The Evolution of Broader Impacts at NSF

Clay Cook, Affiliate Research Professor, HBOI/FAU;

Former Program Director, National Science Foundation (BIO/IOS)
The battle was joined on 18 April when [Rep. Lamar] Smith circulated a three-page draft of his “High Quality Research Act” to committee members.

It would require NSF to certify that any pending research grant addresses national interests and problems “of utmost importance to society.”
The National Science Foundation Act of 1950 (Public Law 81-507) set forth NSF's mission and purpose:

- **basic** scientific research and research fundamental to the engineering process,

- programs **strengthen scientific and engineering research** potential,

- **science and engineering education programs** at all levels and in all the various fields of science and engineering.
NSF Merit Review Criteria

• Have undergone numerous changes since original NSF mandate

• 1974: 11 criteria in 4 categories (!)
  One issue: applied vs. basic research
NSF Merit Review Criteria

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- 1980’s: 4 criteria:
  - Competence
  - Merit of research
  - Utility (benefit to society)
  - Effect on infrastructure

“Intellectual Merit”
NSF Merit Review Criteria

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- 1980’s: 4 criteria:
  - Competence
  - Merit of research
  - Utility (benefit to society)
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“Intellectual Merit”

“Broader Impacts”
NSF Review Criteria
1997 to 2012

• What is the **intellectual merit** of the proposed activity?

• What are the **broader impacts** of the proposed activity?

Both criteria needed to be addressed in the Project Description and the Project Summary
How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields?

How well qualified is the proposer to conduct the project?

To what extent does the proposed activity explore creative and original concepts?

How well conceived and organized is the proposed activity?
NSF Broader Impacts:
1997 to 2012

- 1997: Broader Impacts: response to perceived needs:
  - Accountability
  - Broadening participation in science and engineering
  - NSF’s mandate to improve science education
  - Relevance to larger societal issues / national priorities
How well does the activity advance discovery and understanding while promoting teaching, training and learning?

How well does the proposed activity broaden the participation of underrepresented groups?

To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks and partnerships, or enhance outreach to the public?

Will the results be disseminated broadly?

What may be the benefits of the proposed activity to society?
NSF Broader Impacts: 1997 to 2012

- How well does the activity advance discovery and understanding?
- How well does the proposed activity broaden the participation of underrepresented groups?
- To what extent will it enhance the infrastructure for research and education, or enhance outreach to the public?
- Will the results be disseminated broadly?
- What may be the benefits of the proposed activity to society?

Some PI's viewed this as a checklist leading to 'mile wide and inch deep' BI statements
From the 2011 NSB report on merit review criteria:

“Everyone understands the Intellectual Merit criterion because it is a scientific and technical thing. People know how to identify creative ideas.”

“There is common understanding about this criterion, partly because NSF has been doing this one for years. The community gets it; the reviewers get it.”
As one NSF leader said (quoted in the 2011 NSB review):

“The weakness of the Broader Impacts criterion is [that] it is mysterious to people; it is not understood by principal investigators, prospective principal investigators, or panelists.”
Broader Impacts

“I shall not today attempt further to define the kinds of material I understand to be embraced within that shorthand description ….. but I know it when I see it…”

NSF Merit Review Criteria

• Have undergone numerous changes since original NSF mandate

• 1997: Developed current system of Intellectual Merit and Broader Impacts

• 2011: National Science Board review of Merit Review

• 2012: Changes to NSF Proposal Guide for 2013 in response to NSB report
Current edition of the NSF Proposal and Award Policies and Procedures Guide (PAPG)
BI Changes in 2013 PAPG

- BI language is simpler..
- The five BI checklist questions have been removed
BI Changes in 2013 PAPG*

- **BI language is simpler** ..‘The statement on BI should describe the potential of the proposed activity to benefit society and contribute to the achievement of specific, desired societal outcomes”.

*Proposal and Award Policies Guide
BI Changes in 2013 PAPG

• BI language is simpler.

• The five BI checklist questions have been removed.

• **IM and BI are described together** as an integrated whole in the Merit Review Principles and Criteria section.
“Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, yet are complementary to the project.”
Broader Impacts

From the 2011 NSB report on merit review criteria:

“The Broader Impacts [criterion] is wonderful in that it asks the question about what's the context in which the Intellectual Merit takes place; how do we strengthen the value of research?”

“By having to write about it, proposal writers now have to think about the societal context of their research beyond simple knowledge creation and beyond the 'four walls of their lab'.”
BI Changes in 2013 PAPG

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- The five BI checklist questions have been removed

- **IM and BI are described together** as an integrated whole in the Merit Review Principles and Criteria section

- The same list of quality elements for reviewers to consider is used for both IM & BI
2013 NSF Review Criteria:
Common to both IM and BI

1. To what extent do the proposed activities suggest and explore creative, original or potentially transformative concepts?

2. 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?

NOTE: this is a new addition, not in previous PAPG’s
1. To what extent do the proposed activities suggest and explore creative, original or potentially transformative concepts?

2. 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?

3. How well qualified is the individual, team or organization to conduct the proposed activities?

4. Are there adequate resources available to the PI (either at the home organizations or through collaborations) to carry out the proposed activities?
Broader Impacts 2.0®
Frequently Asked Questions About
Revisions to NSF’s Broader Impacts Criterion†

Richard A. Tankersley¹ and Patti Bourexis²
¹Florida Institute of Technology and Boot Camps 4 Scientists, LLC
²The Study Group, Inc.