Welcome and Introductions

Associate Vice Chancellor for Research Turan Kayaoglu and Chancellor Mark Pagano welcomed over 70 faculty and staff from 17 institutions across the state of Washington including the tri-campus UW system and 14 community and technical colleges located both in the Puget Sound region (e.g. Green River College, Highline College, Everett Community College) and farther afield (e.g. Grays Harbor College, Walla Walla Community College).

Overview of NSF and the Merit Review Process

Dr. Stephanie August and Dr. Pushpa Ramakrishna, Program Directors of the Division of Undergraduate Education (DUE), provided an overview of the NSF and DUE. The NSF is an independent federal agency with a mission “…to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense.” The NSF awards nearly $7 billion of funds to over 50,000 proposals each year in a wide range of disciplines.

The Division of Undergraduate Education sits under the Directorate for Education and Human Resources (EHR). Its mission is “to promote excellence in undergraduate science, technology, engineering, and mathematics (STEM) education for all students.”

In evaluating proposals, NSF follows a ‘Merit Review’ process. The first criteria considered, **Intellectual Merit (1a)**, evaluates the extent to which the proposed research will advance knowledge. Questions considered in evaluating this criterion include:

- What will we learn from the research?
- Why is it important?
- How will it be implemented?
- What assessment tools will evaluate its effectiveness?

The second criteria evaluates the **Broader Impacts (1b)** that are anticipated to be generated by the proposal by evaluating the following questions:

- What will the research’s impact be on society?
- How will it make the nation a better place?
- To what extent is it inclusive?

Other elements of the Merit Review process include:

- (2) To what extent do the proposed activities explore creative, original, or potentially transformative ideas?
- (3) Is the plan for carrying out the proposed research well-reasoned, organized, and based on sound rationale?
- (4) Does the plan incorporate a mechanism to assess effectiveness?
- (5) How qualified is the team and institution to conduct the proposed activities?
- (6) Are there adequate resources available to the PI (either at the home institution or through collaborations) to carry out the proposed activities?
Project Evaluation is often an important component of proposals submitted to DUE, although expectations for evaluation differ considerably by division of the NSF. For this division, proposed research must include a Project Evaluation Plan that achieves the following criteria:

- Conducted by a disinterested third party – The evaluator could be a colleague outside of your college who does not have any stake in the project, or someone outside of your institution.
- Completed annually and integrated with project milestones (‘formative evaluation’) – The evaluator should offer critical feedback to the PI on a formal and informal basis throughout the project in order to drive refinements to the research plan.
- Completed at the end of the project (‘summative assessment’).
- Consumes 5-10% of the budget (although later panelists suggested that they commonly allocate 10-15% of the budget to evaluation).

The speakers pointed participants to several resources to support successful Project Evaluation Plans:

- “Common guidelines for education research and development” (2013) – This is a very useful resource that outlines six different types of work, and how you might think about project evaluation in those contexts.
- “2010 User-friendly handbook for project evaluation” – This handbook describes different types of evaluation you might conduct for different types of projects.
- “Describing and measuring undergraduate STEM teaching practices” (2012) – Another helpful resource.

The speakers also recommended several resources for identifying experienced project evaluators:

- The EvaluATE Center maintains a list of evaluators that have worked on projects funded through the NSF Advanced Technology Education (ATE) solicitation here: [https://atecentral.net/evaluators](https://atecentral.net/evaluators)
- The speakers also suggested conducting an ‘Advanced Search’ at [www.nsf.gov](http://www.nsf.gov) (click on the “Awards” link) to retrieve information on funded proposals for the particular solicitation and/or topic you’re interested in, then contact the PIs to ask about the evaluators they used in their proposals.
- Department heads at your institution and/or other local institutions may also be good resources. Schools of Education are often the best source of evaluators for proposals submitted to DUE.
- Institutional Review staff usually do not qualify as disinterested parties, although it may depend on the specific solicitation. When in doubt, contact the Program Officer.
- Evaluators typically ‘donate’ their time to the proposal effort.

The speakers also emphasized that all proposals must include a Data Management Plan that identifies how data will be protected and shared with the public.
Funding Opportunities at the NSF Division of Undergraduate Research

Drs. August and Ramakrishna provided an overview of several DUE and cross-directorate programs relevant to STEM education. These programs are identified below, with links to their respective websites where more information on due dates, eligibility, and the programs themselves can be found.

- **Advanced Technological Education (ATE)** – Program Solicitation 17-568
- **Scholarships in STEM (S-STEM)** – Program Solicitation 17-527
- **Improving Undergraduate STEM Education (IUSE: EHR)** – Program Solicitation 17-590
- **Robert Noyce Teacher Scholarship Program (Noyce)** – Program Solicitation 17-541
- **Research Experiences for Undergraduates (REU: EHR)** – Program Solicitation 13-542
- **Faculty Early Career Development Program (CAREER: EHR)** – Program Solicitation 15-555
- **EHR Core Research (ECR)** – Program Solicitation 15-509
- **Research Coordination Networks for Undergraduate Biology Education (RCN: UBE)** – Program Solicitation 17-594
- **Dear Colleague Letter: Improving Undergraduate STEM Education in Hispanic-Serving Institutions**

