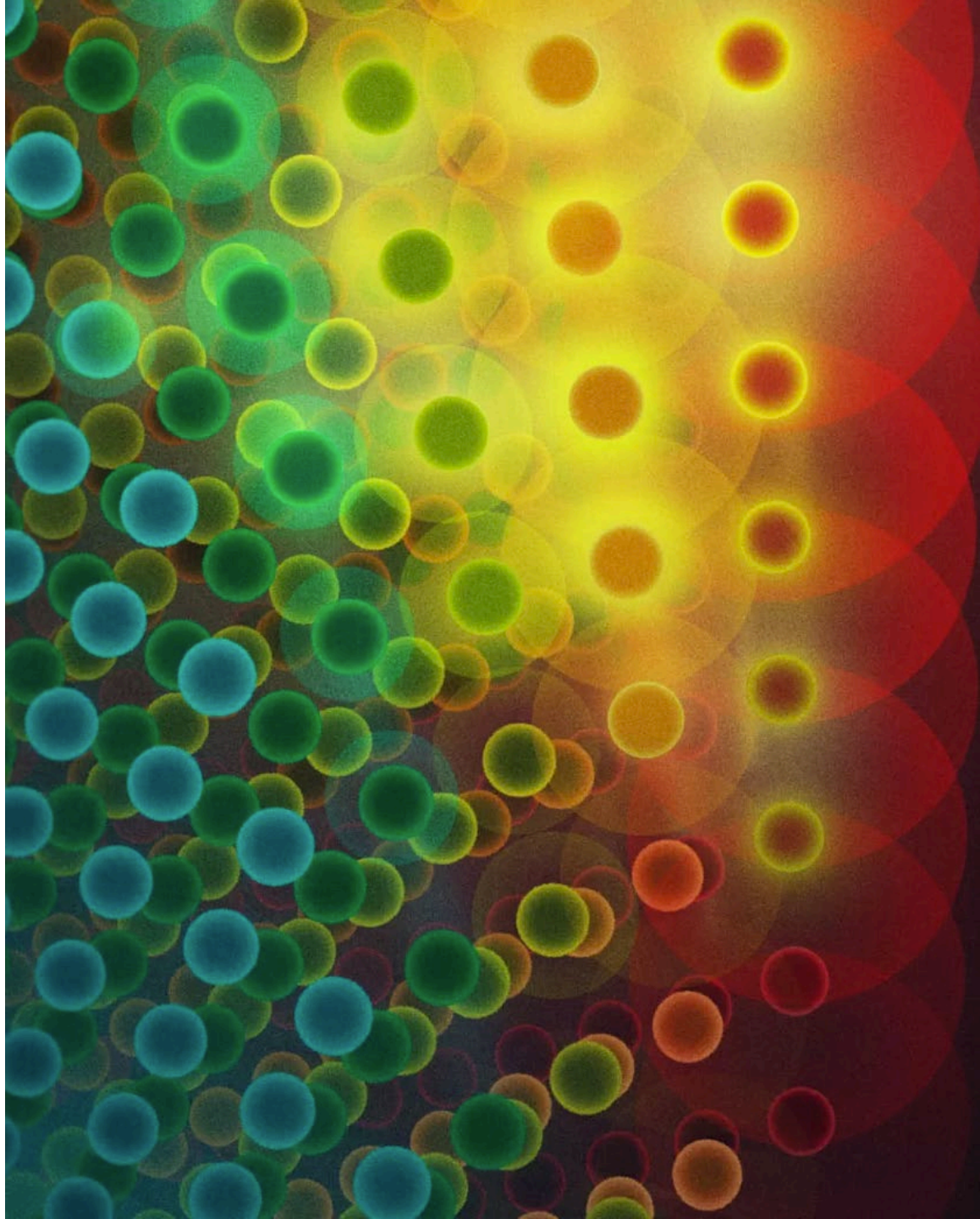
NSF Division of Molecular and Cellular Biosciences (MCB)

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

Visit www.nsf.gov and 'Sign Up' for emails on choice topics (news, event notices, etc.)

