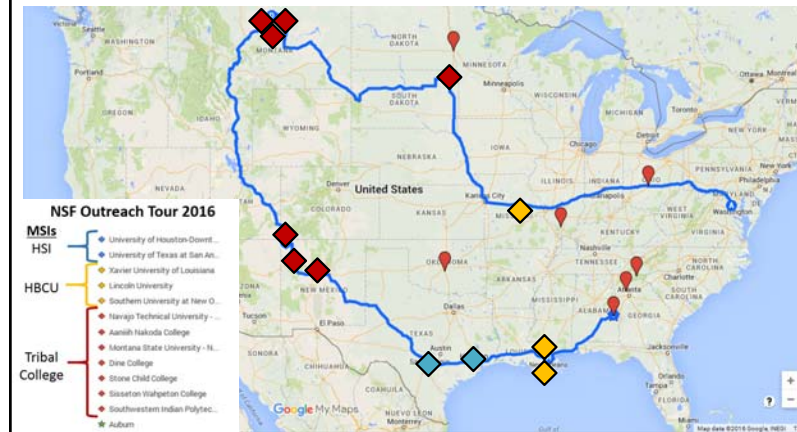# National Science Foundation: organizational structure, review process, opportunities, and secrets for success

Dr. Alan E. Wilson
National Science Foundation
Division of Environmental Biology
aewilson@nsf.gov

NSF OUTREACH EFFORTS

NSF Outreach Tour 2016

MSIs
HSI
 ◆ University of Houston-Downt...
 ◆ University of Texas at San An...
HBCU
 ◆ Xavier University of Louisiana
 ◆ Lincoln University
 ◆ Southern University at New O...
Tribal College
 ◆ Navajo Technical University - ...
 ◆ Aaniih Nakoda College
 ◆ Montana State University - N...
 ◆ Dine College
 ◆ Stone Child College
 ◆ Sisseton Wahpeton College
 ◆ Southwestern Indian Polytec...
 ★ Auburn

NSF MSI contacts

- Tribal colleges
  Jody Chase – lchase@nsf.gov
- HBCUs
  Claudia Rankins - crankins@nsf.gov
- HSIs
  Victor Santiago - vsantiag@nsf.gov

NSF outline

- NSF organizational structure
- NSF review process
- BIO Divisions and core programs
- Finding funding opportunities
- NSF programs for graduate students, postdocs, and new faculty
- Working at NSF
- Tips for writing successful proposals

NSF Overview

- Supports basic research and education via grants

- Discipline-based structure

- Cross-disciplinary programs

- Rotators and permanent staff

- Annual budget ~$7 billion
  overhead is 6%, the rest is award budget

- >55,000 proposals; ~13,000 new awards per year supporting
  ~200,000 scientists, educators and students
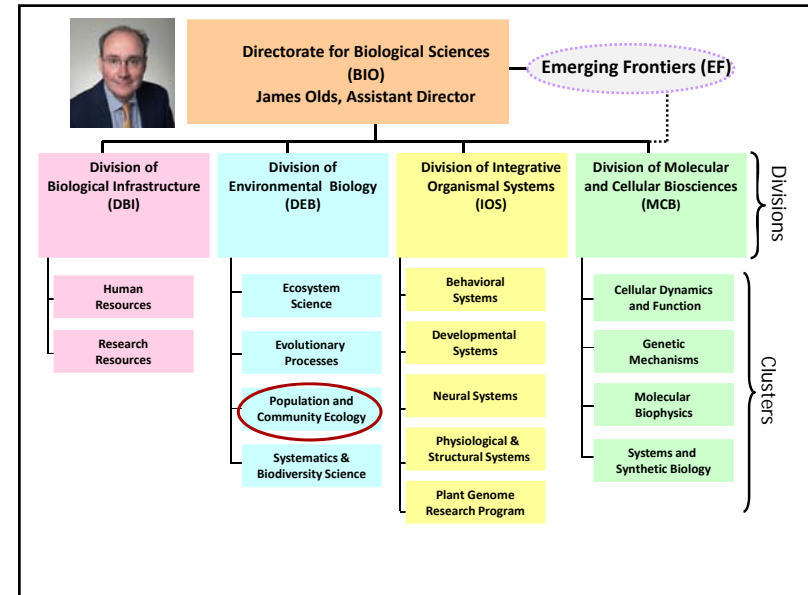
Why do universities want to write grants?

- High visibility for the university
- Overhead or indirect costs help balance the university budget and pay for administration
- Contributes to prestige and national ranking of the university
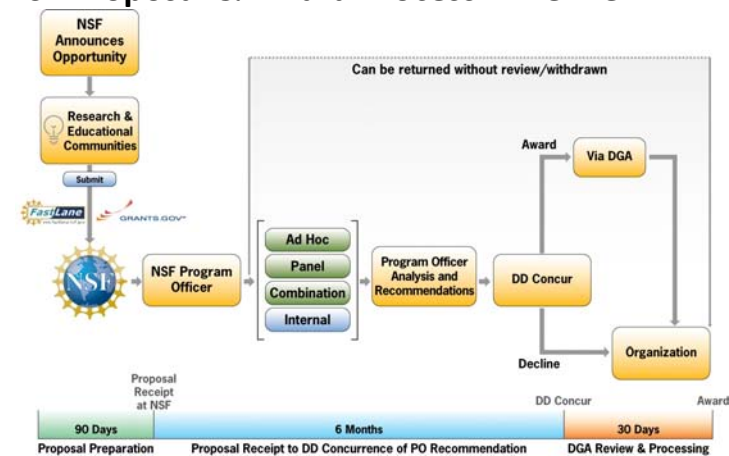
Why do you want to write grants?

- Pay dissertation research costs: travel, data, funds for equipment, time to write
- Raise your research visibility
- Open doors to consulting, collaborative research, new research agendas, etc.
- Increase opportunities for national & international presentations, and shaping public policy
- Improve research and writing
- Help you get a job and make tenure

NSF outline

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- NSF programs for graduate students, postdocs, and new faculty?
- Tips for writing successful proposals

Slide 1

NATIONAL SCIENCE FOUNDATION

National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230
TEL: 703.292.5111 | FIRS: 800.877.8339 | TDD: 800.281.8749

February 2015

Slide 2

Directorate for Biological Sciences (BIO)
James Olds, Assistant Director

Emerging Frontiers (EF)

Division of Biological Infrastructure (DBI)
Division of Environmental Biology (DEB)
Division of Integrative Organismal Systems (IOS)
Division of Molecular and Cellular Biosciences (MCB)

Divisions

- Human Resources
- Research Resources

- Ecosystem Science
- Evolutionary Processes
- Population and Community Ecology
- Systematics & Biodiversity Science

- Behavioral Systems
- Developmental Systems
- Neural Systems
- Physiological & Structural Systems
- Plant Genome Research Program

- Cellular Dynamics and Function
- Genetic Mechanisms
- Molecular Biophysics
- Systems and Synthetic Biology

Clusters

Slide 3

NSF outline

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Slide 4

NSF Proposal & Award Process Timeline

NSF Announces Opportunity

Research & Educational Communities

Submit

FastLane / GRANTS.GOV

NSF Program Officer

Ad Hoc
Panel
Combination
Internal

Program Officer Analysis and Recommendations

Can be returned without review/withdrawn

DD Concur

Award — Via DGA

Decline

Organization

Proposal Receipt at NSF

DD Concur — Award

90 Days — Proposal Preparation

6 Months — Proposal Receipt to DD Concurrence of PO Recommendation

30 Days — DGA Review & Processing

Reminders When Preparing Proposals

- **Read the funding opportunity; ask a Program Officer for clarifications if needed**

- **Address all the proposal review criteria**

- **Understand the NSF merit review process**

- **Avoid omissions and mistakes**

- **Check your proposal to verify that it is complete!**

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Program Officer Review

- **Upon receipt at NSF, proposals are routed to the correct program office.**
- **NSF staff conducts a preliminary review to ensure they are:**
  - Complete;
  - Timely; and
  - Conform to proposal preparation requirements.
- **NSF may not accept a proposal or may return it without review if it does not meet the requirements above.**
  - The return without review process will be discussed in greater detail later in the session.

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Merit Review Criteria
Guiding Principles

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects.

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Merit Review Criteria

When evaluating NSF proposals, reviewers should consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits would accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers are asked to evaluate all proposals against two criteria:

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

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

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Five Review Elements

The following elements should be considered in the review for **both criteria**:

1. What is the potential for the proposed activity to:
   a. advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
   b. 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?

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 at the home institution or through collaborations) to carry out the proposed activities?

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Review Format in FastLane

- Reviewers provide feedback to NSF based on the Review Criteria and the Review Elements

- Review criteria and elements are available as reviewers provide feedback

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Types of Reviews

- *Ad hoc*: proposals sent out for review —
  - *Ad hoc* reviewers usually have specific expertise in a field related to the proposal.
  - Some proposals may undergo *ad hoc* review only.

- **Panel: Face-to-face sessions conducted by reviewers mainly at NSF but also in other settings**
  - Panel reviewers usually have a broader scientific knowledge.
  - Some proposals may undergo only a panel review.
  - Some proposals may undergo reviews by multiple panels (especially for those proposals with cross-cutting themes).

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Types of Reviews

- **Combination: some proposals may undergo supplemental *ad hoc* reviews before or after a panel review.**

- **Internal: review by NSF Program Officers only**
  - Examples of internally reviewed proposals:
    - Proposals submitted to Rapid Response Research Grants (RAPID)
    - Proposals submitted to EArly-concept Grants for Exploratory Research (EAGER)
    - Proposals for conferences or workshops

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How are Reviewers Selected?

