

Advisory Committee for Environmental Research and Education (AC ERE)

September 28-29, 2016

NSF Room 1235, 4201 Wilson Blvd, Arlington, VA 22230

Summary Minutes

Committee Members Present: Dr. David Skole (Chair), Dr. Tina Bahadori, Dr. David Blockstein, Dr. Michelle Buchanan (Sept. 28), Dr. Andres Clarens, Dr. Scott Doney (virtual Sept. 28), Dr. Margaret Honey (virtual Sept. 28), Dr. Charles Isbell, Jr., Dr. Anthony Janetos, Dr. Maria Carmen Lemos, Dr. Rich Loft, Dr. Paty Matrai, Dr. David McGinnis, Dr. Julia Parrish, and Dr. Anu Ramaswami

NSF Staff: Dr. Suzi Iacono (Head of the Office of Integrative Activities), Dr. Leah Nichols (Staff Associate OIA, Executive Secretary for AC ERE), Dr. Steve Meacham (Senior Staff Associate OIA, Executive Secretary for AC ERE), Mr. Patrick Southern (Program Specialist, OIA), Dr. Ariela Zycherman (AAAS Policy Fellow, ENG), Dr. Chris Washington (AAAS Policy Fellow, OIA)

Wednesday – September 28, 2016

8:30 – 9:30a New Member Orientation

Committee Members Present: Dr. David Skole, Dr. Tina Bahadori, Dr. Anthony Janetos, Dr. Maria Carmen Lemos, Dr. Rich Loft, Dr. Paty Matrai, Dr. David McGinnis, Dr. Julia Parrish

NSF Staff: Dr. Suzi Iacono, Dr. Leah Nichols, Dr. Steve Meacham, Dr. Karen Santoro

Dr. Santoro briefed the AC ERE's newest members on conflict of interest policy and other ethical considerations of their role as an advisory committee member. Dr. Suzi Iacono welcomed the committee members and discussed the history and purpose of the AC ERE. Drs. Skole and Janetos outlined the AC ERE's recent activity and current work.

9:30 – 10:00a Welcoming Remarks

Dr. Skole called the meeting to order and outlined the agenda. Dr. Iacono welcomed the committee to the NSF and briefed the committee on current activities at NSF, including: the FY2017 budget request, the pending move to Alexandria, results from the Federal Employee Viewpoint Survey, the Big Ideas, and award highlights from ERE relevant programs.

10:00 – 10:45a ERE Portfolio Assessment

Dr. Leah Nichols gave a presentation that outlined two of NSF's newest text mining tools and discussed the types of portfolio analysis made possible with these tools. She also demonstrated the capabilities of

these tools by explaining an example analysis that utilized the text of the AC ERE's Gold Report as input. The committee then discussed how these tools and analyses could be used to inform their deliberations.

11:00 – 11:45a AC ERE Business

The committee first approved the minutes for the March 2016 meeting. Dr. Skole then discussed the results of the online community input survey that sought comment on the research agendas that emerge from the Gold Report. It was noted that the survey received only a moderate response, with most suggestions appearing to come from the ocean and coastal sciences community. The committee decided to extend the duration of the survey and broadcast more widely its request for input.

The committee then discussed the draft white paper prepared by Dr. Skole. This white paper is being prepared in response to the Assistant Directors' collective request for specific research questions that would help advance NSF's ERE portfolio toward the vision put forth in the AC ERE's Gold Report. The committee decided to establish a subcommittee to hone the white paper and convene an interim virtual meeting in order to finalize and deliver the white paper to the NSF.

11:45 – Noon NSF Strategic Plan

The NSF is currently engaged in a process to prepare the agency's 2018-2020 strategic plan. Dr. Steve Meacham briefed the committee on this process and asked the committee to consider responding to the NSF's request for public comment. The committee decided to recommend that the NSF examine and take into consideration the AC ERE's recommendations outlined in the Gold Report while developing the next strategic plan.

Noon – 1p Working Lunch: Reports from Liaisons to NSF Advisory Committees

The AC ERE liaisons (Dr. Charles Isbell – AC CISE & CEOSE, Dr. Margaret Honey – AC EHR, Dr. Andres Clarens – AC ENG, Dr. Scott Doney – AC GEO, Dr. Michelle Buchanan – AC MPS, Dr. Dave McGinnis – AC SBE, and Dr. Rich Loft – ACCI) to NSF's other Advisory Committees provided updates regarding the activities of the other Advisory Committees – noting when possible points of intersection with AC ERE's interests. The committee spent a little time considering engagement with SBE and the AC SBE.

1:00 – 2:15p Sustainable Urban Systems

Introduction of NSF Smart and Connected Communities Initiative by Dr. Ken Calvert
(CISE/CNS Division Director)

Presentation by Dr. Stephanie Pincetl (University of California, Los Angeles)

Discussion led by Dr. Anu Ramaswami

Dr. Calvert briefed the committee about NSF's Smart and Connected Communities Initiative and the White House's Smart Cities Initiative. Dr. Pincetl gave a presentation titled "Cities in the Anthropocene: A Research Agenda" in which she situated cities as critical and understudied socio-environmental

systems. She juxtaposed the fact that more than half of the people on the planet already live in cities with the scarcity of data and theory about urban processes and change. She also argued that research on urban processes must take into account the highly contextual nature of cities.

