The Ten Big Ideas

National Science Foundation Funding Opportunities

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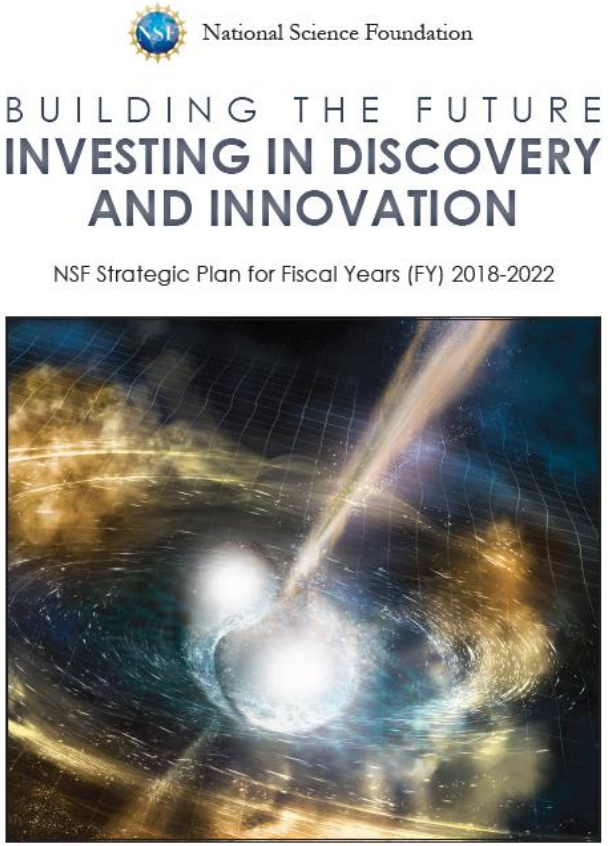
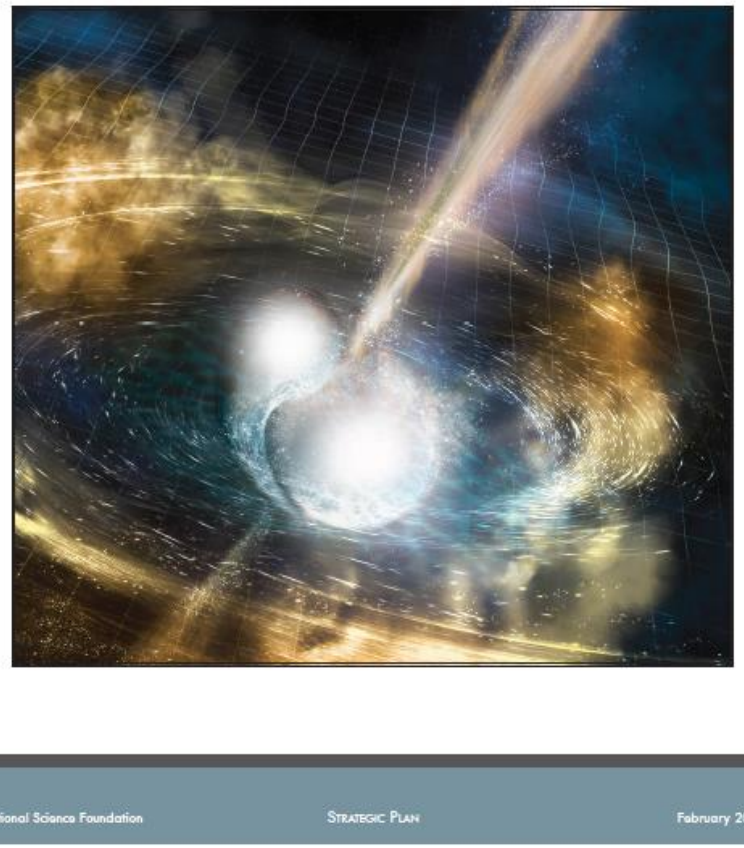
NSF Vision and Goals

- Mission
  - To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." (NSF Act of 1950)
- Vision
  - A Nation that is the global leader in research and innovation.
- Strategic Goals
  - Expand knowledge in science, engineering, and learning.
  - Advance the capability of the Nation to meet current and future challenges
  - Enhance NSF's performance of its mission
- Agency Priority Goal:
  - Expand public and private partnerships to enhance the impact of NSF's investments and contribute to American economic competitiveness and security.