MCB Virtual Office Hour

Today's Topic:

Tips on Writing a Competitive NSF Proposal

Diana Chu (dschu@nsf.gov)

Manju Hingorani (mhingora@nsf.gov)

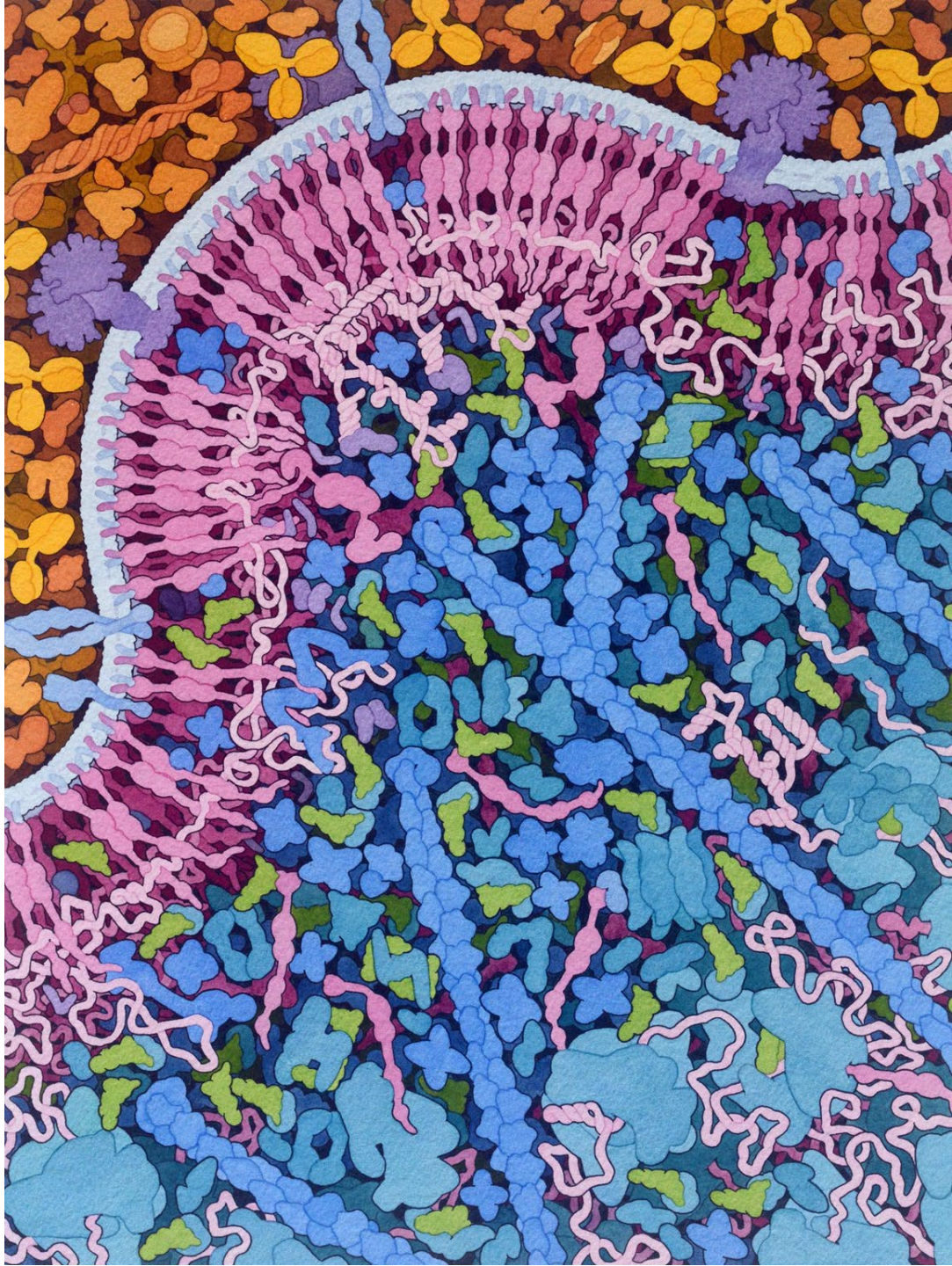
Slides and recording will be available shortly at the NSF Events page

https://www.nsf.gov/events

(search for "MCB")

What does the U.S. National Science Foundation Support?

- Basic research and education across all STEM disciplines since 1950.
- 24% of all federally-funded basic scientific research.
- Keep up with changes at NSF, including updates on NSF policies and priorities: https://www.nsf.gov/executive-orders



What does Molecular and Cellular Biosciences Fund?

Molecular Biophysics

Computational and experimental research on the structure, dynamics and function of biomolecules, supramolecular assemblies and their interactions.

