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# **NSF at Tennessee Technological University**

**April 2013**

**Kathleen McCloud**  
*Program director*  
*Major Research Instrumentation*



# NSF Vision and Goals

- **Vision**
  - » Advancing discovery, innovation and education beyond the frontiers of current knowledge, and empowering future generations in science and engineering
- **Goals**
  - » Discovery
  - » Learning
  - » Research Infrastructure
  - » Stewardship





# Outline

- Role of NSF as government agency
- NSF-wide investments
- Proposal submission and review process
- What makes a strong proposal
- Resources



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# **Role of NSF as a Government Agency**



# NSF in a Nutshell

- Independent agency supporting basic research and education
- Invests in all fields of science/engineering
- Discipline-based organizational structure with cross-disciplinary and interdisciplinary mechanisms
- Supports individual-, group-, center-type research and large facilities
- Two forms of research proposals:
  - » Unsolicited, on topic of PI's choice (*majority of \$*)
  - » Solicited, more focused
- Merit review: intellectual merit & broader impacts

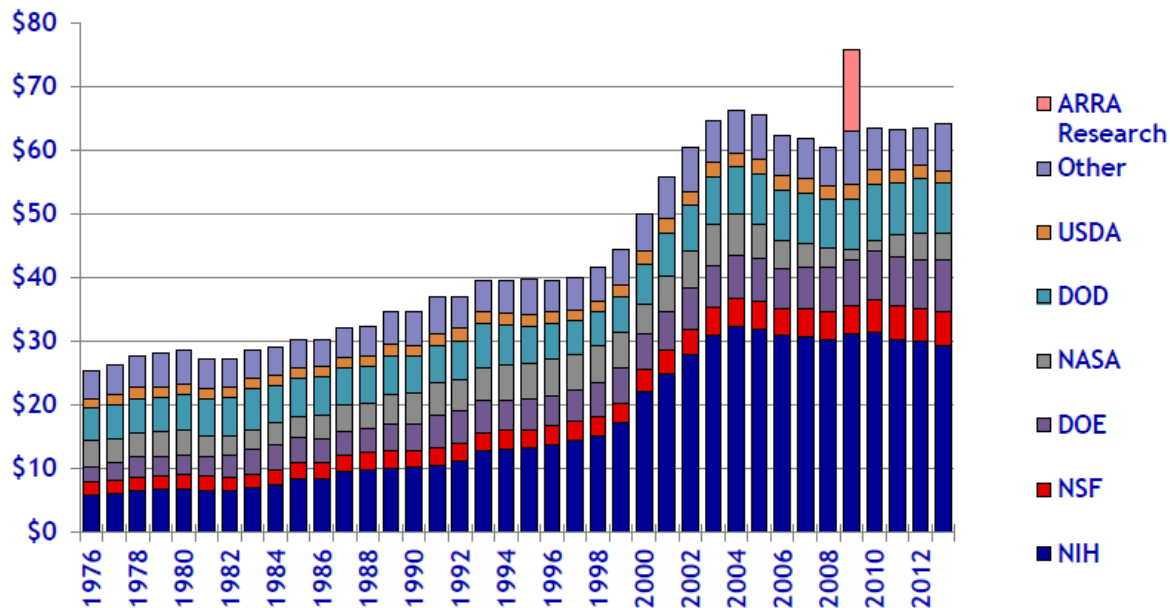


# Trends in Basic Research by Agency

(Source: AAAS)