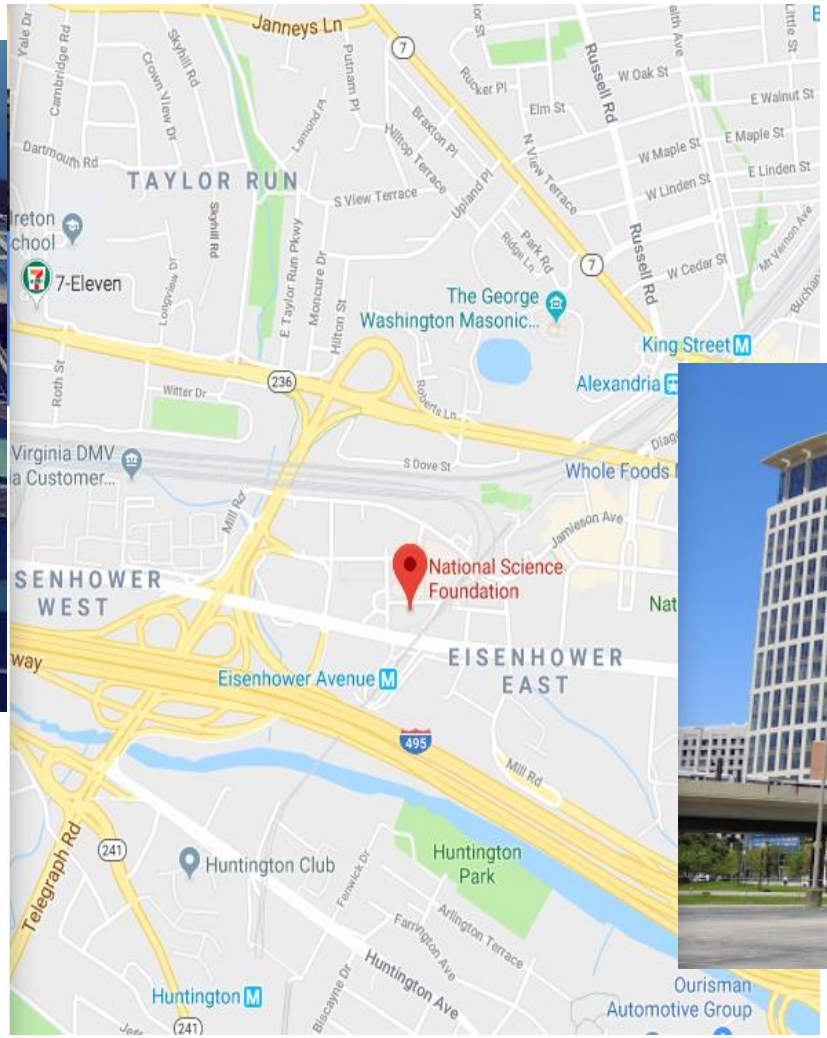


NSF Core Values

- ExPLICIT
  - Excellence
  - Public Service
  - Learning
  - Inclusion
  - Collaboration
  - Integrity
  - Transparency