- **Types of reviewers recruited:**
  - Reviewers with specific content expertise
  - Reviewers with general science or education expertise

- **Sources of Reviewers:**
  - Program Officer's knowledge of the research area
  - References listed in proposal
  - Recent professional society programs
  - Computer searches of S&E journal articles related to the proposal
  - Former reviewers
  - Reviewer recommendations included in proposal or sent by email

- **Three or more external reviewers per award are selected.**

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How Do I Become a Reviewer?

- **Contact the NSF Program Officer(s) of the program(s) that fit your expertise:**
  - Introduce yourself and your research experience.
  - Tell them you want to become a reviewer for their program.
  - Ask them when the next panel will be held.
  - Offer to send a 2-page CV with current contact information.
  - Stay in touch if you don't hear back right away.

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What is the Role of the Reviewer?

- **Review all proposal material and consider:**
  - The two NSF merit review criteria and any program specific criteria.
  - The adequacy of the proposed project plan including the budget, resources, and timeline.
  - The priorities of the scientific field and of the NSF program.
  - The potential risks and benefits of the project.

- **Make independent written comments on the quality of the proposal content.**

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What is the Role of the Review Panel?

- **Discuss the merits of the proposal with the other panelists**

- **Write a summary based on that discussion**

- **Provide some indication of the relative merits of different proposals considered**

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Why Serve on an NSF Panel?

- **Gain first-hand knowledge of the merit review process**

- **Learn about common problems with proposals**

- **Discover proposal writing strategies**

- **Meet colleagues and NSF Program Officers managing the programs related to your research**

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Funding Decisions

- **The merit review panel summary provides:**
  – Review of the proposal and a recommendation on funding.
  – Feedback (strengths and weaknesses) to the proposers.

- **NSF Program Officers make funding recommendations guided by program goals and <u>portfolio considerations</u>.**

- **NSF Division Directors either concur or reject the Program Officer's funding recommendations.**

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BIO Divisions

- Division of Biological Infrastructure (DBI)
  – Various (see individual solicitations)
- Division of Molecular and Cellular Biology (MCB)
  – Full proposals: November 15
- Division of Integrative Organismal Systems (IOS)
  – <u>Pre-proposals</u>: Third Friday in January
  – Full proposals: First Friday in August
- Division of Environmental Biology (DEB)
  – <u>Pre-proposals</u>: January 23
  – Full proposals: August 2

Division of
Biological Infrastructure (DBI)

Support for the development and enhancement of biological resources and human capital
– REU Sites
– Postdoctoral fellowships
– Field station improvements
– Support for biological collections
– Instrument development
– Advancing Biological Informatics

Division of Molecular and
Cellular Biosciences (MCB)

Research aimed at understanding life processes at the molecular, subcellular and cellular levels
– Cellular biology and biochemistry
– Molecular genetics and genomics
– Molecular biophysics
– Networks and regulation
– System and synthetic biology
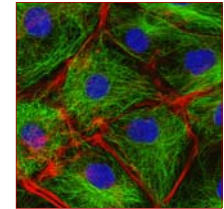
Division of Integrative
Organismal Systems (IOS)

Research aimed at understanding the individual organism -- plant, animal, microbe -- as a unit of biological organization

– Behavior
– Development
– Neurobiology
– Physiology
– Structure & Function

Division of
Environmental Biology (DEB)

Research aimed at understanding populations, species, communities, and ecosystems
– Biodiversity, phylogenetic systematics
– Molecular evolution, life history evolution, natural selection
– Ecology, biogeography
– Ecosystem services, global change, biogeochemical cycles

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Finding Funding Opportunities

- www.nsf.gov
- NSF Updates
- **Award Search**
- **Division Websites**

Solicitations

Dear Colleague Letters

DEB International Dear Colleague Letters

Lead Agency Model: a streamlined review process that helps facilitate international collaboration
- Submission to and review at one agency
- If awarded, each country's agency will fund their own researchers
- <u>No new money</u> = same anticipated funding rate as core

Israel: Binational Science Foundation (BSF)
http://www.nsf.gov/pubs/2014/nsf14094/nsf14094.jsp
United Kingdom: Natural Environment Research Council (NERC)
http://www.nsf.gov/pubs/2014/nsf14098/nsf14098.jsp

Questions? NSFDEB-BSF@nsf.gov or NSFDEB-NERC@nsf.gov

Full proposals and pre-proposals

- Integrated Organismal Systems (IOS) and the Division of Environmental Biology (DEB) both require pre-proposals (next deadline January 2016)

- Molecular and Cellular Biology (MCB) has an annual full proposal deadline (next one November 15, 2016)

No pre-proposals for DEB Special Programs

- Long Term Research in Environmental Biology (LTREB)
- Long Term Ecological Research (LTER)
- Dimensions of Biodiversity
- Ecology and Evolution of Infectious Diseases (EEID)
- Coupled Natural and Human Systems (CNH)
- Genealogy of Life (GoLife)

Annual Cycle of Review and Recommendation
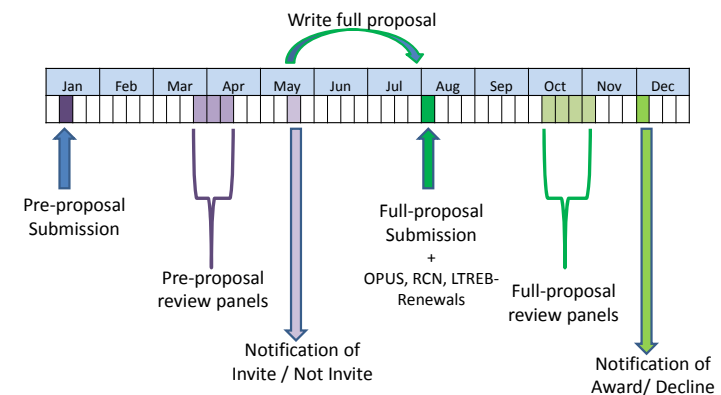
Write full proposal

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |

Pre-proposal Submission

Pre-proposal review panels

Notification of Invite / Not Invite

Full-proposal Submission + OPUS, RCN, LTREB-Renewals

Full-proposal review panels

Notification of Award/ Decline

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NSF Graduate Research Fellowship Program

- Supports individuals proposing a comprehensive holistic plan for graduate education
- Plans for graduate education must demonstrate potential for significant achievements in science and engineering
- Awarded to individuals in the early stages of their graduate study
  - Undergrad seniors and 1st and 2nd year graduate students
  - ~20% success rate
  - Flexible; students can take award to any US institution
- Applicants must be US citizens or permanent residents
- Two (MS) or three (PhD) years of support
- $34,000 annual stipend plus $12,000 tuition support
- 2,000 new Fellowships will be offered for 2016
- Anticipated Funding Amount: $337,500,000
- November deadline with April award announcement
- https://www.nsfgrfp.org/

NSF Graduate Research Fellowship Program

- Chemistry
- Computer and Information Science and Engineering
- Engineering
- Geosciences
- Life Sciences
- Materials Research
- Mathematical Sciences
- Physics and Astronomy
- Psychology
- Social Sciences
- Science, Technology, Engineering and Mathematics Education (research-focused)

NSF Doctoral Dissertation Improvement Grants (DDIG)

- Small grants (~$13K (direct costs) for up to 2 yrs) to provide support for costs related to dissertation:
  - field work, data collection, payment to subjects, survey expenses, software, microfilm, reproduction of tapes and written materials, data transcribing
  - Travel to specialized facilities and field research sites
  - Partial living expenses for conducting research away from the student's university
- Dissertation advisor is the grant PI
- October deadline
- All DEB programs and one IOS program
- http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5234

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East Asia and Pacific Summer Institutes for U.S. Graduate Students (EAPSI)

- US student works at international research institute in 7 east Asian and Pacific locations between June and August.
  - Australia, China, Japan, Korea, New Zealand, Singapore, and Taiwan
- Applicant proposes location, host scientist, and research project.
- $5,000 summer stipend, travel and lodging provided
- ~200 new Fellowships will be offered for 2016
- Anticipated Funding Amount: $2,400,000
- November deadline
- http://www.nsf.gov/pubs/2013/nsf13593/nsf13593.htm

Postdoctoral Research Fellowships in Biology (PRFB)

- Three current themes:
  - (1) Broadening Participation of Groups Under-represented in Biology
  - (2) Research Using Biological Collections
  - (3) National Plant Genome Initiative (NPGI) Postdoctoral Research Fellowships.
- $54,000/year stipend + $15,000/year for research
- November deadline
- http://www.nsf.gov/pubs/2015/nsf15501/nsf15501.htm

Faculty Early Career Development (CAREER)

- NSF's most prestigious award to junior faculty who exemplify the role of "teacher-scholar"
- NSF-wide: all disciplines including cross-disciplinary
- In BIO, faculty are funded at a minimum of $500,000 for 5 years
- Proposals are submitted to the research programs ('core') with deadlines in July each year
- Faculty early in career (assistant professor), read solicitation for other eligibility requirements

CAREER Awards

Solicitation 15-555

Due Dates: July 20, 2016 BIO, CISE, EHR
July 21, 2016 ENG
July 22, 2016 GEO, MPS, SBE

http://www.nsf.gov/career

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CAREER Awards

Foundation wide
Supports junior faculty
Research and education integration
PECASE *(Presidential Early Career Award for Scientists and Engineers)*
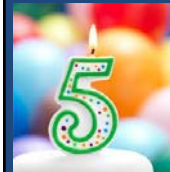eligibility

http://www.nsf.gov/career

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CAREER Awards

Stable support for 5 years

NSF wide: 400 per year

> **$400K** – CISE, EHR, MPS, SBE

> **$500K** - ENG, BIO, GEO/PLR

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CAREER eligible investigators must:

Hold PhD (by proposal deadline)

Be employed in a tenure-track (or equivalent) position at an eligible institution as an Assistant Professor (until Oct 1st following deadline)

51

An eligible institution must be:

An academic institution in the U.S., its territories or possessions, and the Commonwealth of Puerto Rico that award degrees in fields supported by NSF.

