



**The Current State
of Broader Impacts:**

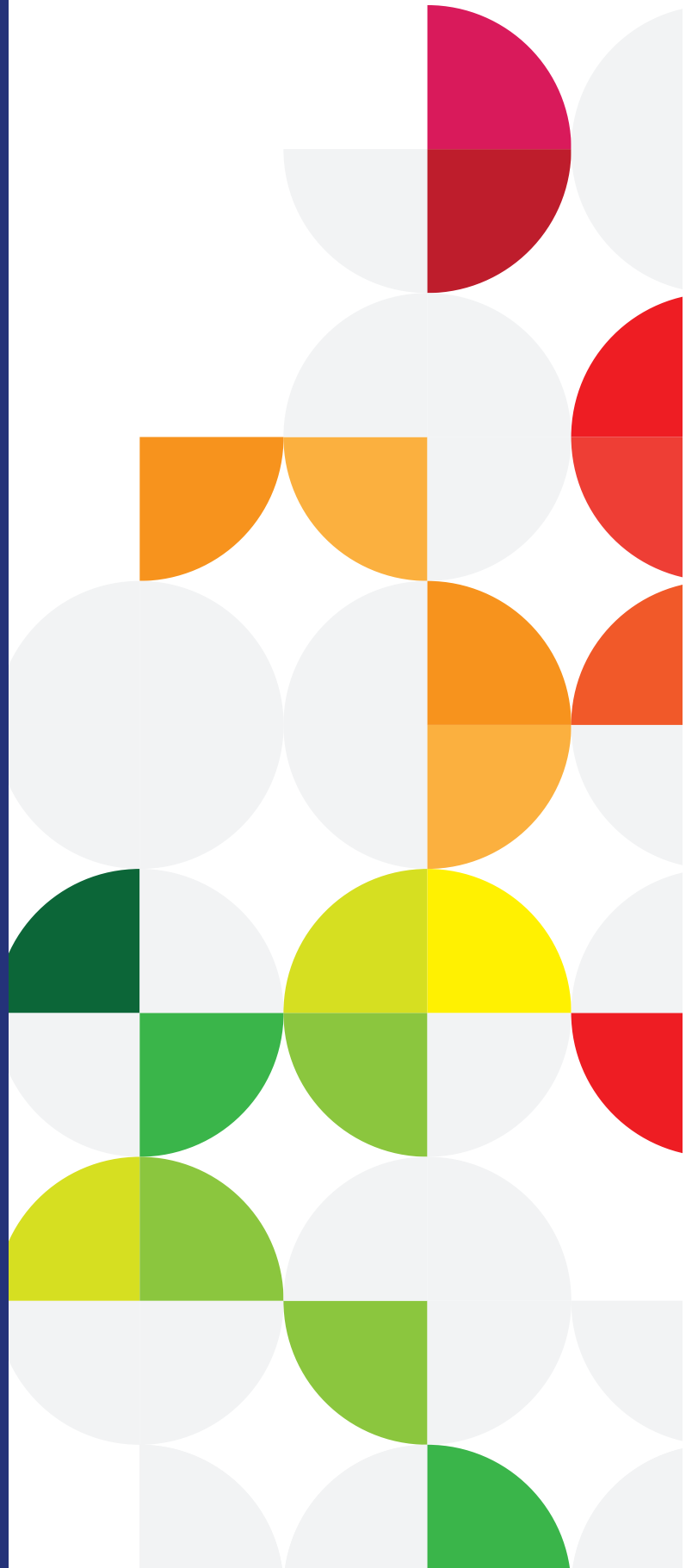
*Advancing Science and
Benefiting Society*

January 2018

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

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BACKGROUND

Each year, the National Alliance for Broader Impacts (NABI) seeks to understand the current state of broader impacts (BI) in the national context. In 2017, NABI convened two forums to identify needs and solicit recommendations. The first event was a 90-minute town hall session with 120 participants facilitated by Jamie Bell at the April 2017 BI Summit. The second event was a two-day convening facilitated by Goose Creek Consulting at NSF headquarters in May 2017 of stakeholder groups including university administrators (e.g., provosts, associate provosts, vice-presidents of research), university faculty, government officials (e.g., NSF program officers, congressional staffers), non-academic stakeholders (e.g., non-profit leaders, national organizational representatives), and BI professionals. Participants in these forums identified issues that inhibit innovative and successful BI outcomes and presented recommendations to address these barriers.