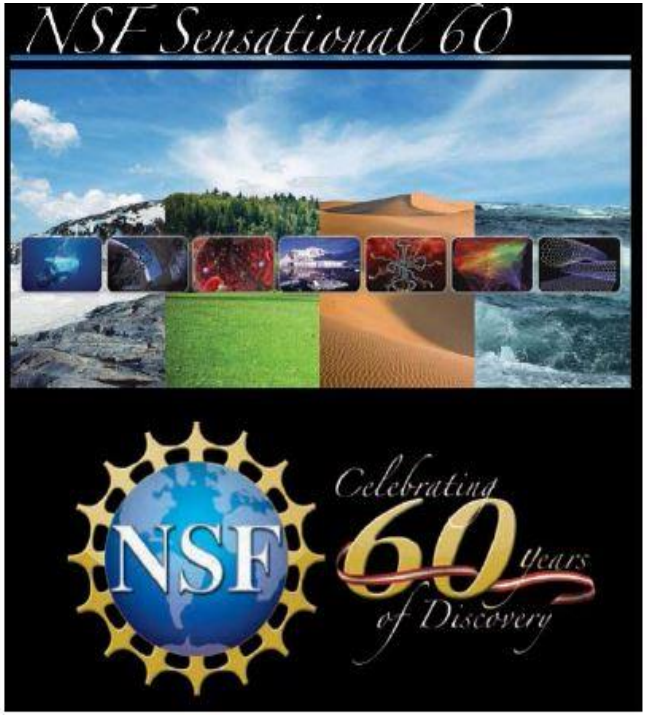
NSF's new location



2415 Eisenhower Ave,
Alexandria, VA 22314

NSF in a Nutshell

- Independent agency to support basic research & education
- Grant mechanism in two forms:
  - Unsolicited, curiosity driven (the majority of the $)
  - Solicited, more focused
- All fields of science/engineering
- Merit review: Intellectual Merit & Broader Impacts
- Discipline-based structure, some cross-disciplinary
- Support large facilities