The committee agreed that cities are complex socio-environmental systems in which social, engineered, physical, and natural systems all interact and that a significant knowledge gap exists with respect to understanding urban systems. The research required for understanding urban systems mirrors the recommendations outlined in the Gold Report. The committee also noted that:

- Many more data are needed in order to model urban processes, but many of the desired data do not exist or are very difficult to access;
- Environmental issues are often siloed from other issues, such as poverty and inequity, despite the fact that these issues all interrelate;
- Lots of opportunities exist for engagement with stakeholders and decision makers; and
- Urban system science should strive to forecast system trajectories and produce usable knowledge that allows decision-makers to act.

2:25 – 2:45p Briefing on Big Ideas

Dr. Iacono gave a presentation in which she outlined the processes by which NSF's Big Ideas were conceptualized and are being developed and described the current framing of the 10 different Big Ideas. The committee asked about research on environmental change in this context. Drs. Iacono and Dr. Wakimoto pointed out that Navigating the New Arctic and the Rules of Life Big Ideas are focused on environmental questions. They also noted that the Harnessing Big Data Big Idea would be important to the ERE community, as would the process-oriented Convergence Big Idea. Dr. Skole noted that the next several sessions of the meeting would delve into the intersection of these Big Ideas with NSF's ERE portfolio.

3:00 – 4:15p Harnessing Data for 21st Century Science and Engineering

Introduction of Big Idea by Dr. Jim Kurose (CISE Assistant Director)

Presentation by Dr. David Maidment (University of Texas, Austin)

Discussion led by Dr. Charles Isbell

Dr. Kurose described the Harnessing Data Big Idea to the committee. He described a need to harness the data revolution by supporting research reliant on large-scale data, educating students to utilize large-scale data, and to build the cyberinfrastructure ecosystem. He also noted the possible need for a new data science discipline. Dr. Maidment then gave a presentation in which he used the recently-launched National Water Model as an example of significant advancement within the ERE field through a national-scale data initiative.

The committee first suggested some potential opportunities for connecting the National Water Model with other datasets, such as land use zoning and property value data, census data, and National

Ecological Observatory Network (NEON) data, in order advance ERE. Then the committee discussed some of the challenges of harnessing data in these contexts, including the need to incentivize people to share data and work across disciplines, the need to build cyberinfrastructure to support and utilize these data, and the need to involve decision-makers in the development of some data tools.

4:30 – 5:30 Growing Convergent Research at NSF

Members of NSF’s Convergence Working Group present: Dr. Grace Wang (AD ENG), Dr. Roger Wakimoto (AD GEO), Dr. Jim Olds (AD BIO), Joan Ferrini-Mundi (EHR), Dr. James Kurose (AD CISE), Dr. Suzi Iacono (OH OIA)

The Assistant Directors from the Convergence Working Group outlined their vision of convergence research and asked the committee for its thoughts on (a) the key technical, organizational, and operational challenges that hinder highly convergent complex socio-environmental system research; (b) opportunities to stimulate research that is deeply integrated with environmental research; and (c) how to educate students so that they are prepared to do convergent research. The committee discussed how convergent research compares with interdisciplinary research and agreed that the need for better support for convergent research is high. The discussion revealed that convergent research is typically more problem-focused and more integrated than interdisciplinary research.

The committee continued by noting that convergent research will likely require the co-production of knowledge, so the NSF should consider encouraging the early involvement and frequent engagement of stakeholders with researchers. Committee members also commented on the need for NSF to recognize and support scientists with the broad diversity of skill-sets needed for convergent research. The committee also discussed the importance of including early career scientists on teams charged with conducting convergent research. The committee also noted the importance of taking ethics into consideration when supporting problem-focused research.

Thursday September 29

9:00 – 10:15a Navigating the New Arctic

Introduction of Big Idea by Dr. Roger Wakimoto (GEO Assistant Director)

Presentation by Dr. Amanda Lynch (Brown University)

Discussion led by Dr. Paty Matrai

Dr. Wakimoto described the Navigating the New Arctic Big Idea to the committee. He noted that the New Arctic Big Idea focuses primarily on the establishment of cyber-enabled observational infrastructure to document the rapid changes already occurring in the Arctic. He also discussed the importance of community engagement and the parallels he sees between the New Arctic Big Idea and the ERE’s Gold Report. The New Arctic Big Idea would improve data and predictions about the Arctic, couple science with engineering, and support design for resilience. Dr. Lynch then gave a presentation titled “Navigating the New Arctic: Trajectories of Change” that outlined the how current polar projects

generate expectations regarding access to resources, trade, and international security. She argued that while science can generally project long-term trends of Arctic change, predictions of interannual variability are lacking – yet these shorter-term predictions are critical to economic activity, security, and human well-being.