In addition, NSF's Office of Integrative Activities (OIA) has conducted a two-year study of BI implementation to uncover trends across the Foundation and across directorates. Results of the study have been presented at the last two BI Summits by Dr. Suzi Iacono, Office Head of OIA, and have been very informative. Another useful source of information about the state of BI are the Committee of Visitors (COV) reports that NSF receives each year. NSF convenes external experts as a COV to provide feedback across the Foundation in two critical areas: (1) assessments of the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions, and (2) comments on how the outputs and outcomes generated by awardees have contributed to the attainment of NSF's mission and strategic outcome goals (NSF.gov, 2017). Included in the reports are information on how the BI criterion is being applied across programs and directorates.

“We all need to be public advocates for science and engineering. We need to speak about the contributions of federal investments to research and discovery. We need to illustrate the ways we are influencing a new generation of researchers, expanding both their number and their diversity. So that the science and engineering core is filled with people with lots of different backgrounds and perspectives.”

– France A. Córdova,
Director of NSF



SUMMARY OF RESULTS

The results were similar across all stakeholder groups. Although many resources are available to support researchers in the design, implementation, and evaluation of their BI work, much work remains to clarify the BI criterion and how to effectively address it. Common issues across all stakeholder groups included:

- BI criterion is unclear
- Random judgments on BI are common in the merit review process
- Relative weighting of intellectual merit and BI is not consistent; BI is used by reviewers as a tie-breaker rather than a more substantial and equally weighted criterion
- It is unclear whether BI needs to be specifically related to the research aspects of the proposal
- Academic culture does not reward BI activities and dissemination
- Resources to support BI are lacking at the individual, institutional, and national levels
- Universities, governmental representatives, and non-academic partners need better ways to understand and communicate about BI internally and externally to demonstrate research value

Stakeholders also identified several recommendations they felt were crucial to advancing BI:

- Develop a common BI language
- Educate principal investigators (PIs), program officers, and reviewers about the BI criterion
- Create a communication strategy for stakeholders at all levels that will facilitate audience understanding of impacts and results of research investments
- Professionalize the BI community to increase the support infrastructure
- Build BI capacity within PIs
- Aggregate BI results to show impacts
- Create recognitions for exemplary BI, such as national awards
- Develop cross-institutional collaborations, including with disciplinary organizations and other community engaged scholarship organizations

What kinds of resources, expertise, and infrastructure do you wish existed (or you would like to know more about)?

NABI stakeholders focused on the development of tools and resources to build BI professional legitimacy through the help of networks like NABI or a BI center. Activities such as the creation of a “NABI Stamp of Approval” or annual awards for PIs and administrators that recognize their BI work would go far to enhance the stature of BI as a field.

Successful BI should be a resourced, sustainable activity that functions more like intellectual merit-related activities.

that for continuity, BI offices should use consistent language to reinforce the BI community of practice through their use of office names and professional titles.

Participants once again stressed the need for a BI journal to disseminate information and to receive credit for publication for themselves and PIs. It was also suggested

Building on the success of the NABI Guiding Principles document, several attendees suggested creating additional publications that focus on sustainability of BI programming and the development of a BI office at one’s institution. Training was also strongly desired by NABI members. Target audiences ranged from BI professionals to graduate students to PIs and university administrators. In-person regional trainings and online modules were suggested, and specific training designed for NSF program officers and panel members was regarded as a top priority.

BROADER IMPACTS CONVENING, MAY 2017

Seventy participants representing five stakeholder groups¹ (BI professionals, university administrators, faculty, government professionals, and non-academic professionals) met at the former NSF headquarters in Arlington, VA on May 30-31, 2017. See Appendix 1. As an icebreaker, participants were asked to provide metaphors to describe the current and future states of BI.

Participants described the current state of BI using the following metaphors and terms: under-resourced; an add-on, not-core activity; a requirement; burden; inconsistent; limited buy-in; broadcasting networks limited to certain situations; unsolved equations; a kaleidoscope or puzzle with lots of pieces; immature, not fully-developed; and lacking standards.

¹ Participants are listed in Appendix 4, and the planning committee is listed in Appendix 5.