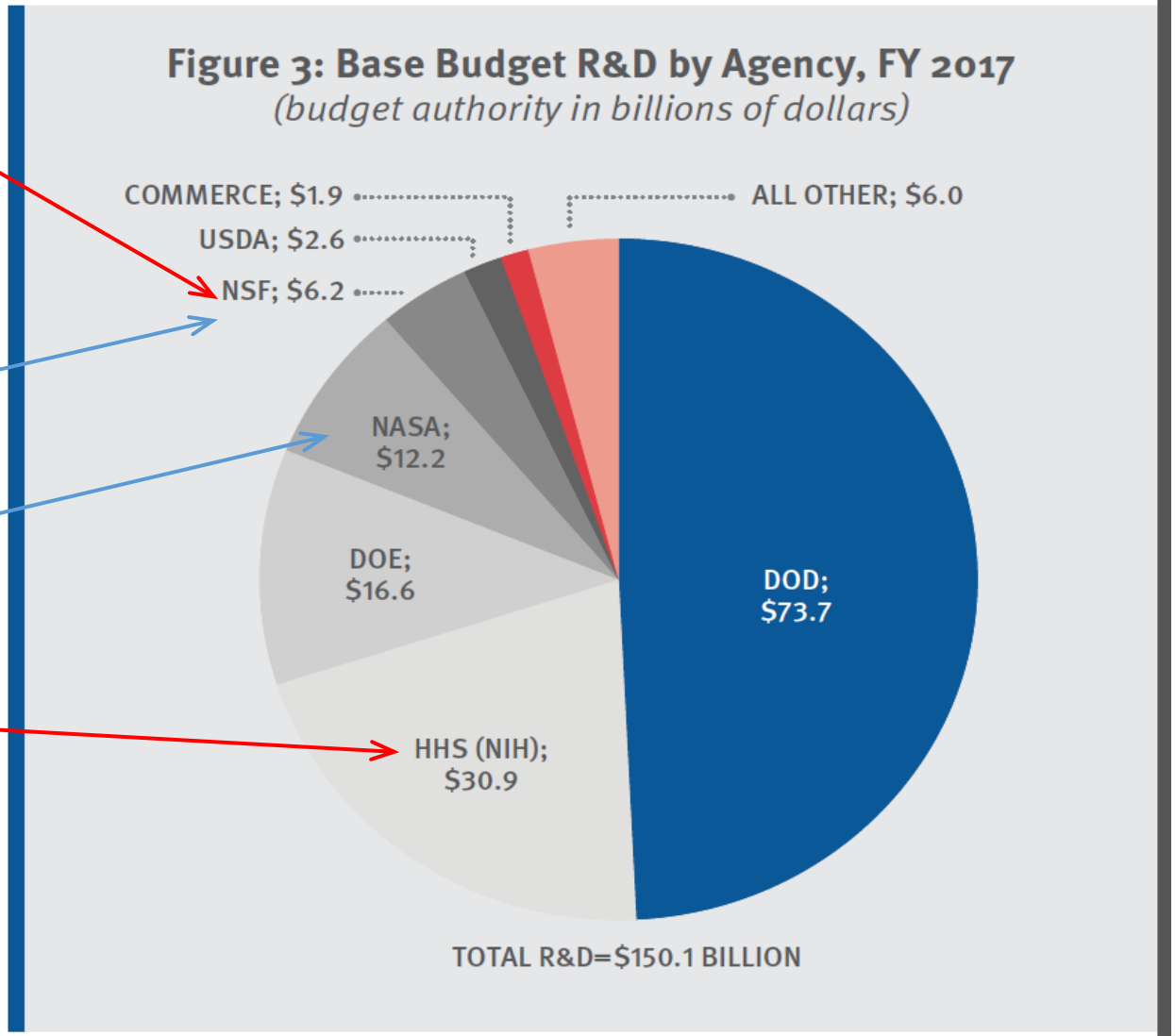
Federal Funding for Research

BIO research

Ground based AST

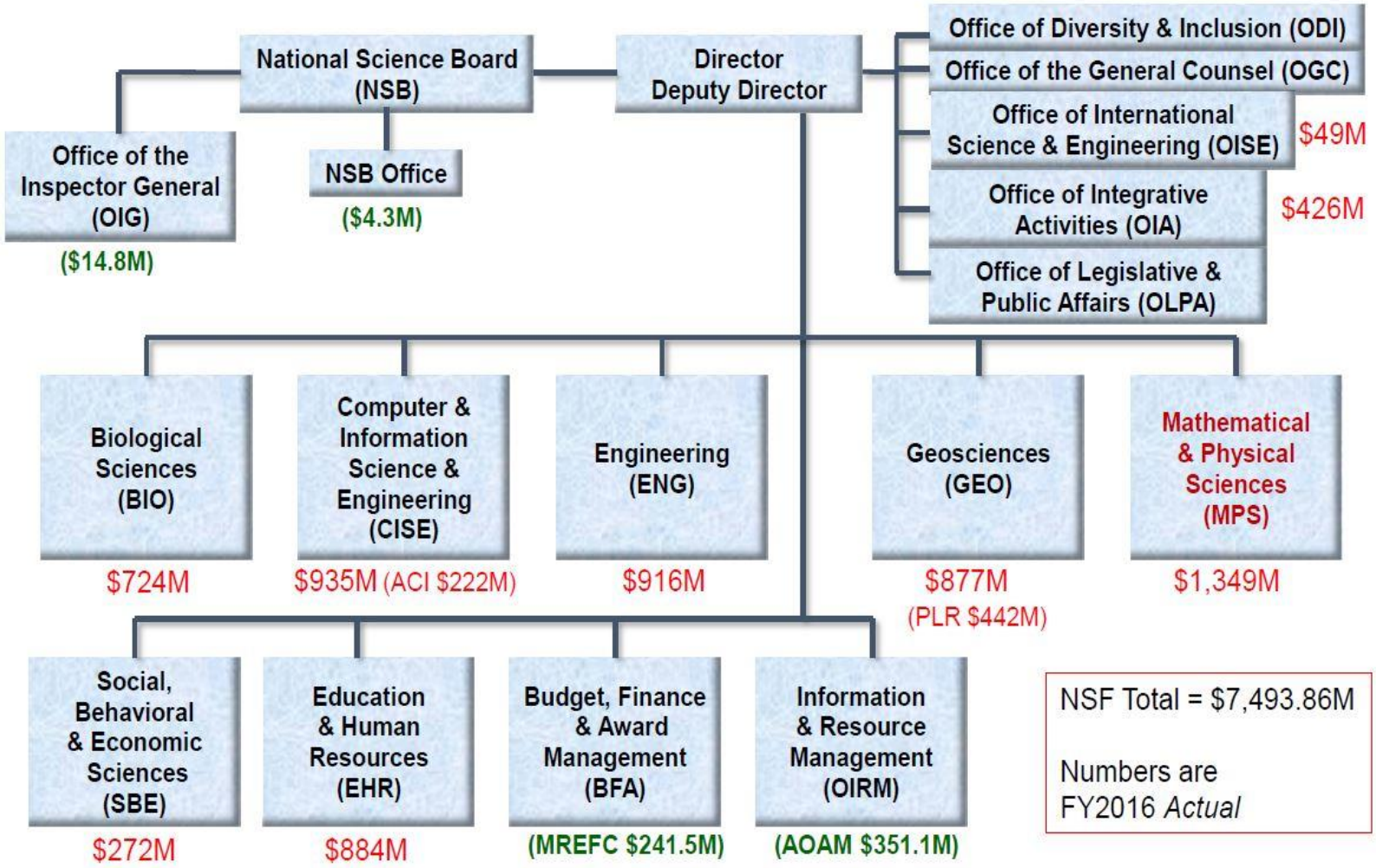
Space based AST

Medical research



Source: OMB R&D data, agency budget justifications, and other agency documents and data. R&D includes conduct of R&D and R&D facilities.