## Trends in Research by Agency, FY 1976-2013

Billions of FY 2012 Dollars



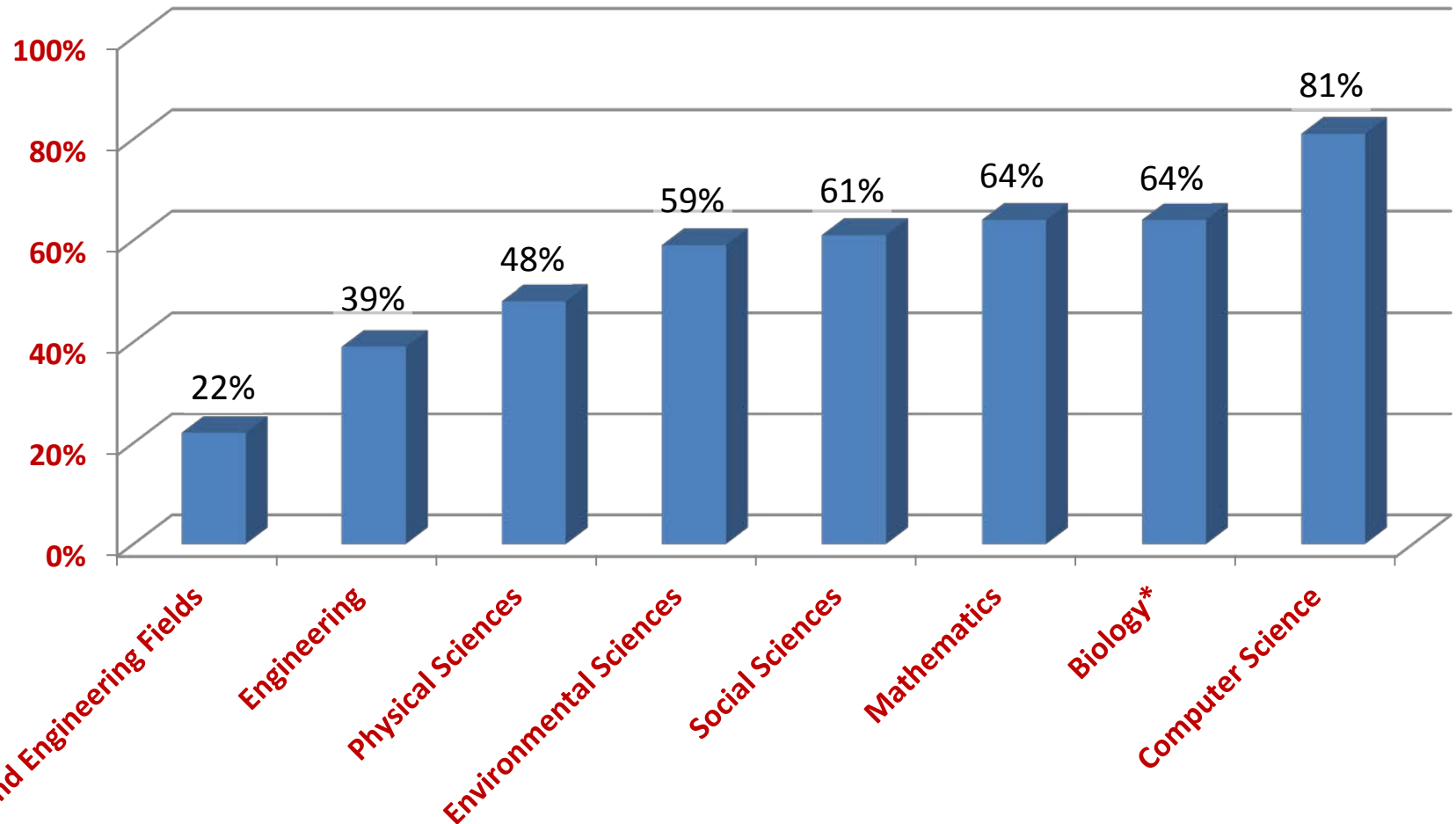
Source: 1976-1994 figures are from the NSF federal funds survey; remainder is from AAAS R&D reports. FY 2012 figures are latest estimates, FY 2013 is the President's budget.

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# NSF Support of Academic Basic Research (as % of total federal support)

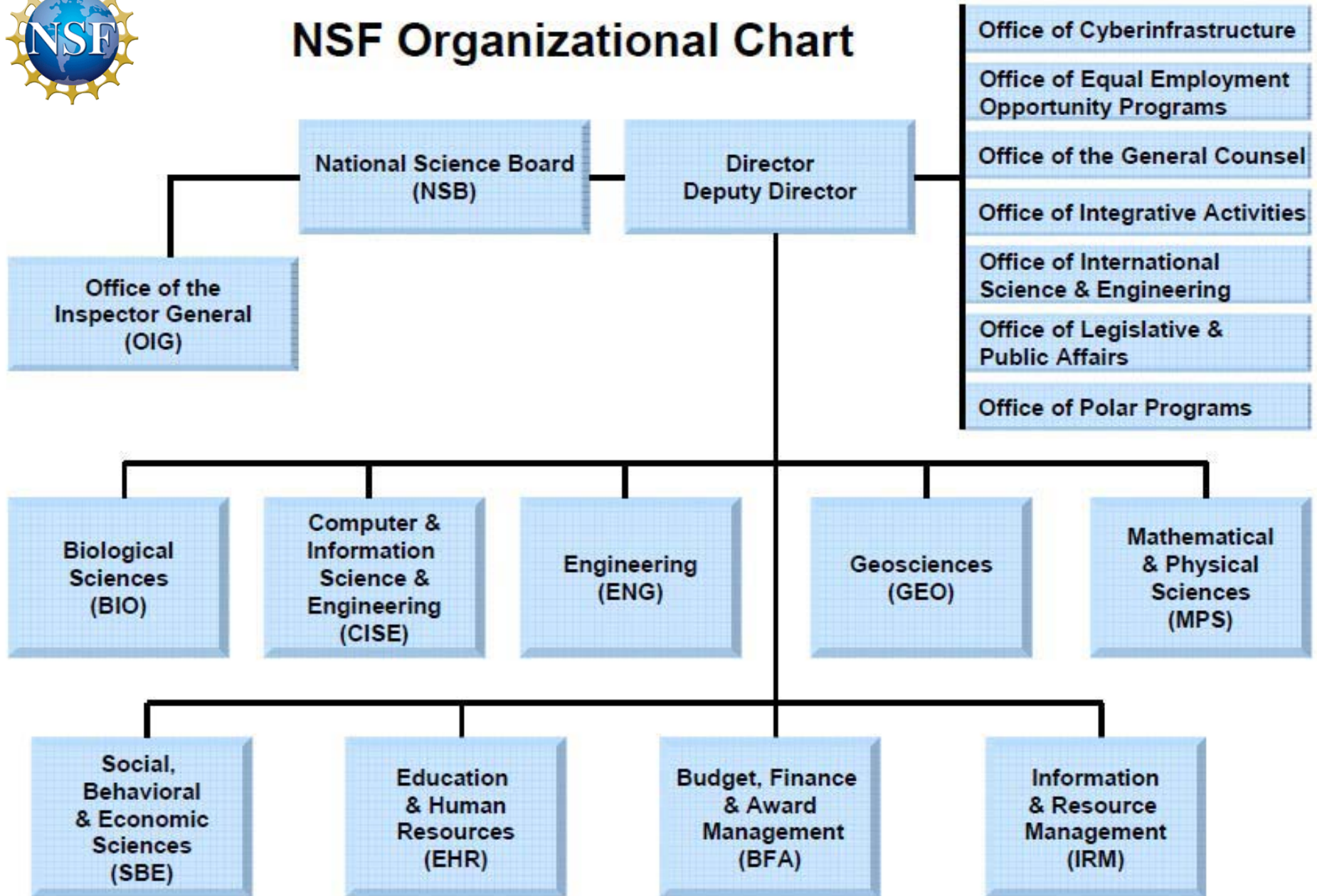


\* Includes biological sciences and environmental biology; excludes NIH

Source: NSF FY13 Budget Request (2008 data)



