Broader Impacts Design for NSF Proposals:
New Resources for Cornell Researchers

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Cornell University, Office of Sponsored Programs

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Agenda

Overview: NSF and Broader Impacts (BI)

NSF at Cornell

History of BI: Challenges and Opportunities

BID Team Resources for Reseachers & Stakeholders

Questions and Discussion

National Science Foundation – Overview

1950: Created by Congress "to promote the progress of science; to advance the national health, prosperity and welfare; to secure the national defense"…

Today
- NSF receives 50,000 proposals, funding +/- 12K new proposals (22% average annual funding rate)
- 2020 Federal Budget: $8.3B
  - 7 STEM Directorates
    - 10%/$823M to EHR Directorate/ STEM EDU
  - NSF = ¼ of all federally sponsored basic, non biomedical research at US universities.

NSF - Cornell's Largest Federal Research Sponsor

- 2017: Cornell ranked #3 in NSF
- 2018: $116M Ithaca campus

- Most awards go to individual and small groups of researchers

- -15.3% decline over last 5 years
- + in 2018

Sponsored Research Expenditures FY 2018
Federal Agencies - Ithaca Campus (in thousands)

■	DHHS $76,361
■	NSF $116,047
■	DOD $27,364
■	USDA $29,033
■	DOE $21,331
■	NASA $10,639
■	AID $1,876
■	Other $12,068

Total Federal Sponsored Expenditures: $294,720,844
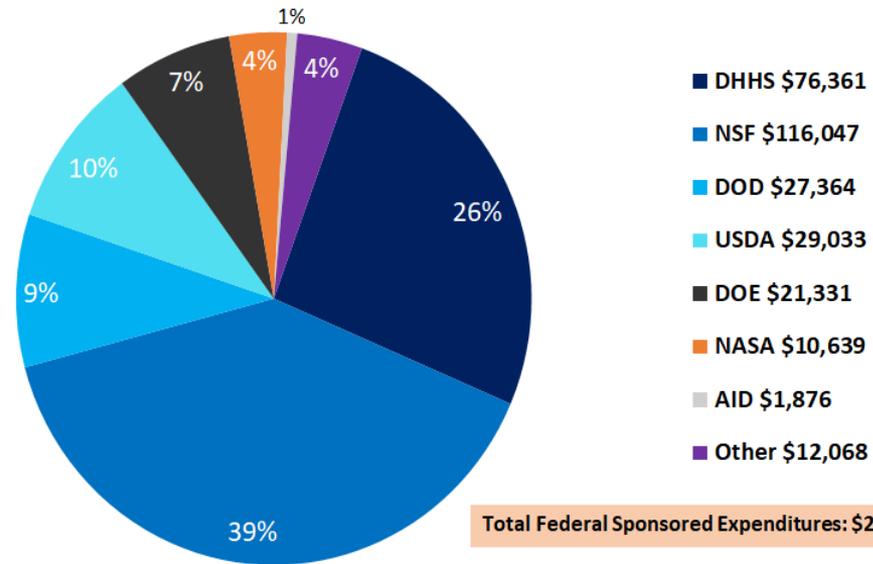
NSF has a long history of advancing science and society interests

1981-1997: 4 criteria (suggested societial impact)

1993 Government Performance and Results Act
Improve performance and public accountability at Federal Agencies

Since 1997 NSF Merit Review has included 2 criteria:

- Intellectual Merit (research potential to advance scientific knowledge)

- Broader Impacts (potential of research to benefits society)

- Check out: nsf.gov.discoveries

Researcher Reservations Early on (1997-2011)

Diverse reservations about BI criteria:

'Don't understand it'

'Not very important'

'Irrelevant'

'Impossible to address'

(J. B. Holbrook. 2005, 2012)

"It's huge"

"The weakness of the BI criterion is [that] it is mysterious to people; it is not understood by PIs, prospective PIs, or [review] panelists"

"We understand (how to write, do) the IM, not the BI."

"It's not a question of language, but belief."

BI Timeline

Broader Impacts Criterion

5 Explicit Elements

Merit Review Process

NSF Strategic Plan 2011-2018

National Science Board, NSF governing body, task force on Merit Review for BI.