Genetic Mechanisms

Fundamental mechanisms involved in the organization, dynamics, processing, expression, regulation and evolution of genetic and epigenetic information in diverse organisms.

Cellular Dynamics and Function

Interdisciplinary research aimed at mechanistic understanding of the structure, function and evolution of cellular and subcellular systems across the tree of life.

Systems and Synthetic Biology

Systems biology or synthetic biology approaches to understand molecular and cellular mechanisms in established, new, or emerging model systems.

Core Programs in MCB: Solicitation NSF 24-539 **No deadline – submit proposal anytime**

MCB and Administration Priorities

"How can the U.S. secure its position as the unrivaled world leader in **critical and emerging technologies*** — such as **artificial intelligence, quantum information science, and nuclear technology**…"

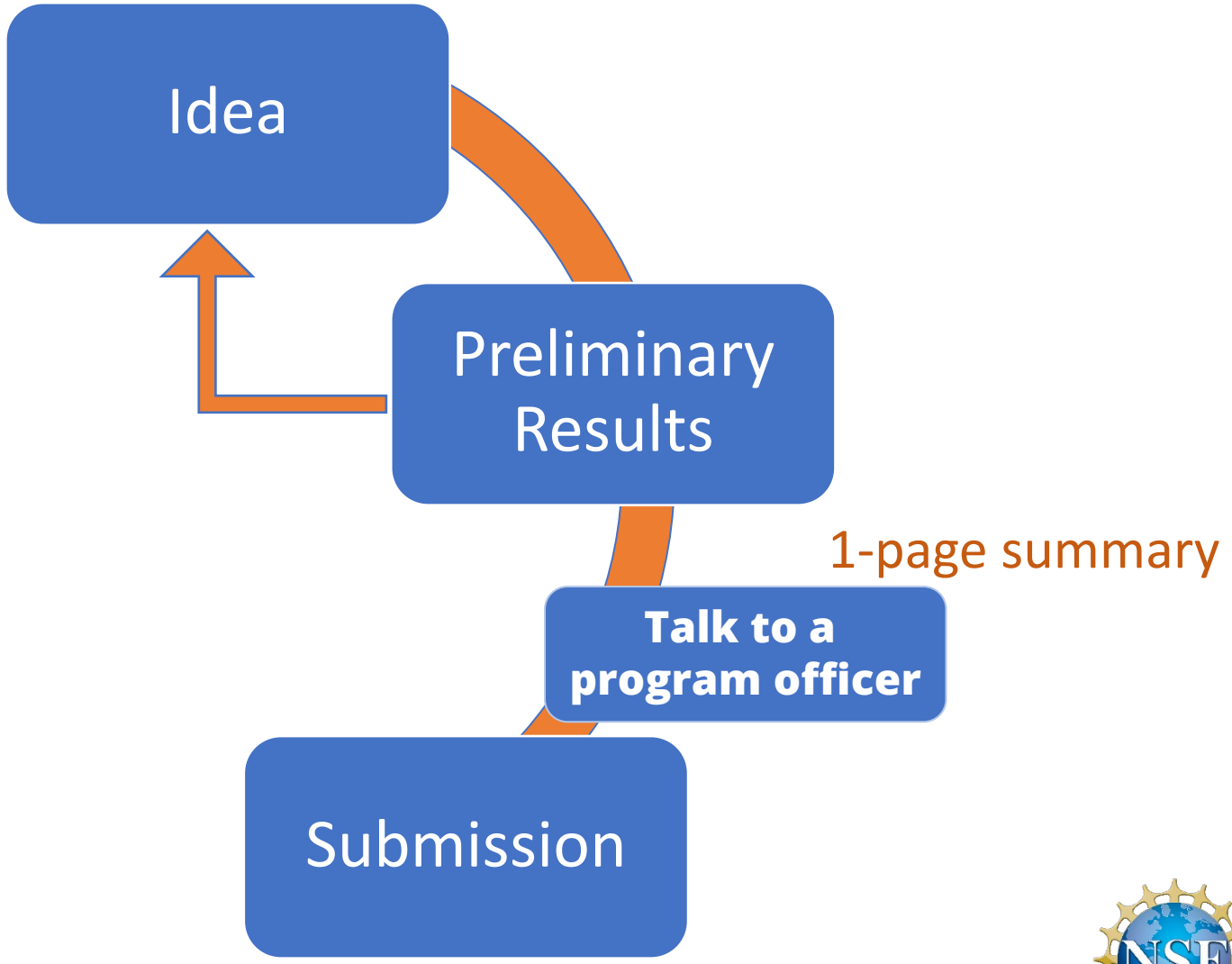
*** includes biotechnology**

- *Letter from President Trump to Michael Kratsios, Director of the White House Office of Science and Technology Policy (OSTP)*

Most MCB science can connect to one of these areas

How does the NSF Review Process Work?