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An eligible institution may also be:

Non-profit, non-degree-granting (e.g. a museum, observatory or lab) if the eligibility requirements of the PI are satisfied.

NSF encourages proposals from different institutional types, including minority serving and undergraduate institutions

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CAREER eligible investigators may NOT:

- **Receive tenure before Oct 1st following proposal deadline**
- **Have previously received a CAREER award**
- **Have had more than two CAREER proposals reviewed**
- **Be an untenured associate professor**

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CAREER varies across NSF

- **Number of submitted CAREER proposals**
- **Review and Funding methods**
- **Other Proposals with which CAREERs compete**

NSF CAREER Coordinating Committee Sets NSF-wide goals

http://www.nsf.gov/career

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CAREER Proposals

Contact program manager liaison* and ask about:

- **Expectations for scope of research and education**

- **Assessment of 2-page departmental letter**

- **Funding rate trend for regular proposals in the program of interest**

* see http://www.nsf.gov/crssprgm/career/contacts.jsp

Are CAREER awards right for you?

Yes, if:

Your proposed research is innovative, ambitious and within NSF's the purview of research and education supported

You have support from your department/ organization, mentors.

You are at the right stage of your career.

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CAREER Personnel and Budgets

YES

NO

Consultants, subawards, unpaid collaborators

Co-PI, senior personnel

Academic year buyouts for teaching intensive institutions

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CAREER Departmental 2 Page Letter

- **Statement of PI CAREER program eligibility**

- **Support for PI's proposed research and education activities**

- **Description of how the PIs career goals and responsibilities mesh with that of the organization and department**

- **Commitment to support professional development and mentoring of the PI**

- **NOT a letter of recommendation or endorsement of the PI or the research project**

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CAREER Awards Urban Myths

"You cannot apply because you have another NSF award. . ."

"It is an entry program, so you must first apply to CAREER. . ."

"I need to see a successful proposal to write a successful proposal. . ."

"You have no chance, if you are not from a research intensive institution.."

"CAREER proposals are more portable than other NSF funding."

"The education component does not matter."

"I read on the web that to succeed, I have to…."

Traits of a Successful CAREER Proposal

High quality -- This is a highly competitive program!

Matches disciplinary program expectations

Includes an appropriate scope of activities for a 5-year plan, not one's whole life!
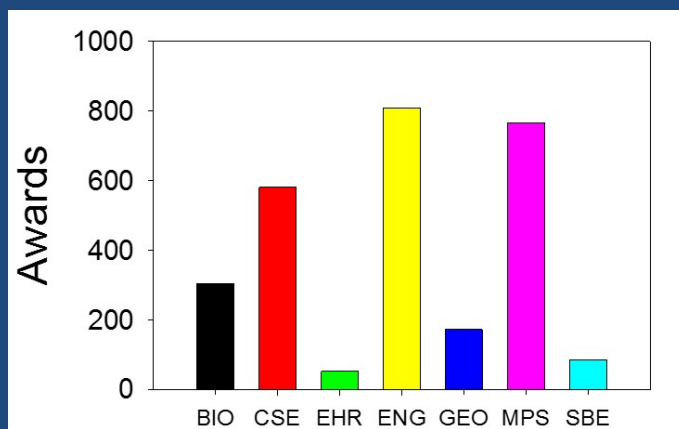
Goes outside the education box of regular research proposals in the field

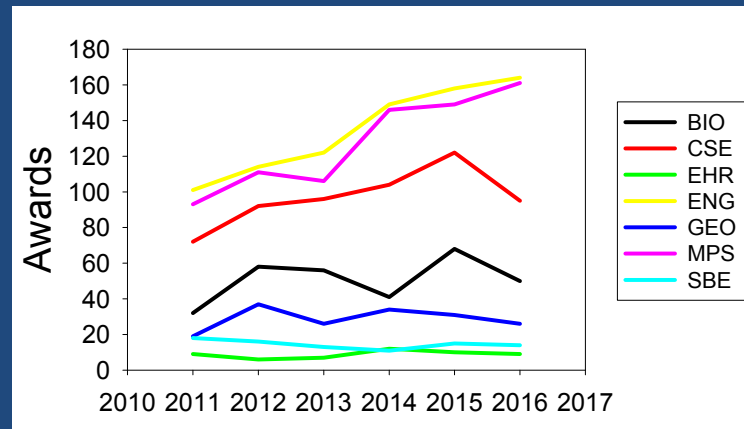**Strikes a balance between doable research activities and more risky pursuits**

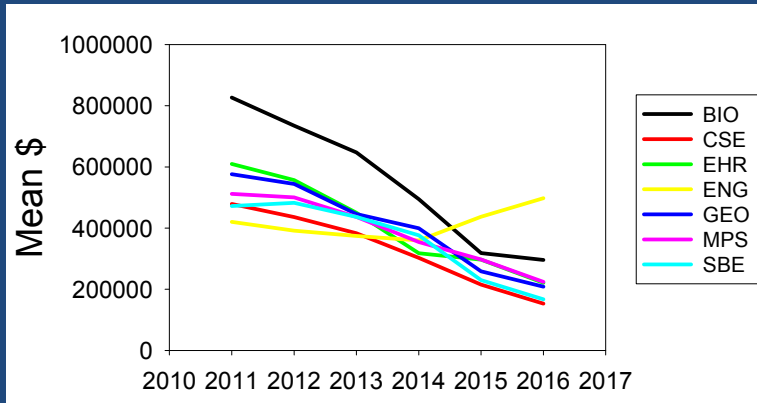## PECASE: Presidential Early Career Awards for Science and Engineering
April 18, 2014

CAREER AWARDS BY DIRECTORATE (2011-2016)

CAREER AWARDS BY DIRECTORATE over time

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CAREER AWARD AMOUNTS BY DIRECTORATE
over time, to date

Mean $ vs. years 2010–2017

Legend:
- BIO
- CSE
- EHR
- ENG
- GEO
- MPS
- SBE

CAREER Awards Resources:

- **Program Solicitation - NSF 15-555**
- **Frequently Asked Questions - NSF 15-057**
- **CAREER Directorate/Division Contacts**
  - **http://www.nsf.gov/crssprgm/career/contacts.jsp**
- **Links to recent CAREER and PECASE awards**

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Major Research Instrumentation (MRI)

➢ NSF-wide, ~$50k – 6M, funding for PUIs

➢ Supports the acquisition of major state-of-the-art instrumentation to improve access to, and increased use of, modern instrumentation by scientists, engineers, and students;

➢ Supports the development of the next generation of instrumentation (cheaper, faster, better)

➢ Enable well-equipped research environments that integrate research with education

➢ Cost sharing required for research intensive institutions

Research Coordination Networks in Undergraduate Biology Education (RCN-UBE)

- Goal: "focus on any topic likely to lead to improved participation, learning, or assessment in undergraduate biology curricula"
  - active and inquiry-based learning
  - engage faculty in professional development
  - incorporate new fields into the biology curriculum
  - improve assessment of student learning
  - improve transition from 2-year to 4 year institutions
  - incorporate authentic research experiences into undergraduate laboratory courses
- Incubator awards ($50 K) and Full awards (up to $500K for five years)
  Current solicitation is NSF **15-527**.

Small Grants

- A special category within the pre-proposal competition
- Intended to support full-fledged research projects that require a smaller budget
- If invited, the budget for the full proposal is capped at $150,000 total costs
- Indicate in pre-proposal by starting the title with "SG:"

RAPID and EAGER

- RAPIDs
  - Grants for Rapid Response Research
  - Maximum $200,000, 1 year
- EAGERs
  - EArly-concept Grants for Exploratory Research
  - High-risk, potentially transformative research
  - Maximum $300,000, 2 years
- Contact your program director to discuss and they will share guidance documents!!

Research in Undergraduate Institutions (RUI)

- For predominantly undergraduate institutions (PUI)
- Allowance made for reduced research productivity of faculty due to high teaching load
- Expectation that students will be actively involved in the research project
- "RUI impact statement" and "RUI certification" must accompany proposal
- RUI is a mechanism, not a separate funding stream
- Submit preliminary proposal in January and full proposal (if invited) in August

Research Experiences for Undergraduates (REU)

- NSF-funded programs run by institutions
- NSF-wide: all disciplines including cross-disciplinary
- Typical program: 10-weeks in summer; 10 students
- Main focus: research plus orientation, lab prep, workshops, seminars, presentations, etc

National Ecological Observatory Network (NEON)

A continental research platform to understand the biosphere at regional to continental scales, quantify the forces regulating these systems, and forecast the effects of climate change, land use change, and invasive species for the biosphere

- Do large scale climate processes (e.g. El Nino, droughts) produce regional to continental ecological responses (e.g. changes in plant productivity or emission of CO_2)?

