Agenda for NSF Broader Impact Workshop
October 20, 2011
2:00- 4:00pm
Tong Auditorium (Room 1003), Engineering Centers Building

1. Introductions

2. Reviewing the Broader Impact Sections of Successful NSF Fellowships Applications

3. Overview of Broader Impact Criteria and Review Process

4. Example of a Successful Broader Impact Plan

5. Introduction to Delta Program and the CIRTL Network

6. Discussion of Resources

7. Q&A

8. Evaluation

9. Networking
1. What are the objectives of your broader impact plan?

2. How does your plan relate to your scientific research?

3. Specifically, how are you going to implement your plan?

4. Who will your audience be? Is it diverse?

5. Can you draw on any campus resources to help you implement your plan?
6. What are the expected outcomes of your plan?

7. How will you know if you achieved the expected outcomes?

8. What past or current experiences do you have that would convince the reviewers that you can achieve these goals?

Applications will be reviewed by panels of disciplinary and interdisciplinary scientists and engineers and other professional graduate education experts. Applications will be assigned to panels based on the applicant's chosen Field(s) of Study and the discipline(s) represented. Thus, applicants are advised to select the Field of Study in the FastLane GRFP Application module that is most closely aligned with the proposed graduate program of study and research plan.

Each application will be reviewed independently in accordance with the NSF Merit Review Criteria using all available information in the completed application. In considering applications, reviewers are instructed to address the two Merit Review Criteria as approved by the National Science Board - Intellectual Merit and Broader Impacts (NSF Proposal and Awards Policies and Procedures Guide, NSF 11-1). Therefore, applicants must address explicitly each criterion in their written statements in order to provide reviewers with the information necessary to evaluate the application with respect to both Criteria as detailed below.

What is the intellectual merit of the proposed activity?

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 (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources? If international activities are proposed, are the proposed activities relevant and do they benefit the applicant?

For example, panelists may consider the following with respect to the Intellectual Merit Criterion: the strength of the academic record, the proposed plan of research, the description of previous research experience or publication/presentations, references, and the appropriateness of the choice of institution relative to the proposed plan for graduate education and research.

What are the broader impacts of the proposed activity?

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 (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society? Background information and examples of Broader Impacts activities are available at http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf

For example, panelists may consider the following with respect to the Broader Impacts Criterion: the personal, professional, and educational experiences, the future plans and prior accomplishments in the integration of research and education, and the potential to reach diverse audiences and benefit society.
Broader Impacts Review Criterion

Dear Colleague,

The National Science Foundation employs two criteria in the merit review of proposals: What is the intellectual merit of the proposed activity? What are the broader impacts of the proposed activity? While most researchers know what is meant by Intellectual Merit, experience shows that many researchers have a less than clear understanding of the meaning of Broader Impacts.

The *NSF Grant Proposal Guide* uses a series of questions to illustrate the Broader Impacts criterion: “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 (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society? “

These questions help to assess the potential of the proposed activity - beyond the research, *per se* - to benefit the Nation. Thus, the Broader Impacts criterion speaks directly to the mission of the National Science Foundation, “To promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense.” (NSF Act of 1950).

It may be helpful to illustrate the kinds of activity that are appropriate to each of the questions above. *Caveat lector* - the following list is neither prescriptive nor exhaustive and should not be read in ways that constrain the creativity of researchers in proposing activities with broader impact. However, in all instances a proposal must be specific in how it addresses the Broader Impacts criterion.

**Advance discovery and understanding while promoting teaching, training, and learning,** for example, by training graduate students, mentoring postdoctoral researchers and junior faculty, involving undergraduates in research experiences, and participating in the recruitment, training, and professional development of K-12 mathematics and science teachers.

**Broaden participation of under-represented groups,** for example, by establishing collaborations with students and faculty from institutions and organizations serving women, minorities, and other groups under-represented in the mathematical sciences.

**Enhance infrastructure for research and education,** for example, by establishing collaborations with researchers in industry and government laboratories, developing partnerships with international academic institutions and organizations, and building networks of U.S. colleges and universities.

