



Broader Impacts Design for National Science Foundation Proposals

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Institute for
Learning Innovation



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Aims and Agenda

Clarify the broader impacts concept

Share a structure and resources to improve BI effectiveness across orgs.

Lower Barriers in BI Design and (Impact) for **ALL involved**

Invitation to work together

NSF Overview

What are Broader Impacts? And why are they so challenging?

Broader Impacts Design (BID project)
NEW Resources for **Faculty, Research Admins, and Partners, Community-Based Orgs (CBOs)**

Case Studies (PIs and Partners)

Upcoming Opportunities

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

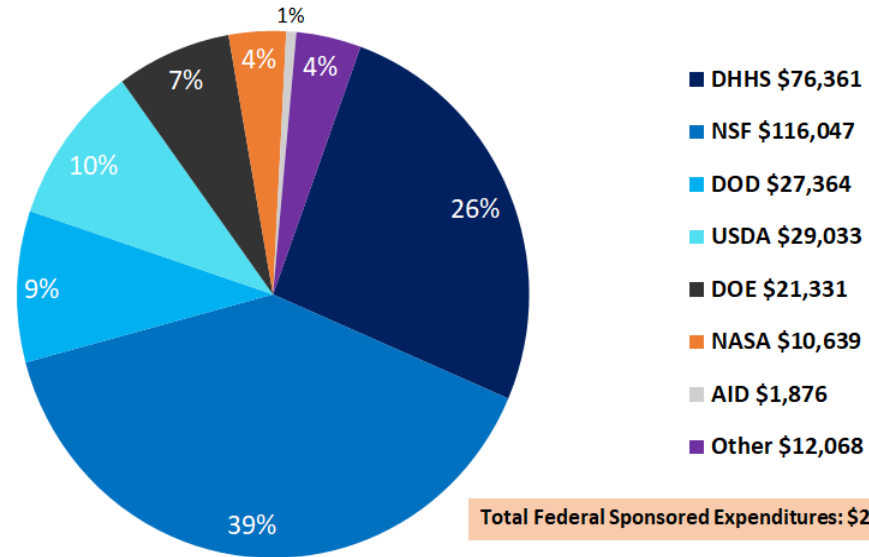
- NSF receives 50,000 proposals and funds 12,000 new projects annually
- 2018 Federal Budget: \$7.8B
 - 7 Directorates
 - 12%/\$902M to EHR Directorate/ STEM EDU all levels
- NSF = ¼ of all federally sponsored basic research at US universities



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)





NSF has a long history of advancing science and society interests

1981-1997: 4 criteria (suggested societal 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** (benefits to society)



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)





BI Timeline

Broader Impacts Criterion

5 Explicit Elements

Merit Review Process

NSF Strategic Plan 2011-2018

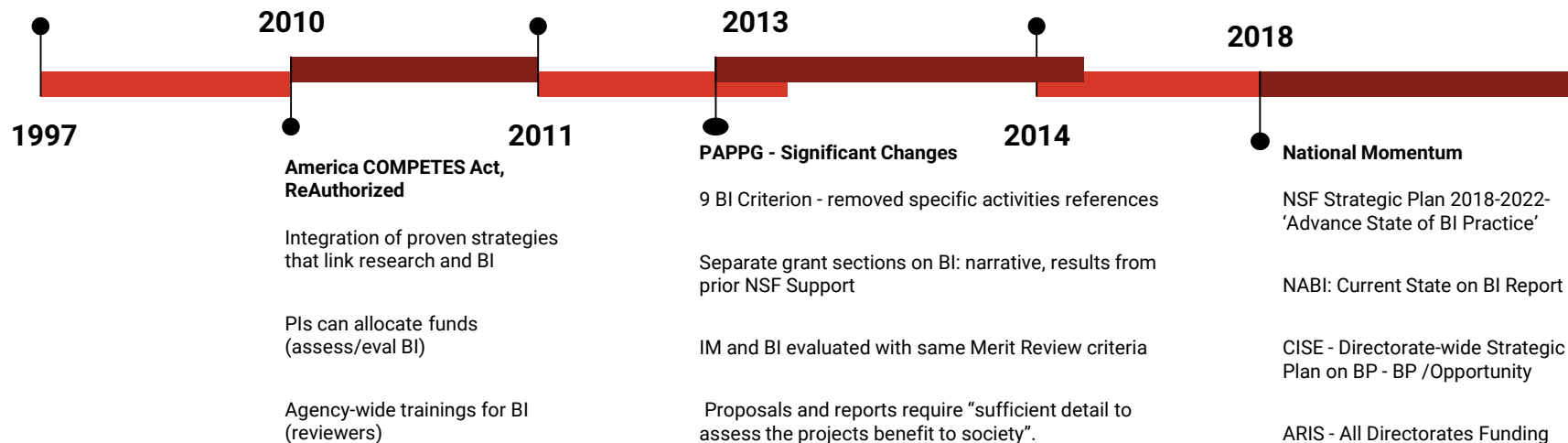
National Science Board, NSF governing body, task force on Merit Review for SP.