- How will land use change affect the dispersion of invasive species through a region and across the continent?

- How will these biosphere changes alter the climate?

National Ecological Observatory Network (NSF/NEON)

- Designed to deliver synoptic, high resolution, temporal and spatial data.

- Juxtaposition of advances in the underlying science with the establishment of NEON provides the foundation for a new era of NEON-enabled science with potential breakthroughs in our ability to measure, understand and predict the behavior of ecological systems across multiple spatial and temporal scales.

- When fully operational, NEON must be combined with both coordinated and distributed experiments* in order to generate transformative and lasting innovations and progress.
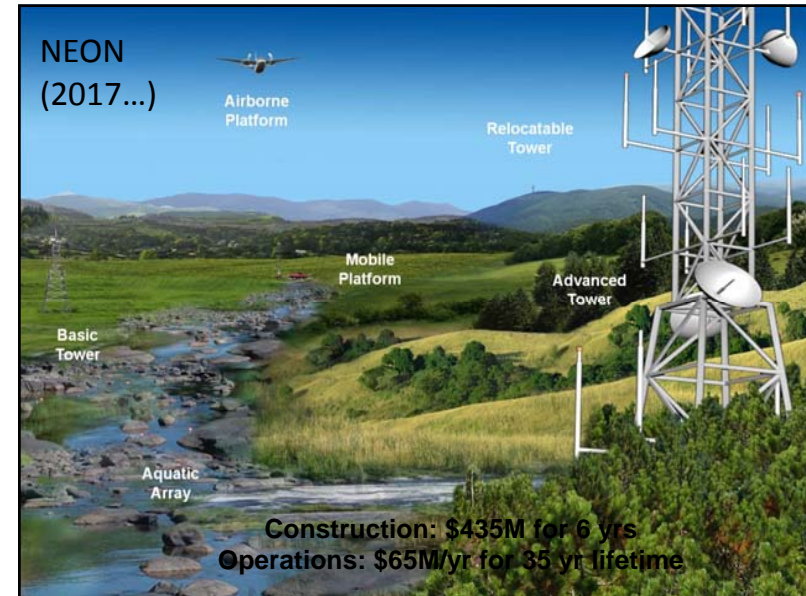
* Currently not in NEON…

NEON – baseline role

- We live on a human-dominated planet in which the majority of land is highly managed through crop agriculture, grazing, timber extraction, fire management, water diversions, human settlements, and other uses.

- Yet much of the body of knowledge in ecology stems from studies in environments in which current and past land uses were minimal or largely unaccounted for.

- Can provide critical baseline data to anchor studies of land-use gradients within and across regions, and at regional to continental scales.
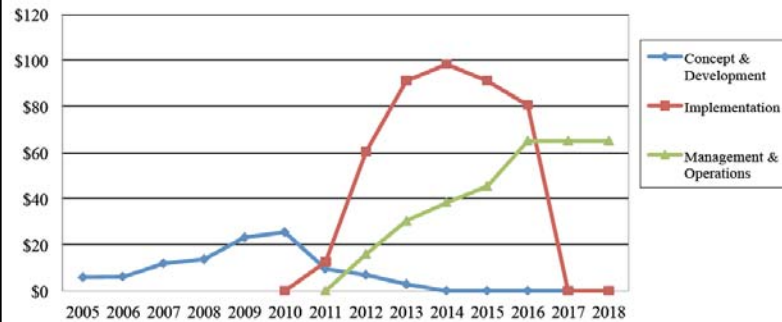
NEON – role in microbial research

- NEON Backbone consists of measurements of environmental changes that are primarily governed by microorganisms.

- NEON environmental data include measurements of microbial biogeochemical processes involved in productivity, decomposition and nutrient cycling.

- Includes archiving soil and aquatic samples, as well as microbial genomic extracts to measure the biomass, diversity, abundance, metabolism and productivity of microorganisms.
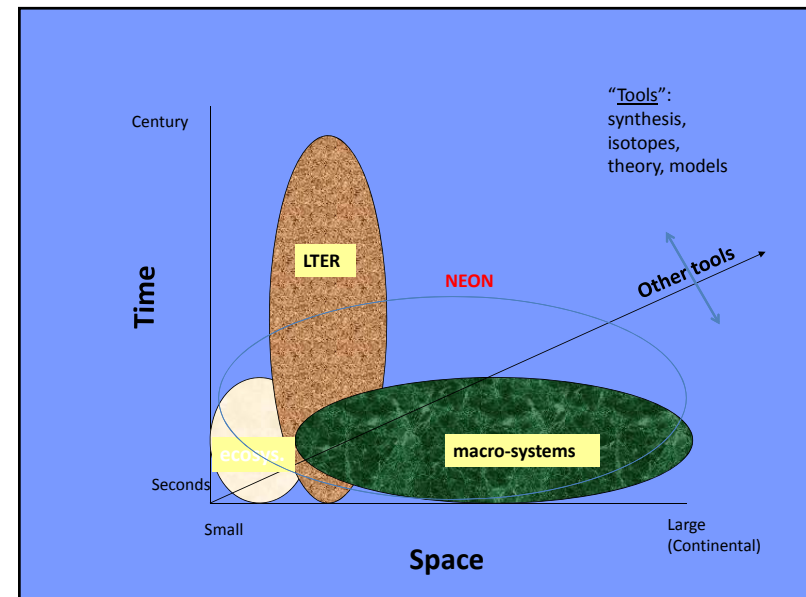
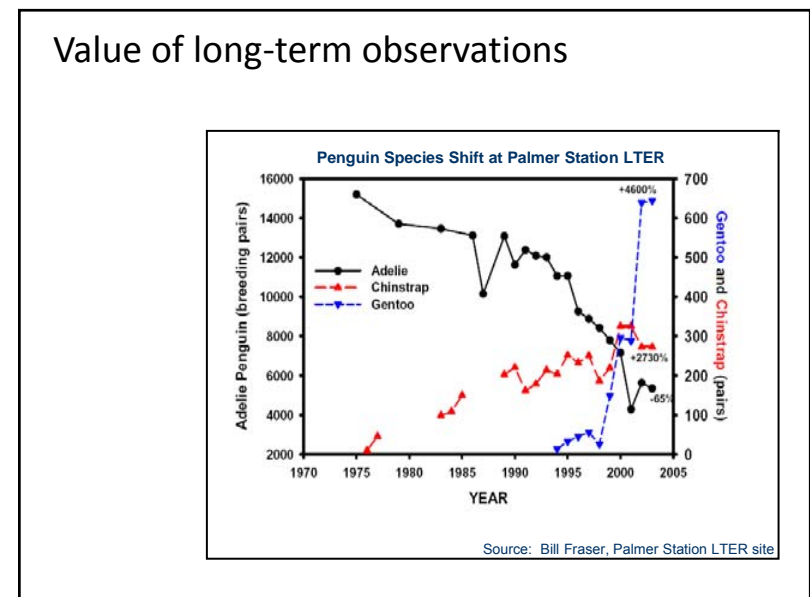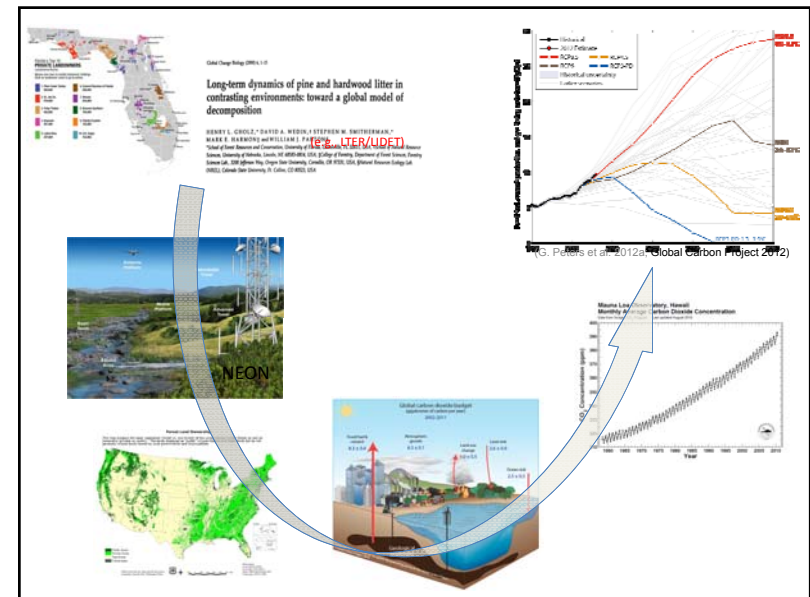NSF's National Ecological Observatory Network (NEON) – 18 domains

NEON (2017…)

Construction: $435M for 6 yrs
Operations: $65M/yr for 35 yr lifetime

From NSF/BIO Budget FY13 Request

MacroSystems Biology: scaling in time and space to regions/continents

Molecules to canopies

Region

Tools (RS, SF₆, EC, models)

Disturbances

HSD: Land Ownership; LU/LCC

The power of networked science:

The LTER Experience

(1980-?)

