Advisory Committee for Environmental Research and Education (AC-ERE)
7 & 8 November 2023

Summary Minutes

Committee Members in Attendance: Lora Billings, Vicki Grassian, Rupa Iyer, Kimberly Jones (Chair), Robin Leichenko, Bo Li, Amanda Lynch, Claire Monteleoni, Ada Monzon, Diane Pataki, Raina Plowright, Cathy Whitlock
Committee Members Absent: Rodolfo Torres

Guest Speakers: Sara Beery (Massachusetts Institute of Technology), Sidney D'Mello (University of Colorado Boulder), Anthony Scriffignano (The Stimson Center)

NSF Staff: Arnoldo Valle-Levinson (OIA, Executive Secretary for AC-ERE), Alicia Knoedler (OH OIA), Steve Meacham (OIA), Ashley Pierce (OIA), Tom Evans (SBE/BCS), Bruce Hamilton (ENG/CBET), Elena Hillenburg (MEM), Benjamin McCall (OIA), Rebecca Morss (OIA), Brandi Schottel (ENG/OAD), Bernice Smith (BIO/DEB)

Notetakers: Jennifer Riehl (AAAS S&T Policy Fellow, ENG/CBET), Sharon Homer-Drummond (AAAS S&T Policy Fellow, EDU/EES)

Tuesday – November 7, 2023

10:40 – 11:00 am   Welcoming Remarks

Dr. Kimberly Jones welcomed the committee, thanked everyone for attending, and asked attendees and members to introduce themselves.

Dr. Arnoldo Valle-Levinson expressed his gratitude for serving as the Executive Secretary for the last two and a half years and thanked members of the committee.

Dr. Steve Meacham thanked Dr. Valle-Levinson and introduced Dr. Ashley Pierce as the next Executive Secretary of the AC-ERE.

Dr. Jones introduced the agenda for the meeting.

11:00 - 11:30 am   NSF Update

Dr. Meacham thanked and acknowledged the work of several committee members, Dr. Andrés Clarens and Dr. Benjamin McCall, who have rotated off the committee since the last meeting. Dr. Meacham gave an overview of NSF's budget and introduced the themes for the FY24 budget request which include broadening participation (BP), accelerating technology & innovation,

advancing emerging industries, building a resilient planet, creating opportunities everywhere, and strengthening research infrastructure.

Dr. Meacham went over NSF programs relevant to the work of the committee including Growing Research Access for Nationally Transformative Equity and Diversity (GRANTED), EPSCoR, Advanced Technological Education (ATE), and Excellence in Research for HBCU (HBCU-EiR). Dr. Meacham concluded by discussing the requirement in the CHIPs & Science Act to increase investment in EPSCoR jurisdictions. More widespread use of no-deadline proposal submission has coincided with a steep drop in submissions overall, particularly, from EPSCoR jurisdictions. Dr, Meacham asked the committee to think about how to address this decline. Dr. Meacham also noted some updates to the upcoming Proposal & Award Policies and Procedure Guide (PAPPG 24-1) including a requirement to seek and obtain approval from Tribal Nations for proposals that may impact Tribal resources or interests.

The committee discussed the update from Dr. Meacham and how to reduce barriers for communities that are historically underrepresented in STEM. Dr. Jones then called on the committee members to encourage their communities to participate as reviewers and advisory committee members.

11:30 - 12:15 pm   Minimizing Environmental Impacts
Subcommittee Members: Vicki Grassian (Chair), Rodolfo Torres (absent), Cathy Whitlock, Kimberly Jones
Session Moderator and Chair of Work Group: Vicki Grassian

Dr. Grassian reminded the committee of the work that the working group had accomplished leading up to the spring 2023 meeting and outlined the work that had occurred since the spring 2023 meeting. Dr. Benjamin McCall (formerly an AC-ERE committee member who is now an NSF program director) and Dr. Jones met with other advisory committees and received feedback on the initial document the working group had produced for the spring 2023 meeting.

