# The Importance of Broader Impacts at NSF

Jeannette M. Wing Assistant Director for Computer and Information Science and Engineering National Science Foundation June 22, 2010

 Three CISE Committee of Visitors reports, one per division, in 2009.

- Three CISE Committee of Visitors reports, one per division, in 2009.
  - "How should we evaluate broader impacts?"

- Three CISE Committee of Visitors reports, one per division, in 2009.
  - "How should we evaluate broader impacts?"
  - "How should we evaluate how reviewers evaluate broader impacts?"

- Three CISE Committee of Visitors reports, one per division, in 2009.
  - "How should we evaluate broader impacts?"
  - "How should we evaluate how reviewers evaluate broader impacts?"
  - "Why don't you just get rid of this criterion since no one understands it anyway?"

- Three CISE Committee of Visitors reports, one per division, in 2009.
  - "How should we evaluate broader impacts?"
  - "How should we evaluate how reviewers evaluate broader impacts?"
  - "Why don't you just get rid of this criterion since no one understands it anyway?"
- So, this summit is to help you

- Three CISE Committee of Visitors reports, one per division, in 2009.
  - "How should we evaluate broader impacts?"
  - "How should we evaluate how reviewers evaluate broader impacts?"
  - "Why don't you just get rid of this criterion since no one understands it anyway?"
- So, this summit is to help you
  - To understand the intent and importance of broader impacts

- Three CISE Committee of Visitors reports, one per division, in 2009.
  - "How should we evaluate broader impacts?"
  - "How should we evaluate how reviewers evaluate broader impacts?"
  - "Why don't you just get rid of this criterion since no one understands it anyway?"
- So, this summit is to help you
  - To understand the intent and importance of broader impacts
  - To inspire you to think of ways your research can have broader impact and thus write meaningful (to you and the reviewers) broader impacts statements.

### History

#### History

- 1997: Four merit review criteria merged into two
  - Intellectual Merit
    - Intrinsic scientific merit
    - Soundness of team's approach
  - Broader Impacts
    - Utility or relevance of project
    - Effect on the infrastructure of science and engineering

#### History

- 1997: Four merit review criteria merged into two
  - Intellectual Merit
    - Intrinsic scientific merit
    - Soundness of team's approach
  - Broader Impacts
    - Utility or relevance of project
    - Effect on the infrastructure of science and engineering
- 2002: NSF announced that any proposal that did not address both Intellectual Merit and Broader Impacts would be returned without review.

### Goal: Connect Science to Society

## Goal: Connect Science to Society Why?

### Goal: Connect Science to Society

Why?

Intellectual reasons

### Goal: Connect Science to Society

Why?

- Intellectual reasons
  - Better public understanding of science and engineering

## Goal: Connect Science to Society Why?

- Intellectual reasons
  - Better public understanding of science and engineering
  - Better public appreciation of research, its purpose and impact

## Goal: Connect Science to Society Why?

- Intellectual reasons
  - Better public understanding of science and engineering
  - Better public appreciation of research, its purpose and impact
  - Inspire the young to enter science and engineering

### Goal: Connect Science to Society

Why?

- Intellectual reasons
  - Better public understanding of science and engineering
  - Better public appreciation of research, its purpose and impact
  - Inspire the young to enter science and engineering
- Pragmatic reasons

### Goal: Connect Science to Society

- Why?
- Intellectual reasons
  - Better public understanding of science and engineering
  - Better public appreciation of research, its purpose and impact
  - Inspire the young to enter science and engineering
- Pragmatic reasons
  - Taxpayer dollars fund your research
    - We NSF and who NSF funds (i.e., you) are accountable to Congress and the public

## Goal: Connect Science to Society

- Why?
- Intellectual reasons
  - Better public understanding of science and engineering
  - Better public appreciation of research, its purpose and impact
  - Inspire the young to enter science and engineering
- Pragmatic reasons
  - Taxpayer dollars fund your research
    - We NSF and who NSF funds (i.e., you) are accountable to Congress and the public
- NSF continually needs to explain what basic research is and the importance of science and engineering to society, the economy, and the well-being of the nation.

#### Importance: Recent Attention by Many

### Importance: Recent Attention by Many

- National Science Board
  - Report due 2011

### Importance: Recent Attention by Many

- National Science Board
  - Report due 2011
- Media
  - "Science for the Masses", Nature, May 2010
    - "No agency has gone as far as the US NSF..."
    - "The criterion was established to get scientists out of their ivory towers and connect them to society" A. Bement, former NSF Director
    - "By not tracking broader-impacts activities, the NSF undervalues its true contribution to society" M. Roberts, Univ. Colorado, Boulder

### Importance: Recent Attention by Many

- National Science Board
  - Report due 2011
- Media
  - "Science for the Masses", Nature, May 2010
    - "No agency has gone as far as the US NSF..."
    - "The criterion was established to get scientists out of their ivory towers and connect them to society" A. Bement, former NSF Director
    - "By not tracking broader-impacts activities, the NSF undervalues its true contribution to society" M. Roberts, Univ. Colorado, Boulder