The committee noted a critical need for studying the Arctic and agreed with Dr. Lynch’s assertion that the scientific prediction of interannual variability within the Arctic needs to be advanced. They discussed how the need for decision-relevant science in the Arctic is pushing the science in important ways. The committee also noted that scientific understanding of risk and resilience is important in the changing Arctic and that the social sciences must be deeply integrated into these efforts in order to understand the impacts of policy on the Arctic system. One committee member urged the NSF to consider supporting an Arctic-based Decision Making Under Uncertainty (DMUU) Center. The committee also noted that the Arctic provides significant opportunity for international collaboration.

10:30 – 11:00a Prepare for Discussion with NSF Leadership

The committee discussed potential questions for NSF Senior Leadership.

11:00 – Noon Discussion with NSF Director France Córdova

Dr. Skole welcomed the Director and outlined the meeting agenda. After commenting about her participation in the recent Arctic ministerial meeting, the Director noted that environmental change is happening faster than our ability to predict the changes. Dr. Ramaswami then described the committee’s interest in advancing the science of urban systems. The Director asked the committee to articulate what specific research is needed and how science might best proceed to accomplish these objectives. The committee noted that urban systems are complex socio-environmental systems and much science is needed in order to understand the interactions across and between component parts and the processes that govern change within cities. The committee also noted the importance of working with stakeholders and producing science that allows decision-makers to act. The discussion then turned toward NSF’s Big Ideas and the intersection of the 10 Ideas with the ERE portfolio and the vision outlined in the AC ERE’s Gold Report. In addition to noting several points of intersection, the Director invited the committee to suggest a couple of research themes from the ERE community that the NSF might consider as testbeds for how NSF might approach convergent research.

Noon – 1:00p Working Lunch: General Discussion of NSF’s Big Ideas

Over lunch, the committee engaged in a general discussion of NSF’s Big Ideas. The committee was generally enthusiastic about the ideas, but also wanted greater clarity about the specific focus of some of the ideas. Members noted that the Big Ideas, especially the Convergent Research Big Idea, are focused on bringing about solutions to societal problems – which is an aim that aligns well with the committee’s recommendations in the Gold Report. The committee also discussed whether and how its

thoughts regarding the Big Ideas should be reflected in the supplemental white paper to the Gold Report.

1:00 – 1:30p Powell Center for Synthesis and Analysis

Mr. Kevin Gallagher (USGS)

Mr. Kevin Gallagher gave a presentation in which he described the work of the USGS Powell Center for Synthesis and Analysis to the committee. The committee asked clarifying questions primarily around whether and how the Powell Center was integrated with other research centers.

1:30 – 2:00p NEON Science Opportunities

Briefing by Dr. Tim Kratz (BIO/DBI Program Director)

Dr. Tim Kratz gave a brief presentation in which he outlined the purpose, scope, and current status of the National Ecological Observatory Network (NEON). He also discussed some of the science opportunities that are being made possible by NEON. The committee was interested in how NEON interacted with other programs, such as the Experimental Program to Stimulate Competitive Research (EPSCoR) and the Ocean Observatories Initiative (OOI).

2:00 – 2:30p NSF Broader Impacts Assessment

Dr. Suzi Iacono (OIA Office Head)

Dr. Iacono gave a presentation that outlined an extensive study of broader impacts in NSF's portfolio. This study used text-mining algorithms to identify the types of broader impacts described in NSF's proposals and awards and examined patterns of broader impact types by directorate, investment types, and project size. The committee was very interested in and receptive to this analysis. Members suggested combining the broader impacts assessment with the ERE portfolio assessment and recommended focusing part of a future meeting on broader impacts of the ERE portfolio.

2:30 – 3:00p Discussion of AC ERE Future Trajectories

The last session was spent discussing action items and next steps for the committee. The committee members first decided that their collective input regarding NSF's strategic plan could be summarized and delivered to the NSF in the Chair's letter report about the September meeting. They also decided to establish three subcommittees to complete work in the interim between meetings:

- Gold Report Supplement Subcommittee: This subcommittee will be comprised of a small group of existing members. They will complete and refine the white paper supplement to the Gold Report.
- Big Ideas Subcommittee: This subcommittee will also be comprised exclusively of existing members. This group will first rapidly respond to NSF's request for research ideas from the ERE

community that could immediately benefit from support to encourage convergence by outlining specific examples of such research in a short white paper. Subsequently, this subcommittee will also consider the other Big Ideas and identify emergent environmental research areas congruent with the other Big Ideas.

- Urban Systems Subcommittee: This subcommittee will include some existing committee members and experts drawn from the broader urban systems research community. They will develop a white paper that articulates a compelling research agenda that will significantly advance and transform our understanding of sustainable urban systems.

The committee also decided to convene via teleconference in November or December in order to discuss and deliver the Gold Report Supplement white paper and the Convergence Research Ideas white paper to the NSF in a timely manner.

3:00p Meeting Adjourned