- 26 sites, Pole-to-Pole
- 1 Network Office
- NSF partners
- External partners
- $36M/yr budget

www.lternet.edu

Value of long-term observations

Penguin Species Shift at Palmer Station LTER

Source: Bill Fraser, Palmer Station LTER site

LTER: Regional affects of sea level rise on coastal zones

PIE	2.6 mm y^{-1}
VCR	**3.9 mm y^{-1}**
GCE	2.9 mm y^{-1}
FCE	2.2 mm y^{-1}

M. Alber, Ecotrends

ILTER Potential:
Data/model intercomparisons and expanded assessments of human impacts enabled by international collaborations
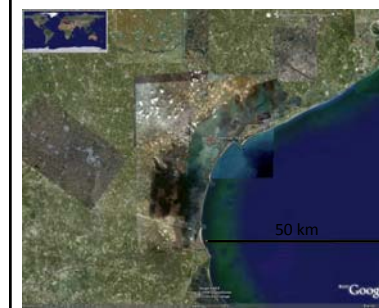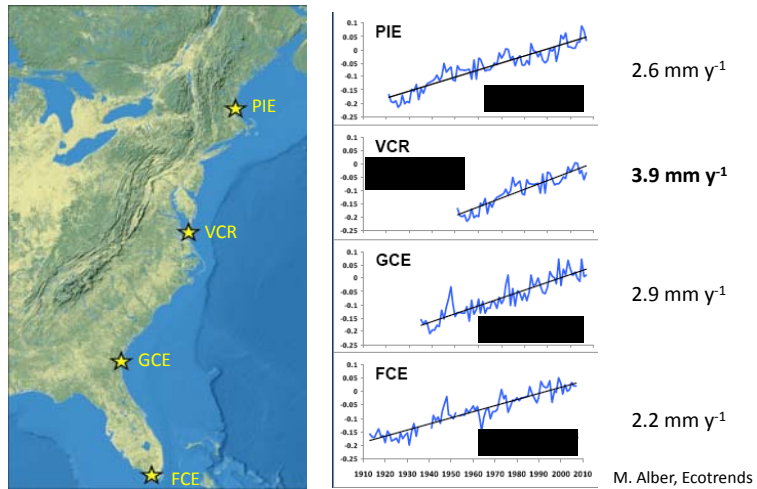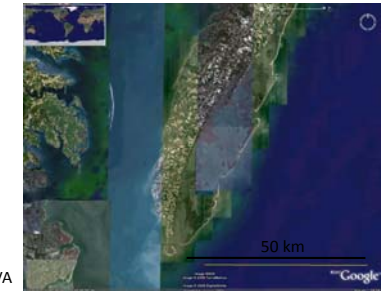

Venice, Italy

e.g., Venice lagoon similar to Virginia Coastal lagoon (distribution of barrier islands, tidal flats, salt marshes), but with 2000 years of human history (McGlathery)
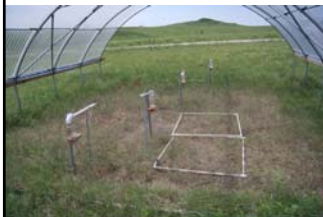
Eastern Shore, VA

NEON: Synoptic experiments were de-scoped for budgetary reasons…

Konza Prairie (LTER)

Hays, KS

But some large-scale experiments have been supported: "EDGE" rainfall manipulation experiment – US sites (Knapp et al. MacroSystems Biology project)

NSF Directorate for Education and Human Resources (EHR)
Division of Human Resource Development (HRD)

Educating the Next Generation
DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
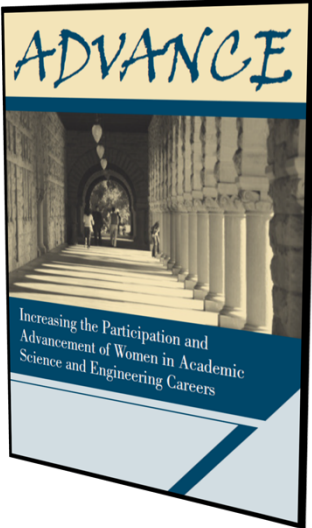DISCOVERY   KNOWLEDGE   WORKFORCE
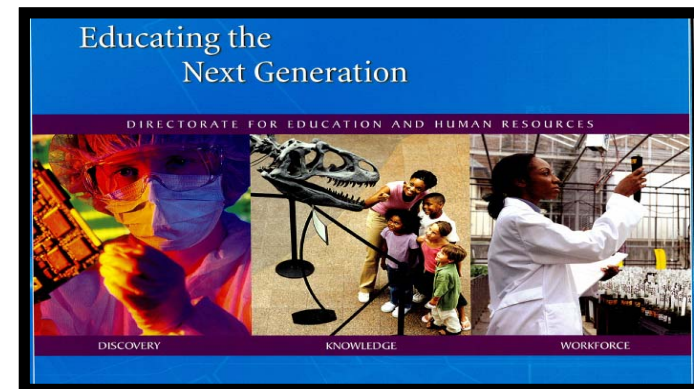
HRD Programs

- **Increasing the participation and advancement of Women in Academic Science and Engineering Careers (ADVANCE)**

- **Alliances for Graduate Education and the Professoriate (AGEP)**

- **Centers of Research Excellence in Science and Technology (CREST)**

- **Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)**

- **Louis Stokes Alliances for Minority Participation (LSAMP)**

- **Tribal colleges and universities program (TCUP)**

ADVANCE seeks to address the persistent **u**nderrepresentation of women faculty, especially in leadership positions, which affects students' critically important relationships with mentors, participation as members of research and education teams, and self-identification as potential researchers **.**

AGEP-Brookhaven National Laboratory project Faculty, post-docs, graduate students, administrators.

Alliances for Graduate Education and the Professoriate (AGEP) seeks to advance knowledge about models to improve pathways to the professoriate for historically underrepresented minority doctoral students (including those with disabilities), postdoctoral fellows and faculty in specific STEM disciplines and/or STEM education research fields.

New and innovative models are encouraged, as are models that reproduce and/or replicate existing evidence-based alliances in significantly different disciplines, institutions, and participant cohorts.

Centers of Research Excellence in Science and technology (CREST)

The **CREST** program provides support to enhance the research capabilities of minority-serving institutions through the establishment of centers with collaborating partners that effectively integrate education and research.

Projects must demonstrate a compelling vision for research infrastructure improvement, and a comprehensive to achieve and sustain national competitiveness in a clearly defined area of national significance in science or engineering research.

CREST project – California State University, Bakersfield For the study of 21st century water resources and subsurface carbon storage in the San Joaquin Valley.

Historically Black Colleges & Universities Undergraduate Program (HBCU-UP)

HBCU-UP seeks to meet the nation's accelerating demands for STEM talent, and more rapid gains in achievement and successful degree completion in STEM for underrepresented minority populations.

Awards support development, implementation, and the study of evidence-based, innovative models and approaches to nourish substantial improvements in the preparation and STEM workforce career success of HBCU undergraduates.

Louis Stokes Alliances for Minority Participation (LSAMP)

LSAMP was authorized by Congress and established in 1991. The LSAMP program provides funding to alliances that implement comprehensive, evidence-based, innovative, and sustained strategies that ultimately result in the graduation of well-prepared, highly-qualified students from underrepresented groups who pursue graduate studies or careers in STEM.

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Tribal Colleges and Universities Program (TCUP)

2015 Cohort: Tribal College Librarians Institute (founded in 1989 by Montana State University).

TCUP provides awards to Tribal Colleges and Universities, Alaska Native-serving institutions, and Native Hawaiian-serving institutions to promote high quality STEM education and research in order to support the preparation of a science and engineering workforce that is broadly inclusive and capable of performing in an international research and development environment in order for the U.S. to remain at the forefront of world science and technology.

NSF INCLUDES

Inclusion Across the Nation of Learners of Underrepresented Discoverers in Engineering and Science

NSF INCLUDES

NSF 16-544

Inclusion Across the Nation of Learners of Underrepresented Discoverers in Engineering and Science

Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES) is a comprehensive national initiative designed to enhance U.S. leadership in science, technology, engineering and mathematics (STEM) discoveries and innovations focused on NSF's commitment to diversity, inclusion, and broadening participation in these fields.

Preliminary Proposal Due Date(s) *(required)* (due by 5 p.m. proposer's local time): **April 15, 2016**

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time): **June 24, 2016**

"Diversity – of thought, perspective, and experience – is essential to achieving excellence in 21st century science and engineering research and education."

Dr. France Córdova, February 22, 2016, NSF 16-048

THE COMMUNITY IS CALLING FOR ACTION.

"NSF should implement a bold new initiative, focused on broadening participation of underrepresented groups in STEM, similar in concept and scale to NSF's centers, that emphasizes institutional transformation and system change; collects and makes accessible longitudinal data; defines clear benchmarks for success; supports the translation, replication and expansion of successful broadening participation efforts; and provides significant financial support to individuals who represent the very broadened participation that we seek."

CEOSE 2011-12 report

Committee on Equal Opportunities in Science and Engineering, 2011-2012 Biennial Report to Congress

" Increase America's talent pool by vastly improving K-12 mathematics and science education for underrepresented minorities . . . Take coordinated action to transform the nation's higher education institutions to increase inclusion of and college completion and success in STEM education for underrepresented minorities."

National Research Council, 2011. Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads

- Learn from and build on existing successes
- Promote wide-ranging partnerships involving "more than the usual suspects"
- Encourage shared measurements and systematic networked coordination, collaboration and leveraging
- Aim for a national agenda with sensitivity to local differences and contexts
- Connect the "science of broadening participation" with practice

INCLUDES: Achieving Scale for Inclusion in STEM, A Director's Workshop, CAISE, September 2015, http://informalscience.org/research/ic-000-000-011-055/INCLUDES_Report

NSF HAS RESPONDED WITH $15.5 MILLION AVAILABLE TO GET STARTED IN FY2016.

What is NSF INCLUDES?

NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES) is a comprehensive initiative to enhance U.S. leadership in science and engineering discovery and innovation by proactively seeking and effectively developing STEM talent from all sectors and groups in our society.

Source: Program Solicitation NSF 16-544

NSF INCLUDES GOALS

The long-term goals of NSF INCLUDES are to fund new research, models, networks, and partnerships that lead to measureable progress at the national level, and the ability to scale the concepts of diversity and inclusion in STEM. This will be achieved, in part, by increasing coherence and leveraging synergies across the NSF broadening participation (BP) portfolio through alignment with the NSF INCLUDES framework.

Source: NSF FY2016 President's Budget Request

NSF INCLUDES GOALS

The multi-year goals are:

- Synthesize and build the research base for broadening participation and foster the spread and adaptation of proven effective practices.
- Support the identification and development of a set of shared goals and objectives developed by stakeholders, including those from specific STEM disciplines, whose attainment is essential for success in achieving inclusion in the Nation's scientific workforce and in high quality science learning opportunities.
- Support local/regional and discipline-specific and crosscutting multi-stakeholder partnerships and networks (NSF INCLUDES Alliances) and support an NSF INCLUDES National Network.

Source: NSF FY2016 President's Budget Request

The long-term goal of NSF INCLUDES is to support, over the next ten years, innovative models, networks, partnerships, and research that enable the U.S. science and engineering workforce to thrive by ensuring that women, blacks, Hispanics, and people with disabilities are represented in percentages comparable to their representation in the U.S. population.

Source: Program Solicitation NSF 16-544

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Improve the preparation, increase the participation, and ensure the contributions of individuals from groups that have been traditionally underserved and/or underrepresented in the STEM enterprise.

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Three Essential Components of NSF INCLUDES

- INCLUDES Design and Development Launch Pilots
- INCLUDES Alliances
- INCLUDES Backbone Organization

NSF INCLUDES in FY2016

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Seeking outstanding leadership.

"As University and college presidents and chancellors, and heads of organizations funded by the National Science Foundation, I urge you to take a direct and personal role in helping build these collaborative alliances – with ambitious goals for STEM inclusion– at a national scale."

Dr. France Córdova, February 22, 2016, NSF 16-048

Looking for new ideas and new communities.

- *Novel systems approaches and designs for achieving scale are critical for advancing diversity and inclusion in STEM*
- *New research, models, networks, and partnerships to lead measureable progress at the national level and the ability to scale the concepts of diversity and inclusion, using collective impact-style strategies.*
- *Mobilize communities concerned with STEM opportunities*
- *Collaborative alliances spanning education*

Using Collective Impact*-style approaches to scaling social innovation.

- Common agenda
- Shared measurements
- Mutually reinforcing activities
- Continuous communications
- Backbone support organizations

*J. Kania, M. Kramer, Stanford Social Innovation Review, 2011

Building on the current NSF Broadening Participation Portfolio.

- There is a wealth of commitment, experience, and knowledge in our current BP portfolio.
- NSF's investments in the science of broadening participation are key resources.
- NSF INCLUDES will leverage the current BP Portfolio through:
  - Supplements, new program tracks, and Dear Colleague Letters
  - Partnerships with NSF INCLUDES Alliance leaders and organizations

Design and Development Launch Pilots

Successful Launch Pilots will:

- Identify measurable goals and objectives
- Present bold and innovative approaches for solving broadening participation challenges in STEM and articulate the potential for scaling
- Deliver models or prototypes for collective efforts to increase the participation of underrepresented groups in STEM
- Identify teams of local, regional, national, and/or disciplinary-based partners and justify the contribution of team members

Design and Development Launch Pilots

- Are expected to test the feasibility of developing a full-scale plan beyond the pilot including sustainability
  - Year 1: Refine collective commitment to common set of objectives
  - Year 2: Implement and report the results of the collective-impact style approach
- Deadlines:
  - Preproposal (required): April 15, 2016
  - Full proposal: June 24, 2016
- Number of awards: 30-40 Design and Development Launch Pilots
- Budget: Approximately $300,000 over 2 years for a total investment of $12.5M

NSF INCLUDES Alliances

- Up to five NSF INCLUDES Alliances will be funded beginning in FY2017
- Alliances will build from Design and Development Launch Pilots; may be reconfigured by adding new partners, collaborators or networks = new Alliance team
- Proposals will propose, implement and assess solutions to address barriers to broadening participation in STEM
- Key components = common goal, collective-impact style approaches & a strategy to deploy at scale
- Alliances may focus on emerging fields in science and engineering or established fields that promote inclusion as key domains to advance BP
- Each Alliance to be funded for 5 years at $2.5M per year

NSF INCLUDES Backbone Organization

- A successful Backbone Organization fosters communication and cohesion across the set of Launch Pilots and Alliances
- It is a separate and neutral entity focused on facilitation of collective activities across the National Network
- Role of the Backbone Organization (NSF 2017 budget request):
  - communication, assessment, measurement of progress towards goals
  - data collection and monitoring, supporting implementation research
  - scaling technological innovations, providing technical expertise on collective impact

NSF INCLUDES Backbone Organization

- Drives the following activities over the lifecycle of the initiative (Kania & Kramer, 2011) :
  - ✓guiding vision and strategy
  - ✓alignment of activities
  - ✓establishing shared measurement practices
  - ✓building public will
  - ✓advancing policy
  - ✓mobilizing funding

NSF INCLUDES IS A MULTI-YEAR EFFORT TO BUILD A NATIONAL NETWORK OF NETWORKS FOR INCLUSION.

Overall Goal of NSF INCLUDES
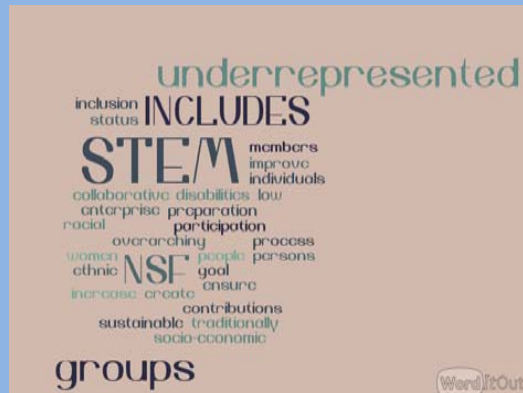
Multi-year Goals:

- Synthesize and build the research base for broadening participation and foster the spread and adaptation of proven effective practices
- Support the identification, development, and attainment of a set of shared goals and objectives developed by stakeholders, including those from specific STEM disciplines, which are essential for achieving inclusion in the nation's scientific workforce and in high quality STEM learning opportunities
- Support local/regional and discipline-specific or crosscutting multi-stakeholder partnerships and networks (NSF INCLUDES Alliances) and support an NSF INCLUDES National Network

Long Term Goals of NSF INCLUDES are to

Fund new research, models, networks, and partnerships to lead to measureable progress at the national level and the ability to scale the concepts of diversity and inclusion.

NSF INCLUDES National Network

Turner, Merchant, Kania & Martin, 2012.
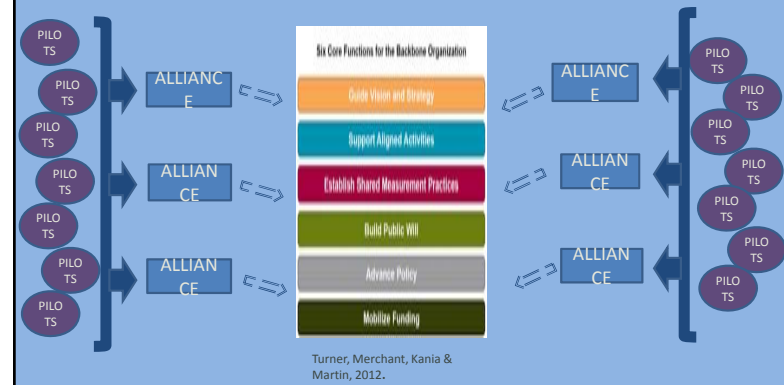
Timeline

Development

- Director's DCL to Presidents & Chancellors – NSF 16-048
- Solicitation for Design & Development Launch Pilots – NSF 16-544
- DCL Backbone Organization Conferences and Workshops

Implementation

- Alliances
- Backbone Organization
- Design & Development Launch Pilots
- Linkages to existing BP programs
- Assessment & Evaluation

Expansion

- Alliances
- Backbone Organization
- Linkages to existing BP programs
- Assessment & Evaluation

2016   **2017**   **2018 - 20**

Get involved.

Start now with your great ideas and collaborators, bring new partners and leaders, and become a part of the NSF INCLUDES National Network of Networks!