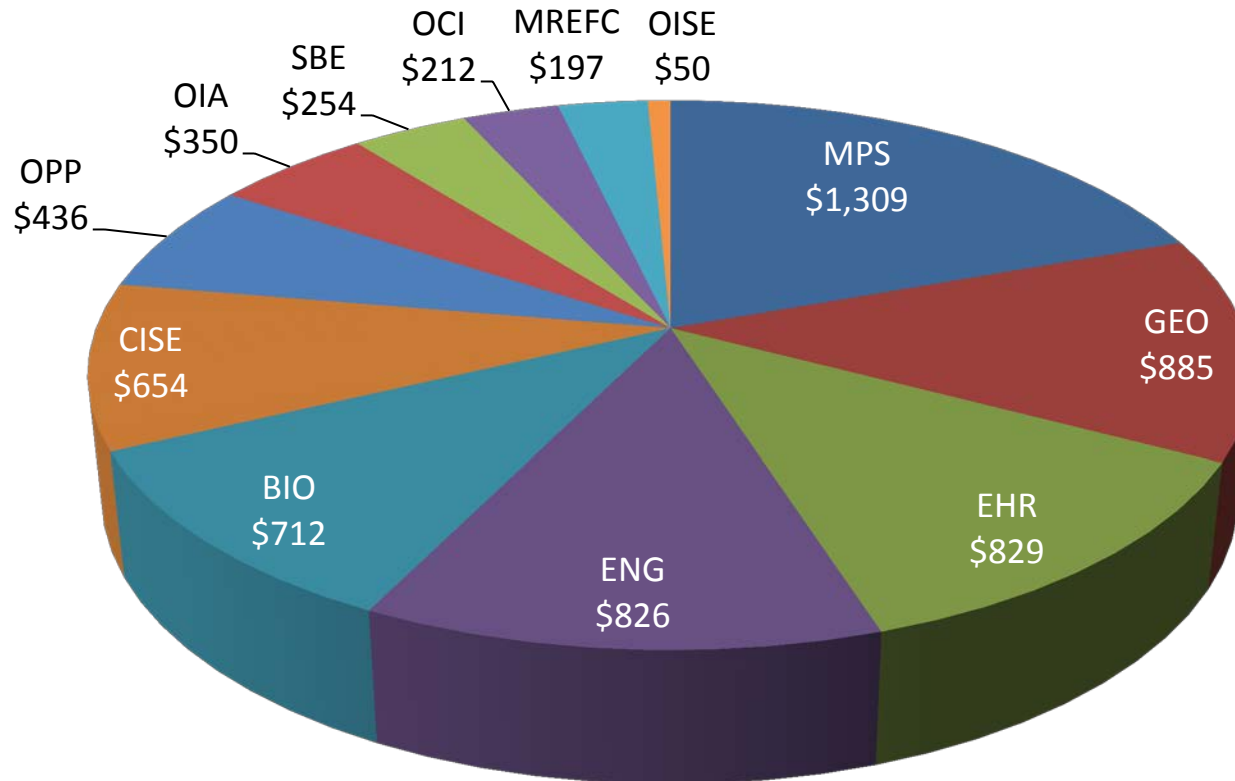
# NSF Organizational Chart







# 2012 NSF Budget (\$M)



BIO: Biological Sciences

CISE: Computer & Information Science & Engineering

EHR: Education and Human Resources

ENG: Engineering

GEO: Geosciences

MPS: Mathematical and Physical Sciences

MREFC: Major Research Equipment Facilities & Construction

OCI: Office of Cyberinfrastructure

OIA: Office of Integrative Activities

OISE: Office of International Science & Engineering

OPP: Office of Polar Programs

SBE: Social, Behavioral & Economic Sciences



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# **NSF-wide Special Scientific Investments**





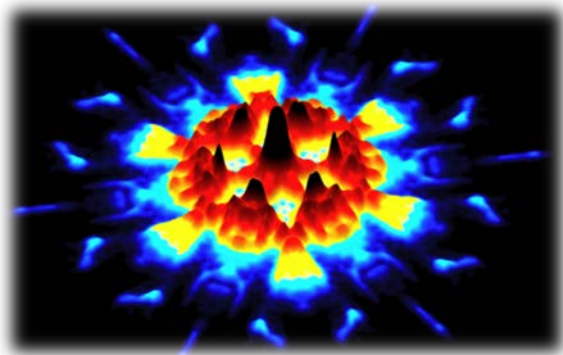
# Cyber Infrastructure Framework for 21<sup>st</sup> Century Science and Engineering (CIF21)

- Cyberinfrastructure to transform research, innovation, and education
- Major components
  - » Computational and Data-enabled Science
  - » Core Technologies, Tools, Algorithms
  - » Big Data Projects
  - » Workforce Development
  - » Partnerships: internal/external