Participants envisioned effective, successful BI as: a resourced, sustainable activity that functions more like scientific activities (i.e., intellectual merit-related activities); a bridged network connecting all types of people and research; consistent; matured, more-fully-developed as in middle-age, having agreed-upon standards.

During the first discussion group time, four stakeholder groups, with BI professionals integrated throughout, met to discuss resource needs. See Appendix 2 for table of resource needs. Next, participants intermingled to address four NABI-defined themes: Building Institutional Capacity, Building Capacity Through Partnerships, Building Capacity Across NSF, and Building Capacity Beyond NSF. Common themes from those breakout groups are found in Appendix 3.

Areas for Change. From analysis of participant feedback, three main areas emerged for moving forward as a field, including needs to: 1) professionalize the BI field; 2) strengthen communications regarding BI; and 3) create a cultural shift around the value of BI/community engagement in the fabric of institutions of higher education and funding agencies.

Professionalizing the BI field was discussed several times during the convening. This stemmed from a perceived lack of respect for BI as a profession. Professionalizing entails:

- Growing the existing scholarship (research and publications) of BI to provide evidence-based practices and move beyond anecdotes
- Providing professional development and career

“In the evolution of our national life we have reached a place where science, and the research which has discovered and released its powers, cannot be regarded as matters of accidental growth and application, but must be consciously related to our social life and well-being. What these relations are or may become is now a matter of general or public concern.”

– Science Advisory Board Report, 1933-1934

trainings for those interested in making BI a career—including fellowships for graduate students and postdoctoral fellows

- Creating a BI journal and other communication pathways
- Providing awards for excellence in BI
- Creating common language and definitions for BI
- Growing the national BI community of practice

Strengthening communications regarding BI success was seen as critical to public and political perception of and support for science. Participants identified opportunities for collaboration with public communications efforts currently led by NSF through the Office of Legislative and Public

Affairs and the OIA. A multimedia approach to communication—press releases, blogs, publications, social media, etc.—is needed to reach more audiences in targeted ways. Action items around communication include:

- Help researchers communicate their BI stories
- Systematize BI communication
- Improve communication to policymakers and the public
- Develop a public database of BI success stories
- Partner with communication professionals such as university media relations staff or professional organizations such as AAAS to increase the quality and effectiveness of communication strategies

Culture change. The need for a cultural shift to value public engagement as a vital part of the scientific mission was explicitly discussed throughout the event and was related to building capacity within and among institutions. In addition, the general consensus among participants was that shifting to an institutional culture of engagement was desired, but that no one organization or institution alone could affect that level of change. A joint effort between NSF/other governmental agencies, institutions of higher education, NABI, and other organizations was needed to effect the desired change. Specific recommendations were made on how to get started.

Build capacity within NSF. Some recommendations focused on how the culture of NSF might further support the BI criterion and reporting.

- Participants perceived a disconnect between the BI requirements stated in the *NSF Proposal & Award Policies & Procedures Guide* and how panelists review BI activities. They recommended incorporating NABI’s *Broader Impacts Guiding Principles and Questions for National Science Foundation Proposals* into all solicitations, panel trainings, and publications on BI and including a BI professional on review panels.
- Participants recommended that stronger accountability be developed to ensure that proposed BI are implemented and considered in subsequent proposals.

Build capacity beyond NSF.

Additional recommendations addressed strategies to strengthen BI awareness and support in other agencies, institutions, and organizations.

- Reimagine the BI brand as it has become synonymous with NSF. Related concepts across disciplines include, but are not limited to: outreach and engagement, implementation and dissemination, knowledge mobilization, knowledge transfer, and public engagement. Participants believed communicating the need to expand BI to a larger audience will appeal to more organizations and saw NSF as the one to lead the charge.
- Diversifying funding for BI was a common theme throughout the meeting. Although NSF was viewed as the most likely source for significant contributions, other government funding sources should also be pursued, including collaborative efforts with agencies that benefit from BI, such as the U.S. Department of Energy, the National Institutes of Health, the National Institute for Science and Technology, and the U.S. Department of Agriculture. All funding agencies have programs related to improved STEM education and broadening participation, which are key components of BI. They also benefit when the value of research is effectively communicated to the public. In addition, there is also a need to pursue funding from non-governmental sources including private foundations and industry.

“It is now more vital than ever for us, the research community, to make a convincing case to the public about the tangible societal benefits that flow from science and technology, and the importance of investing adequately in research and education.”