**Broaden dissemination to enhance scientific and technological understanding,** for example, by presenting results of research and education projects in formats useful to students, scientists and engineers, members of Congress, teachers, and the general public.

**Benefits to society** may occur, for example, when results of research and education projects are applied to other fields of science and technology to create startup companies, to improve commercial technology, to inform public policy, and to enhance national security.

Further examples of broader impacts can be found in the NSF document *Merit Review Broader Impacts Criterion: Representative Activities*. Of course, not every proposal must demonstrate impact in each of these pre-defined areas. Rather, activities with significant broader impact will emerge from the nature of the proposal and the authentic interests of the proposer.

Sincerely,

Peter March
National Science Foundation
Proposals submitted to the National Science Foundation are evaluated through use of two merit review criteria, which all proposals must address explicitly. Experience shows that while most proposers have little difficulty responding to the criterion relating to intellectual merit, many proposers have difficulty understanding how to frame the broader impacts of the activities they propose to undertake.

The *Broader Impacts* of a proposed activity are important considerations in advancing the NSF Mission: “To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes” (NSF Act of 1950). The [NSF Strategic Plan](https://www.nsf.gov/od/stratплн) provides further background information for *Broader Impacts* through the NSF Vision, Core Values, Strategic Outcome Goals, and Investment Priorities (NSF Strategic Plan for FY 2006-2011: Investing in America’s Future (NSF 06-48)).

The examples provided below are organized by the set of potential considerations used in assessing the broader impacts of the proposed activity. They illustrate activities that, when successfully incorporated in a project description, will help reviewers and NSF program staff address the broader impacts criterion in the review and decision process.

The list is not intended to be exhaustive, nor is any particular example relevant to all proposals. Proposers can draw from the examples but are urged to be creative in their approaches to demonstrating the broader impacts of their projects. Proposers already undertaking similar kinds of activities should carefully consider how to link these examples to the research and education projects they are proposing for funding. Proposers also should consider what types of activities best suit their interests, while enhancing the broader impacts of the project being proposed.

The components of the broader impacts criterion as defined by the National Science Board are listed below. The list is followed by short sections on each component that provide representative activities.

**Broader Impacts Criterion: What are the broader impacts of the proposed activity?**

- 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 (e.g., gender, ethnicity, disability, geographic, etc.)?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks and partnerships?
• Will the results be disseminated broadly to enhance scientific and technological understanding?
• What may be the benefits of the proposed activity to society?

**Advance Discovery and Understanding While Promoting Teaching, Training and Learning**

**Examples of Activities:**
• Integrate research activities into the teaching of science, math and engineering at all educational levels (e.g., K-12, undergraduate science majors, non-science majors, and graduate students).
• Include students (e.g., K-12, undergraduate science majors, non-science majors, and /or graduate students) as participants in the proposed activities as appropriate.
• Participate in the recruitment, training, and/or professional development of K-12 science and math teachers.
• Develop research-based educational materials or contribute to databases useful in teaching (e.g., K-16 digital library).
• Partner with researchers and educators to develop effective means of incorporating research into learning and education.
• Encourage student participation at meetings and activities of professional societies.
• Establish special mentoring programs for high school students, undergraduates, graduate students, and technicians conducting research.
• Involve graduate and post-doctoral researchers in undergraduate teaching activities.
• Develop, adopt, adapt or disseminate effective models and pedagogic approaches to science, mathematics and engineering teaching.

**Broaden Participation of Underrepresented Groups**

**Examples of Activities:**
• Establish research and education collaborations with students and/or faculty who are members of underrepresented groups.
• Include students from underrepresented groups as participants in the proposed research and education activities.
• Establish research and education collaborations with students and faculty from non-Ph.D.-granting institutions and those serving underrepresented groups.
• Make campus visits and presentations at institutions that serve underrepresented groups.
• Establish research and education collaborations with faculty and students at community colleges, colleges for women, undergraduate institutions, and EPSCoR institutions.
• Mentor early-career scientists and engineers from underrepresented groups who are submitting NSF proposals.
• Participate in developing new approaches (e.g., use of information technology and connectivity) to engage underserved individuals, groups, and communities in science and engineering.
• Participate in conferences, workshops and field activities where diversity is a priority.

