Getting Funded by NSF: Proposal Preparation and the Merit Review Process

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Presentation Outline

- Mission and workings of the NSF
- Merit Review process
- Foundations of an NSF proposal
- Special considerations for the CAREER proposals
- The key do's and don'ts
- The next steps

Motivation

BEAT THE FUNDING RATE BY IMPROVING YOUR PROPOSAL!

NSF Introduction

GOALS & MECHANISMS

NSF Strategic Goals

Strategic Goal 1: Transform the Frontiers of Science and Engineering

"to promote the progress of science"

Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education

"to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes"

What NSF Does

- Supports all fields of fundamental science and engineering, except for medical sciences.
- Ensures that research is integrated with education so that today's revolutionary work will also be training tomorrow's top scientists and engineers.

NSF By the Numbers

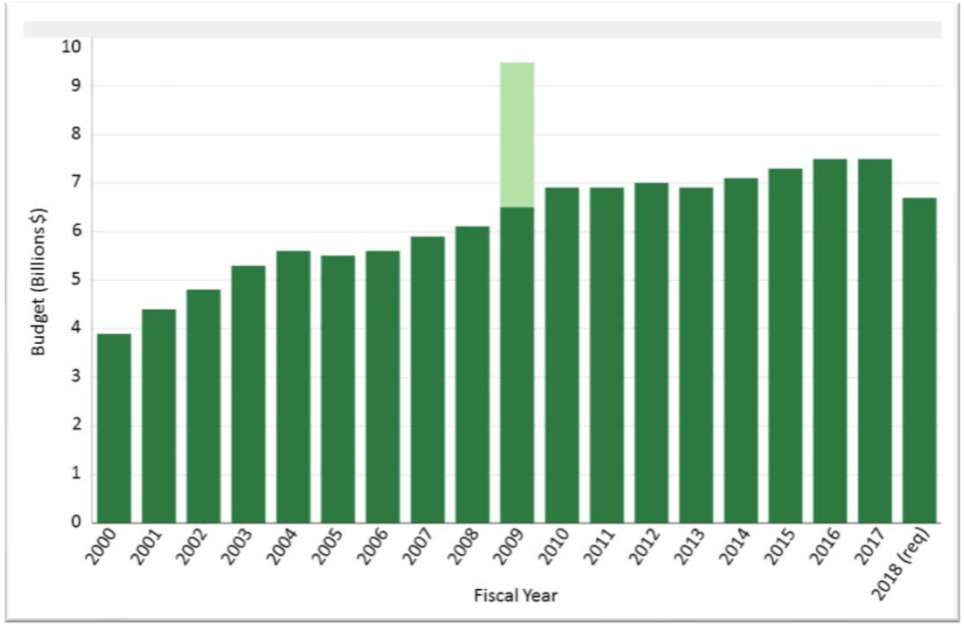
$8.1B FY 2019 Budget

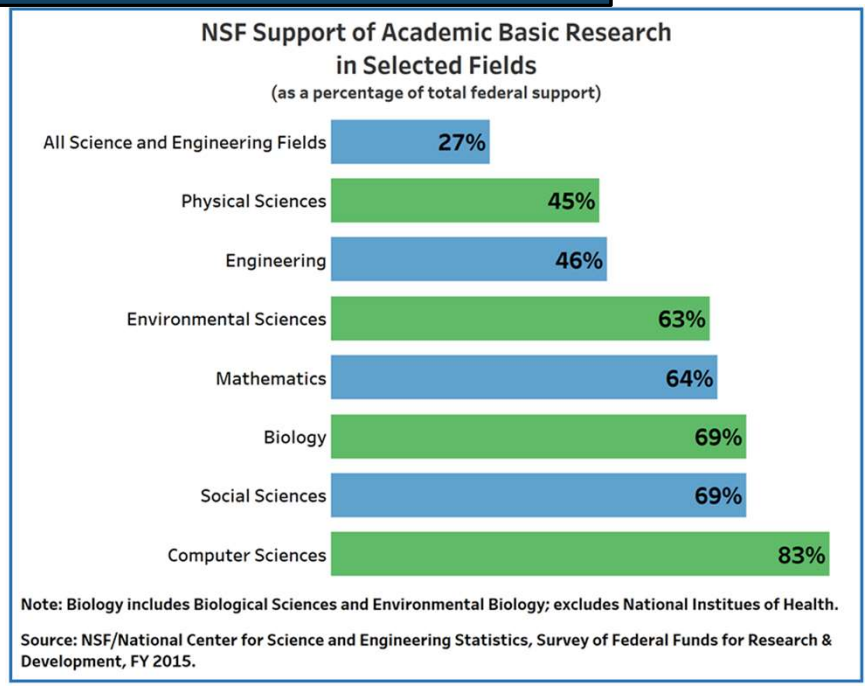
48,300 Competitive proposals

11,700 Awards Funded

1,800 Institutions Funded

386,000 People Supported





Funding Mechanisms

- **Core/Unsolicited:** Usually supports one graduate student and one month PI salary
  - Individual/small collaborative teams: funds increase for collaboration
- **Solicitations:** Small to large funding size; multiple divisions can be involved
  - Special research call – DMREF, NRI, SNM
  - *Early Career – CAREER*
  - Instrumentation – MRI
  - Centers – ERC, STC
- **EAGER, RAPID** (external review not required)
- **Workshops/Conferences**
- **Supplemental awards** (e.g., REU, travel stipends)