—Neal Lane, NSF Director 1993-1998

Building capacity within and among institutions. A final set of recommendations focused on the importance of collaboration among institutions to change the culture of BI.

- Participants suggested pilot collaborative projects as a way to build and unite the BI community, including the development of database tools that can be shared with faculty between institutions to foster collaboration and encourage partnerships between non-institutional resources.
- Participants reiterated that institutions play a critical role in communicating the impact of research and voiced the need for stronger connections to institutional

news bureaus and media relations teams.

Opportunity. Demand for support among institutions, faculty, government, science communications groups, public policy groups, and others involved in BI far exceeds the capacity of

Demand for support among institutions, faculty, government, science communications groups, public policy groups, and others involved in BI far exceeds the capacity of NABI in its current form.

NABI in its current form. Participants agreed that greater staffing and resources were necessary to meet the needs of these stakeholders moving forward and to ultimately expand BI resources available to PIs, academic administrators, and others.

Not all institutions can support a full BI infrastructure, nor should they. Resources should be available in a centralized place from which institutions can draw and

“The broader impacts criterion is pushing members of the research community to think beyond the boundaries of their science to a broader mindfulness of their work in the context of the nation’s future.”

– Arden L. Bement, Jr., NSF Director 2004-2010



change would align and unite the significant efforts being made by NSF, NABI, universities, and other organizations to increase efficiency and effectiveness and the availability of resources for researchers and BI professionals.

Participants reaffirmed that BI work is critical to public understanding of and engagement with scientific research and noted that the proposed culture change created by these recommendations would, among other goals, create larger ecosystems for organizational learning, increase awareness and resources available

to which they can contribute. This could include, but is not limited to, a database of exemplars to share with stakeholders and training for various groups. Related to this is a need for institutions to collaborate around BI and public engagement. Both NABI and other institutions would benefit from meaningful partnerships to increase public impact. Centralization of BI support would contribute to the creation of scholarly publications that share best practices and efforts to expand the constituency engaged in BI.

NABI can play an important role in facilitating collaboration across institutions. Participants felt it is critical for NABI to develop more organizational networks in an effort to expand as an organization and to facilitate more information exchanges and partnerships. NABI has established a presence in all 50 states and internationally through its development of a professional community of practice centered on campus engagement and BI. In

its current role, NABI supports individual BI practitioners. To increase the impact of NABI’s core mission, participants suggested that these collaborations extend beyond the individual level and expand to university infrastructure and administration, including the development of centralized campus resources and a common language to unite institutions towards the shared goal of enhanced BI capacity.

Conclusion. Participants concluded that a cultural shift needs to occur to increase the value of public engagement across universities, NSF, and other organizations if the goals exemplified by the BI criterion are to be met. This culture

The path forward, participants concluded, involves creating a centralized infrastructure that would expand the pilot to meet the demand for BI resources and further increase awareness.

for faculty, and better convey evidence of the impact of scientific research to stakeholders.

In conclusion, participants believed that the current NSF investment in NABI has identified the needs of the community and served as a successful pilot of the programs necessary to

accomplish the Foundation’s objectives. The path forward, participants concluded, involves creating a centralized infrastructure that would expand the pilot to meet the demand for BI resources and further increase awareness. Participants recommended that the best way to accomplish these objectives is through an NSF-supported center.

APPENDIX 1. CONVENING AGENDA

DAY ONE

8:15 a.m.	Opening Remarks <i>Susan Renoe, Principal Investigator of NABI and Executive Director of the UM Connector, University of Missouri</i>
8:25 a.m.	Icebreaker Overview of the Meeting: Goals and Structure
9:15 a.m.	State of Broader Impacts in the Advancement of Science <i>Joan Ferrini-Mundy, Chief Operating Officer, National Science Foundation</i>
10:00 a.m.	Broader Impacts Panel Discussion <i>Barry Johnson, Acting Assistant Director for Directorate of Engineering</i> <i>Scott Borg, Acting Assistant Director for the Directorate of Geosciences</i> <i>Jim Kurose, Assistant Director for the Directorate of Computer and Information Science and Engineering</i> <i>Jim Lewis, Acting Assistant Director for the Directorate of Education and Human Resources</i> <i>Jim Ulvestad, Acting Assistant Director for the Directorate of Mathematical and Physical Sciences</i> <i>Kellina Craig-Henderson, Deputy Assistant Director for the Directorate of Social, Behavioral, and Economic Sciences</i> <i>Jane Silverthorne, Deputy Assistant Director for the Directorate of Biological Sciences</i> <i>Sam Howerton, Deputy Office Head for the Office of International Science and Engineering</i> <i>Suzi Iacono, Office Head for the Office of Integrative Activities</i>
11:00 a.m.	1st Discussion Group What are your current broader impacts needs and resources? What resources do you wish existed? What could a broader impacts resource center do for you?
12:00 p.m.	Lunch
12:30 p.m.	2nd Discussion Group Building Institutional Capacity Building Capacity Through Partnerships Building Capacity Across NSF Building Capacity Beyond NSF