 America COMPETES Reauthorization Act of 2010, passed by House on May 28, 2010

 America COMPETES Reauthorization Act of 2010, passed by House on May 28, 2010

- America COMPETES Reauthorization Act of 2010, passed by House on May 28, 2010
- Section 214(a) Goals The Foundation shall apply a Broader Impacts Review Criterion to achieve the following goals:
  - (1) Increased economic competitiveness of the United States.
  - (2) Development of a globally competitive STEM workforce.
  - (3) Increased participation of women and underrepresented minorities in STEM.
  - (4) Increased partnerships between academia and industry.
  - (5) Improved pre-K-12 STEM education and teacher development.
  - (6) Improved undergraduate STEM education.
  - (7) Increased public scientific literacy.
  - (8) Increased national security.

- Section 214 (b) Policy
   — Not later than 6 months after the date of enactment of this Act, the Director shall develop and implement a policy for the Broader Impacts Review Criterion that—
  - (1) provides for educating professional staff at the Foundation, merit review panels, and applicants for Foundation research grants on the policy developed under this subsection;
  - (2) clarifies that the activities of grant recipients undertaken to satisfy the Broader Impacts Review Criterion shall—
    - (A) to the extent practicable employ proven strategies and models and draw on existing programs and activities; and
    - (B) when novel approaches are justified, build on the most current research results;
  - (3) allows for some portion of funds allocated to broader impacts under a research grant to be used for assessment and evaluation of the broader impacts activity;
  - (4) encourages institutions of higher education and other nonprofit education or research organizations to develop and provide, either as individual institutions or in partnerships thereof, appropriate training and programs to assist Foundation-funded principal investigators at their institutions in achieving the goals of the Broader Impacts Review Criterion as described in subsection (a); and
  - (5) requires principal investigators applying for Foundation research grants to provide evidence of institutional support for the portion of the investigator's proposal designed to satisfy the Broader Impacts Review Criterion, including evidence of relevant training, programs, and other institutional resources available to the investigator from either their home institution or organization or another institution or organization with relevant expertise.

### NSF Broader Impacts Website

my italics

- Advance discovery and understanding while promoting teaching, training, and learning
- Broaden participation of under-represented groups
- Enhance infrastructure for research and education
- Broaden dissemination to enhance scientific and technological understanding
- Benefits to society

### Selected Representative Examples

- Develop educational materials for elementary, highschool and undergraduate students
- Involve elementary, high-school and undergraduate students in the research where appropriate
- Create mentoring programs
- Maintain and operate shared research infrastructure
- Establish international, industrial or government collaborations
- Form start-up companies
- Present research results to non-scientific audiences such as policy-makers
- Give presentations to the public
- Develop exhibits in partnership with museums

### Selected Representative Examples

- Develop edua school and u
- Involve elements in the students in the students in the students.
- Create mento
- Maintain and
- Establish inte collaboration
- Form start-u
- Present resea as policy-ma
- Give presenta
- Develop exhi

Med Strate Brade Input Critician Representate Automo-

regards referred to the Testand Lineau Prophilities are extended Energia que el tres articles commen, electrá al proposite man colletto applicable. Disputation destre final histo como proposite terri del dell'activo respectable, so the collection collette, and articles castel, many proposite faces dell'activo politicologico della collection del articles castel, many proposite faces dell'activo politicologico della collection della della castella dell'activo della collection del

In Proceeding Departs of a purposed scientis and construction considerations in advancing the PM Dissource. We present the purposes of purposes of the process of the construction of the control of the construction of the cons

To energie provide below on expected by to not of potential requirements continues executing the forestic superior of the proposed extents. They therein activates that, when accounting acceptance is a propose description, will hap enforces and forest requiremental distincts the forestic superior distincts in the recent and the time acceptance and distinct to the contract of the forest contract proposed and distincts the forestic superior distincts in the contract and the time acceptance.

The last open described in the collections, see a new particular energing obstess in an opposition. Frequency, because on the first in the companion that any agent in the content of the angular that content is not expected in the content of the collection of the c

The component of the bracke cognitive contains an definal to the National Compotional and based the last of Mathewal St. dark solving all each component that provide proposation is provided.

Breaks Expert Criterion. Wast on the breaks Expert of the proposal activity?

- The will be for exist, of our decrees out submodity with property makes from an instance.
- in the other street of the parties of the first distriction properties, or J's other street will be delicated the substraction for material and other than the

- Will the epoly be directated breedly in educar country and reclassical co
- Was not be backed to discovered writing to society?

#### London.

Empire of Arthur:

I langua meants activities are the molecular of science, both and explanating
of determined bank to a Vol. and explanation orders rather to the con-

- major, and profess reviews;

  Social reviews (e.g., \$1.5), undergrature comes super, socialists super,
- Design manufactured with the street of countries to define could be
- Bridge and committee of wholey affects came in
- Surrey roles principles a samp sel units of polycome works.
- polarie maker, sel miser ser mellering memit.