NAS, PCAST, Broadening Participation

NSF Continues Investment/Improvement

NABI (National Alliance for Broader Impacts) established; 3 directorates

NSF Summit and Publication

The Current State of Broader Impacts: Advancing Science and Benefiting Society
January 2016

1997

2010

2011

America COMPETES Act, ReAuthorized

Integration of proven strategies that link research and BI

PIs can allocate funds (assess/eval BI)

Agency-wide trainings for BI (reviewers)

2013

PAPPG - Significant Changes

9 BI Criterion - removed specific activities references

Separate grant sections on BI: narrative, results from prior NSF Support

IM and BI evaluated with same Merit Review criteria

Proposals and reports require "sufficient detail to assess the projects benefit to society".

2014

2018

National Momentum

NSF Strategic Plan 2018-2022- 'Advance State of BI Practice'

NABI: Current State on BI Report

CISE - Directorate-wide Strategic Plan on BP - BP / Opportunity

ARIS - All Directorates Funding

What are Broader Impacts?
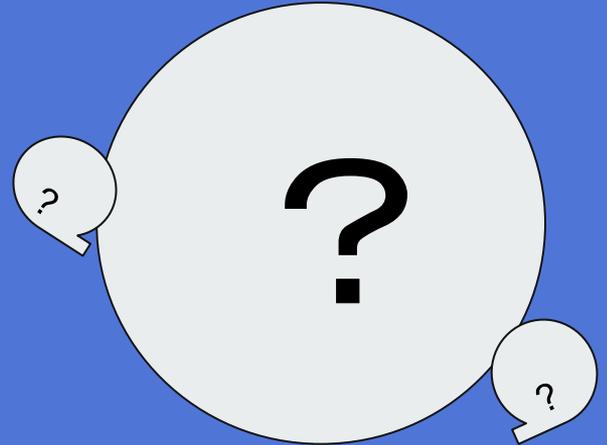
# Broader Impacts potential (of the proposed research) to "benefit society and contribute to the achievement of specific, desired societal outcomes." -PAPPG 2019

- Research itself CAN BE the broader impact

- BI activities can be directly related to the research project

- BI activities can be supported by or complementary to the project

"If the research itself is transformational, that is enough; but most researchers can't make that case at the proposal stage; so they need to do something else" (Susan Renoe NABI, 2018, B. Olbricht, NSF ENG Direcotate, 2018

BI Merit Review Criteria (PAPPG 2019)

Full participation of women, persons with disabilities, and underrepresented minorities in 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

Trends in Grant Success across NSF Directorates:
Broadening Participation & Broad Dissemination of Outcomes
Dr. Susi Iocono, NABI 2018, 2019, ARIS 2020

Other Considerations: Integration

"NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities" (Merit Review from PAPPG 2018).

Other Considerations: NSF's Strategic Plan 2018-2022

Future STEM Workforce

Diverse STEM Workforce

Convergence, Collaboration

NSF's 10 Big Ideas

Broader Impacts are:

Specific

Strategic

Flexible

Non-prescriptive
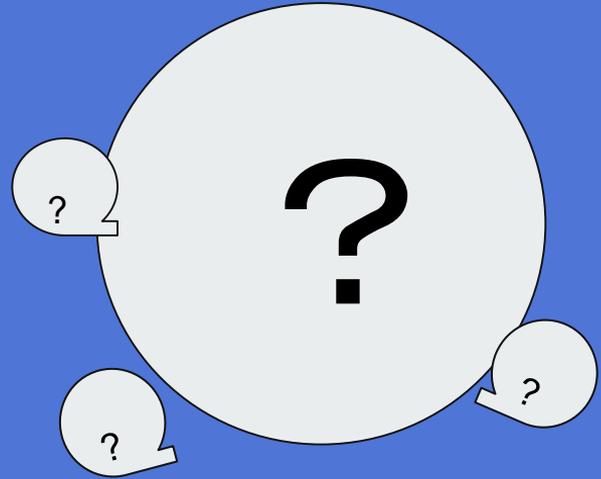
Reviewed in diverse directorates/fields, with their own cultural values, beliefs, needs, and agendas. **Implemented** in diverse cultures, environments and communities.