Enhance Infrastructure for Research and Education

Examples of Activities:
• Identify and establish collaborations between disciplines and institutions, among the U.S. academic institutions, industry and government and with international partners.
• Stimulate and support the development and dissemination of next-generation instrumentation, multi-user facilities, and other shared research and education platforms.
• Maintain, operate and modernize shared research and education infrastructure, including facilities and science and technology centers and engineering research centers.
• Upgrade the computation and computing infrastructure, including advanced computing resources and new types of information tools (e.g., large databases, networks and associated systems, and digital libraries).
• Develop activities that ensure that multi-user facilities are sites of research and mentoring for large numbers of science and engineering students.

Broad Dissemination to Enhance Scientific and Technological Understanding

Examples of Activities:
• Partner with museums, nature centers, science centers, and similar institutions to develop exhibits in science, math, and engineering.
• Involve the public or industry, where possible, in research and education activities.
• Give science and engineering presentations to the broader community (e.g., at museums and libraries, on radio shows, and in other such venues.).
• Make data available in a timely manner by means of databases, digital libraries, or other venues such as CD-ROMs.
• Publish in diverse media (e.g., non-technical literature, and websites, CD-ROMs, press kits) to reach broad audiences.
• Present research and education results in formats useful to policy-makers, members of Congress, industry, and broad audiences.
• Participate in multi- and interdisciplinary conferences, workshops, and research activities.
• Integrate research with education activities in order to communicate in a broader context.
Benefits to Society

Examples of Activities:

- Demonstrate the linkage between discovery and societal benefit by providing specific examples and explanations regarding the potential application of research and education results.
- Partner with academic scientists, staff at federal agencies and with the private sector on both technological and scientific projects to integrate research into broader programs and activities of national interest.
- Analyze, interpret, and synthesize research and education results in formats understandable and useful for non-scientists.
- Provide information for policy formulation by Federal, State or local agencies.
Some NSF-Supported initiatives at UW-Madison

CIRTL - Center of the Integration of Research, Teaching and Learning
CIRTL promotes the development of a national faculty in science, technology, engineering, and mathematics (STEM) committed to implementing and advancing effective teaching practices for diverse student audiences as part of their professional careers. To accomplish these goals CIRTL is founded on three pillars: Teaching-as-Research, Learning Communities and Learning-through-Diversity. The local implementation of CIRTL at UW-Madison is The Delta Program in Research, Teaching, and Learning.

For more information visit: **www.cirtl.net** and **www.delta.wisc.edu**

MIDWEST – Midwest Alliance in Science, Technology, Engineering and Mathematics
Midwest aims to increase the quantity and quality of students at the associate, baccalaureate and graduate levels in Science, Technology, Engineering, and Mathematics (STEM) and to help students transition to employment. To accomplish these goals a consortium of educators, scientists, and student service providers identify students with disabilities at the middle and high school, undergraduate and graduate levels who demonstrate academic excellence and potential for success in STEM careers.

For more information visit: **www.stemmidwest.org**

WiscAmp – Wisconsin Alliance for Minority Participation
WiscAMP aims to address retention and persistence of underrepresented minorities in STEM disciplines by expanding and improving on successful models already in place and fostering and sustaining an alliance among partner institutions.

For more information visit: **wiscamp.engr.wisc.edu/**

WISELI – Women in Science, Engineering and Leadership Institute
The long-term goal of WISELI is to have the gender of the faculty, chairs, and deans reflect the gender of the student body. To accomplish these goals, WISELI will be a visible, campus-wide entity, endorsed by top-level administrators, which will use UW-Madison as a "living laboratory" to study the problem and implement solutions.