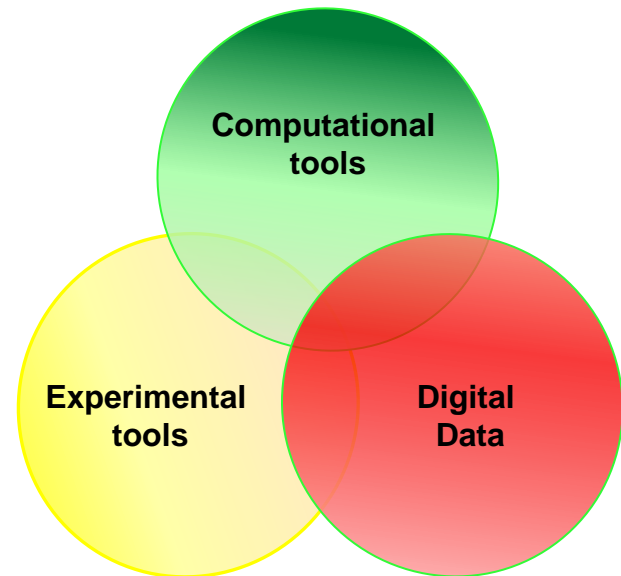
# Cyber-Enabled Materials Manufacturing and Smart Systems(CEMMSS)



- Partnership with ENG and CISE
- Advanced Manufacturing
- DMREF

- Fundamental research for discovering, modeling, making, optimizing and manufacturing with new materials and material systems

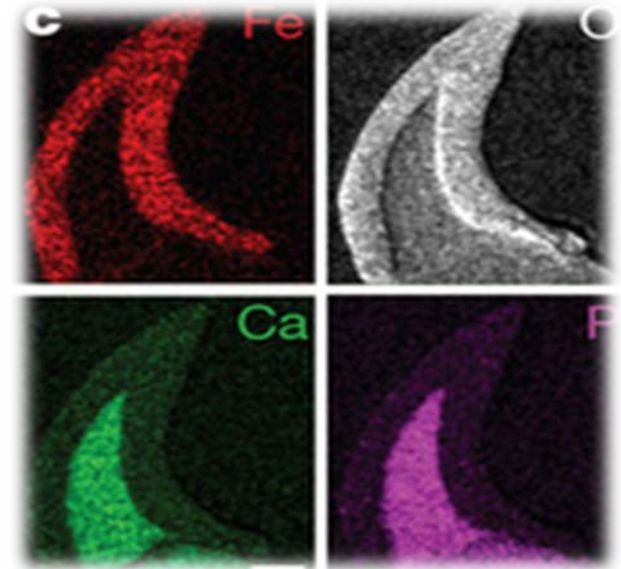
## Materials Innovation Infrastructure





# Research at the Interface of Biological, Mathematical, & Physical Sciences (BioMaPS)

- Adaptive network models
- Biological design strategy for better composite materials
- Computational, Mathematical and Statistical modeling