Current Challenges and Barriers

A lot to keep up with

Policy continues to be refined, expectations continue to grow, bar is higher

NSF is not a monolith, nor are fields, directorates

BI is not a last-minute 'activity' or 'statement'

Many, diverse stakeholders (not always talking to one another) **

Cornell Specific

Large campus, small community, and challenging finding the right people and supports

Not part of tenure package/Land-Grant University

Important to early career faculty success

Pockets of knowledge, resources, access to BI

Resources

Can we lower the barriers?

Can we make better connections, share knowledge, develop lasting BI partnerships?
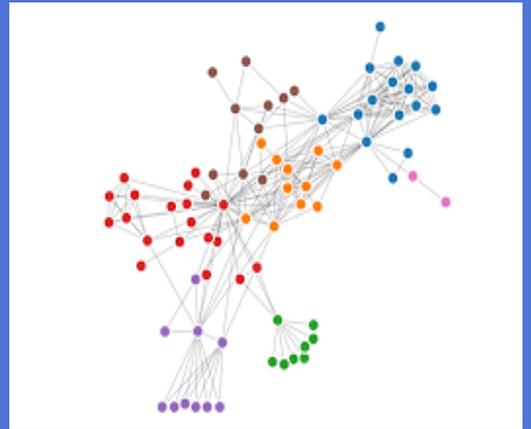
Common resources for BI Stakeholders?

- Diverse Stakeholders
- Unique resources
- Shared resources?
- Stakeholders may or may not be speaking the same "BI language"
- Resources and structures need to improve this.
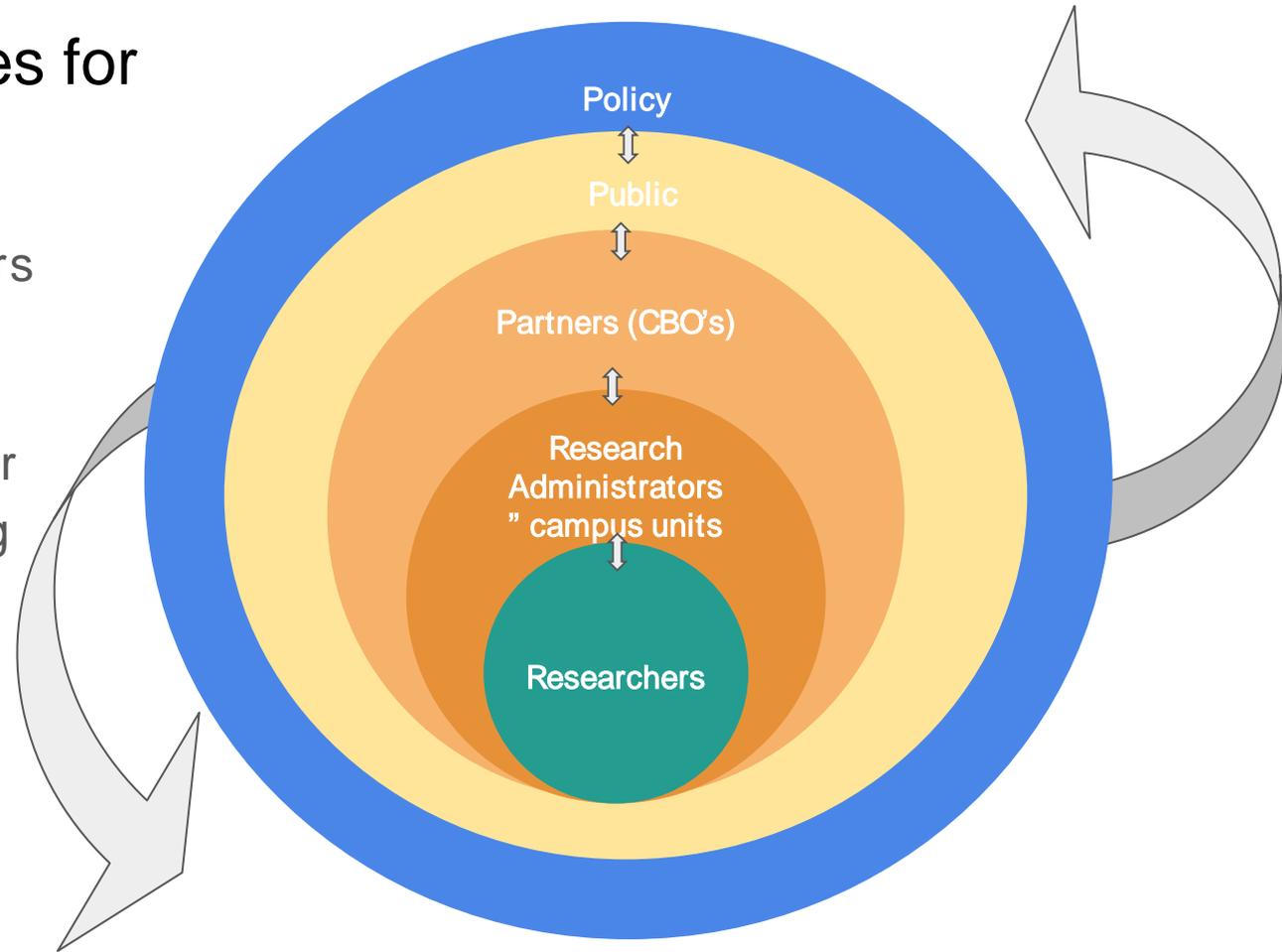
Resources at a Glance