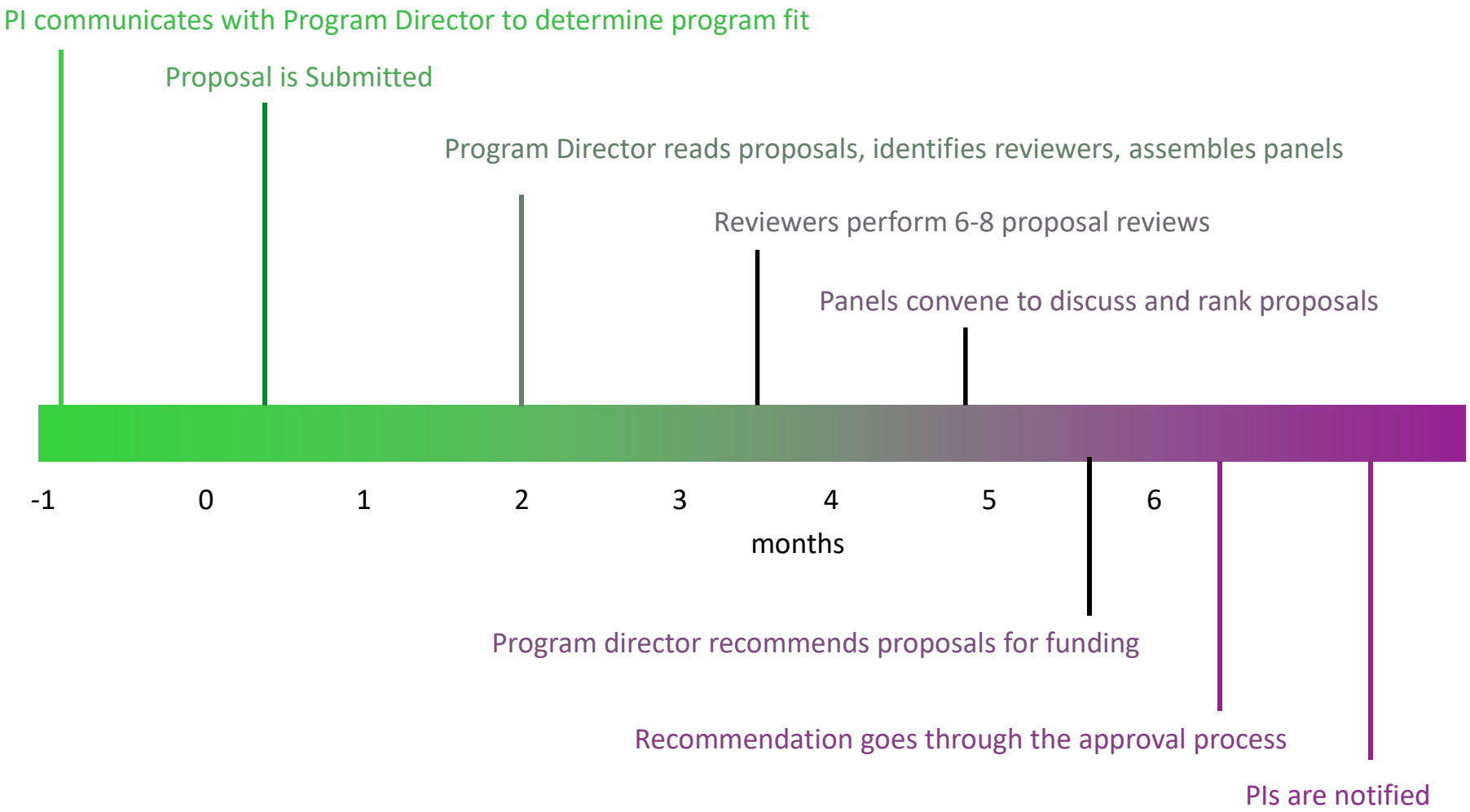
NSF Supports Basic Research

- Not mission driven → not applied research
- Winning proposals focus on research, not development
- If the focus of the proposal is an artifact (a device, system, product, process,…) → it's probably development
- If the focus of the proposal is knowledge (the truth of a hypothesis) → it's probably research

Merit Review Process

TIMELINE & RUBRICS

Merit Review Timeline



Merit Review Criteria

Intellectual Merit: How important is the proposed activity to **advancing knowledge and understanding** within its own field or across different fields?

Broader Impacts: What is the potential for the proposed activity to **benefit society** or advance desired societal outcomes?

The Five Elements of Merit Review

1. What is the potential for the proposed activity to:
   - advance knowledge and understanding within its own field or across different fields (**Intellectual Merit**); and
   - benefit society or advance desired societal outcomes (**Broader Impacts**)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?

The Five Elements of Merit Review (2)

3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?

4. How well qualified is the individual, team, or institution to conduct the proposed activities?

5. Are there adequate resources available to the PI (either internally or through collaborations) to carry out the proposed activities?

How to Achieve Broader Impact?

NSF Mission: To promote the progress of science; advance the national health, prosperity, and welfare; and to secure the national defense

Broader Impact: Advancement of scientific knowledge and activities that contribute to the achievement of societally relevant outcomes

Can be accomplished through:

- the research itself,
- the activities that are directly related to specific research projects,