For more information visit: **wiseli.engr.wisc.edu**
Some Research Experience for Undergraduates (REU)
Current programs partially funded by NSF at UW-Madison
http://info.gradsch.wisc.edu/education/diversity/srop/index.html

Research Experience for Undergraduates – Astrophysics (REU Astrophysics)
Edwin Mierkiewicz
Phone: 608.262.1152
Email: emierk@astro.wisc.edu
Website: http://wisp/physics.wisc.edu/~reu/

Research Experience for Undergraduates – Microbiology
Robin Kurtz
Phone: 608.263.1781
Email: rskurtz@wisc.edu
Website: http://www.bact.wisc.edu/programs_reu.php

Summer Undergraduate Research Experience for Undergraduates
Kelly Burton
Phone: 608.263.4583
Email: sure-reu@engr.wisc.edu
Website: http://studentservices.engr.wisc.edu/diversity/sure/

Integrated Biological Sciences Summer Research Program (IBS-SRP) for Undergraduates
Janet Branchaw
Phone: 608.262.1182
Email: branchaw@facstaff.wisc.edu
Website: http://www.wisc.edu/cbe/srp-bio/

Research Experience for Undergraduates – Chemistry, Nanotechnology, and Biological Engineering
Andrew Greenberg
Phone: 608.890.1534
Email: Greenberg@chem.wisc.edu
Website: http://genchem.chem.wisc.edu/reu

Psychology Research Experience Program (PREP)
Simona Perales
Phone: 404.798.1278
Email: prep@psych.wisc.edu
Website: http://glial.psych.wisc.edu/index.php/prep
Connecting Your Research to K-12 Education & Public Outreach

Opportunities and resources for UW-Madison faculty, staff and graduate students
(Additional resources available at http://cbe.wisc.edu/)

Precollege Science Enrichment Programs for Students:
Host minority or underserved high school students for a summer research experience as a mentor in the Summer Science Institute (SSI) (http://cbe.wisc.edu/ssi). Contacts: Brian Asen, Robert Bohanan

Lead a one-week or three-week summer science inquiry course for minority/underserved high school students in the Pre-college Enrichment Opportunity Program for Learning Excellence (PEOPLE) (http://www.peopleprogram.wisc.edu). Contacts: Brian Asen, Robert Bohanan

Professional Development for K-12 Teachers:
Team up with other educators to create K-12 teacher professional development courses or materials based on your research in the Wisconsin Teacher Enhancement Program (WisTEP; http://wistep.wisc.edu) or SchoolYard Science (http://lter.limnology.wisc.edu/K_12.html). Contacts: Robert Bohanan, Kevin Niemi

Serve as a research mentor for a middle or high school teacher in your lab (Research Experiences for Teachers). Contacts: Robert Bohanan, Kevin Niemi

Instructional Materials Development for K-12 Students:
Collaborate with teachers and science educators to create and test K-12 instructional materials that integrate your research through Adult Role Models in Science (ARMS) (http://cbe.wisc.edu/arms) or WisTEP (http://wistep.wisc.edu). Contacts: Robert Bohanan, Dolly Ledin, Sarah Wright, Kevin Niemi

Outreach:
Partner with community members and agencies in providing science enrichment for students and families in K-12 schools or as part of informal science activities for youth (science fairs, family science nights, afterschool clubs and more) through ARMS (http://cbe.wisc.edu/arms) or enroll in Engage Children in Science – Lead After-School Science Clubs (http://www.biology.wisc.edu/Courses) Contacts: Dolly Ledin, Sarah Wright

Learn about model programs, like the Mazomanie Outreach Outpost, that bring UW-Madison based science to the K-12 community and general public or engage individuals as “citizen scientists” (http://wistep.wisc.edu/moo-get-involved.html). Contacts: Catherine Woodward, Dolly Ledin, Sarah Wright, Robert Bohanan.

Contact us to discuss how to make any of these activities part of the broader impact component of your research proposal.