**Helpful Tips for Successful NSF Proposals from Program Directors**

Throughout the workshop, Drs. August and Ramakrishna provided several helpful tips for successful NSF proposals as listed below, in no particular order:

- **Read the solicitation closely** and follow its requirements!
- **The NSF Proposal and Award Policies and Procedures Guide (PAPPG)** is your source for all requirements of your proposal. Chapter 2 outlines the organization of the proposal and budget guidelines. The most recent version (PAPPG 17-1) is available here: [https://www.nsf.gov/pubs/policydocs/pappg17_1/index.jsp](https://www.nsf.gov/pubs/policydocs/pappg17_1/index.jsp)
- **Serving on a Review Panel** is one of the best things you can do to become a better proposal writer. The DUE is always looking for new reviewers. Fill out the form at the below site to be considered for a panel: [https://www.nsf.gov/news/news_summ.jsp?cntn_id=127951&org=DUE](https://www.nsf.gov/news/news_summ.jsp?cntn_id=127951&org=DUE)
- **When submitting for REU funding**, be sure to demonstrate that students will acquire skills that prepare them for the workforce through high-quality mentoring and other activities that support their professional development. At least 60% of students for REU Site funding should be recruited from outside the university. Activities that support cohort development is also important in successful REUs.
• **Proposals are rated** in one of five categories: Poor, fair, good, very good, and excellent. Proposals rated in the bottom two categories (fair/poor) are not considered for funding. Proposals in the top three categories advance for further consideration.

• **Contact the PIs of successful proposals** awarded for the solicitation to see if they might be willing to share their proposals, and/or offer any insight. To search successful proposals, go to [www.nsf.gov](http://www.nsf.gov), click on the “Awards” heading, and conduct an “Advanced Search” for the solicitation number.

• Reviewers are likely to be smart scientists who know little about your specific topic. Develop your proposal with this audience in mind, and **have someone with no knowledge of the project review your proposal.**

• **Think about active ways to disseminate findings** that go beyond publications and conference presentations. For example, you could bring a group of people to your campus as part of a workshop (letters of commitment from these folks could be helpful).

• When things do not according to plan for an awarded proposal (e.g. a change of PIs is necessary), clearly **explain what your need to do and justify why.** No-cost extensions are typically approved with a brief explanation of the funds that have spent, what has been accomplished with those funds, and why more time is necessary (for example, recruitment issues).

**Experienced Principal Investigator (PI) and Experienced Reviewer Panels**

Experienced PI Panelists:
- **Dr. Chitra Solomonson**, Physics Instructor, Green River College, NSF TUES Awardee
- **Dr. Raj Katti**, Dean, Institute of Technology, UW Tacoma, NSF REU Awardee
- **Dr. Carrie Tzou**, Assoc. Prof of Education, UW Bothell, Multiple NSF Awards

Experienced Reviewer Panelists:
- **Dr. Ed Kolodziej**, Assoc. Professor, Env. Science, UW, UW Tacoma, and CUW
- **Dr. JW Harrington**, Professor, Urban Studies, UW Tacoma (Former Program Director, NSF)
- **Dr. Ann P. McMahon**, Executive Director of Research Strategy for Broad Impact, UW Bothell

Panelists briefly introduced themselves and offered advice to future NSF PIs, including:

• Things do not always proceed as planned – **be flexible and resourceful** in solving problems as they come up.

• Developing undergraduate research programs in a 2-year college setting is a lot of work, and **requires strong institutional support.** Institutional support is also important in a 4-year setting.

• **Requesting REU supplements** as part of proposals is most often a very good idea, especially in institutions focused on undergraduate education.

• Try to **track down awarded proposals** – successful PIs are often an excellent resource. **Seek out experienced PIs as mentors**, either in your institution or elsewhere.

• **Serving as a panelist** is the best thing you can do to improve our proposal writing.

• In writing a proposal, **aim to recruit champions and not to recruit detractors.** Proposals need to be perceived by reviewers as innovative while at the same time be uncontroversial. All it takes is one negative review to take a proposal out of consideration.
• Reviewers spend very little time – no more than two hours and often much less – with your proposal. You therefore must pull the reader through the narrative to tell a coherent, compelling story that catches the reviewer within the first 20 minutes. The reviewer should not have to connect the dots – that is the proposal writer’s job.

• Dr. Ann McMahon (UW Bothell) suggests that PIs think of proposal writing as communicating a “hero’s journey” that starts with the problem, explains why it is bad, identifies the gap in our knowledge about the problem, and lays out the plan the PI has to fill the gap.

• Dr. McMahon also suggests that PIs give their proposal to someone outside of their discipline to read in 20 minutes, and then ask the reader to report back what they have taken away. If readers are not able to tell the basic story of the proposal, the PI needs to rework the proposal.

• While PIs must keep an eye towards satisfying the needs outlined in the solicitation, reviewers are not looking at the solicitation and the proposal at the same time. Rather, reviewers are primarily concerned with the Intellectual Merit and Broader Impacts of the proposal. Ensure these are unambiguously communicated in the Project Summary and throughout the proposal.