The committee then discussed what the best path forward would be for the working group. Discussion included what data are available and necessary to understand the problem, what is the scope of the problem, what recommendations are useful to help PIs think about the impact of their research, protocols that already exist and if new ones are needed, PI proposal requirement burdens, using requirements that already exist, and being mindful of the institutional context of PIs who may have more or less support depending on what resources are available at their institution. It was noted that other agencies already require answers to a set of questions about the environmental impact of proposed research. The committee agreed that it will be important to put clear boundaries on the issue, to frame recommendations around educating the research community and providing information, and to think about what to recommend to NSF as far as a potential workshop or Dear Colleague Letter (DCL). The working group will work on finishing the recommendation document to present at the spring 2024 meeting.

12:15 – 1:00 pm   Environmental Equity

Work Group: Robin Leichenko, Amanda Lynch, Claire Monteleoni, Ada Monzon, Raina Plowright, Kimberly Jones
Session Moderator: Kimberly Jones

Dr. Jones reviewed what the working group and the committee had discussed previously on this topic and then presented a set of framing questions for discussion. The framing questions focused on how the committee members brought equity into their work, how NSF could better support equity in research, what are best practices, and how to assess whether equity is improving.

The committee discussed several topics including access for marginalized groups, hidden inequities, inequities that are introduced by current systems, support from NSF to improve equity, support for building group counseling and building community to help students, knowledge awareness of resources that exist but are not well known, and the time and effort it takes to build community partnerships for research.

1:00 – 2:00 pm   Lunch

2:00 – 2:45 pm   Broadening Participation
Work Group: Lora Billings, Vicki Grassian (Co-Chair), Bo Li (Co-Chair), Ada Monzon, Diane Pataki, Raina Plowright
Session Moderators and Co-Chairs: Bo Li and Vicki Grassian

Dr. Jones introduced the working group moderators then turned the session over to Dr. Li and Dr. Grassian.

Dr. Grassian introduced the guiding questions which focused on the institutional hurdles to broadening participation, how to have better public visibility of ERE to help broaden participation, how to increase the potential professional and education pathways to broaden participation, economic barriers to broadening participation, and how working on environmental justice issues can lead to broader participation in STEM.

The discussion that followed emphasized areas where there are perceived gaps in NSF focus and funding, including K-12 STEM education, community colleges, student involvement in problem-solving for large challenges (e.g., climate change), accessibility for first generation and under-resourced learners, pay equity (for grad students, adjunct faculty, teaching faculty, etc.), and how to encourage more technical certification learners.

2:45 – 3:30 pm   Water Availability and Security
Work Group: Vicki Grassian, Kimberly Jones, Diane Pataki (Chair), Cathy Whitlock
Session Moderator and Chair of Work Group: Diane Pataki

Dr. Pataki opened the session by discussing the state of water resources and sources in the western US. Dr. Pataki noted that the working group supplied the committee with two reports in the briefing book to read before the meeting and that the Convergence Accelerator has an

equity and water sustainability track. Dr. Pataki presented the discussion questions which focused on knowledge gaps impacting the ability to provide safe and sufficient water sources, linkages across social and environmental systems, and the key areas and participants in research and education to engage on water availability and security.

The discussion touched on access to data, water quality and useability, linkages to other environmental and social systems, gaps in funding between NSF, NOAA, EPA, etc., community engagement, the need for more water sensing technologies, environmental toxicology, the coastal and drinking water interface, and the need for more interdisciplinary and convergent research.

3:30-3:45 pm   Break

3:45 – 4:45 pm   AC-ERE Priorities

Dr. Jones opened the discussion by asking the committee what the most important things to focus on in the next 6-9 months are. Dr. Jones also asked if there are areas where they need additional expertise and what specific products they need to put out for the Environmental Equity, Broadening Participation, and Water Availability and Security topics.

Discussion addressed the need for more committee members to meet the workload, the need to improve transdisciplinary and convergent research funding, and the need for clear guidance on some of the tools already available for interdisciplinary funding such as RAISE. The committee agreed that it would be useful to have a discussion with members of the Building a Resilient Plant initiative to understand what will be funded. Committee members noted that the Building a Resilient Plant framing allows for more aspects to be included beyond climate change, such as equity, broadening participation, and workforce development.

