TIGER TIPS
RESOURCES FOR AUBURN RESEARCHERS
BROADER IMPACTS

All funding agencies anticipate that the work they support will bring tangible benefits to society. But no agency (in the world) has articulated this hope as clearly as the National Science Foundation (NSF). Since 1997, NSF has required that proposals explicitly detail activities that demonstrate the project's 'broader impacts' on science or society at large. The purpose of this Tiger Tips article is to help faculty design and implement the education, diversity, and outreach "broader impact" (BI) components of their research proposals.

In accordance with the NSF Proposal & Policies & Procedures Guide, "broader impacts may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to the project." While this article is not intended to guide the development of the intellectual merit aspects of an NSF proposal, it is important to understand the three NSF Merit Review Principles and five Review Elements that should be considered in the review for **both** review criteria:

Review Principles	Review Elements
All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.	1. What is the potential for the proposed activity to: a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and b. Benefit society or advance desired societal outcomes (Broader Impacts)?
NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These broader impacts may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.	2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.	3. 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?
	4. How well qualified is the individual, team, or organization to conduct the proposed activities?
	5. Are there adequate resources available to the PI to carry out the proposed activities?

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While NSF is not prescriptive about what constitutes broader impacts, there are eight outcomes referenced in the NSF Proposal & Policies & Procedures Guide. Consider these outcomes when developing your broader impacts section of the proposal (**note**: you do not need to address every one nor is the list of activities exhaustive):

1. *Integrating research and education*

- Mentor undergraduate or graduate students. (Help them develop a poster for a professional conference, for example.)
- Auburn hosts several summer programs. Work with organizers to be included for teaching, tours, and related activities.
- Consider developing a video game. Find ideas at web sites such as http://www.nobelprize.org/educational/.
- Be sure to connect with the Biggio Center for the Enhancement of Teaching and Learning to explore potential resources.
- Consider the inclusion of experiential education in developed classes. Science Education for New Civic Engagements and Responsibilities (SENCER) can serve as a resource in this regard.

2. *Broadening participation of under-represented groups*

- Involve students from grant programs as well as other programs directed by Auburn University faculty. These students could be mentees or lab assistants.
- Learn about activities on campus that target underrepresented students.
- Contact the Office of Diversity and Multicultural Affairs (resources include programs such as the Louis Stokes Alliance for Minority Participation [LSAMP]; Women in Science and Engineering [WISE] Institute; and Women's Resource Center).
- Seek out opportunities to partner with Historically Black Colleges and Universities (HBCU's).

3. *Enhancing infrastructure for research and education*

- If you are requesting funding for advanced technology or major research instrumentation in your proposal, explore and indicate how can it be used by the larger community/university or other area universities?
- Develop teaching media that will enhance an existing course at Auburn University.
- Work with another professor to develop teaching materials for targeted classes or tutoring programs.

4. *Broad dissemination of scientific ideas and methods (general scientific literacy)*

- Write an article for a lay publication to be submitted for publication.

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- Write an op-ed piece for multiple newspapers/publications related to research and its role in the community. Do an interview for The Plainsman.
- Develop a display or an activity for the Auburn University Libraries (or another area library or libraries).
- To broaden the impact of your program, be a guest lecturer for area community colleges (Southern Union State Community College; Chattahoochee Valley Community College; Central Alabama Community College) or for other local groups.
- Hold seminars, conferences or briefings for the general public.

5. *Direct benefit to society*

- Demonstrate links between discovery and societal benefit with specific examples and applications. Are there opportunities to work with University Outreach or the Alabama Cooperative Extension System (ACES)? Is there an outreach office within your college that may serve as a resource?
- Is your research a part of a larger national initiative?

6. *Increased partnerships between academia, industry, and other*

- Is there an opportunity to partner with industry, thus securing a means for additional funding, distribution of research product and wider exposure of results? If the industrial partner is internationally-based this enhances the opportunity to disseminate information and benefits on a larger scale.

7. *Improved national security*

8. *Increased economic competitiveness of the United States*

Regardless of programming or impact, there are several things to keep in mind:

- If necessary, be sure to ask OSP staff and/or college-level designees if you can include BI expenses in the budget. Otherwise, you will need to provide details on how you will fund your plans.

- Connect with others who will help sustain (and evaluate) your project - can you link with other programs on campus? (For example: TEAM Math, Alabama Science in Motion, Alabama Math, Science, Technology Initiative, etc.).

- Take advantage of available resources (see list provided at the end of this article). In addition to resources provided by NSF, other institutions have provided guidance and tools (for instance, COSEE Network Ocean World has created a suite of online resources for scientists, including a Broader Impacts Wizard that is developed to help you develop a broader impact statement that meets the requirements of NSF and fulfill your interest in communicating your science).

- Your plan must have intellectual contribution from you and your team. Take the time to learn about the BI criteria in detail to gain a ***nuanced understanding of their intent and purpose, and of the framing of BI within the three guiding review principles and five review elements***. Truly understanding and appreciating the BI intent and purpose will then allow you to develop good ideas for BI activities in your proposal as required by the specific solicitation to which you are responding at NSF. Avoid "***farming out***" the BI activities of your proposal to someone who does not have detailed knowledge of your research. The BI activities you propose have to make sense within the overall context of your research activities and must withstand scrutiny by reviewers and program officers.

- The project has to fit with your research, it must use your research/discoveries as the base, and it needs to make sense. Be wary of designing a new university class; many reviewers may see this as a part of your job even without the grant.

- Potential broader impact activities need to be developed in accordance with the target population where you hope to have an impact: What can you do to involve these groups (underrepresented minorities, K-12)? Who will help you? What do you have to do? Quantify what you are going to do. For example, don't make vague comments about women or minorities; get the real numbers regarding minorities/women at Auburn University and in the community with whom you may be working. The Office of Institutional Research and Assessment can assist with demographic information.

Evaluating your Broader Impacts: Did it work?

The 2013 revision of the NSF Proposal & Policies & Procedures Guide Chapter II C.2.d. includes this easily missed phrase: "Intellectual Merit *and Broader Impact* activities **must be described in two separate sections in the summary of 'Results from Prior NSF Support.'"** As such, you will need to (1) document what you have accomplished; and (2) be in a position to say how effective it was. It does not need to be long and involved -- but it is something for which everyone needs to plan.

Additional Information:

NSF Merit Review Criteria: Review and Revisions

NSF Merit Review Resources

COSEE Broader Impact Wizard

Broader Impacts 2.0

Science for the Masses (Nature, Volume 465/27 May 2012)