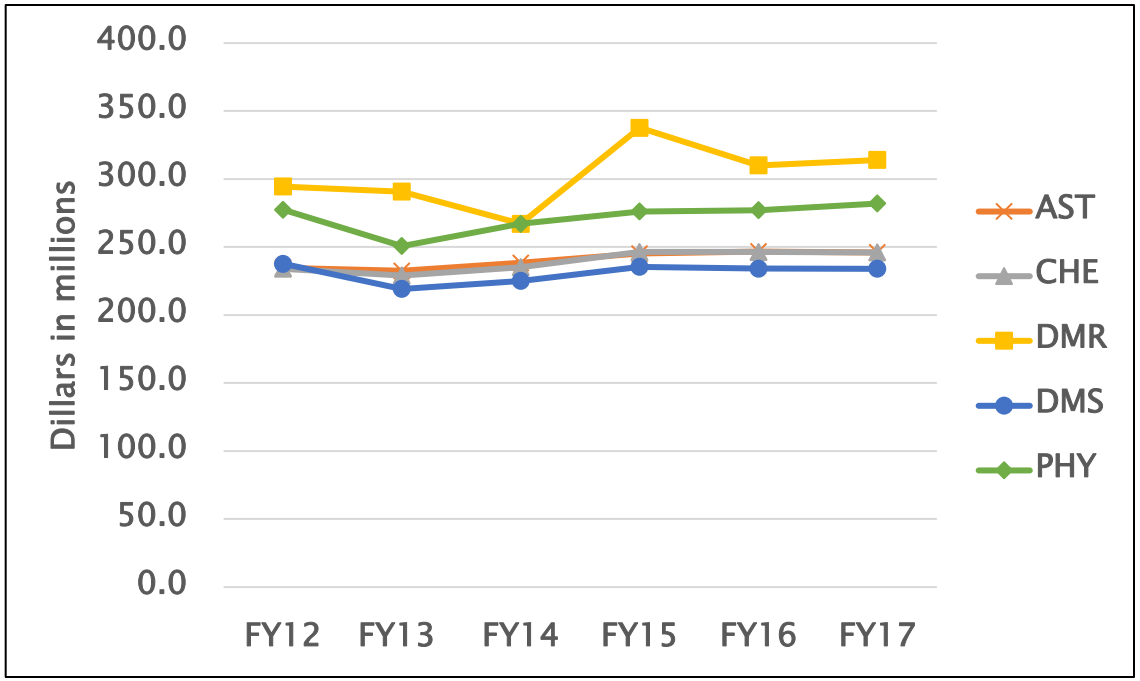
NSF Organization Chart



World Class Major Facilities

Keeping Researchers at the Frontier

Funding



Funding in then-year dollars

No adjustment for inflation

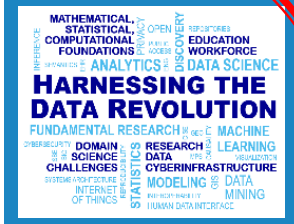
	FY12	FY13	FY14	FY15	FY16	FY17
MPS	1308.7	1249.5	1267.9	1376.3	1349.2	1356.0
AST	234.7	232.5	238.4	245.2	246.7	246.0
CHE	234.0	229.0	235.2	246.3	246.3	246.0
DMR	294.4	290.7	267.1	337.6	310.0	314.0
DMS	237.7	219.2	225.0	235.4	234.1	234.0
PHY	277.4	250.7	267.1	276.1	277.0	282.0
OMA	30.4	27.4	35.2	35.7	35.0	35.0

Big Ideas in NSF

- Since 2017, NSF has been building a foundation for the Big Ideas through pioneering research and pilot activities.
- In 2019, NSF will invest $30 million in each Big Idea and continue to identify and support emerging opportunities for U.S. leadership in Big Ideas that serve the Nation's future.

NSF's Ten Big Ideas

RESEARCH IDEAS

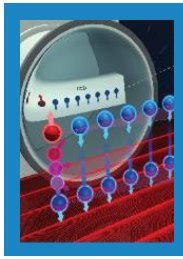


Harnessing Data for 21st Century Science and Engineering

Work at the Human-Technology Frontier: Shaping the Future

Navigating the New Arctic

Windows on the Universe: The Era of Multi-messenger Astrophysics



The Quantum Leap: Leading the Next Quantum Revolution

Understanding the Rules of Life: Predicting Phenotype

PROCESS IDEAS

Mid-scale Research Infrastructure

NSF 2026

Growing Convergence Research at NSF

NSF INCLUDES: Enhancing STEM through Diversity and Inclusion

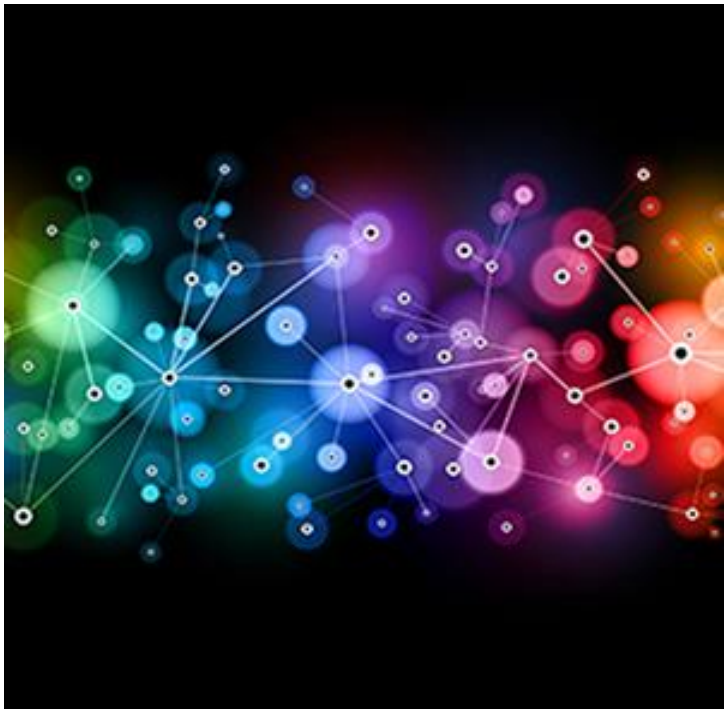
1. Future of Work at the Human-Technology Frontier

- Four research themes:
  - Building the human-technology partnership
  - Augmenting human performance
  - Illuminating the socio-technological landscape
  - Fostering lifelong learning.