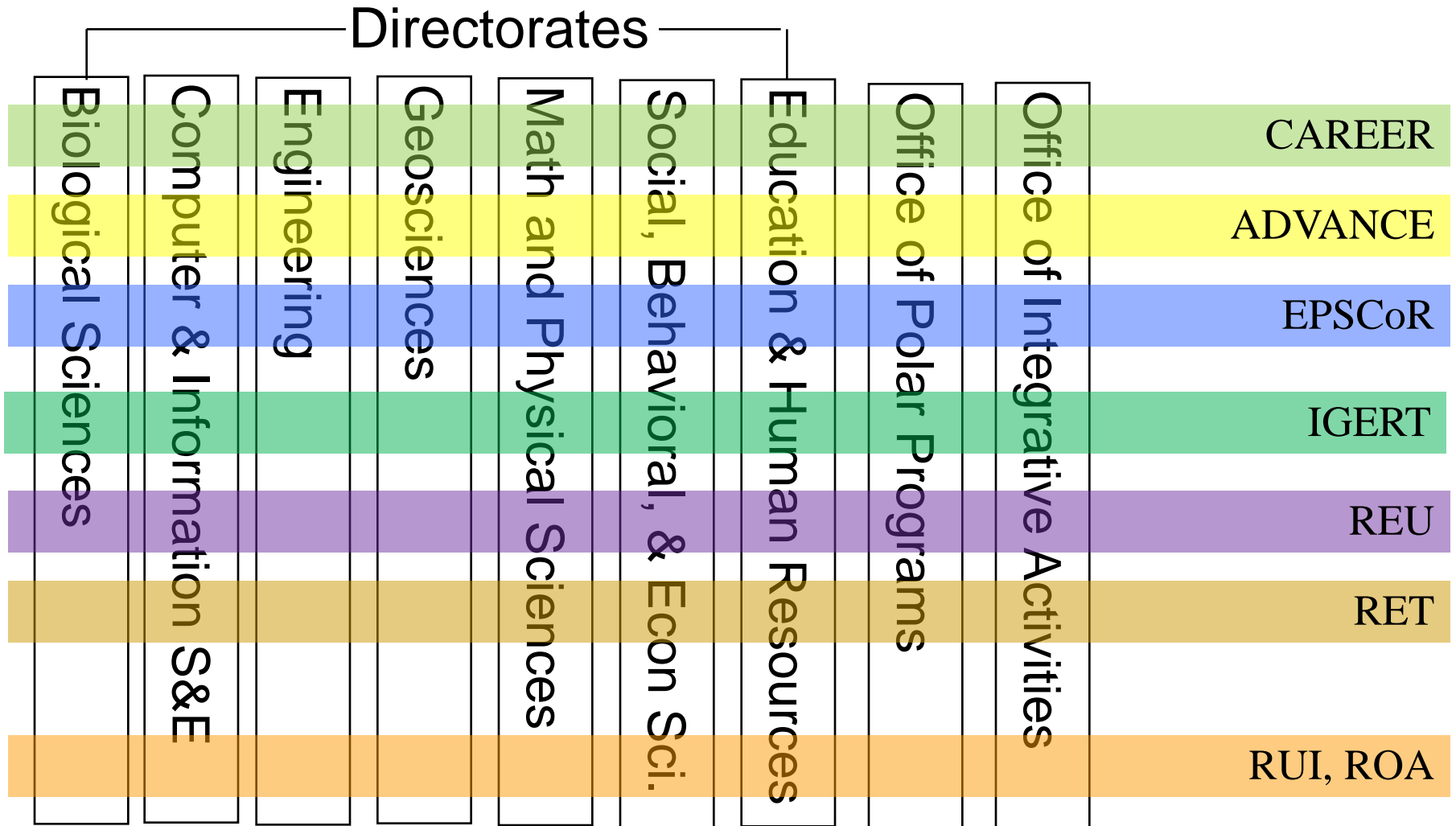


# Supporting Multidisciplinary Research Across NSF

- **INSPIRE**
  - » High-risk/high-reward interdisciplinary research that does not fit into existing programs
- **I-Corps**
  - » Public-private partnership program that
  - » teaches grantees to identify valuable product opportunities that emerge from academic research
  - » offers entrepreneurship training to student participants
- **Science Across Virtual Institutes (SAVI)**
  - » “Glue” funding to support connection between NSF-funded researchers/centers and their international collaborators