The committee discussed a dynamic roadmap to help inform the Assistant Directors, NSF at large, and the research community about what is needed to cut across portfolios internally and across agencies for environmental research and education. Specifically, a Roadmap to address some of the gaps discussed in previous sessions that are not covered by Building a Resilient Planet.

Dr. Jones then called for a vote to make the Minimizing Environmental Impacts of Research working group into a Subcommittee, which passed with one abstention. The Subcommittee will finish a white paper on this topic addressing the major concerns from the previous meetings with the other advisory committees and the discussion in this meeting and present the revised white paper in the spring meeting. The committee agreed to keep the Water Availability and Security a working group with topics likely included in the Strategic Roadmap.

4:45-4:50 pm   Committee Business
Approval of Minutes: The minutes were approved with one abstention.

4:50-5:15 pm Liaison Reports
Kimberly Jones, ENG
Dr. Jones reported on the Engineering Advisory Committee (AC) which highlighted topics, recommendations, and observations centered on broadening participation, education, innovations related to workforce development, and assessment of success.

Cathy Whitlock, GEO
Dr. Whitlock reported on the GEO AC, which had a joint meeting with the Office of Polar Programs (OPP) at the National Center for Atmospheric Research (NCAR) in Boulder, CO. That meeting focused on facility use and management, the field safety and sexual harassment (SAHPR) office, the new research vessel for Antarctic research, Building a Resilient Planet, and touched on the student decline in GEO and how to address the decline.

5:15 pm   Adjourn Day 1

10:00 – 11:00 am   AC-ERE Strategic Planning
                         Kimberly Jones, AC-ERE Chair
Dr. Jones presented a few slides on the last ten-year report the AC-ERE completed, *America's Future: Environmental research and education for a thriving century*. The committee discussed ways to disseminate any output that came out of a strategic roadmap and what the best time scale would be. The committee agreed that they would move forward with a strategic roadmap and that topics such as broadening participation, environmental equity, and workforce development, among others, would likely be part of the roadmap.

Liaison Reports
Robin Leichenko, SBE
Dr. Leichenko noted that the SBE AC meeting touched on Strengthening America's infrastructure (SAI) and Centers for Research and Innovation in Science, Environment (CRISES) as SBE programs that were relevant to the AC-ERE.

11:00- 12:00 pm   AI for Environmental Research and Education
                         Work Group: Lora Billings (Chair), Bo Li, Claire Monteleoni, Rodolfo Torres, Kimberly Jones
                         Session Moderator and Chair of Work Group: Lora Billings
                         Panelists:
                         Claire Monteleoni, Professor, Department of Computer Science, University of Colorado Boulder, AC ERE Member
                         Sara Beery, Assistant Professor, Artificial Intelligence and Decision-Making, MIT
                         Sidney D'Mello, Professor, Institute of Cognitive Science, University of Colorado Boulder
                         Anthony Scriffignano, Distinguished Fellow, Alfred Lee Loomis Innovation Council, The Stimson Center

Dr. Billings introduced the panel members, and stated that the purpose of the panel was to address significant opportunities in environmental research and education and noted a recent executive order on AI, safety, and security. Guiding questions for the panel were: 1) What are the most significant opportunities in research? And 2) How might we use AI to educate the next generation of scientists? Each of the panelists then introduced their background and specific interests in AI.

Claire Monteleoni, Professor, Department of Computer Science, University of Colorado Boulder, AC-ERE Member
Dr. Monteleoni discussed the use of AI in environmental data science to predict and protect from extreme events and cascading hazards caused by anthropogenic environmental change. One use mentioned was improving long-term prediction and downscaling climate model simulations for short- and medium-term decisions relating to mitigation and adaptation to climate change. AI could also be used to fill data gaps, which has equity implications for areas

that are data-poor. Dr. Monteleoni noted that an area that needs more work is extreme event detection and forecasting since models are trained to predict averages.

Sara Beery, Assistant Professor, Artificial Intelligence and Decision-Making, MIT
Dr. Beery discussed her work using AI to monitor ecosystems and biodiversity. Dr. Beery noted that there are many different data types from monitoring biodiversity and ecosystems including animals as intelligent sensors, stationary sensors like field cameras, citizen science apps, spectroscopy, and LiDAR that benefit from the use AI because the data is often imperfect, i.e., noisy, biased, and spotty. A major goal for using AI in environmental systems is to monitor the environment and detect changes across scales globally and in real time. Challenges include biased data, data-poor areas, and the large range of data types. Convergent research is needed to improve AI use for research and basic AI literacy in other fields is necessary to produce useful data for AI models.