NAS, PCAST, Broadening Participation

NSF Continues Investment/Improvement

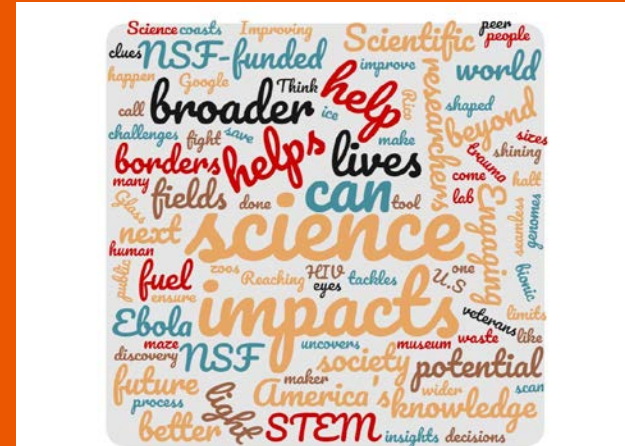
NABI (National Alliance for Broader Impacts) established; 3 directorates

NSF Summit and Publication





What are Broader Impacts?





Broader Impacts potential (of the proposed research) to benefit society and contribute to the achievement of specific, desired societal outcomes.”

- 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, ARIS, B. Olbricht, NSF ENG panel reviews).



— BI Merit Review Criteria (PAPPG 2019)

9 Broad BI areas for BI (specific, desired societal outcomes)

- 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

Important for Success at all NSF Directorates : Broadening Participation & Broad Dissemination of Outcomes



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).



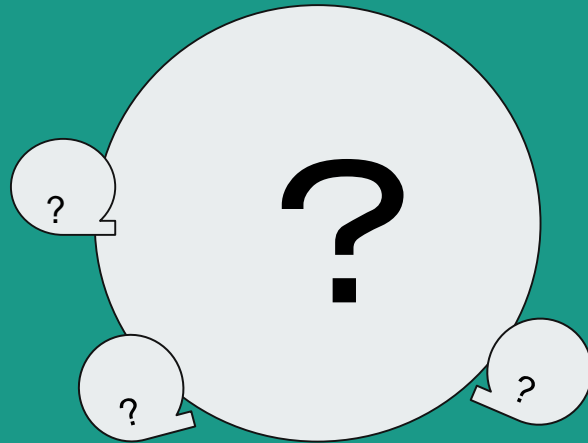
Broader Impacts are:

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.



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

Confusion, frustration and excellence around BI

Not part of tenure package/Land-Grant University

Important to early career faculty success

Pockets of knowledge, resources, access to BI



Resources

What's out there now?

For whom?



Resources at a Glance

INTERNAL

- OSP – Research Development Team
- BID project team and tools
- Office of Faculty Development and Diversity
- Engaged Cornell - Opportunity Grants
- Public Service Center – Faculty Grants
- McCormick Center for Teaching Excellence in Engineering
- K-12 Outreach Centers