# NSF-wide Programs

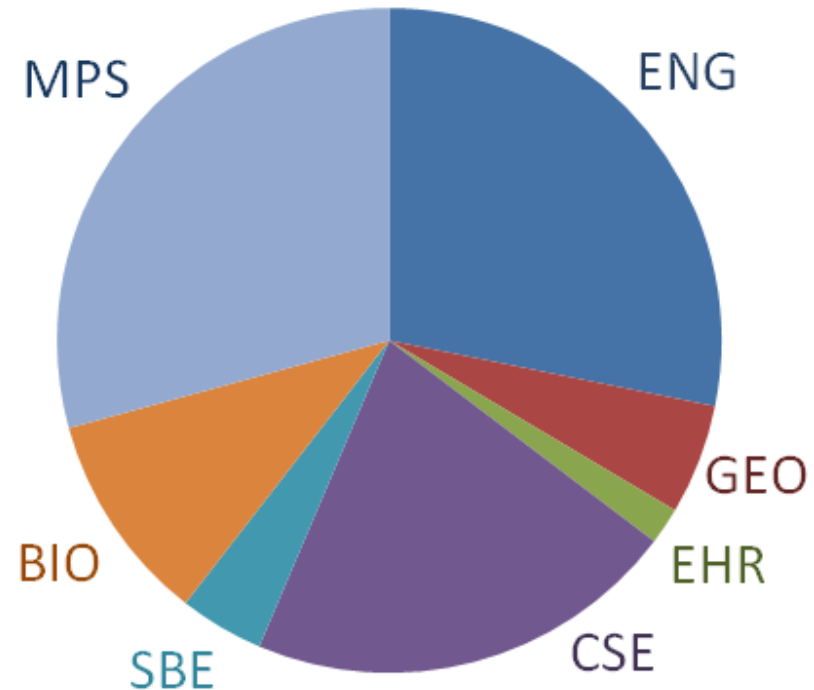






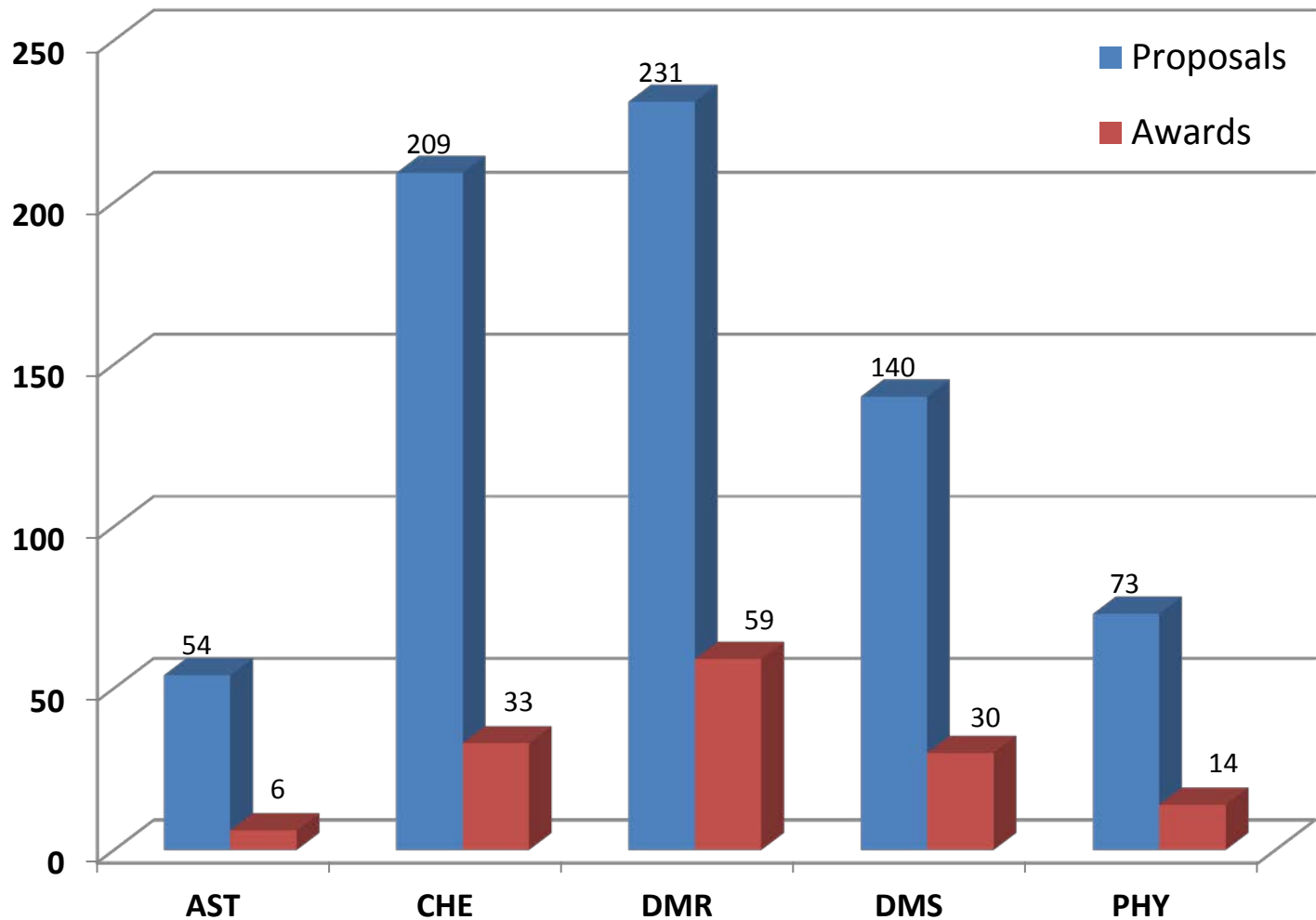
# CAREER Program

- NSF's most prestigious awards for junior faculty.
- Awardees are selected based on a plan of outstanding research and education, and the integration of research and education, within the context of the mission of their organizations, building a firm foundation for a lifetime of leadership.
- Increased participation of those traditionally under-represented in science and engineering is encouraged.





# 2011 CAREER Awards in MPS



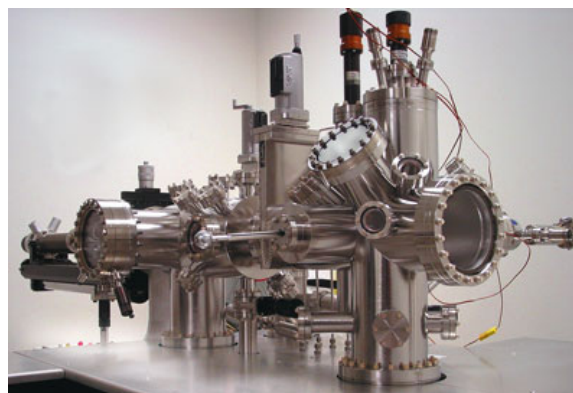
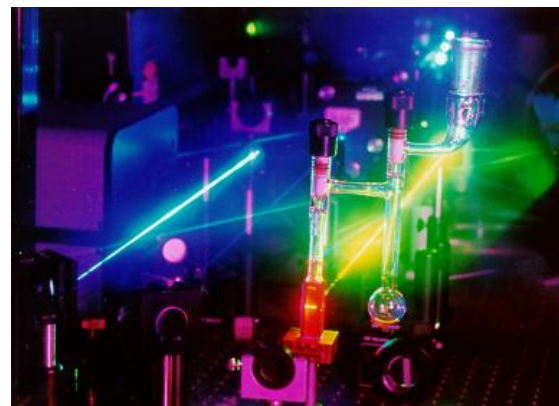
MPS totals:  
707/142/20%

NSF totals:  
2748/490/18%



# Instrumentation

- Grants for acquisition, development, and research.
- Major Research Instrumentation (MRI):
  - » \$100k-\$4M (FY 2012)





# Major Research Instrumentation Strategic Goals

- Supporting the *acquisition* (**Track 1**) of major state-of-the-art instrumentation, thereby improving access to, and increased use of, modern instrumentation shared by the Nation's scientists, engineers, and graduate and undergraduate students;

**OR**

- Fostering the *development* (**Track 2**) of the next generation of major instrumentation, resulting in new instruments that are more widely used, and/or open up new areas of research and research training;

**AND**

- Enabling academic departments, disciplinary & cross-disciplinary units, and multi-organization collaborations to *integrate research with education*.



# MRI Proposals – The Basics

- **Restrictions on organization submission eligibility** - see solicitation NSF 13-517.
- **Submission limit** - Three (3) per organization: *If three proposals are submitted, at least one of the proposals must be for instrument development.*
- **Cost-sharing** at the level of 30% of the ***total project cost*** is required for Ph.D.-granting institutions and non-degree-granting organizations. ***Cost-sharing is not required for non-Ph.D. granting institutions.***
- **Merit Review** - At the time of submission, PI's are asked to identify an NSF division(s) to review proposal. NSF reserves the right to place proposals in the appropriate division(s) for review.

**Note:** Proposals responding to a funding opportunity with a due date on or after January 14, 2013, must comply with the guidelines in NSF 13-1.