NSF INCLUDES – Points of Contact

- Program Officers:
  - Bernice T. Anderson, telephone: (703) 292-5151, email: banderso@nsf.gov
  - Janice Cuny, telephone: (703) 292-8900, email: jcuny@nsf.gov
  - Tasha R. Inniss, telephone: (703) 292-4684, email: tinniss@nsf.gov
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  - Julio E. Lopez-Ferrao, telephone: (703) 292- 5183, email: jlopezfe@nsf.gov
  - James L. Moore, telephone: (703) 292-7082, email: jamoore@nsf.gov
- Email: NSFINCLUDES@nsf.gov
- ADD WEBPAGE

QUESTIONS

Improving Undergraduate STEM Education Program (IUSE: EHR)

Program Solicitation: NSF 15-585

IUSE: EHR Program Goals

- **Improve STEM Learning & Learning Environments –** Improve the knowledge base for defining, identifying, and innovative effective undergraduate STEM education teaching and learning
- **Broaden Participation & Institutional Capacity for STEM Learning –** Increase the number and diversity of undergraduate students
- **Build the Professional STEM Workforce for Tomorrow –** Improve the preparation of undergraduate students

---

IUSE: EHR

2 tracks

Engaged Student Learning	Institutional and Community Transformation
Research, Design, and Development studies that involve creation, exploration, and implementation of tools, resources, or models	*Projects that use innovative approaches to substantially increase the propagation of highly effective methods of STEM teaching and learning in institutions of higher education*

Basic perspectives from the Common Guidelines for IUSE: EHR Projects

- Should be both "knowledge -using" and "knowledge-producing."
  - *Using: Is the project building on prior work?*
  - *Producing: What will "we" learn from the planned conduct of this project?*

*Perspective: It is OK for IUSE: EHR projects to serve the PI's institution, but they should also serve all of us by providing useful knowledge for broad constituencies of educators

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(Basic Perspectives cont.)

- Applied work (e.g. development) is fine as long as it adheres to the principles of the preceding slide. *[NSF budgets are not large enough to support simple local improvement projects.]*

- While we call for innovation, *replication* is also acceptable and an important part of science. *[How do we know that something is effective if has been tested at only one place?]*

BIO Supplementary Funding

- For researchers with <u>active NSF awards to engage other researchers</u>
  - Research Opportunity Awards (ROA)
  - Research Experiences for Teachers (RET)
  - Research Experiences for Undergraduates (REU)
 - Research Assistantships for High School Students (RAHSS)

NSF outline

- NSF organizational structure
- NSF review process
- BIO Divisions and core programs
- Finding funding opportunities
- NSF programs for graduate students, postdocs, and new faculty
- Tips for writing successful proposals
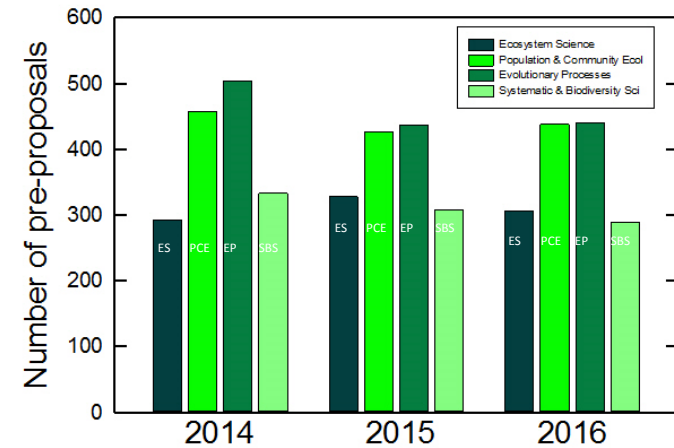
DEB trends in proposals and awards
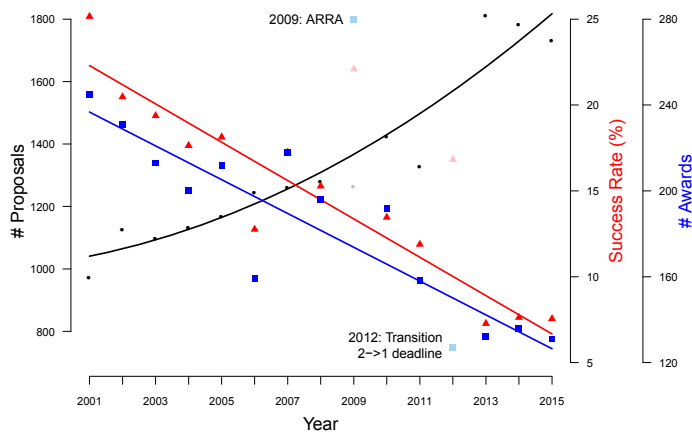
Evolutionary Processes
Trends in budgets and proposals
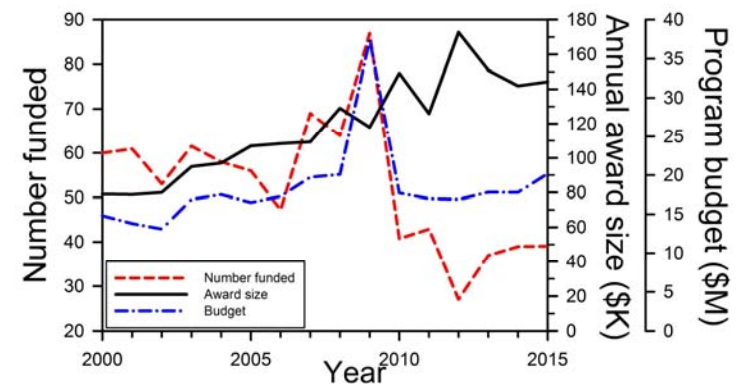
Success rates for pre- and full proposals (and overall) from the Jan 2015 submissions
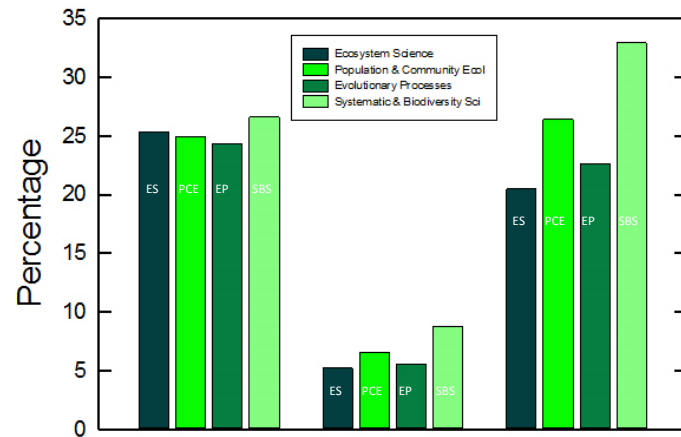
DEB Core Programs Pre-Proposal submissions

Basis for Decisions

- <u>Excitement</u>, significance, rationale for the main idea
- <u>Conceptual</u> framework of the main objectives and specific aims
- <u>Research questions</u> or hypotheses the project will pursue
- <u>Approach</u> or experimental plan that will address the questions
- <u>Broader</u> <u>impacts</u>
- <u>Qualifications</u> of the PI team to conduct the research

General guidance when preparing proposals

- **Read the funding opportunity; ask a Program Officer for clarifications if needed**

- **Address all the proposal review criteria**

- **Understand the NSF merit review process**

- **Avoid omissions and mistakes**

- **Check your proposal to verify that it is complete!**

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Writing proposals for NSF (general)

• Lead with best **ideas** for moving forward the frontiers of science.

• Everything else must logically follow.

This is the greatest contrast with all other agencies.

(do not start proposals stating where you would like to work, which species/ecosystem you want to study, the newest techniques you will use, what societal problem you are going to solve, what you can leverage…)

Writing Successful Pre-proposals

• In a compelling pre-proposal, the logical flow and significance of the proposed line of investigation must be articulated clearly and the broader impacts of the work apparent.

• Pre-proposals are reviewed by panelists only, so should be developed with a generalist, scientist reviewer in mind.

Writing Successful Pre-proposals

• Ideas new and novel, potentially transformative, conceptually well-grounded
• Potential impact of the science clear
• Experimental approaches and design feasible, logically linked to central ideas
• PIs well qualified and sufficiently experienced to effectively conduct the research
• Risks recognized and evaluated
• Convincing and significant effort made towards broader impacts (incl. required resources, leveraging)

Writing Successful Full Proposals

• Start with the big picture (conceptual framework), the fundamental question/science issue
• Make your science compelling and relevant to fundamental issues (generalizable)
• Experimental plan well-matched to hypotheses
• Preliminary data consistent with hypotheses
• New methods usually require preliminary data or demonstration they work
• Methods and design are best to test the hypotheses
• Alternative experimental outcomes considered

Slide 1

DEBrief

Blog of the Division of Environmental Biology, NSF

Subscribe to the DEB Blog
http://nsfdeb.wordpress.com

Home | DEB Resources and Links | About | Blog Policies

JULY 23, 2013 BY DEB SCIENCE STAFF

DEB Numbers: Award Size and Duration

This installment of DEB Numbers looks at the DEB Core Programs' regular research project portfolio through the lens of award size and duration.

Introduction

This post was inspired by some of the reaction we heard to our earlier DEB Numbers posts on collaboration. (We also will take the serendipitous bounce off these recent findings about award size from north of the border and subsequent discussion here.)

Featured Posts

Introductory Post

Blog Policies

Slide 2

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Slide 3

NSF Needs You!