- through activities that are supported by, but are complementary to, the project.

Broadening Participation is <u>one</u> Broader Impact goal

Proposal Foundations

Proposal Basics

- Write to the reviewers (not to the program director and not to yourself)
- Your proposal will be judged by the reviewers
- Reviewers want to know four things:
  - What is it about (the research objective)?
  - How will you do it (the technical approach)?
  - Can you do it (you and your facilities)?
  - Is it worth doing (intellectual merit and broader impacts)?
- This is, basically, all the proposal needs to convey – but it needs to convey this

12 Steps to a Better Proposal

1. Know yourself - strengths/weaknesses
2. Know the program (director) from which (whom) you seek support
3. Read the program announcement and PAPPG
4. Formulate clear and appropriate research and education objectives
5. Develop a viable plan to accomplish your stated objectives
6. State your objectives up front in your proposal
7. Frame (contextualize) your project around the work of others

12 Steps to a Better Proposal

8. Grammar and spelling count
9. Format and brevity are important
10. Know the review process
11. Proof read the proposal before you submit it
12. Submit your proposal early and proofread it after you submit it

Writing a good proposal takes common sense and effort—it's not magic!

CAREER Awards

SPECIAL CONSIDERATIONS

Introduction

- Foundation-wide activity that offers NSF's most prestigious awards for faculty members beginning their careers
- Provides stable support at a sufficient level and duration to enable awardees to develop careers as outstanding researchers and educators who effectively **integrate teaching, learning, and discovery**
- *High priority for Engineering!*
- ENG award size is **at least** $500,000.