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**How do I apply?**  
**What are the processes?**  
**How will my proposal be  
reviewed?**

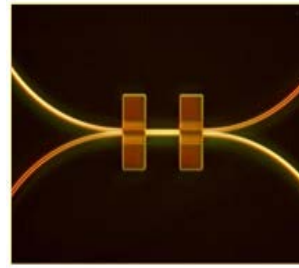


# NSF Proposal Process

1. Principal Investigators submit proposal (solicited or unsolicited) through their institution's SRO
2. NSF conducts a compliance check/review
3. NSF evaluates proposals using merit review:  
*By mail (ad hoc) and/or panel*  
*Confidential*  
*Anonymous*
4. Program Officers weigh reviews and portfolio balance issues; recommend proposals for funding or declination
5. Division Directors review those recommendations; make final decisions
6. PIs are notified
7. PIs can read reviews, panel summary, and context statement



# Merit Review Criteria



NSF Proposals are evaluated through the use of two NSB approved **Merit Review Criteria**:

- **Intellectual Merit** (strengths and weaknesses)
- **Broader Impacts** (strengths and weaknesses)
- Some have additional **Program-specific criteria** (*see the Solicitation*)

Proposal must have *separate sections* for **Intellectual Merit** and **Broader Impact** in

- **Project Summary**
- **Project Description**
- **Results from Prior NSF Support**

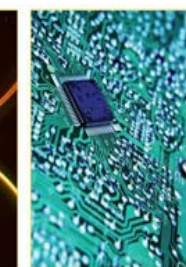
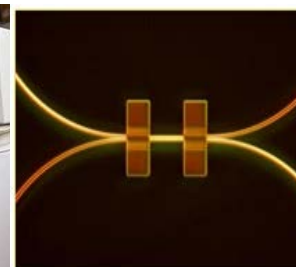
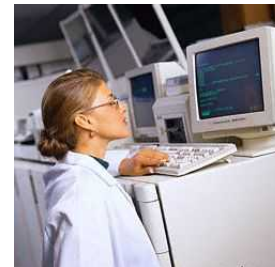
**Refer to the new Grant Proposal Guide (GPG)**

[http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf13001](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13001)





# Merit Review Criteria: Intellectual Merit



## Intellectual Merit – the potential to advance knowledge

- What is the potential for the proposed activity to advance knowledge and understanding within its own field or across different fields?
- To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
- 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?
- How well qualified is the individual, team, or organization to conduct the proposed activities?
- Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?



# Merit Review Criteria: Broader Impacts



## Broader Impacts – the potential to benefit society and contribute to the achievement of specific, desired societal outcomes

- What is the potential for the proposed activity to benefit society or advance desired societal outcomes (Broader Impacts)?
- To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
- 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?
- How well qualified is the individual, team, or organization to conduct the proposed activities?
- Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?





# Broader Impacts: Examples



## Broader Impacts see GPG – Ch II.C.2.d.(i)

NSF values the advancement of scientific knowledge and activities that contribute to the achievement of societally relevant outcomes. Such outcomes include, but **are not limited** to:

- » full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM);
- » improved STEM education and educator development at any level;
- » increased public scientific literacy and public engagement with science and technology;
- » improved well-being of individuals in society;
- » development of a diverse, globally competitive STEM workforce;
- » increased partnerships between academia, industry, and others;
- » improved national security;
- » increased economic competitiveness of the United States;
- » enhanced infrastructure for research and education.





# What Makes a Strong Proposal?

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- New and original ideas
- Potentially transformative research
- Sound, succinct, detailed, focused plan
- Clear description of impact of new research within the context of prior work in the field
- Preliminary data and/or convincing feasibility
- Thoughtfully developed and well articulated broader impacts



# For a strong proposal ...

- It is your responsibility to “make your case” to the reviewers and panel, not theirs to draw out hidden meaning

**Secrets for Success !**

## Pay attention to:

- NSF-wide requirements (GPG)
- Solicitation and Program webpage
  - Program requirements
  - Due dates!
  - Program goals, mission
  - What has been funded by the Program
- Model on successful proposals
- Get someone experienced to read your proposal
- Talk to NSF Program Officers



# NSF Proposal Preparation

- Read the funding opportunity (program descriptions, solicitations) carefully first, and then ask an NSF Program Director for clarifications if needed
- Contact the Program Director(s) to discuss your project:  
email with 1-2 page description and questions  
(or call, visit)
- Be familiar with programs and funded projects
  - Guide to Program:  
[http://www.nsf.gov/funding/browse\\_all\\_funding.jsp](http://www.nsf.gov/funding/browse_all_funding.jsp)
  - Award information, including abstracts:  
<http://www.nsf.gov/awardsearch>
- Know the audience for your proposal's review