Proposal Cycle from a PI's Perspective: Until Submission



Proposal Cycle from a PI's Perspective: After Submission

NSF Merit Review Criteria

PAPPG 24-1

Intellectual Merit

Potential to advance knowledge within/across fields

- Creative, original, potentially transformative concepts
- Well reasoned and organized ideas and experiments
- Qualified investigators
- Adequate resources

Broader Impacts

Potential to benefit society

- Well reasoned, organized and resourced plans to (for example):
  - Promote STEM training and education
  - Enhance infrastructure, resources
  - Improve national security, economy
  - Increase public engagement
  - Broaden participation of ALL individuals in STEM

Note: Broader impacts include fundamental research outcomes that benefit society, e.g., lead to novel approaches/applications to address societal challenges.

MCB 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

Reviewer Ratings

Excellent

Very Good

Good

Fair

Poor

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

Preparing a Strong NSF Proposal

- Get some feedback on your ideas
- Grant writing tips
- What reviewers need
- What reviewers don't want
- Q and A

Core Programs in MCB: Solicitation NSF 24-539
No deadline – submit proposal anytime

Get some Feedback…

- Think **broadly** about what basic scientific questions your research might address in the context of your field and beyond
- Consider what broader impact activities you want to propose
- Peruse the NSF website to identify likely programs (www.nsf.gov)
- Contact a Program Director **before** you submit a proposal
  - Email a 1-page summary of your research idea
  - Ask for feedback - we are here to help!

Your 1-page Project Summary

Describe your **research idea**. Include:

- Brief introduction to research field
- Motivation ("what" and "why" in the context of current state/gaps in field)
- Specific hypotheses/questions driving the project
- Plan to address them (cover the "how" with specific aims)
- Expected outcomes (how they support/refute hypothesis)
- Anticipated impact in/beyond the field
- Particularly novel, innovative, or transformative aspects

Outline your **broader impacts interests and goals**. Include:

- Brief description of motivation, how many participants, plans, and impacts for proposed activities.

Who is Your Audience?

Panelists and Program Directors

- Generalists in the programmatic area for your proposal (e.g., development biologists (both plant and animal))

Ad Hoc reviewers

- Experts in your specific area
- You should recommend 4-5 reviewers

Advice for Writing an Excellent Proposal: Scientific Soundness

Generate excitement and convey the potential of the work

- Brief introduction to research field
- Motivation ("what" and "why" in the context of current state/gaps in field)
- Preliminary data - Provide proof-of-concept especially if approach is new to you, or the field
- Specific hypotheses/goals/questions driving the project
- Sound scientific rationale for each aim that relates to hypothesis/goal
- Expected outcomes (how they support/refute hypothesis)
- Anticipated impact in/beyond the field
- Particularly creative, innovative or transformative aspects

Advice for Writing an Excellent Proposal: Why?

Generate excitement and convey the potential of the work

- Brief introduction to research field
- Motivation ("what" and "why" in the context of current state/gaps in field)
- Preliminary data - Provide proof-of-concept especially if approach is new to you, or the field
- Specific **hypotheses**/goals/questions driving the project
- Sound scientific rationale for each aim that relates to hypothesis/goal
- Expected outcomes (how they support/refute hypothesis)
- Anticipated impact in/beyond the field
- Particularly creative, innovative or transformative aspects

Advice for Writing an Excellent Proposal: Potential Impact

Generate excitement and convey the potential of the work

- Brief introduction to research field
- Motivation ("what" and "why" in the context of current state/gaps in field)
- Preliminary data - Provide proof-of-concept especially if approach is new to you, or the field
- Specific hypotheses/goals/questions driving the project
- Sound scientific rationale for each aim that relates to hypothesis/goal
- Expected outcomes (how they support/refute hypothesis)

- Anticipated impact in/beyond the field
- Particularly creative, innovative or transformative aspects

Make it stand out – create a section, use bolding, restate in key places

Advice for Writing an Excellent Proposal: Broader Impacts

Broader impacts interests and goals

- Description of motivation and need
- Past experience/preparation
- Plans for engagement
- How many participants, recruitment, activities
- Assessment and impacts for proposed activities