Beware!

The CAREER award is NOT a research award

The CAREER award is a career development award

Your proposal must reflect this focus

You

- **Who are you?**
  - Your expertise/interests
  - Your career/life goals
  - Your position/resources
- **Your proposal should fit into your life plan**

What is your life plan?

Do you need to develop a strategic plan?

Your Strategic Plan

- **A strategic plan has three parts:**
  - Where are you today?
  - Where do you want to be in the future (5, 10, 20 years from now)?
  - How do you get from here to there?
- **Questions: What do you want to leave as your career legacy? Do you need to work on important problems?**

A strategic plan is a roadmap for your life!

Your Proposal

- **Should advance you toward your life goals**
  - Should be a stepping stone to the next thing
- **Should be compatible with your institution's goals**
- **Should represent a contribution to society at large**

Test: If you accomplish your objectives, are you better off for the effort?

Do’s & Don’ts

PLUS ETHICS

DOs

- Have a strategic plan
- Build on your strengths
- Differentiate this proposal from your Ph.D. thesis work and other sponsored work
- Perform a thorough literature search and exploratory research before writing the proposal

DON'Ts

- Rush
- Wait until last minute (1 month) to contact program directors
- Make the proposed work (research and education) too broad
- Make the proposed work too narrow
- Ask for too much (or too little) money
- Ignore rules (PAPPG) and misc. items – violation of the PAPPG requirements will result in return without review

Talking to Program Officers: Pre-Submission

DO:

Discuss the objectives of the program

Relate your research idea to the program objectives

Ask about Broader Impact activities

Ask about budgets

Volunteer to serve on review panels

DON'T:

Argue that your proposal fits the program

Try to convince the PD to fund your proposal

Count on the PD remembering anything you talked about

Talking to Program Officers: Post-Decisions

DO:

Ask for feedback on the panel discussion

Respond to technical issues from the reviews

Discuss a possible revision

Volunteer to serve on review panels

DON'T:

Get mad

Insult the reviewers and/or the PD

Try to convince the PD to change the decision

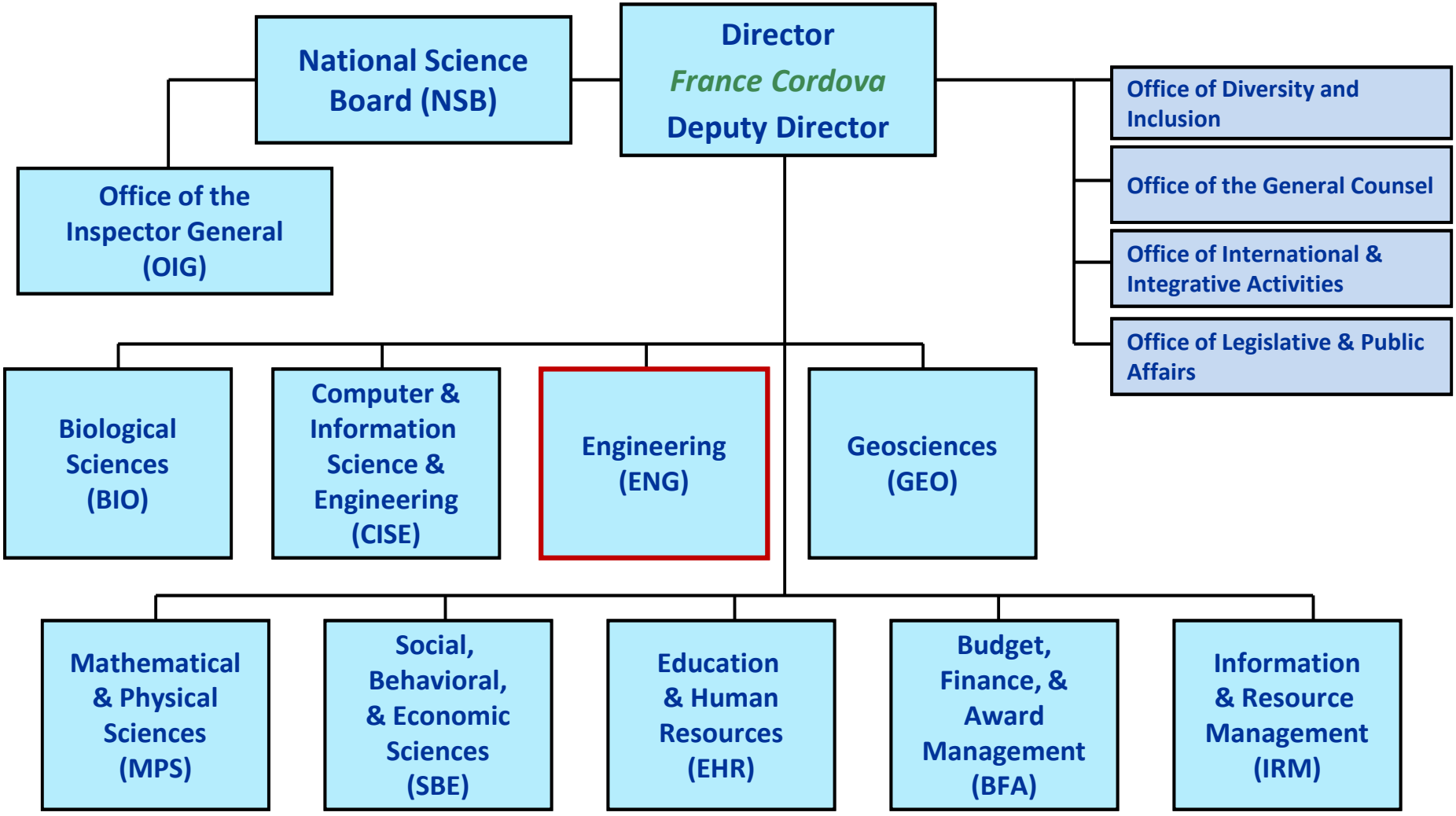
Ethics!!!