  Innine palane sel pro-derived member in subspectus melling
- Device, objet objet or dissentant effects model and polyage approxits could authorate and appearing techniq.

Streets Facilitation of Enterpresent Scotts.

Employ of Authors

- Employ man is not observe relationary with realize males facility of
the manufact of authors residently from

- Section of indexpression prop.
   Section delays from underspressed group in participant in the proposal materials and advances.
- Earth ment of electric collection with relate and first for earth party collection of the orang enterpresent prop.
   Talle maps can all production of arthritis for arts subsequently
- India ment at shore obtains ut both at man a
- Here with come control and agreem from underspreaded group with an extension CVF control.

ary, high-

rgraduate

astructure nment

audiences such

lums

Bedicalean

Description of Labour Versions discover and excited benefit for providing source company and excited the providing source company and excited the property and excited

- of electronical.

  Inter the extension country, out a below spaces and with the prime server on both electronical and country proper to images resemble and
- Assists, suspect and confusion beautiful and education could be fire materialation and earlight per-column.

 Density will the data data that matrices the title on one of mounts inserting for large position of vision and expensing molecu.

Broad Disconnection is Endown Scientific and Technological Codes Studies

Complete of Authorities

Annual wide interests, unless makes, where makes, and could furthers

- Notice with coveror, arter restor, cover report, and cooler betterne to the map collector or covera, such, and regulatoring facilities for policy or authors, where provide, in meanth and obsertion
- One comes and explaining presenting in the branks community (e.g., 4) morneys and different, so rather down, and in other rath reason.
- Name the resident normal for some of motion, dignic frames, of other manuscales (2-2-60).
   Nation is drawn under ing. are reclased linears, and witness, (2-40).
- pro-tate is mart reservablem.

  I have march and alcohol march in female march in pricy make pendien of Congress, substituted and endown.
- people: of Coopers, solvers, and head endower.

  In the pass is made and associate plane; confinence, makings, and made

Simple result will observe activitie as other in companion as a book case.

http://www.nsf.gov/pubs/2007/nsf07046 nsf07046.jsp

 Some broader impacts seem to take more effort than others. Do I get more credit for that?

- Some broader impacts seem to take more effort than others. Do I get more credit for that?
- How should reviewers evaluate broader impacts statements?

- Some broader impacts seem to take more effort than others. Do I get more credit for that?
- How should reviewers evaluate broader impacts statements?
- How much should broader impacts count compared to intellectual merit?

- Some broader impacts seem to take more effort than others. Do I get more credit for that?
- How should reviewers evaluate broader impacts statements?
- How much should broader impacts count compared to intellectual merit?
- How should NSF monitor progress of broader impacts statements?
  - How are PIs held accountable to their current and past statements?

- Some broader impacts seem to take more effort than others. Do I get more credit for that?
- How should reviewers evaluate broader impacts statements?
- How much should broader impacts count compared to intellectual merit?
- How should NSF monitor progress of broader impacts statements?
  - How are PIs held accountable to their current and past statements?
- How does one measure the success of a broader impacts activity?

- Some broader impacts seem to take more effort than others. Do I get more credit for that?
- How should reviewers evaluate broader impacts statements?
- How much should broader impacts count compared to intellectual merit?
- How should NSF monitor progress of broader impacts statements?
  - How are PIs held accountable to their current and past statements?
- How does one measure the success of a broader impacts activity?
- What is the cost of broader impacts and where should it come from? Line item in budget? Separate program?

- Some broader impacts seem to take more effort than others. Do I get more credit for that?
- How should reviewers evaluate broader impacts statements?
- How much should broader impacts count compared to intellectual merit?
- How should NSF monitor progress of broader impacts statements?
  - How are PIs held accountable to their current and past statements?
- How does one measure the success of a broader impacts activity?
- What is the cost of broader impacts and where should it come from? Line item in budget? Separate program?
- Who should be responsible? The PI? The University? NSF?

## FY11 Funding Opportunities

- CISE core (CCF, CNS, IIS) and cross-cutting research program solicitations posted June 11
  - Cross cuts: Smart Health and Well-being, Network Science and Engineering, Trustworthy Computing
- CISE + X programs
  - Cyber-Physical Systems (with ENG)
  - Social-Computational Systems (with SBE)
  - Interface between Computer Science and Economics (with SBE)
  - Software for Sustained Innovation Institutes (with OCI) (S^2I^2)
  - ... [Please see website <u>www.cise.nsf.gov</u> ] ...
- CISE education program (coming this summer)
  - Long and fat pipeline: K-16 x Diversity of all dimensions
- NSF foundation-wide activities in FY11 Budget Request
  - Science, Engineering and Education for Sustainability (SEES)
  - Cyberlearning Transforming Education (CTE)
  - Cyber-enabled Discovery and Innovation (CDI)
  - Science and Engineering Beyond Moore's Law (SEBML)
- Increase in Graduate Research Fellowships and CAREER awards

#### Thank You!