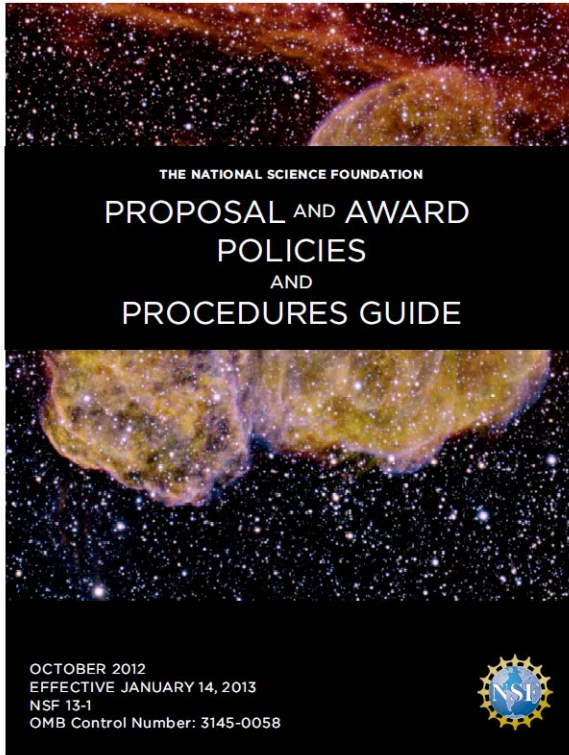
# NSF Proposal Submission

- Know and follow the **current** Grant Proposal Guide (GPG) - it changes (currently 2013 version).
- **Explicitly** address Intellectual Merit **and** Broader Impacts in the Project Summary **and** Project Description **and** Results from Prior NSF Support
- Match and justify the budget to the scope of the proposed work - ask for what you need
- Submit proposals before the last day/hour
- Download your completed proposal back to you to check it's what you sent (formats, all required material, etc.)





# Some Examples of Significant Changes to the GPG



- ***Project Summary:*** FastLane modified to display three separate text boxes - proposers must provide an Overview and address the “Intellectual Merit’ and “Broader Impacts”
- ***Project Description:*** Must contain, as a separate section within the narrative, discussion of the Broader Impacts of proposed activities.
  - Intellectual Merit and Broader Impact activities must be described in two separate sections in ***Results from Prior NSF Support.***
- ***Facilities, Equipment and Other Resources:*** Indicates that an aggregated description internal and external resources available to the project (physical and personnel) should be provided - new format in FastLane to assist with compliance with NSF cost sharing policy available effective in January 2013.
- ***Review Criteria:*** Now Merit Review Principles and Criteria - new language added on merit review principles, and revised merit review criteria language inserted.





# www.nsf.gov

The screenshot shows the NSF website homepage. At the top right, a "QUICK LINKS" button is circled in red. The main header features the NSF logo and the text "National Science Foundation WHERE DISCOVERIES BEGIN". Below this is a search bar. A dark navigation bar contains several menu items: "HOME", "FUNDING", "AWARDS", "DISCOVERIES", "NEWS", "PUBLICATIONS", "STATISTICS", "ABOUT NSF", and "FASTLANE". The "FUNDING" and "AWARDS" items are circled in red. Below the navigation bar is a large banner image of a woman driving a car. Overlaid on the right side of the banner is a dark box with the text "Improving Road Safety" and a "FULL STORY" button. At the bottom of the page, there is a dark bar with three sections: "Advancing the Sciences", "Funding & Supporting", and "Inspiring & Educating". A "HIDE" button is located on the far right of this bar.



# www.nsf.gov



## Research Areas

- › Biological Sciences
- › Computer & Information Science & Engineering
- › Cyberinfrastructure
- › Education and Human Resources
- › Engineering
- › Environmental Research & Education
- › Geosciences
- › Integrative Activities
- › International Science & Engineering
- › Mathematical & Physical Sciences
- › Polar Programs
- › Social, Behavioral & Economic Sciences



## Learning Resources

- › Film, TV, Exhibits & More!
- › Slideshows & Photo Galleries
- › Classroom Resources
- › Funding for Research on Learning in Formal & Informal Settings



## Funding & Awards

### FUNDING INFO

- › Search Funding Opportunities
- › Browse Funding Opportunities A-Z
- › Recent Funding Opportunities
- › How to Prepare a Funding Proposal
- › Grant Proposal Guide
- › Submit a Proposal to FastLane

### AWARD INFO

- › Managing Awards
- › Award & Administration Guide
- › Search Awards
- › Award Statistics (Budget Internet Info System)



## News & Discoveries

- › Recent News
- › Recent Discoveries
- › Multimedia Gallery
- › Special Reports



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# Proposal Preparation - GPG

The screenshot shows the NSF website interface. At the top left is the NSF logo and the text 'National Science Foundation WHERE DISCOVERIES BEGIN'. To the right is a 'QUICK LINKS' button and a search box. Below this is a navigation bar with links: HOME, FUNDING, AWARDS, DISCOVERIES, NEWS, PUBLICATIONS, STATISTICS, ABOUT NSF, and FASTLANE. The main content area features a 'Publications' sidebar on the left and a main article titled 'Proposal and Award Policies and Procedures Guide, January 2013'. The article includes sharing options (Email, Print, Share), available formats (HTML, PDF), document type (Policies and Procedures), and document number (nsf13001). A 'Public Comment' section states the guide is effective for proposals submitted on or after January 14, 2013. A 'Document History' section notes it was posted on October 4, 2012. A footer contains various links and social media icons.

**Proposal and Award Policies and Procedures Guide, January 2013**

Available Formats: [HTML](#) | [PDF](#)  
Document Type: Policies and Procedures  
Document Number: nsf13001

Public Comment: Effective for proposals submitted or due on or after January 14, 2013. For proposals submitted prior to January 14, 2013, the guidelines in [NSF 11-1](#) apply.

Document History: Posted: October 4, 2012.

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

[http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf13001](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13001)



# Get Involved

- Proposals: Send your best ideas to NSF
- Reviewers and panelists:
  - » Create informative web site and keep it updated
  - » Talk to Program Directors (email, conferences)
- Workshop participants and organizers
- Rotators

For information on a particular MPS division and program, go to the following web address and pick a Division:

**<http://www.nsf.gov/mps>**

**Contact NSF Program Directors for questions & suggestions**



**Thank you very much!**

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**Questions?**