OSP website: BI resources and list of CBO contacts

EXTERNAL

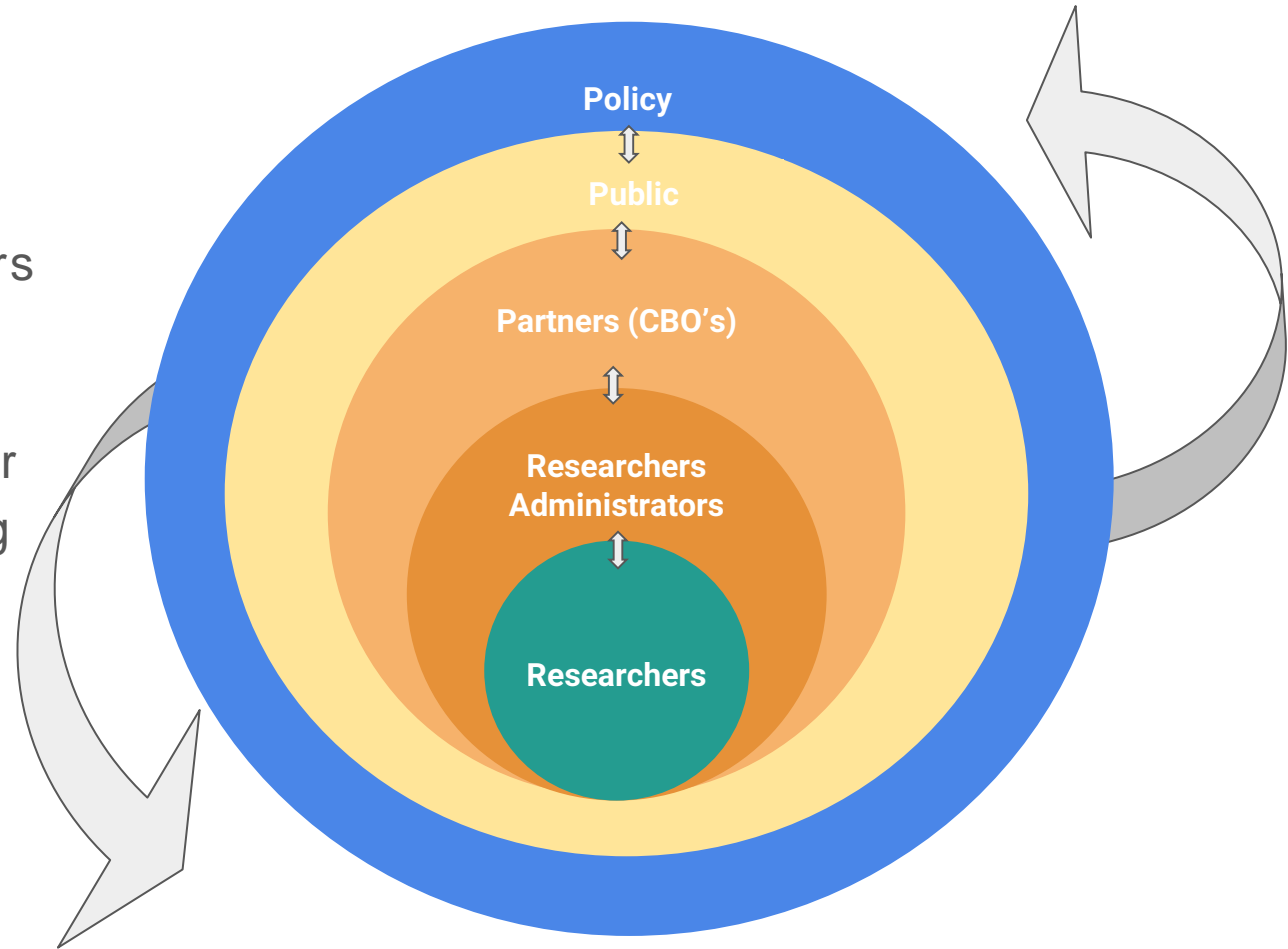
- NSF Strategic plan 2018-2022
- NABI – listserv, summit
- ARIS – fellowships, PD, assessment
- Portal to the Public
- Community Based Organizations





Resources for all 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.