- 1:30 p.m.
3rd Discussion Group
Building Institutional Capacity
Building Capacity Through Partnerships
Building Capacity Across NSF
Building Capacity Beyond NSF
- 2:30 p.m.
Broader Impacts from a Researcher's Perspective
Beronda Montgomery, Professor of Biochemistry and Molecular Biology, Michigan State University
- 3:30 p.m.
Plenary: Discussion and Reflection: Report Out and Gallery Walk
- 5:00 p.m.
Closure — Day One
Comments by Kemi Jona, Director, Lowell Institute, Associate Dean Undergraduate Programs, Northeastern University
- 5:15 p.m.
Reception- The Front Page

DAY TWO

- 8:00 a.m.
Welcome
Amy Pratt, Associate Director, Office of STEM Education Partnerships, Northwestern University
- 8:10 a.m.
Synthesis: Reports from Day One
- 8:50 a.m.
Town Hall Discussion
- 10:00 a.m.
Moving Forward — Action Plans
- 11:20 a.m.
Group Reports on Actionable Recommendations
- 12:00 p.m.
Lunch
- 1:00 p.m.
Plenary Discussion
- 2:00 p.m.
Closing Remarks
Susan Renoe, Principal Investigator of NABI and Executive Director of the UM Connector, University of Missouri

APPENDIX 2. STAKEHOLDER NEEDS

Stakeholder Group	Needs
University Administrators	<ul style="list-style-type: none"> • Tools that evaluate and document human and economic impacts of research • Repository of success stories • Sharing of best practices and training for faculty • Recognition/awards for excellence
Faculty	<ul style="list-style-type: none"> • Communication training and infrastructure • Bring message of research beyond university population out to broader society • Institutional support and resources to achieve success
Non-Academic Professionals	<ul style="list-style-type: none"> • Bring non-NSF stakeholders to the table including non-governmental agencies • Better understanding of the current BI resource investment
Government Personnel	<ul style="list-style-type: none"> • Better understanding of how the culture(s) of science are evolving in response to the BI agenda • Database of success stories generating from institutions • Long-term assessment tools to show grants are really doing what they are intended to do • Greater linkages between governmental agencies • Continuing process of vetting for the BI criterion

“The building of a robust broader impacts portfolio is an effective means for scholars, as individuals or groups, to root their academic work in a larger community ecosystem. The specific broader impact activities and initiatives, then, become ways to cultivate the growth of reciprocal connections and interactions with communities of intended impact.”

– Beronda Montgomery,
Professor of Biochemistry
and Molecular Biology,
Michigan State University



APPENDIX 3. TABLE OF COMMON THEMES FROM BREAKOUT GROUPS

<p>Building Capacity at NSF</p>	<ul style="list-style-type: none"> • National Science Board needs to take up the issue of BI again. • Consensus needs to be reached as to what BI means across all directorates and programs to eliminate inconsistencies. • An investment needs to be made in BI resources. • NSF should take the lead in moving BI out to other agencies. • There needs to be better training of review panelists. • NABI’s Guiding Principles document should be integrated into the proposal writing and review process across the Foundation.
<p>Building Capacity at Institutions</p>	<ul style="list-style-type: none"> • There needs to be a cultural shift within and across institutions of higher education to value public engagement as a vital part of their mission—including the tenure and promotion process. • Young faculty and graduate students are coming in with an expectation that outreach should be part of their jobs and are poised to take leadership positions if conditions are such that they feel they can. Many researchers are interested in public engagement but lack support or resources. • Institutional support for BI is critical to successful culture change. • NABI can help identify potential institutional change agents. • BI needs to merge with the mission of IHES. • Institutions can take the lead on telling great BI stories and work with NABI and NSF to convey the message to stakeholders.
<p>Building Capacity Through Partnerships</p>	<ul style="list-style-type: none"> • NABI should find its niche and focus on strategic partnerships that will complement its work. • NABI should engage more stakeholders like business/industry, military, the extension committee on organization and policy (ECOP), HSIs, MSIs, community colleges, etc. • A key part of the center should be international engagement. • A necessary next is the development of a common language.
<p>Building Capacity Beyond NSF</p>	<ul style="list-style-type: none"> • There is a need to develop a cross-agency BI mission. • BI should be funded through multiple sources—not just NSF—and multiple directorates across NSF: foundation, institutions, other agencies.