- Persons submitting proposals to the Federal government are held to high standards of conduct
- Misbehavior can be dealt with quite severely
  - PI barred from submission to NSF for up to 2 years
  - Permanently barred from proposal review
  - At least two cases of jail time (Grimes case, 42 months in Federal prison)
  - Maximum $250,000 fine, 5 years in prison
- Institutions must train and verify

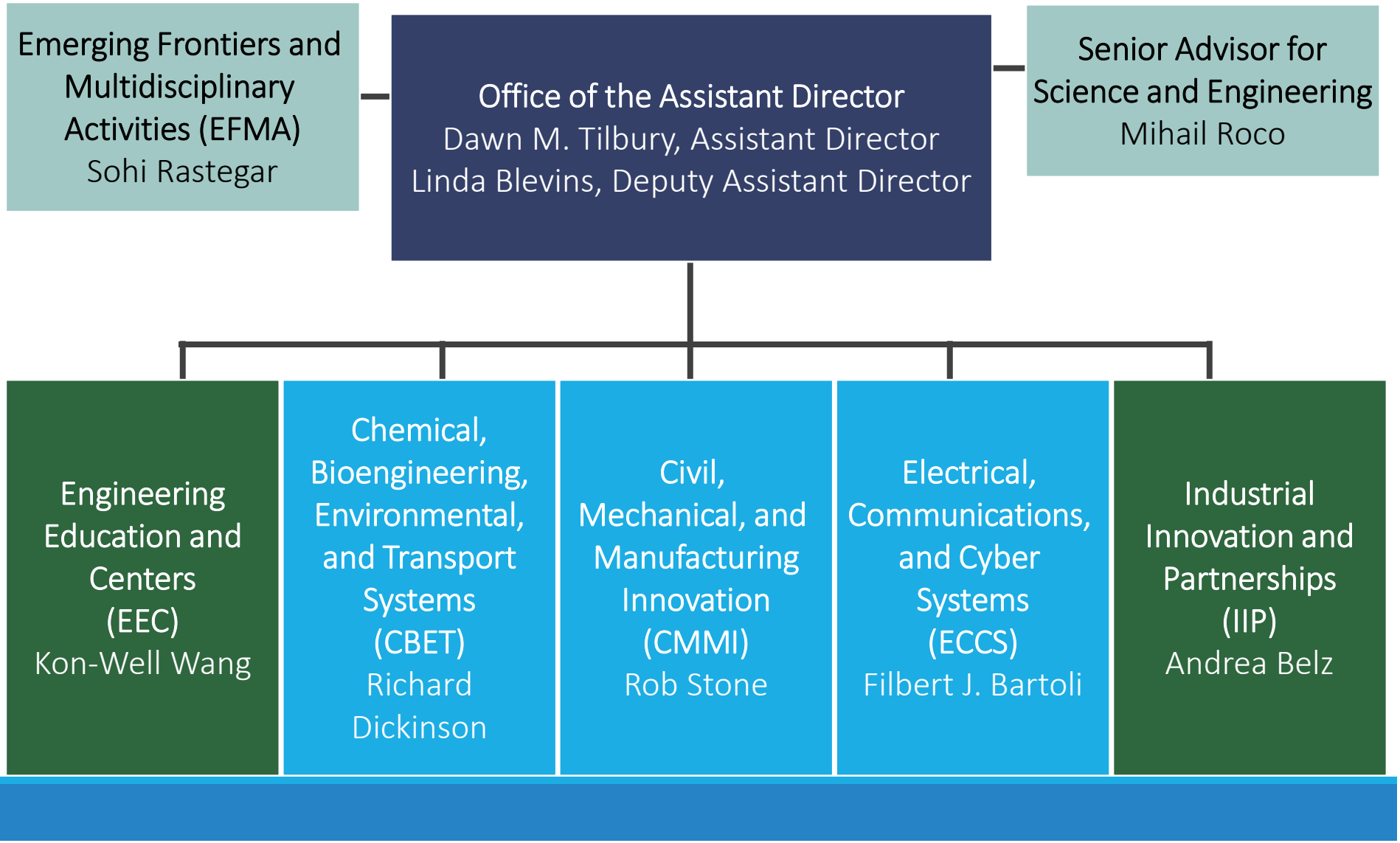
What Next?

IDENTIFY PROGRAM

National Science Foundation



NSF Engineering Directorate



Civil, Mechanical, and Manufacturing Innovation (CMMI)

Deputy Division Director
Mary Toney

Division Director
Rob Stone

Senior Advisor
Bruce Kramer

Program Director
Jordan Berg

Integrative Activities
Jo Culbertson

Advanced Manufacturing Program

Bruce Kramer
Khershed Cooper
Brigid Mullany
Andrew Wells

Dynamics, Control and Cognition

Dynamics Control and Systems Diagnostics
Jordan Berg
Irina Dolinskaya
Robert Landers

Mind, Machine, Motor Nexus
Robert Scheidt

Mechanics and Engineering Materials

Biomechanics and Mechanobiology
Laurel Kuxhaus

Mechanics of Materials and Structures
Siddiq Qidwai
Nakhiah Goulbourne

Operations and Design

Civil Infrastructure Systems
TBA

Humans, Disasters, and the Built Environment
Walter Peacock

Engineering Design and Systems Engineering
TBA

Operations Engineering
Georgia-Ann Klutke

Resilient and Sustainable Infrastructure

Engineering for Civil Infrastructure
Joy Pauschke
Richard Fragaszy
Caglar Oskay

Natural Hazards Engineering Research Infrastructure
Joy Pauschke

Leading Engineering for American Prosperity, Health, and Infrastructure
Bruce Kramer
Brigid Mullany

Target Program

- Begin with
  - **White paper**, i.e., one-page summary
  - **Dialog** with program officer
- Be an NSF **proposal reviewer—**best place to learn about what makes a winning proposal!
- **Remember, we're from the government, and we're here to help!**

NSF Office Hours

9:30am – 11:30am and 1:30pm – 3pm,
Thursday, October 10

NSF Funding Opportunities Special Session

3:30 pm – 5:30 pm, Thursday, October 10

QUESTIONS?

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