2. Growing Convergence Research

- Merging ideas, approaches, tools, and technologies from widely diverse fields of science and engineering to stimulate discovery and innovation.

- Convergence blends scientific disciplines in a coordinated, reciprocal way and fosters the robust collaborations needed for successful inquiry. Convergence builds and supports creative partnerships and the creative thinking needed to address complex problems.



3. Harnessing the Data Revolution

- The increasing speed at which we collect data, as well as the increasing volume and variety of that data, are profoundly transforming research in all fields of S&E. This deluge of data --from large scientific facilities, advanced cyberinfrastructure, new data analysis tools and more --is forcing scientists to ask and answer new types of questions.

4. Mid-scale Research Infrastructure

- Developing an agile process for funding experimental research capabilities in the mid-scale range.

5. Navigating the New Arctic

- Establishing an observing network of mobile and fixed platforms and tools across the Arctic to document and understand the Arctic's rapid biological, physical, chemical, and social changes.

6. NSF 2026 (2050)

- This Big Idea is framed around the year 2026 in order to tie into the Nation's 250th anniversary

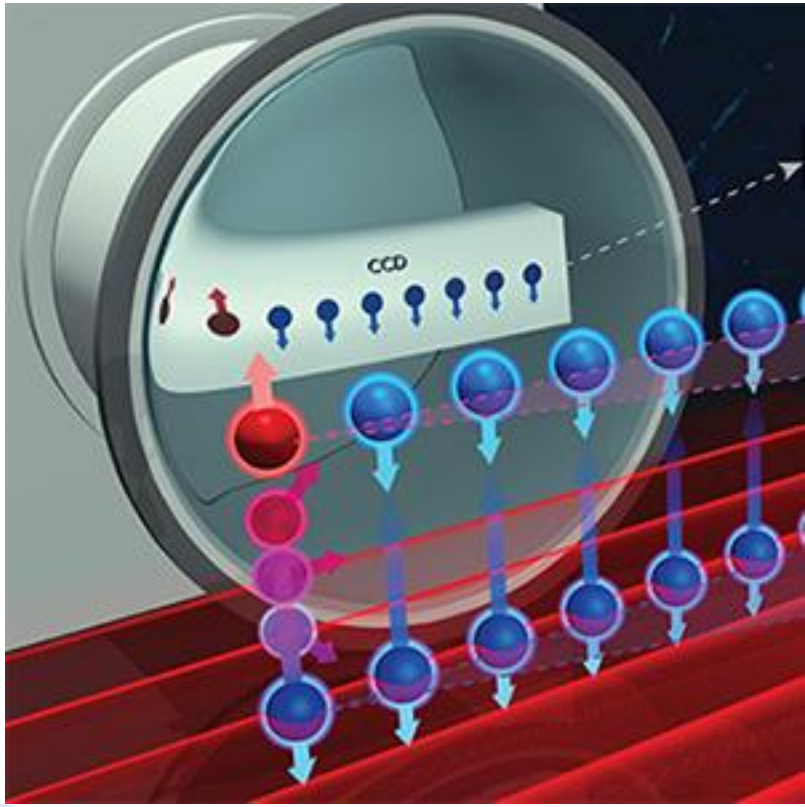
- Such programs could cross boundaries in innovative ways, fill recognized gaps or take advantage of new opportunities.

7. NSF INCLUDES

- Transforming education and career pathways to help broaden participation in science and engineering.

8. Quantum Leap

- Exploiting quantum mechanics to observe, manipulate, and control the behavior of particles and energy at atomic and subatomic scales, resulting in next-generation technologies for sensing, computing, modeling, and communicating.



9. Understanding the Rules of Life

- To enable discoveries that will allow us to better understand such interactions and identify causal, predictive relationships across these scales -- so-called "rules" for how life functions.