Tips on Broader Impacts

- Do something that **interests you** and has measurable outcomes
  - Go above and beyond what you are already paid to do

    Don't rely only on past activities as the description
- 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)

Updated NSF Guidance on Broadening Participation

Broadening participation activities (e.g., outreach) for Broader Impacts*

Investigators should prioritize the first six* broader impacts goals as defined by the America COMPETES Reauthorization Act of 2010. Investigators wishing to address goal seven — expanding participation in STEM for women and underrepresented groups — must ensure that all outreach, recruitment, or participatory activities in NSF projects are open and available to all Americans.

Investigators may conduct these types of engagement activities to individuals, institutions, groups, or communities based on protected characteristics only as part of broad engagement activities. Investigators may also expand participation in STEM based on non-protected characteristics, including but not limited to institutional type, geography, socioeconomic status, and career stage. However, engagement activities aimed at these characteristics cannot indirectly preference or exclude individuals or groups based on protected characteristics.

* https://www.nsf.gov/updates-on-priorities

* (i) Increase US economic competitiveness; (ii) Advance American public health and welfare; (iii) Support US national defense; (iv) Enhance partnerships; (v) Develop American STEM workforce; (vi) Improve US public science literacy and engagement.

Advice for Writing an Excellent Proposal

Checklist:

- ❑ Potential for **high impact – important**, not just interesting
- ❑ New, **original** ideas
- ❑ Focused, **feasible** project plan
- ❑ **Realistic** amount of work; sufficient detail (pitfalls and alternative hypotheses considered)
- ❑ Demonstrate knowledge of subject area; published relevant work
- ❑ Experience in methods or approaches, and/or collaborator expertise
- ❑ **Well written** and understandable to those who do not work directly in the field, and with enough detail for subject matter experts

The process can make your science better

Start early!

- ask colleagues to pre-review to help you gain perspective
- get examples

Ask for help

- get collaborators or partners for where you lack expertise

Consider the busy reviewers perspective

- easy to read
- key info easy to find
- hone your pitch

You have control of these steps!

Anticipate the Common Intellectual Merit ‘weaknesses’

- Work is an **incremental** advance or has limited impact
- Project has too large a **scope** or is too narrowly focused to be exciting
- Experimental / theoretical / analytical design is **flawed**
- Aims are **interdependent**
- **Alternative outcomes**, potential **pitfalls and alternate strategies** are not considered or described
- The PI has not been very productive
- PI has failed to cite essential literature
- Necessary resources not available, or the PI does not have demonstrated expertise
- Proposal is strong in Intellectual Merit, but Broader Impacts are weak, or vice versa

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 24-1)

Contact a Program Director!
(send 1-page summary)

- However, use-inspired basic research with societal benefits/ broader impacts (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**

Avoid a Common Mistake: Failure to Follow Guidelines

- 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!

Declination is a Part of the Process

- **DO NOT** get discouraged! - Be persistent and resilient
  - Take time - 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 (Panel Summary, Reviews, PD Comments)
  - **Contact your Program Director**

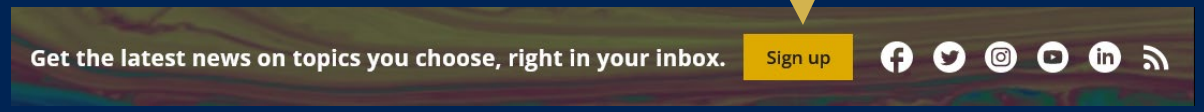
- **Resubmit** after addressing significant weaknesses
  - What were the common themes in the reviews?
  - Do you need more preliminary data?
  - Is one component better than another?
  - What are significant strengths that you can build on for resubmission?

BIO News and Updates

Sign-up for:

- emails on new solicitations, events, and due date reminders
- BIO's quarterly newsletter, including information on new priorities and solicitations, highlights from the community, and more

Visit www.nsf.gov and scroll down until you see the Sign up and social media banner, click on the yellow box, and follow the prompts.



Q: How is NSF implementing executive orders?

NSF continues to apply the statutorily required Intellectual Merit and Broader Impacts review criteria, as well as any solicitation-specific review criteria.

For additional information on implementation of recent executive orders, please visit https://www.nsf.gov/executive-orders.

For information on NSF's updated policies, please visit https://www.nsf.gov/updates-on-priorities.

Questions?