APPENDIX 4. CONVENING ATTENDEES*

- **Oludurotimi Adetunji**, Brown University
- **Elizabeth Ambos**, Council on Undergraduate Research
- **Bernice Anderson**, National Science Foundation
- **Elizabeth Baugher**, National Science Foundation
- **Jamie Bell**, Center for Advancement of Informal Science Education
- **Scott Brummel**, Duke University
- **Emily Bullis**, Duke University
- **Chelsea Chee**, New Mexico EPSCoR
- **Karen Cone**, National Science Foundation
- **Rena Cotsones**, Northern Illinois University
- **Kevin Crowley**, University of Pittsburgh
- **Joan Frye**, National Science Foundation
- **Theresa Good**, National Science Foundation
- **Erin Heath**, American Association for the Advancement of Science
- **James Hewlett**, Community College Undergraduate Research Initiative
- **Jane Horwitz**, University of Pennsylvania
- **Geoff Hunt**, National Academy of Sciences
- **Sheldon Jacobson**, University of Illinois
- **Kemi Jona**, Northeastern University
- **Doug Levey**, National Science Foundation
- **Eric Marshall**, The Kavli Foundation
- **Ann McMahon**, University of Washington - Bothell
- **Nathan Meier**, University of Nebraska
- **Holly Menninger**, North Carolina State University
- **Beronda Montgomery**, Michigan State University
- **Nalini Nadkarni**, University of Utah
- **Kevin Niemi**, University of Wisconsin - Madison
- **Aditi Pai**, Spelman College
- **Cynthia Phillips**, National Science Foundation
- **Amy Pratt**, Northwestern University
- **Miriam Quintal**, Lewis Burke Associates
- **Aragula Rao**, Iowa State University
- **Kacy Redd**, Association of Public and Land Grant Universities
- **Scott Reed**, Oregon State University
- **Susan Renoe**, University of Missouri
- **Julie Risien**, Oregon State University
- **David Rockcliffe**, National Science Foundation
- **Diane Rover**, Iowa State University
- **John Saltmarsh**, University of Massachusetts
- **Erika Shugart**, American Society for Cell Biology
- **Patricia Simmons**, Association for the Advancement of Science
- **Brooke Smith**, The Kavli Foundation
- **Dahlia Sokolov**, House Committee on Science Technology
- **Douglas Spencer**, Edu, Inc.
- **Sarah Spreitzer**
- **Marshall Stewart**, University of Missouri Extension and Engagement
- **Juliet Taylor**, Duke University
- **Rebecca Thompson**, American Physical Society
- **Grace Troxel**, Center for the Advancement of Informal Science Education
- **Thomas Tubon**, Madison Area Technical College
- **Laurie Van Egeren**, Michigan State University
- **Michael Van Woert**, National Science Foundation
- **Sara Vassmer**, University of Missouri
- **Jory Weintraub**, Duke University
- **Steve Wyatt**, University of Missouri

**Some attendees are not listed here at their own request.*



APPENDIX 5. CONVENING PLANNING COMMITTEE

- **Jamie Bell**, Center for the Advancement of Informal Science Education
- **Oludurotimi Adetunji**, Brown University
- **Kevin Niemi**, University of Wisconsin - Madison
- **Amy Pratt**, Northwestern University
- **Susan Renoe**, University of Missouri
- **Julie Risien**, Oregon State University
- **Laurie Van Egeren**, Michigan State University
- **Sara Vassmer**, University of Missouri
- **Jory Weintraub**, Duke University



National Alliance for Broader Impacts

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