10. Windows on the Universe

- Using powerful new syntheses of observational approaches to provide unique insights into the nature and behavior of matter and energy and help to answer some of the most profound questions before humankind.

A Video from NSF

Preparing an NSF Proposal

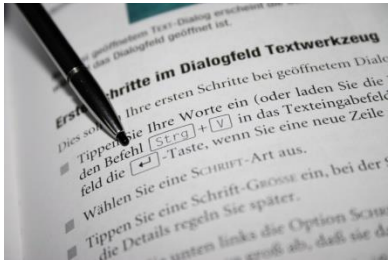
Endorsed by Program Officers:

"Grant writing is like playing the stock market; there is seldom a guarantee that your efforts will be rewarded, but the more you know about the process and the more you use this knowledge, the greater the probability for success."

Proposal Preparation Tips

1. Decide if your proposal fits the program.
2. Check for compliance (Read the Grant Proposal Guide inside PAPPG)
3. Keep the audience (mix of experts and non-) in mind.
4. Make sure the project goals are clearly defined
5. Narrative: Draw clear distinctions between prior work and proposed research
6. Address clearly the novelty of the project.
7. Make it readable (not too technical, check for errors, avoid abbreviations).
8. Seek advice from more senior colleagues.

Read the Program Solicitation



- Note the goals of the program;
- Note the types of activities eligible for funding;
- Note the required elements of a proposal;
- "should"= "must"

Make a checklist!

Merit Review Criteria

- Three Principles
  1. Highest quality: advance, even transform, the frontiers of knowledge.
  2. In aggregate, contribute more broadly to achieving societal goals.
  3. Based on appropriate metrics.
- Two Criteria *(unchanged)*
  1. Intellectual Merit
  2. Broader Impact
- Five Elements
  1. Potential to advance knowledge & benefit society
  2. Creative, original, or potentially transformative concepts?
  3. Well-reasoned, well-organized, sound rationale, & assessed?
  4. Qualified (individual, team, institution)?
  5. Adequate resources?

NSF Review Criteria

Intellectual Merit: The intellectual Merit criterion encompasses the potential to advance knowledge;

Broader Impacts: The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

Intellectual Merit

Panel review is likely to involve both specialists and non-specialists:

Typical questions raised during the review process

- Why is this work important?
- How will the work advance the field generally?
- What is new in the proposed approach?

- Provide an introduction for the well-educated non-specialist
- Put proposed work into context of other work on the topic.
- Tell reviewers how you plan to attack the proposed problems.

Think Like a Reviewer: *Intellectual Merit*

Applicants

- Present a NEW idea
- Explain the expected results and alternative plans
- What you will do, risk mitigation
- Demonstrate your qualifications
  - Preliminary Data
  - Publications

Reviewers

- Advancing the field: is it a big or little step in science?
- Will the negative results be important too?
- Can the applicants do the project?

Broader Impacts

Proposal Should address

- Education through research involvement
- Broadening participation: inclusion of under-represented groups
- Any special dissemination efforts
- Any potential benefits to society

Think Like a Reviewer: *Broader Impacts*

Applicants

- Present an integrated clear plan.
- Document a history of outreach/impact.
- Show who you will impact and how.
- Describe how you will know it works.

Reviewers

- Connected to the research?
- Can it be executed?
- Targeting an appropriate goal/group?
- Will it have an impact and *how will the PI know*?

Review Process

Panel Review (DMS runs ~70 panels per year)

- At least 3 reviews for each proposal
- Panel discussion and ranking
- Panel summary
- A panel typically runs 2-3 days and reviews between 40-60 proposals.

- Program Officers make funding decisions taking into account panel recommendations and addressing budget constraints and portfolio balance

Final Thoughts

- Check the published abstracts on the NSF website
- All divisions at NSF are always looking for panelists–Volunteer!
- All divisions at NSF are always looking for rotators: Great opportunity to see the "big Picture"
- Talk to Program Officers:
  Ask Early. Ask Often.

THANK YOU!