INTERNAL

| OSP web: BI Resources | CAREER Workshops | Research Development Team | Office of Faculty Development & Diversity | Office of Engagement Initiatives | Public Service Center | Center for Teaching Innovation | The Graduate School | McCormick Center for Teaching Excellence | K-12 Outreach Centers | Sci. Comm. Trainings |

| BI Identity | Writing/Design | Partners & Resources | Curriculum Grants | NY State Partnerships Liasion | Community Partners | Diversity & Inclusion | Careers Beyond Academia- | Existing campus BI programs |

BI Resources at a Glance

EXTERNAL

NSF Strategic Plan 2018-2022

NSF Science & ENG Indicators 2020

NSF – Portal to the Public

NABI – ARIS

CAISE

CBO's

National and International Collaborators

Professional Societies

Professional Evauators

Sciencenter

TC3 Comm. Colleges

WSKG Public Media

Community Science Institute

CCE

RD list

Case Studies

Community Org. Researchers, Research Administrators, partnering in BI Design

BID Toolkit
Sample tools

- New BI design tools and Resources have been developed from the 3 partner sites are being tested with 6 new teams at universities and museums across the country.
- See table for Toolkit

Table of Contents

Community Based Organizations

What does it mean to be "NSF Ready?"

- Better Understanding of BI, RFPs, Researcher Questions
- Communications Template
- Pilot Experiences
- Project Narratives with PIs
- Budgets and Contracts
- Scopes of Work
- Biosketch
- PD for all on project
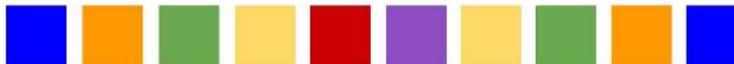
Opportunities for Researchers

- Collaborate with Sciencenter educators to design and deliver hands-on programming for audiences at the Sciencenter and within the broader upstate NY community

- Professional development in informal science communication for your class, lab group, or other network

- Be a part of one of our special programs:
  - *Future Science Leaders* (middle school leadership program)
  - *Sciencenter After Dark* (informal adult-only events)

Who we are:

The Sciencenter is a non-profit hands-on science museum in Ithaca that hosts more than 110,000 guests annually and reaches many more through workshops and partnerships with museums around the world.

Our Mission:

Cultivate a broad community of curious, confident, critical thinkers

You might be surprised to know:

- The Sciencenter has been awarded numerous NSF grants to further science education opportunities

- We have an established partnership with Cornell to aid researchers in developing their broader impacts

- We design and build new exhibits that are displayed in museums across the country and reach more than one million guests each year

Have your own idea?
Contact us!