BID

Partnerships for
Broader Impacts Design

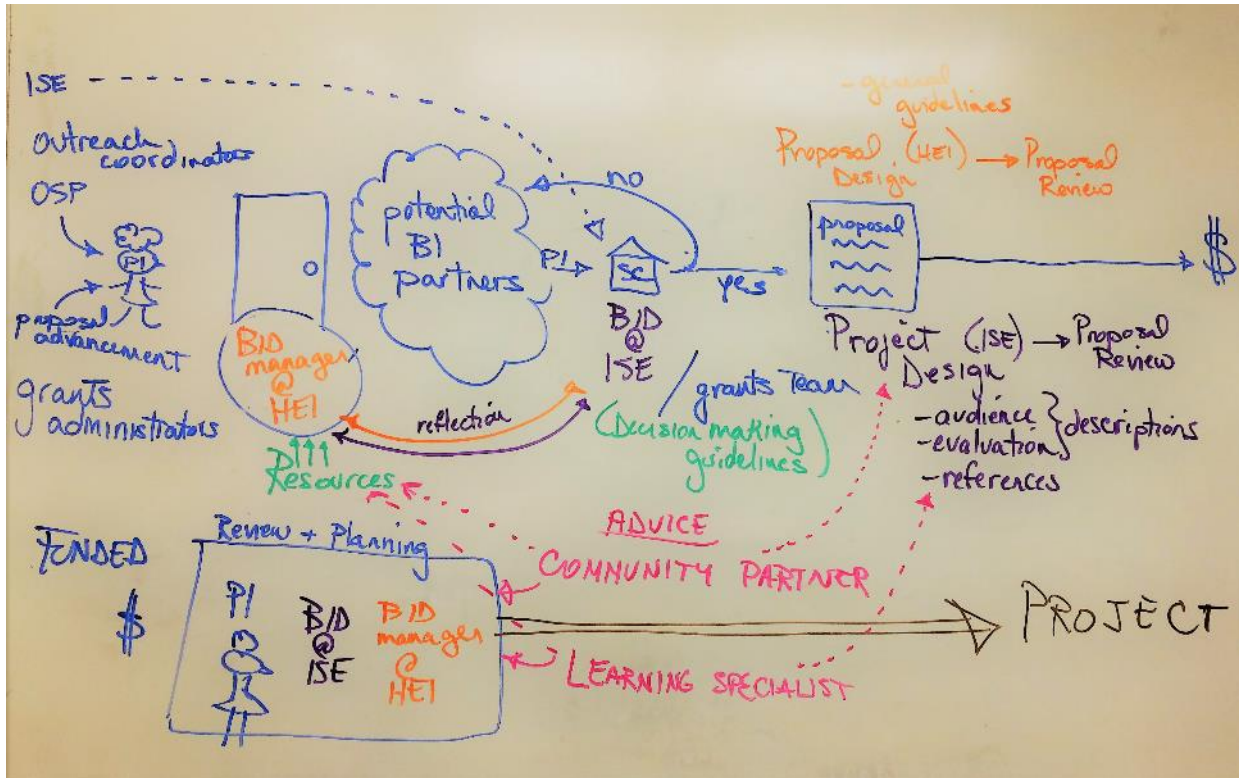


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Our Model (Researcher, Research Administrators Community Organization, other experts)



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

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Case Studies

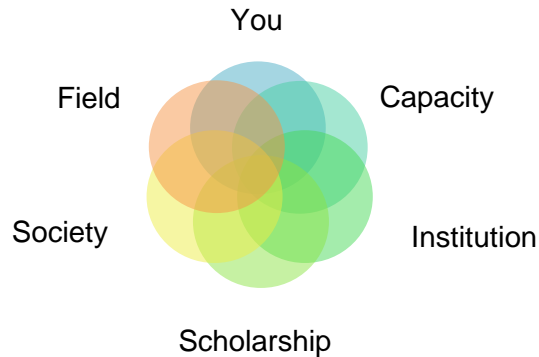
Researchers, Research Administrators, and Community Partners in BI Design





Beginning Work with Faculty - My role in OSP

Broader Impacts Identity



(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

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



Steven Adie, PhD

Work with the Sciencenter:

Sciencenter BID Partner
since 2016

- NSF CAREER grant submitted 2017
- Partnership funding for 5 years of collaboration

- Has collaborated with us to provide Portal to the Public to graduate students in his graduate course at Cornell
- Students engaged guests at the Sciencenter through hands-on activities highlighting current research in optics and biomedical engineering



Assistant Professor,
Meinig School of
Biomedical
Engineering

Michael Sheehan, PhD

Sciencenter BID Partner
since 2017

- NSF CAREER grant submitted 2017
- Partnership funding for 5 years of collaboration with Future Science Leaders (middle school leadership) program

Work with the Sciencenter:

- Portal to the Public science communication training for lab members
- Working with Future Science Leaders to communicate research in behavioral ecology through interactive displays at New York State Parks



Associate Professor in
Neurobiology and
Behavior
Nancy and Peter Meinig
Family Investigator in the
Life Sciences



Tips for PIs Designing Broader Impacts

Develop a BI Identity

- Interests, abilities, aims, and resources align
- Gain experience in BI areas that are of true interest to you:
- Test things out: ISE, outreach, mentoring, communications and media, community arts and theater, diversity, inclusion,
- Learn/document new skills and expertise - Sciencenter, CTEI, Grad School PD, Professional Societies,
- Build plan over time and alongside research and education career aims

Integrate Student Development in IM and BI Plans

Approach BI like you do your Research

- Address a challenge, societal issue or need
- Use data (theory/scholarship) to justify the need and the approach for the project
- What's being done now? What's the best approach and why?
- Foundation of best methods
- Track results
- Share your outcomes

Partnerships with Community Based Organizations

- Assemble the right team/resources - partners, advisors
- Pilot and grow over time
- Be clear about your objectives and design a plan that allows you to measure progress/impact

Opportunities

Writing Broader Impacts Statements : Engaged Cornell, March 4th

NSF Career Workshop, March 27

Standard NSF Proposals Workshop, May 11

RA and CBO workshops coming too – interested, let us know.



Contact me for more information at t Fleming@cornell.edu

Questions
Discussion

Thank you

