Rating Categories

OUTSTANDING

- **Strongest in <u>both</u> Intellectual merit and Broader impacts**
- Most innovative and bold

HIGH PRIORITY

- **Strong in <u>both</u> Intellectual Merit and Broader Impacts**
- Innovative and bold
- Only minor issues

MEDIUM PRIORITY

- **Potentially strong in <u>both</u> Intellectual Merit and Broader Impacts**

  but

- One or more issues dampen enthusiasm

LOW PRIORITY

- **Significant weaknesses in Intellectual Merit <u>or</u> Broader Impacts, or both**

  and/or

- Likely to have **incremental impact** (i.e., confirmatory work)

NON-COMPETITIVE

- **Seriously flawed in Intellectual Merit <u>or</u> Broader Impacts**

  and/or

- Missing crucial elements related to these merit criteria

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 summary of your research idea
    (see Feb 14, 2024, VOH slides for tips on 1-page summary)
  - Ask for feedback; **we are here to help!**

What Makes a Proposal Competitive?
The Good

- Potential for **high impact-Important**, not just Interesting.
- New, **original** ideas
- Focused, feasible project plan
- Articulated knowledge of subject area, published relevant work
- Experience in essential methods or approaches, and/or collaborator expertise
- Sound 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

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

Additional Excellent Features

- **Expected outcomes** are described
  - Unexpected outcomes 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

Common Mistakes: Scientific

The Bad

- Work is too close to what has been done before - i.e., **incremental advance** or limited impact
- Project has too large a **scope** 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.
- Medically motivated
  - Careful, OK to mention disease in Broader Impacts

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
- Proposal is Strong in Intellectual Merit, but Broader Impacts are weak

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 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

Some Notes on Broader Impacts

- 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
- How will you know the activities have the intended outcome?
  - Ask for help with **assessment**
- See resources at Center for Advancing Research Impact in Society (ARIS); researchinsociety.org (see June 7, 2023, VOH slides)

What about Medical Research?

- Biological research on mechanisms of disease in humans, including on the etiology, diagnosis, or treatment of disease or disorder, is normally not supported.
- Biological research to develop animal models of such conditions, or the development or testing of procedures for their treatment, also are not normally eligible for support.

NSF Proposal & Award Policies and Preparation Guide (PAPPG 23-1)

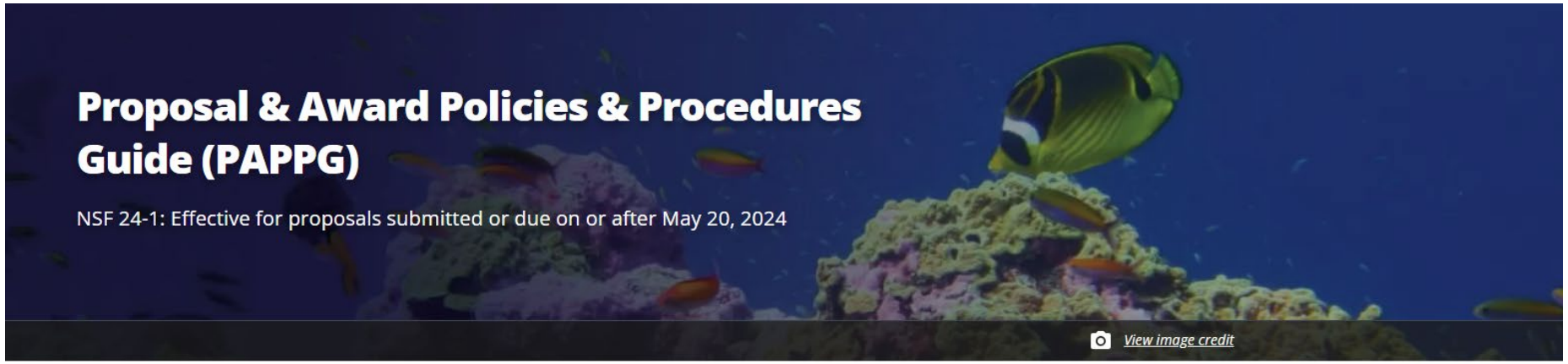
Contact a Program Director!
(send ~1-pg summary)

- However, use-inspired basic research with societal benefits (such as future implications for human health) can be supported.
- For example, research on:
  - Mechanisms of DNA damage and repair – **YES**
    DNA repair pathway/enzyme as drug target – **NO**
  - Fundamental questions about viral structure, replication, evolution, etc. – **YES**
    Therapeutic interventions against infection – **NO**
  - Mechanisms underlying cell motility – **YES**
    Metastasis of tumor cells – **NO**

New PAPPG 24-1 is coming soon

NSF 24-1 - **effective date May 20, 2024**

Summary of Changes: https://new.nsf.gov/policies/pappg/24-1/summary-changes



Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 24-1)

- PAPPG - printable version (PDF)
- Summary of Changes to the PAPPG
- Table of Contents
- Introduction +
  - A. About the NSF
  - B. Foreword
  - C. Acronym List
  - D. Definitions
  - E. NSF Organizations

PAPPG (NSF 24-1) dated January 22, 2024 (PDF, 2.94 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

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
  - 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
  - Do you need more preliminary data?
  - What were the common themes in the reviews?
  - Is one component better than another?
  - Are there significant strengths that you can build upon for resubmission?

Upcoming…

Office hours:

- Wed May 8th, 2024, 2-3 pm ET
  Faculty Early Career Development Program (CAREER)
- Wed June 12th, 2024, 2-3 pm ET
  Meet MCB Program Directors

Funding opportunity deadlines:

- April 23, 2024: Preliminary proposals for participation in Ideas Lab on Use-inspired Acceleration of Protein Design (NSF 24-550)
- May 1-July 1, 2024: Building Research Capacity of New Faculty in Biology (NSF 22-500)
- June 11, 2024: Global Centers – Use-Inspired Research Addressing Global Challenges through the Bioeconomy (NSF 24-556)
- July 24, 2024: CAREER (NSF 22-586)
- July 31, 2024: Research Experiences for Teachers Sites in Biological Sciences (BIORETS) (NSF 21-584)

See Funding Opportunities page on MCB blog for other relevant funding calls.

Use-Inspired Acceleration of Protein Design (USPRD)

USPRD seeks to advance protein design and its applications:

- **Use-driven applications** for small binders
- The design and use of **enzymes** and families of enzymes

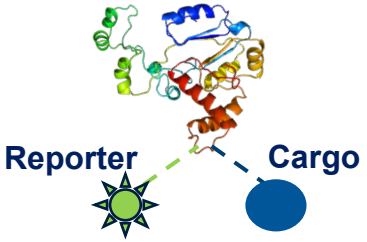
Focus on use-inspired translational research with applications beyond human therapeutics.

Examples: Advanced materials, biomanufacturing, agriculture and food security, environmental remediation, sustainability, climate-related challenges etc.

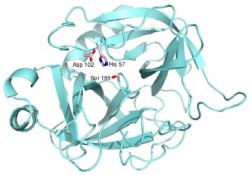
Only teams/groups formed during a special **Ideas Lab Workshop** may be eligible to submit full proposals.

By invitation only, based on a 2-page preliminary proposals.

Small Binders



Enzymes



Preliminary proposals to participate are due **April 23, 2024** (see solicitation for required documents)
Ideas Lab Workshop will take place **on June 10-14, 2024**, in the vicinity of Alexandria, VA

Figures adapted from chemistry.harvard.edu; wikiversity.org