Elizabeth McDonald
Education Program Coordinator
emcdonald@sciencenter.org

Sciencenter
601 1st Street, Ithaca, NY 14850
607-272-0600 x148

Faculty Services– BI Workshops & Consults

Broader Impacts Identity

You

Field   Capacity

Society   Institution

Scholarship
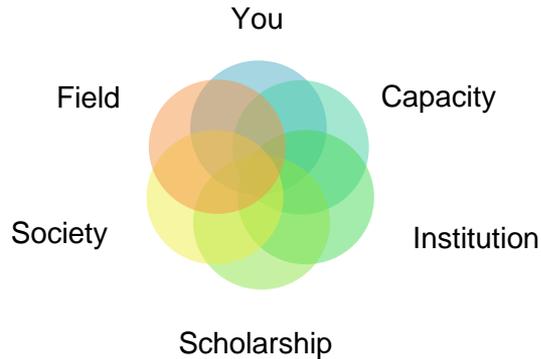
(Risien, J. et al. 2018)

Broader Impacts Strategy

Alignment with NSF's Strategic Outcomes:
- NSF Strategic Plan 2018-2022
- Directorates - Program Officers
- PAPPG/RFP
- Merit Review Criteria
- Reviewers Insights
- Assessing networks and resources

Community Based Organizations – BI Workshops, NSF-ready ?

1. Cornell Botanic Gardens
2. Cornell Cooperative Extension – Tompkins County Youth Programs
3. Cornell Graduate School - Careers Beyond Academia
4. Cornell Tech – K-12 Initiatives, Broadening Participation
5. Cornell Public Service Center
6. Cornell Diversity in Engineering Programs, CURIE and CATALYST
7. Cornell Expanding Your Horizons
8. Discover Cayuga Lake
9. New Visions Engineering, TST BOCES
10. NY State Master Teacher Program, SUNY Cortland Center
11. NY State 4H Youth STEM Programs
12. Office of Engagement Initiatives (OEI)
13. PRI – Museum of the Earth and Cayuga Nature Center
14. Public Service Center
15. Sciencenter
16. Tompkins Cortland Community College (TC3) College Now
17. WSKG Public Media
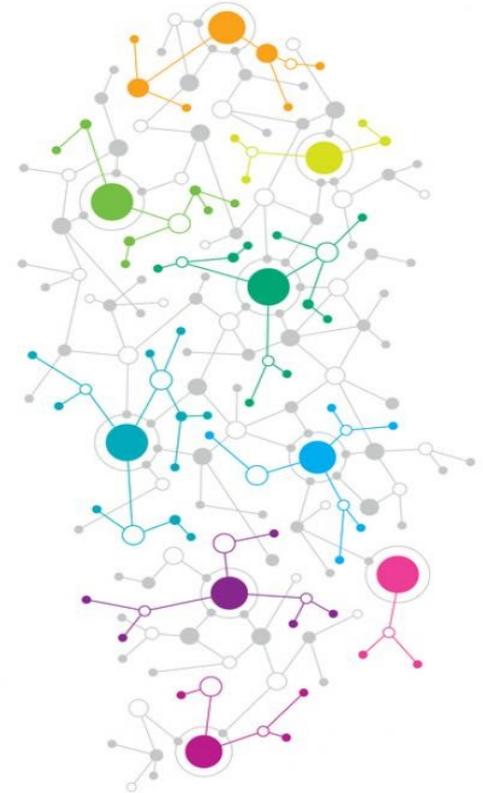
# New NSF BI Resources via OSP

NSF Broader Impacts Resources

Broader Impacts Development Services

Getting Started with Broader Impacts Design

Community Orgs. List (old and new) and Partner Overviews

Ongoing Network Building

Contact: Tiffany Fleming, tcf7@cornell.edu

PERSPECTIVES ON BROADER IMPACTS
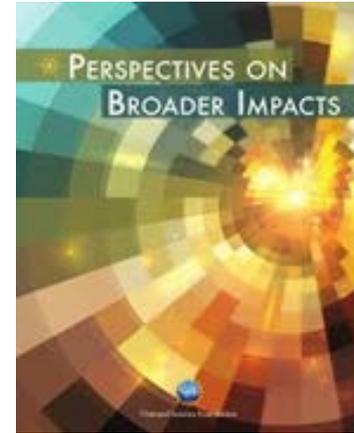
Questions
Discussion

Thank you

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