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Robert Bohanan, 265-2125, rbohanan@wisc.edu
Jane Harris Cramer, 263-0478, jhcramer@wisc.edu
Dolly Ledin, 222-4865, daledin@wisc.edu
Kevin Niemi, 262-5480, kjniemi@wisc.edu
Sarah Wright, 265-9065, sdwright2@wisc.edu
Catherine Woodward, 890-3701, cwoodwar@wisc.edu

October, 2010
Teaching/learning Opportunities and Resources:

To receive information on seminars, workshops, discussion groups, and other events related to teaching and learning in biology, join an email list on biology instruction (http://cbe.wisc.edu/bibs). (Lillian Tong)

To be part of a community focused on teaching and learning issues or to learn about a broad range of related resources, join a Teaching Circle, a book group, or ask for a peer mentor or consultation time at CBE. (Lillian Tong)

To obtain instructional mentoring related to your role as a Teaching Assistant in the biological sciences, enroll in Bio 675, Teaching Biology (Teri Balser)

To engage in discussion/initiatives on interdisciplinary (math/statistics and science) preparation for students in the biological sciences, join SyMBiosis activities (http://cbe.wisc.edu/symbiosis/index.html). (Lillian Tong)

Undergraduate Research Opportunities and Resources:

To help undergraduates find a research opportunity on campus, refer them to the seminar course, “Entering Research” (http://www.biology.wisc.edu/Courses/) (Janet Branchaw)

To collaborate with UW students, faculty and staff in community partnerships that provide children with science education opportunities, enroll in Engage Children in Science – Lead After-School Science Clubs (http://www.biology.wisc.edu/Courses) (Dolly Ledin, Sarah Wright)

To provide research opportunities for students from groups underrepresented in science, become a mentor in the Integrated Biological Sciences Summer Research Program (IBS-SRP; http://www.wisc.edu/cbe/srp-bio/index.html) or the Undergraduate Research and Mentoring program (http://cbe.wisc.edu/urm/index.html). (Brian Asen, Janet Branchaw, David McCullough)

To acquire skills as a leader and research mentor, participate in the Scientific Teaching mentor training seminar (http://scientificteaching.wisc.edu/; http://www.delta.wisc.edu/programs/programs.html). (Janet Branchaw)

To work with and introduce first year undergraduates to the excitement of your research, host a research exploration or serve as a speaker or panel member in the Exploring Biology seminar series (http://www.biology.wisc.edu/Courses/) (Brian Asen, Teri Balser)

Technology Opportunities:

For help in creating and digitizing materials for teaching and learning, or to prepare all or part of your course on line, contact the Biology Learning Technology Consultant and visit the Digital Media Center @ Biotech (http://www.doit.wisc.edu/digital_media_center/). (Alan Wolf)

To create three-dimensional physical models for teaching, inquire about using the 3D printer in the Digital Media Center at Biotech (http://www.doit.wisc.edu/digital_media_center/3DPrinting.asp). (Alan Wolf, David Nelson)

Contact us to discuss how to make any of these activities part of the broader impact component of your research proposal.

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Janet Branchaw, 262-1182, branchaw@wisc.edu  
Dolly Ledin, 222-4865, daledin@wisc.edu  
David McCullough, 890-2389, domccullough@wisc.edu  
David Nelson, 263-6879, nelson@biochem.wisc.edu  
Lillian Tong, 265-3003, tong@wisc.edu  
Alan Wolf, 263-0919, alanwolf@wisc.edu  
Sarah Wright, sdwright2@wisc.edu

October, 2010
1. What is the most significant idea or information that you are taking away from this workshop?

2. What questions remain as you leave?

3. What suggestions, if any, do you have concerning this workshop?

4. Using the rating scale below, please indicate your satisfaction with each of the topics/material covered in this workshop:

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<td>Overview of Broader Impact Criteria and Review Process</td>
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<td>Hearing from successful applicants (Lauren Palmer)</td>
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<td>Overview of Delta and how you can leverage campus resources</td>
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5. Using the scale below, please CIRCLE your satisfaction with today’s activities *overall*.

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6. Would you recommend this workshop to a friend? Why or why not?

7. Additional Comments and suggestions:

Name *(optional)*:

Thank You!