Program Officers

Division Directors

Ad hoc Reviewers

Advisory Panelists

Slide 4

National Science Foundation: organizational structure, review process, opportunities, and secrets for success

Dr. Alan E. Wilson
National Science Foundation
Division of Environmental Biology
aewilson@nsf.gov

Extra slides

NSF outline

- NSF organizational structure
- **NSF review process**
- BIO Divisions and core programs
- Finding funding opportunities
- NSF programs for graduate students, postdocs, and new faculty
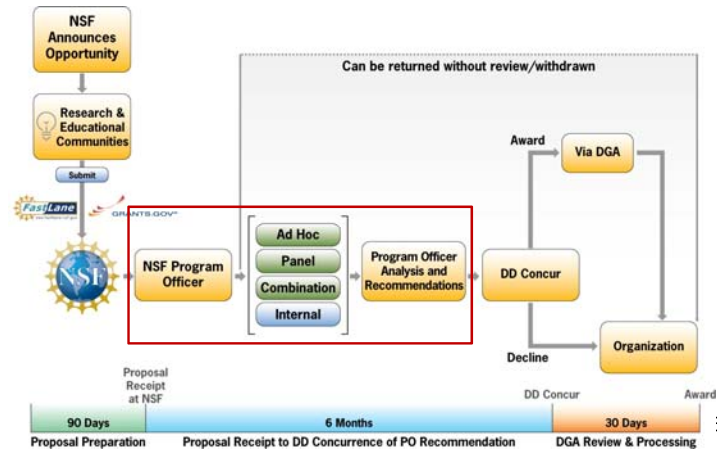- Tips for writing successful proposals

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NSF Proposal & Award Process Timeline
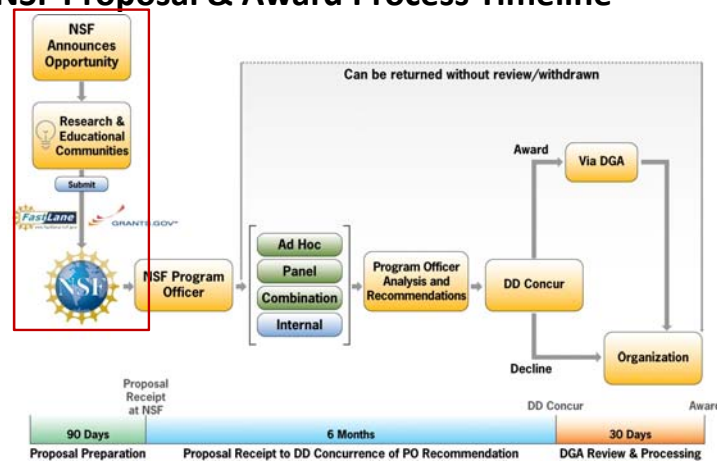
Reminders When Preparing Proposals

- **Read the funding opportunity; ask a Program Officer for clarifications if needed**

- **Address all the proposal review criteria**

- **Understand the NSF merit review process**

- **Avoid omissions and mistakes**

- **Check your proposal to verify that it is complete!**

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Proposal Review and Processing

Program Officer Review

- **Upon receipt at NSF, proposals are routed to the correct program office.**
- **NSF staff conducts a preliminary review to ensure they are:**
  - Complete;
  - Timely; and
  - Conform to proposal preparation requirements.
- **NSF may not accept a proposal or may return it without review if it does not meet the requirements above.**
  - The return without review process will be discussed in greater detail later in the session.

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Merit Review Criteria
Guiding Principles

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects.

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Merit Review Criteria

When evaluating NSF proposals, reviewers should consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits would accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers are asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

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Five Review Elements

The following elements should be considered in the review for **both criteria**:

1. What is the potential for the proposed activity to:
   a. advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
   b. 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?

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 at the home institution or through collaborations) to carry out the proposed activities?

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Review Format in FastLane

- Reviewers provide feedback to NSF based on the Review Criteria and the Review Elements

- Review criteria and elements are available as reviewers provide feedback

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Proposal Review and Processing

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Proposals Not Accepted or Returned Without Review

- **Per the GPG Project Summary Requirement:**
  - Proposals that do not contain the Project Summary, including an overview and separate statements on intellectual merit and broader impacts will not be accepted by FastLane or will be returned without review
- **Per the GPG postdoctoral researcher mentoring requirement:**
  - Proposals that include postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals.
  - The mentoring plan must not exceed one page per project.

- **Per the GPG data management plan requirement:**
  - The plan must be included as a supplementary document.

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Other Reasons for Return of Proposals Without Review

- **It is inappropriate for funding by the National Science Foundation.**

- **It is submitted with insufficient lead time before the activity is scheduled to begin.**

- **It is a full proposal that was submitted by a proposer that has received a "not invited" response to the submission of a preliminary proposal.**

- **It is a duplicate of, or substantially similar to, a proposal already under consideration by NSF from the same submitter.**
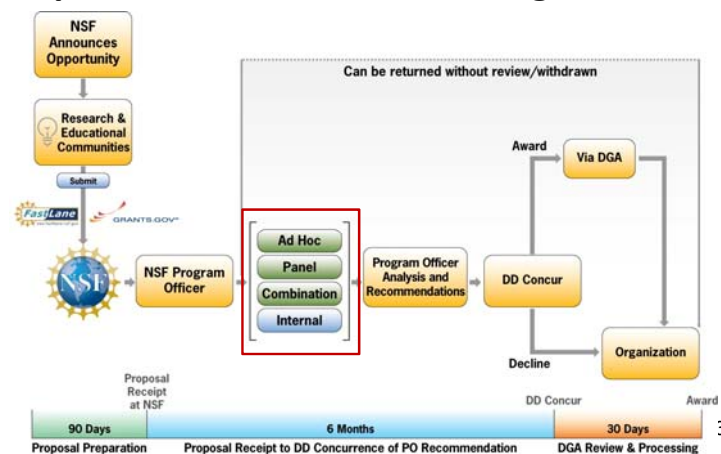
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Other Reasons for Return of Proposals Without Review

- **It does not meet NSF proposal preparation requirements, such as page limitations, formatting instructions, and electronic submission, as specified in the GPG or program solicitation.**

- **It is not responsive to the GPG or program announcement/solicitation.**

- **It does not meet an announced proposal deadline date (and time, where specified).**

- **It was previously reviewed and declined and has not been substantially revised.**

- **It duplicates another proposal that was already awarded.**

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Proposal Review and Processing

Types of Reviews

- *Ad hoc*: **proposals sent out for review —**
  - *Ad hoc* reviewers usually have specific expertise in a field related to the proposal.
  - Some proposals may undergo *ad hoc* review only.

- **Panel: Face-to-face sessions conducted by reviewers mainly at NSF but also in other settings**
  - Panel reviewers usually have a broader scientific knowledge.
  - Some proposals may undergo only a panel review.
  - Some proposals may undergo reviews by multiple panels (especially for those proposals with cross-cutting themes).

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Types of Reviews

- **Combination: some proposals may undergo supplemental *ad hoc* reviews before or after a panel review.**

- **Internal: review by NSF Program Officers only**
  - Examples of internally reviewed proposals:
    - Proposals submitted to Rapid Response Research Grants (RAPID)
    - Proposals submitted to EArly-concept Grants for Exploratory Research (EAGER)
    - Proposals for conferences or workshops

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How are Reviewers Selected?

- **Types of reviewers recruited:**
  - Reviewers with specific content expertise
  - Reviewers with general science or education expertise

- **Sources of Reviewers:**
  - Program Officer's knowledge of the research area
  - References listed in proposal
  - Recent professional society programs
  - Computer searches of S&E journal articles related to the proposal
  - Former reviewers
  - Reviewer recommendations included in proposal or sent by email

- **Three or more external reviewers per award are selected.**

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How Do I Become a Reviewer?

- **Contact the NSF Program Officer(s) of the program(s) that fit your expertise:**
  - Introduce yourself and your research experience.
  - Tell them you want to become a reviewer for their program.
  - Ask them when the next panel will be held.
  - Offer to send a 2-page CV with current contact information.
  - Stay in touch if you don't hear back right away.

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What is the Role of the Reviewer?

- **Review all proposal material and consider:**
  - The two NSF merit review criteria and any program specific criteria.
  - The adequacy of the proposed project plan including the budget, resources, and timeline.
  - The priorities of the scientific field and of the NSF program.
  - The potential risks and benefits of the project.

- **Make independent written comments on the quality of the proposal content.**

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What is the Role of the Review Panel?

- **Discuss the merits of the proposal with the other panelists**

- **Write a summary based on that discussion**

- **Provide some indication of the relative merits of different proposals considered**
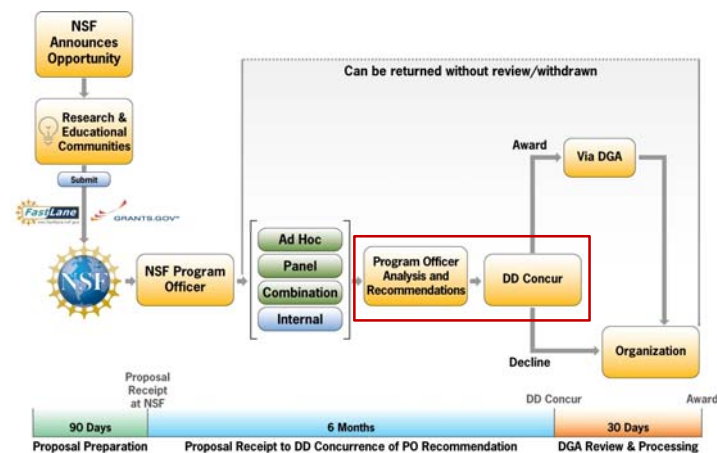
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Why Serve on an NSF Panel?

- **Gain first-hand knowledge of the merit review process**

- **Learn about common problems with proposals**

- **Discover proposal writing strategies**

- **Meet colleagues and NSF Program Officers managing the programs related to your research**

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Proposal Review and Processing

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Funding Decisions

- **The merit review panel summary provides:**
  - Review of the proposal and a recommendation on funding.
  - Feedback (strengths and weaknesses) to the proposers.
- **NSF Program Officers make funding recommendations guided by program goals and <u>portfolio considerations</u>.**

- **NSF Division Directors either concur or reject the Program Officer's funding recommendations.**

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Concept-Driven Merit Review