Sidney D'Mello, Professor, Institute of Cognitive Science, University of Colorado Boulder
Dr. D'Mello described his work as the Director of the NSF funded AI Institute: [Institute for Student-AI Teaming](). The Institute thinks of AI as a collaborative partner in the classroom to assist both students and teachers in learning more effectively. Dr. D'Mello described the use of the Community Builder (CoBi) which builds community agreements with standards of how to interact with each other to assist students in collaboration both in and out of the classroom. AI is seen as a tool for improving learning as opposed to the subject of the learning.

Anthony Scriffignano, Distinguished Fellow, Alfred Lee Loomis Innovation Council, The Stimson Center
Dr. Scriffignano pulled from his experience as a chief data scientist to discuss data and AI convergence and student-to-workforce key skill development and challenges. Dr. Scriffignano noted that where AI and data converge is where the rate of change in a situation, such as a natural disaster, is faster than we can interpret what the data means. Likewise, for students and the workforce, Dr. Scriffignano noted that the field is changing quickly, and we need to think about how to prepare and keep relevant the next generation of students that will enter the workforce.

12:00 – 1:00 pm   Working Lunch: AI for Environmental Research and Education Discussion

Much of the discussion focused on modeling, large language models, generative AI, and the ability to use systems to predict environmental change. The discussion returned to justice, equity, transdisciplinary and convergent research, and training students to use AI and modeling within the contexts of their fields. The conversation also touched on how AI can be used as an education tool or an education topic as well as how to teach interdisciplinary thinking. There was also a discussion on how to fund interdisciplinary research when the tools to solve a problem are not novel, but they are being used to address an otherwise intractable, multi-faceted, major environmental problem in a new way.

1:00 -1:30 pm   Break

1:30 - 2:30 pm   Preparation for Discussion with NSF Senior Leadership

Dr. Jones synthesized the main meeting themes and then asked the members to work on summarizing key points for their discussion with the Directors Office. The main themes were interdisciplinary/transdisciplinary research funding, the equity ecosystem, and knowledge awareness of opportunities that already exist at NSF.

2:30 - 3:00 pm   Discussion with Dr. Sethuraman Panchanathan, NSF Director; Dr. Karen Marrongelle, NSF Chief Operating Officer; Mr. Brian Stone, Chief of Staff

The Director gave a brief introduction touching on AI priorities at NSF in response to the presidential executive order and the CHIPS and Science Act. The committee then discussed with the Director how to support interdisciplinary research both internally through reviewer education and externally through partnerships with other agencies. The Director noted that NSF's [Regional Innovation Engines](#) were set up to try to address some of these points and partner with other agencies. The committee then discussed knowledge awareness around changing policies and procedures at NSF and impacts on equity across academic institutions. The Director noted that they are working with R1 institutions to share resources and knowledge to establish community with other institutions in their area. [Growing Research Access for Nationally Transformative Equity and Diversity (GRANTED)](#) was noted as a good example but more are needed.

3:00 - 3:30 pm   AC-ERE Discussion Wrap-up 3:30 pm

Dr. Jones summarized the key takeaways from the meeting: 1) the Minimizing Environmental Impacts of Research group is now a Subcommittee and will wrap up the white paper, 2) the committee will work on a dynamic strategic roadmap looking 3-5 years out in environmental research and education fields, 3) environmental equity and broadening participation will be included in the strategic roadmap, 4) the committee will hear from Building a Resilient Planet to help inform the strategic roadmap, 5) the water security and availability discussion identified some potential gaps that will be included in the strategic roadmap, and 6) AI and environmental research and education will be included in the roadmap.

The committee voted to make the Strategic Roadmap an official Subcommittee.

Dr. Jones and Dr. Meacham thanked the committee members for engaging and the NSF staff for the meeting support and then Dr. Jones adjourned the meeting.